VOLUME VII | **March, 1915** | NUMBER 11

CONTENTS

Logging, Plantation, Mining, Industrial & Standard Railroad Motive Power.

THE LOCOMOTIVE WORLD

VOL. 7, No. 11 LIMA, OHIO March, 1915

THE LOCOMOTIVE WORLD

PUBLISHED MONTHLY BY

THE FRANKLIN TYPE AND PRINTING COMPANY

H. C. HAMMACK, Editor

WEST AND HIGH STREETS LIMA, OHIO.

Published in the interest of Private Railroad owners and users of Equipment for Logging, Mining, Plantation and Industrial Railroads, etc.

SUBSCRIPTION RATES

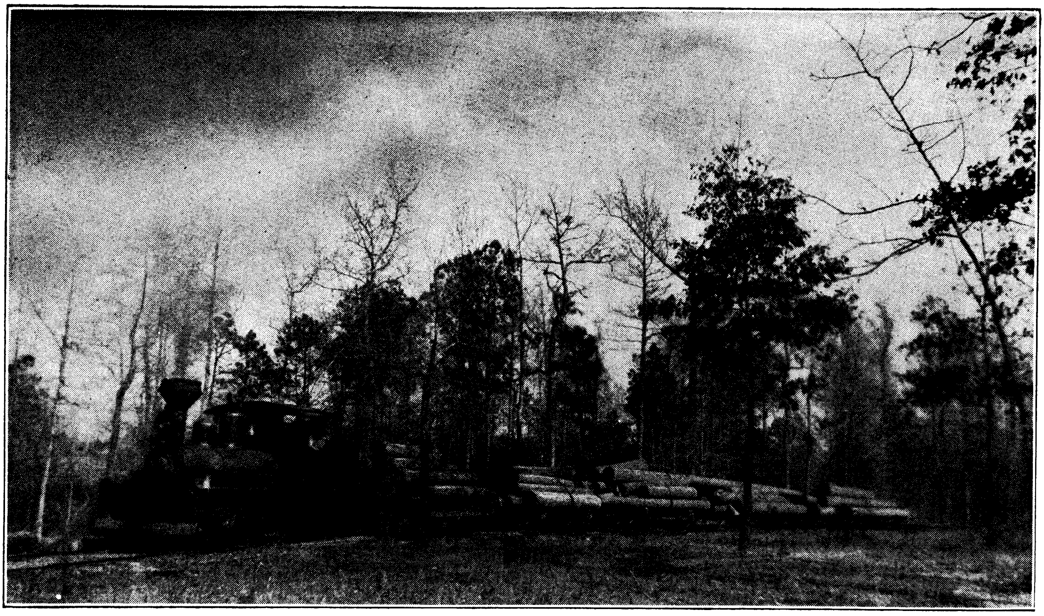
United States, Canada and Mexico.....................50c a year
Foreign...75c a year

Index to Advertisements, Page 15

CONSTRUCTION OF LOGGING RAILWAYS.

IT has been proven that the logging railway is one of the most important links in the chain in the manufacture of lumber, and that being the case there is no question in the minds of economists that there is a great chance in this division of the business for some improvement. Many logging railways are built without serious consideration as to location, and while it may add a small amount of expense to have a civil engineer lay out the road, it will undoubtedly be a saving in the end. Another feature which is well to consider is that of securing the services of a civil engineer experienced in surveying and laying out logging railways. Most any civil engineer can survey the road, but surveying and locating a line are two different classes of work. Civil engineers who specialize in laying out and surveying logging railways will locate your line so that your operations can be carried on much more economically than an engineer who has never had any experience in this line.

In constructing a logging railway the first cost is always an important item, but many times a few hundred dollars per mile added to the initial cost will save thousands of dollars in the cost of operations. However, when building a logging railway to be operated by Shay geared locomotive, considerable saving can be effected as much heavier grades and sharper curves can be negotiated with this type of locomotive. Many times engineers will recommend going to heavy expense to eliminate grades and curves, while as a matter of fact if the proper equipment be used this expense can be cut out and the operations will be just as satisfactory as if the grades and curves were eliminated. Of course reason must be used in deciding this question. The Shay locomotive will operate satisfactorily on grades up to 10 per cent, yet it would be folly for any concern to use heavy grades if a line can be located where the grades can be cut out entirely.



Logging with 45 ton Shay Locomotive, Hope Lumber Co.,
Hope, Arkansas

Shay Locomotive on Logging Railway, Hollywood Lumber Co.,
Palmer, W. Va.

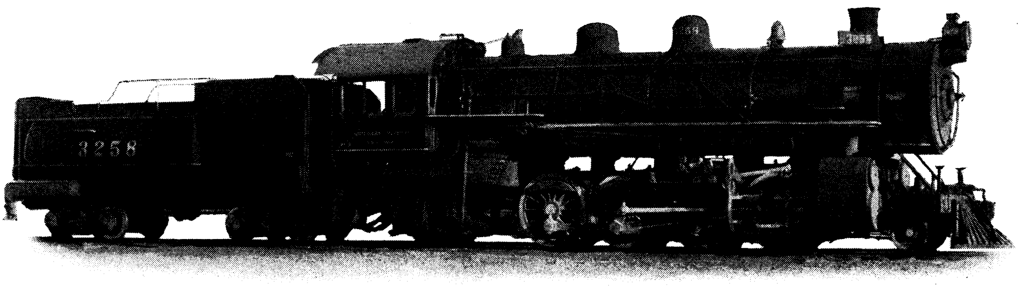
New Mikados for the Southern Pacific

IN the accompanying illustration is shown a Mikado type locomotive, twenty of which have just been completed for the Southern Pacific Company by the Lima Locomotive Corporation.

One of the most interesting features of the design lies in the extensive use of vanadium steel for many of the important parts.

These engines are the first new power purchased by this road on which this material has been used.

Its use in this case was largely due to the excellent results secured from it in similar applications by other roads.



Mikado Type Locomotive, Southern Pacific Company—Extentive use of Vanadium Steel a Feature of the Design.

Heat-treated vanadium steel has been used for practically all the forged steel parts subjected to the heaviest stresses or wear. These include main rods, parallel rods, piston rods, axles, main crank pins and crosshead keys. The frames and frame rails are also made of vanadium cast steel.

In general, the engines are representative of a straight forward, powerful design of Mikado type locomotive.

They are designed for passenger service and are intended for the Sacramento division.

With a total weight of 282,000 lbs. and a theoretical maximum tractive power of 51,075 lbs., they rank among the heavy examples for the above class of service.

Some of the principal dimensions of the design are given in the following table:

Weights	
On driving wheels	210,000 lbs.
Total engine	282,000 lbs.
Total engine and tender	447,000 lbs.
Wheel Base	
Driving	16 ft. 6 in.
Rigid	16 ft. 6 in.
Total engine	35 ft. 2 in.
Total engine and tender	69 ft. 9⅛ in.
Cylinders	
Diameter	26 in.
Stroke	28 in.
Driving Wheels	
Diameter, outside	63 in.
Boiler	
Working pressure, per sq. in.	200 lbs.
Outside diameter at front end	82 in.
Fire-box, width and length	84 in. x 120⅝ in.
Tubes and flues, diameter	2 in. and 5⅜ in.
Tubes and flues, number	275-2 in.; 36-5⅜ in.
Tubes and flues, length	20 ft. 6 in.
Heating surface, fire-box	325 sq. ft.
Heating surface, tubes	3974 sq. ft.
Superheating surface	865 sq. ft.
Equivalent heating surface (L. L. Corp. method)	5596 sq. ft.
Grate Area	70.4 sq. ft.
Tender	
Water Capacity	9,000 gals.
Oil Capacity	2,940 gals.
Maximum Tractive Power	51,075 lbs.

Among the detail features of design will be noticed outside steam pipes and self-centering valve stem crosshead guides.

In the boiler construction, the extensive use of Tate flexible staybolts throughout the breakage zone will also be noticed.

The boiler is equipped with a Schmidt superheater of 36 units.

The vanadium cast steel main frames are 4½ in. wide.

A substantial system of cross-frame bracing is employed. This includes cast steel cross braces at main and back pedestals, a cross tie of the same material between main and back drivers. There is also a big cast steel motion bearer cross tie between main and intermediate drivers: a combination cross tie and brake shaft hanger ahead of the front drivers and a wrought iron cross tie at the base of the intermediate pedestal. The guide yoke knee is of cast steel and serves the purpose of a cross tie on top of the frames between the front and intermediate drivers. The cast steel front furnace bearer also serves as a cross tie. This is likewise true of the cast steel back equalizer fulcrum. Finally, there is the usual foot plate at the back end of the frames.—*American Vanadium Facts.*

THE BRITISH THERMAL UNIT

One B.t.u. is the quantity of heat required to raise the temperature of one pound of water one degree. As a gallon of water weighs 8⅓ pounds, it requires 8⅓ B. t. u. to raise the temperature of one gallon one degree, or 16⅔ B.t.u. to raise the temperature two degrees, and so on.

Thus, when a given coal is said to have a heat value of 13,800 B.t.u. per lb., it is meant that if all the heat caused by the complete combustion of one pound of that coal could be transmitted to 13,800 pounds of water it would raise the temperature of that water one degree. Or, if all the heat could be transmitted to, say, 138 pounds of water, it would raise the temperature of that water just 100 degrees, because

$$138 \times 100 = 13{,}800.$$

The pounds of water heated multiplied by the number of degrees the temperature has been raised equals the number of B.t.u. The standard method of finding the heat value of a fuel is to burn a small sample of it in a tight steel bomb under water. The heat caused by the burning of the sample is then all absorbed by the water and by multiplying the weight of the water by its rise in temperature and dividing by the weight of the sample, the heat value of the coal is calculated direct in B.t.u. per pound. Thus, if we burned a small sample weighing one five-hundredth of a pound in a bomb immersed in 5 lb. of water, and if the temperature of that water increased from, say, 70.4 degrees to 75.92 degrees, a rise of 5.52 degrees, the heat value of the coal would be

$$\frac{5 \times 5.52}{0.002} = 13{,}800 \text{ B.t.u. per lb.}$$

—*The Valve World*

STATISTICS OF FIRE LOSSES

In Chicago dwellings of brick and of frame construction have been collected by Albert C. Cone, editor of the "American Lumberman," and were presented before the building committee of the Chicago City Council recently. These statistics showed that the total fire loss in dwellings alone is surprisingly small. If all the frame dwellings in Chicago, 90,000 in number, were to be replaced by buildings absolutely incombustible, and if all combustible materials were removed from their interiors so that no fires whatever could possibly occur in these 90,000 dwellings, the total fire loss of Chicago would be reduced only 3½ per cent. The Cone statistics further show that the average Chicago frame dwelling has a fire occur in it once every 54 years, in which fire damage of less than $100 is done. Only once in 2758 years does a fire in a frame dwelling communicate to an adjoining building, and only once in 4444 years will a fire occur that will totally destroy the building. Comparing the total fire loss on frame dwellings with their number, Mr. Cone finds that if the City of Chicago had paid in full the entire loss on every fire in frame buildings and their contents in 1913, and assessed the loss on each frame dwelling, the average assessment would have been only $2.11. On 30,000 brick dwellings in Chicago, if the fire loss in 1913 had been distributed in the same way, the assessment would have been $2.93. Mr. Cone's statistics are worth the careful study of engineers responsible for the framing of fire laws and building ordinances.—*Engineering News.*

WORDS OR WORK

Efficiency is the obtaining of results, and results are achieved by work, not by words. Many employers of men have made grievous mistakes by selecting men who were good talkers over those that were good workers to fill responsible positions. Talk is cheap and requires but little energy; work requires effort and concentration and when a man is occupied with work his mind has little opportunity to frame sentences and carry on a conversation.

Many men talk too little for their own good, but many more talk too much. Handle words with care and use them when occasion arises, but be sure that by their use results will be produced. This is the age for result producers. —*Southern Machinery.*

The Possibility of Fire from Locomotive Sparks

Data Obtained from Tests on the Chicago, Indianapolis & Louisville; Greatest Danger Within 50 ft. of Track

AT the December meeting of the Western Railway Club Prof. Lawrence W. Wallace, of Purdue University, presented a paper on the possibility of fire from locomotive sparks. In the summer of 1913 he and Professor Young, also of Purdue, conducted some spark tests on the Chicago, Indianapolis & Louisville, just north of Lafayette, Ind., where there is a 0.77 per cent grade. In the preparation for the tests a plot of ground was marked on each side of the track. Five rows of stakes 20 ft. apart were set at right angles to the track. The stakes in each row were spaced 20 ft. apart, starting from the center of the track and extending to 125 ft. Beyond this distance the stakes were located 150 ft., 200 ft., 300 ft. and 350 ft. from the center of the track. Pans 12 in. square by ⅜ in. deep were placed at each stake. The pans in three or four rows contained paraffine, while those in the remaining rows contained cotton fleece. An American type locomotive (No. 66) and a six-wheel switching locomotive (No. 9) were used in the tests, the former having 18-in. by 24-in. cylinders, 67-in. drivers, a total weight of 100,000 lb., and a tractive effort of 15,800 lb. The switching locomotive had 18-in. by 22-in. cylinders, 45-in. drivers, a total weight of 88,000 lb., and a tractive effort of 20,100 lb. An anemometer was used for obtaining the velocity of the wind.

In conducting the tests the locomotives were run by the field containing the pans at four different speeds varying from a low speed to the maximum that could be obtained under each load hauled. Tests were made with the engine and caboose alone, and tests were then made for each increase in tonnage until the full tonnage was obtained. For each test the direction of the wind and its velocity, the temperature, the condition of the weather, the number of cars, the weight and speed of the train, the position of the reverse and throttle levers, the draft and the character of the smoke were taken.

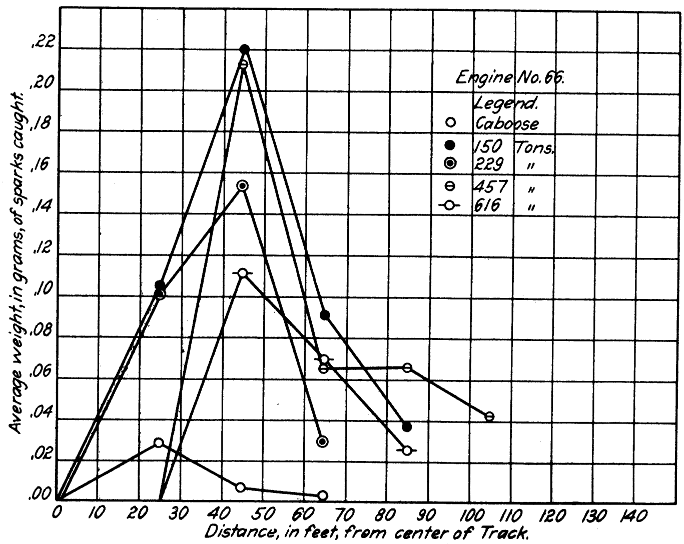


Fig. 1.—Average weight of sparks caught from the American type locomotive

Fifteen tests were made with the American type engine, a summary of the results being shown in Fig. 1, the chart showing the average weight of sparks caught in each pan for the tests made with the different tonnages. From this it will be seen that the greatest number of sparks fell within 50 ft. from the center of the track. No sparks were caught beyond 150 ft., and in only one test were there sufficient sparks caught at 150 ft. to weigh. It was also found that the quantity of sparks ejected was not materially affected by an increase of tonnage. It was evident, however, that as the tonnage increased the range over which the sparks were spread increased. Of the total weight of sparks caught, 71 per cent was within 45 ft. of the center of the track and 85 per cent within 55 ft.

The tests with the switching locomotive were made in the same manner as those with the American type. Fig. 2 shows similarly the results obtained. These curves have the general characteristics of those illustrating the other tests. No sparks were caught further than 65 ft. from the track when the caboose alone was attached. With a full loading of 630 tons a comparatively large amount were caught at 150 ft., but at the next station beyond there was no trace found. Sixty-two per cent by weight of all the sparks caught from this locomotive was within 50 ft. of the center of the track, and 81 per cent was caught within 65 ft.

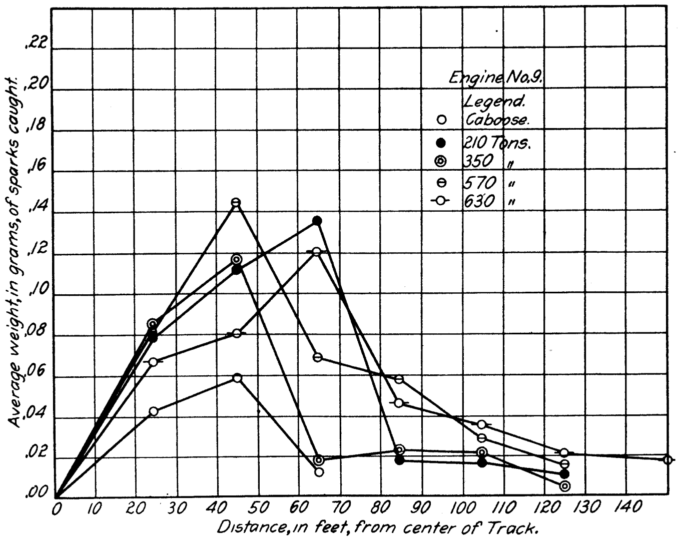


Fig. 2.—Average weight of sparks from the Switching locomotive

There were 613 sparks from both locomotives in all tests caught in the paraffine pans, that were warm enough to stick or to melt into the paraffine. Of these, 83 per cent were caught within 45 ft. of the center of the track, and 96 per cent within 65 ft. In Fig. 3 the total number of sparks that stuck in the paraffine for each locomotive is shown plotted against the distance from the center of the track.

One of the purposes of the test was to determine, if possible, to what extent the possibility of fire from locomotive sparks was influenced by the velocity of the wind, but as the wind velocity during these tests did not exceed nine miles an hour definite results were not obtained. It is intended, however, to continue the tests some time in the spring when the wind is much stronger. From a study of the information obtained under these conditions no fixed law was found as to the influence of the wind on the sparks.

Paraffine and cotton fleece were used in the pans in order to determine as far as possible the temperature of the sparks when they reached the ground. The sparks sticking to the paraffine were closely studied and compared with similar sparks at known temperatures placed in paraffine in the laboratory, and in this way the sparks caught in the tests were assigned temperatures. Laboratory tests were made for the purpose of determining the temperature at which locomotive sparks of different sizes would set fire to various combustible materials and to obtain data whereby the temperature of the sparks falling in the paraffine pans in the tests might be gaged. In preparation for this several hundred pounds of sparks were sifted. The sieves used were carefully made and were of ⅝-in., ½-in., 7-16-in., ⅜-in., ¼-in. and 3-16-in. mesh, the sparks being passed through the sieves in the order named. One or more of each of the several sizes of sparks was placed in a small furnace until a temperature of 100 deg. F. was reached, and for a few minutes thereafter to insure that the sparks were of an equal temperature. Then one spark of each size was dropped on each of the combustible substances prepared, namely, cotton fleece, dry grass, excelsior and paraffine, and was closely observed in order to discern what took place. These tests were repeated for all sizes of sparks and for all temperatures

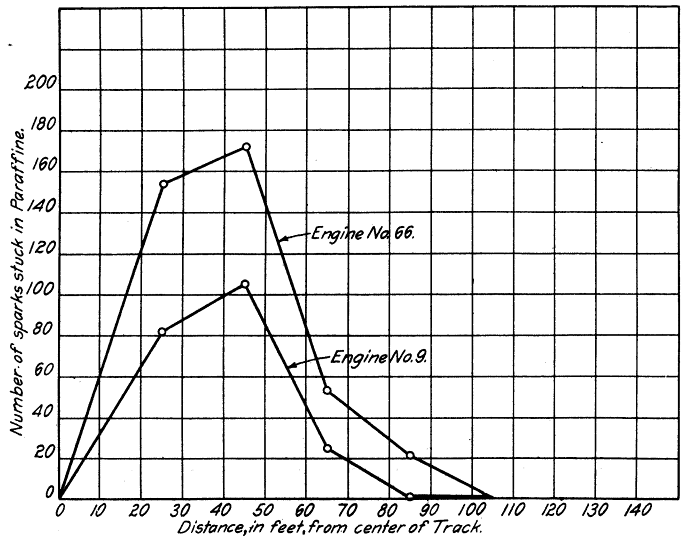


Fig. 3.—Total number of sparks that stuck in the paraffine for both locomotives

up to and including 1,800 deg. F., the increment of increase of temperature being 100 deg. F.

The conclusions drawn from these laboratory tests are: First, that it requires a spark larger than ¼ in. at a temperature greater than 1,000 deg. F. to ignite so inflammable a material as cotton; second, it requires a spark larger than ⅜ in. at a temperature greater than 1,400 deg. F. to burn either excelsior or dry grass, and for the latter even higher temperatures may be required. From the information obtained in the laboratory tests with the paraffine pans, the 613 sparks that were hot enough to stick to the paraffine in the field were studied and only one gave evidence of having been at a temperature of 1,200 deg. F.; this spark was caught 25 ft. from the center of the track. Only three sparks were graded as having been 1,000 deg. F., and of all the sparks that were 800 deg. or more, there was only one than was caught in the pans as far away from the track as 85 ft. Of all the sparks graded as being 200 deg. F., and there was a large number, only two were found as far as 105 ft. from the center of the track. Out of the 32 tests with the two different locomotives worked at their greatest capacity and with the wind velocity as high as 8.7 miles per hour, only four sparks having a temperature of 1,000 deg. F. or over, were caught, and they fell within 65 ft. of the track. Even then it was shown by the laboratory tests that a spark must be hotter than 1,000 deg. F. to set fire to so combustible a material as cotton.

From these tests it was found that the greatest danger of fire from locomotive sparks is within 50 ft. from the center of the track; and that it is unlikely that any sparks over 1,200 or 1,300 deg. F. will reach the ground from a locomotive stack. For a locomotive spark ⅜ in. or less to set fire to so inflammable a material as cotton fleece it must reach the ground at a temperature of 1,300 deg. F. For excelsior the temperature must be 1,600 or 1,700 deg. F., and to set fire to dry grass it must be 1,700 or 1,800 deg. F. The largest sparks caught during the road tests were less than 3-16 in. Professor Wallace stated that the subject had not been fully covered, and the influences of wind of higher velocity and of heavier working conditions are yet to be determined.—*Railway Age Gazette.*

NATIONAL FOREST FIRES IN 1914

The season of 1914, according to the officials of the forest service, carried greater danger from fire to the national forests than any year since the establishment of the national forests. To meet this emergency and to prevent great loss of public property, the department of agriculture was obliged to exceed the amount appropriated for fire protection and incur a deficiency of $349,243. The conditions of drought and other factors of forest fire hazard were said to be worse than in 1910, when the disastrous Idaho fires occurred.

Weather bureau reports show that in most of the Rocky Mountain and Pacific coast region last winter's snows were much below the normal, and as a result there was an early spring and an early drying out of the forests. In western Montana and northern Idaho there were forest fires in considerable numbers by the end of May and they continued until October. In California, where there is normally a very long season of drought, the fire season started in some portions five weeks earlier than usual, and in the southern part of the state fire danger was still great at the end of November. A long dry season, sustained periods of high temperature, recurring hard and steady winds, and in certain places, unusually hot, dry nights, rendered the forests exceedingly inflammable and the problem of fire prevention unusually difficult.

The total number of fires during the season of 1914 which threatened the national forests and which had to be handled by the protective organization of the forest service were 6,112, or about 1,000 more than occurred in 1910. This number represents the fires reported up to December 1. At that time reports indicated that there was still a dangerous condition in southern California and in certain portions of the national forests of the east. The service says that the total for the year will be increased by fires in these regions during December.

The most serious conditions are reported from western Montana and northern Idaho and on the Pacific slope. The weather conditions in the central and southern Rocky Mountain regions were more nearly normal. As a consequence only fifteen per cent of the total number of all national forest fires occurred in these regions and they were handled without difficulty and with very small loss of property.

Of the entire 6,112 fires which threatened the national forests, eighty-one per cent were extinguished by the protective organization before they had covered ten acres. The percentage of fires that burned over more than ten acres was smaller than in any previous year.

While detailed reports have not yet been received appraising the exact loss to the Government through the forest fires, a preliminary estimate shows that the loss of merchantable timber will probably not exceed $400,000. In 1910 the corresponding estimate of loss was nearly $15,000,000, but later estimates materially reduced the amount. Through the work of the protective force the fires this year were largely confined to old burns and to less heavily timbered areas. The loss to the Government through the destruction of young trees which had sprung up in these openings is larger than the actual loss to green timber.

In Montana and Idaho alone, it is said that the value of specific bodies of timber which were threatened by the approximately 2,000 fires which started and were put out, aggregated the enormous sum of over $59,000,000. It was in this section that the largest amount of money had to be spent to prevent a recurrence of the great disaster of 1910. In Oregon and Washington, the 1,200 fires which were handled by the department threatened upwards of $24,000,000 worth of timber. And these figures, according to the department experts, do not include the value of non-merchantable land, and several million dollars worth of ranch and private property which lay in the path of the threatening conflagrations.—*Mississippi Valley Lumberman* (Minneapolis).

WORRY AND HURRY

Street cars start every minute. Men and women rush wildly to catch each car and save the part of a minute.

Every man hurries to his home and hurries away every day.

Every employe, every child, hears all day long the word, "Hurry."

There is little peace or rest for any of us except those staring in the cradle, or dozing in old age.

And even the poor little baby in the cradle is hurried from one bottle to another and from one bath to another.

And old age is worried by the hurry that goes on around.

Every one of us has inside of his skull a power that drives him. And if the power is too weak to force him to hurry and struggle, wearing himself out if necessary, he is among the failures.

The question that every man should ask himself as he feels the lash fall upon his shoulders is:

"What is driving me? Am I well or badly driven?"

The only good driver is the little driver AMBITION. The harder he drives you the better, and the farther he drives you the better. Your legs and your lungs may get tired, your heart may beat and your head become wearied. But you will get in the end, even though it be in the grave, a reward for all the driving that ambition does.

There are other drivers—cupidity, selfishness, vanity.

The main thing is to get the right kind of a driver, and then go as far and as fast as you can.

Ambition sent General Grant through the war and into the White House.

Ambition sent Christopher Columbus across the ocean, sent Peary to succeed at the North Pole and Scott to die at the South Pole.

Ambition drives the little unknown clerk, who will be the big man ten years from now, as he drives Theodore N. Vail, long past middle age, who, without need, is doing ten men's work at the head of the telephones and telegraphs.

Ambition drives the millions of mothers whose ambition for their children makes every sacrifice welcome.

If you are not harnessed up to ambition you are not going anywhere in particular.—*Bagology.*

COAL EXPORTS FROM UNITED STATES

The United States, which produces 40 per cent of the world's coal, exports annually 27,500,000 tons, or about 5 per cent of the output of last year, the total export in the fiscal year being valued at $86,000,000. Exports of domestic coal have doubled during the last decade, having increased from 8,482,867 long tons in 1904 to 19,664,080 tons in 1914, the latter total being with one exception (1913) the largest on record.—*Railway and Locomotive Engineering.*

The Burroughs—A Help to the Station Agent

A Burroughs Adding Machine helps the Station Agent because it enables him to get his work out during the ordinary working day—

Because it makes it easier to do the work by shortening the time required to do the necessary things, and by cutting out the drudgery of going over work already done.

The Burroughs is especially helpful in the one-man station, because here it really becomes an assistant to the agent. You can't appreciate how many hours of overtime work a Burroughs will relieve you of, until you have tried it in your station office on ***your*** work.

No matter what your problems are we have a Burroughs to fit the case. The Burroughs man will be glad to size up your requirements and recommend the machine that will handle your work to best advantage.

Burroughs Adding Machine Co.

146 Burroughs Block, Detroit, Michigan

MINING & SCIENTIFIC PRESS

Controlled and Edited by Mining Engineers
Now in its Fifty-second Year
Published Weekly at
J20 MARKET STREET, SAN FRANCISCO

BRANCH OFFICES
Chicago, 734 Monadnock Building
New York, 29 Broadway
London, 819 Salisbury House, E. C.

Railway and Locomotive Engineering

The largest circulation of any Railroad Journal in the World among the men engaged in mechanical departments of railways.

Official Organ of the International Railway General Foreman's Association.

Has long been acknowledged the most interesting Technical paper published.

MONTHLY, $2.00 A YEAR

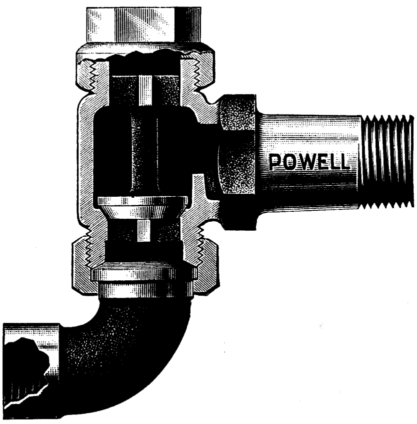
Specimen copy on request. 114 Liberty St., New York

The Locomotive World

Published in the Interests of Private Railroad Owners. Sample copy on request.

Subscription Price { Domestic, 50 cents a year. Foreign, 75 cents a year.

PUBLISHED MONTHLY AT West and High Streets, Lima, Ohio



Ask your dealer for Powell Valves, or write us.

POWELL VALVES

(Especially The "White Star" Valve)

Five Points of Efficiency Combined in the Powell Locomotive Boiler Check Valve

1—Body symmetrically designed and well proportioned. Metal distributed to meet the most wear.

2—They are cast of the best steam bronze composition and machined with great care.

3—The disc and seat accurately fitted and thoroughly ground; guided both top and bottom.

4—The elbow swivel connection has a ground face and heavy large hexagon nut.

5—Made of few parts, all easily accessible and interchangeable.

We manufacture a complete line of Locomotive Valves, Lubricators, Oil Cups and Grease Cups

ESTABLISHED IN 1846

Oldest Regrinding Valve Manufacturers in the World

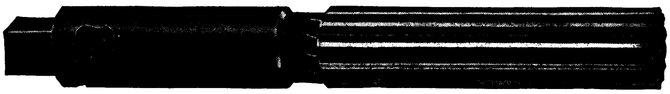
THE WM. POWELL CO.

DEPENDABLE ENGINEERING SPECIALTIES.

CINCINNATI, O.

In answering advertisements please mention The Locomotive World


These Tests
were made with our regular stock of
Seamless
Steel Boiler Tubes
Arch Tubes
Superheater Flues
and
Pipes
and tell the story of strength, toughness, ductility and vast superiority of these tubes over other types.
Samples and test pieces gladly furnished if required.
We solicit your valued inquiries.
PITTSBURGH
STEEL PRODUCTS CO.
PITTSBURGH, PA.
BRANCH OFFICES
NEW YORK · CHICAGO · ST. LOUIS



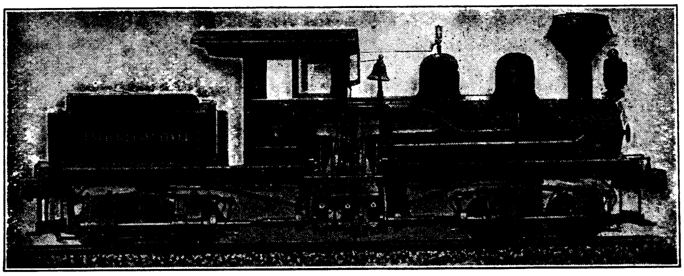
INDEX TO ADVERTISERS AND WHAT THEY HAVE TO SELL

SECOND HAND LOCOMOTIVES

***

This
18 Ton
Second Hand
Shay Locomotive
For Sale at a
Bargain
Write
or
Wire for
Full Particulars

Reference No. 137



This Locomotive is built for 56½" Gauge

PARTIAL LIST OF SECOND-HAND LOCOMOTIVES

	Tonnage	Type	Gauge	Location	Reference No.
1	55	Shay	56½"	New Mexico	0832
1	65	Shay	36 "	New Mexico	083
1	65	Shay	56½"	New Mexico	0831
1	30	Mogul	56½"	Alabama	133
1	40	American	56½"	Alabama	134
1	24	Shay	42 "	Pennsylvania	138
1	24	Shay	36 "	Pennsylvania	0138
1	30	Shay	56½"	Pennsylvania	139
1	42	Shay	56½"	Louisiana	140
1	50	Shay	56½"	Wisconsin	141

Write for full information and price on the above Equipment

THE LIMA EQUIPMENT CO.

LIMA, OHIO