VOLUME VII November, 1914 NUMBER 7

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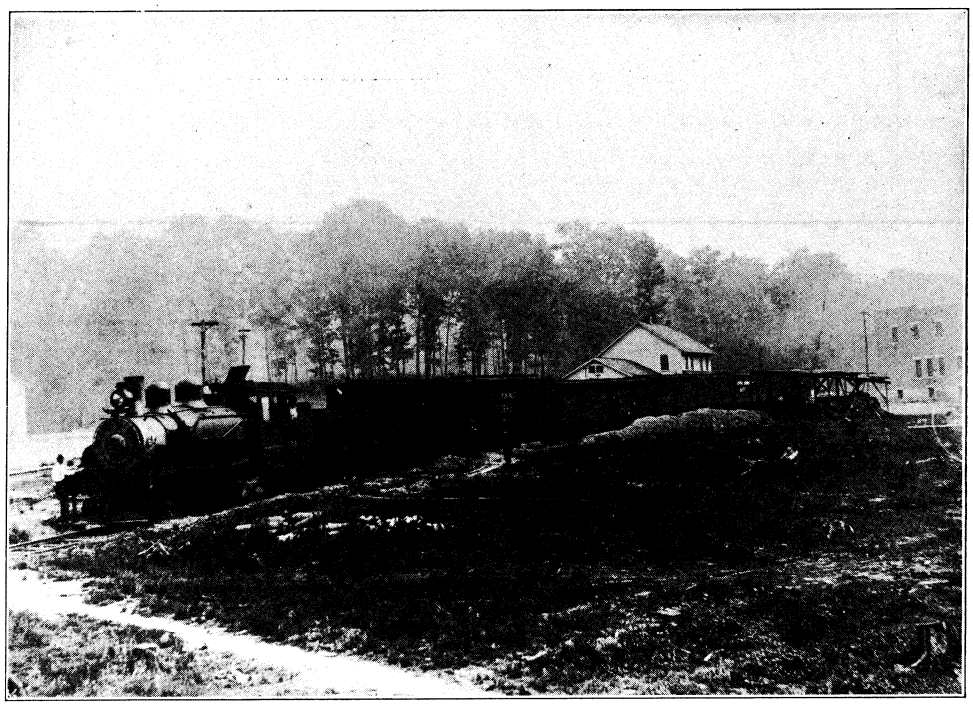
Logging, Plantation, Mining, Industrial & Standard Railroad Motive Power.

SHAY Locomotives



Sewell Valley Railway, 90 Ton Shay Locomotive Hauling Mixed Train

Are Particularly Adapted for Heavy Hauling as well as Logging

The Shay Locomotives have been constantly improved, from the standpoints of design, workmanship and material. We are profiting by our experience of more than thirty years, combined with the practical suggestions of users, which have worked out in practice. Hence, Shay Locomotives embody the experience of our customers and our own—built in accordance with modern demands.

Shay Locomotives have the greatest tractive power consistent with their weight. They are adapted for heavy grades, sharp curves and light rail. Their steady draft, due to the great number of exhausts, makes fuel combustion low—hence, unusually economical in fuel.

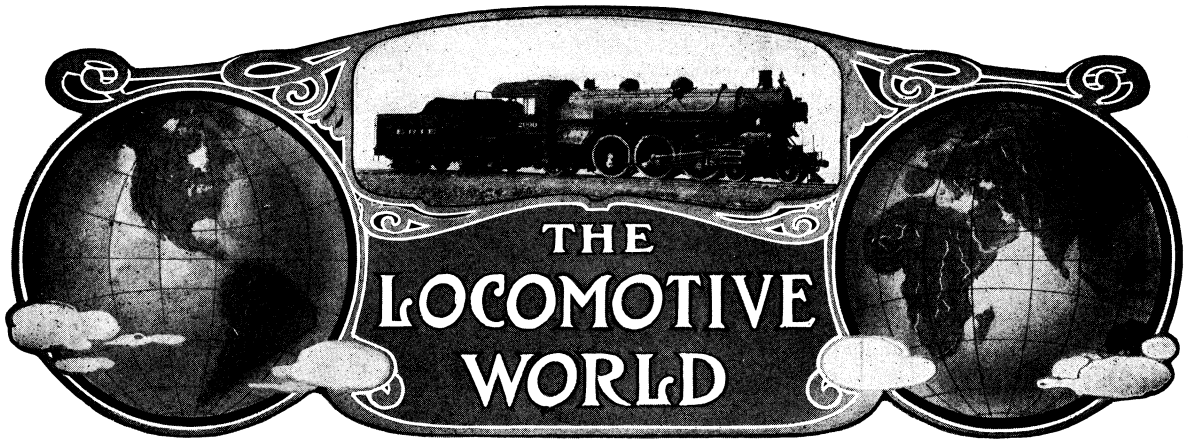
We've an unusually attractive catalog about Lima Locomotives. Shall we forward a copy?

Lima Locomotive Corporation

Builders of

Locomotives of All Types

Lima, Ohio



VOL. 7, No. 7 LIMA, OHIO NOVEMBER, 1914

THE LOCOMOTIVE WORLD

PUBLISHED MONTHLY BY

THE FRANKLIN TYPE AND PRINTING COMPANY

H. C. HAMMACK, Editor

WEST AND HIGH STREETS LIMA, OHIO.

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Advertising rates furnished upon application. Change in advertisements intended for a particular issue should reach the office of the Locomotive World no later than the 20th of the month prior to the date of issue. New advertisements requiring no proof can be received up to the 1st of the month of date of issue.

THE FRANKLIN TYPE AND PRINTING COMPANY

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Broken Engine Truck Wheel on Axle

IN case of a broken engine truck wheel on either a consolidation or mogul engine, the first thing to do would be to raise this wheel off the rail. This may be accomplished by running both engine truck wheels upon blocks or wedges, providing the wheel is not too badly broken to allow it to turn. If the wheel can be run up in this manner, block up bweteen the engine truck cellar and the binder braces so as to hold the wheels clear of the rail, chain truck to main frames and proceed. If the wheel is so badly broken that it cannot be raised by running it up on a block or wedge, first block up on the tops of both the front driving boxes to take up the slack; then run the front driving wheels up on high blocks or wedges. This will take the weight off the engine truck wheels so that with an ordinary pinch bar they can readily be raised to clear the rail; then block up between the engine truck cellars and the binder braces. Now, in order to keep the wheels clear of the rail, block between the tops of the intermediate driving boxes and the bottom of the frames while the front driving boxes are still up on blocks or wedges. Run the front driving wheels off the blocks and block up so as to take up all the slack between the tops of the front driving boxes and the bottom of the frames. Then run these wheels up on blocks again and remove the blocks over the intermediate driving boxes. This will throw the weight of the front end of the engine on the front driving boxes and relieve the engine truck. This latter method can also be pursued in case of a broken engine truck axle on a mogul or consolidation engine. where the axle is broken in the middle. Where the axle is broken outside of the box, so that one wheel falls off, it will only be necessary to block up the opposite wheel. In either case, however, of a broken wheel or broken axle, the engine truck should be chained up to the front frames when the front driving wheels are still up on blocks; or, if the engine truck wheels are run up on blocks, while the truck is in that position.

In case of a broken wheel or axle on a standard or ten-wheel locomotive; that is, one having a four-wheel engine truck, the same method can be pursued for raising the wheel to clear the rail. After the engine has been raised by running it up on blocks the end of the engine truck having the broken wheel should be chained up to the main frames; then blocks should be cut and placed between the top of the engine truck frame

and the bottom of the main frame over the good pair of wheels, so that the good pair of wheels will carry the weight that was formerly carried by the entire engine truck—Locomotive Firemen and Enginemen's Magazine.

Private Railways Excel In Russia

The Bureau of Railway News and Statistics has issued the following: "Had Russia's government railways been operated as economically in 1910 as were her private lines the saving in operating expenses would have exceeded $37,000,000. Such a discrepancy in comparative efficiency of state and private railway operation in Russia is brought out in the annual report for 1910.

"Private companies in European and Asiatic Russia operate 13,526 miles of railway against 28,366 miles operated by the state. In 1910 these companies paid out $59 to operate, for every $100 received in gross revenues. Against this showing the state railways spent $70. Moreover, whereas in 10 years since 1901 the private companies effected a reduction in operating expenses from $68 for every $100 revenue to $59, a saving of over 13.2 per cent, the state railways in the same time contracted their expenses only 1.4 per cent, from $71 to $70. With over $342,000,000 in gross business the government railways would have saved exactly $37,644,903 had they equalled the private companies' performance.

"Overstaffing of the government railways is largely responsible for this unfavorable showing. Whereas the private companies handle a relatively larger traffic, $12,989 per mile against $12,426 on the government roads, they accomplished the work with only 169 employees for every 10 miles against 203 for every 10 miles on the state railways. Even more striking than this discrepancy is the gap between Russia's most efficient roads and railways of the United States, which in 1910 operated only 70 employees for every 10 miles of line.

"Comparison of rates charged in the two countries likewise demonstrates the efficiency of the United States railway system, for with higher cost of materials, wages four times those paid to Russian railway employees, and with the value of the cent correspondingly higher in Russia than in this country, United States railways received only 0.75 cents per ton mile against 0.94 cents received by Russian carriers. Average receipts per passenger mile were only one-third ours, but 91.5 per cent of the travel was third and fourth class against ½ of 1 per cent first class. One day's wage, 70.5 cents, will buy 103 miles of this third and fourth class travel in Russia against 124 miles of first class travel for a day's wage in the United States." —Railway Age Gazette.

The Care of Wire Rope

The primary method of avoiding accidents caused by breaking wire rope is to buy a thoroly dependable rope, and the next is to take reasonable care of the rope after it is in use.

In the first place a wire rope in service requires constant lubrication in order to minimize the constant internal friction of wire on wire. The lubricant should also be heavy enough to prevent water from reaching the inside strands. Once the hemp core becomes saturated with water it is only a question of time until the rusting of the inside strands will cause a fracture.

It is always cheaper to buy a *good* lubricant and use it *right* than to lubricate a rope haphazard with the first alleged lubricant that comes to hand.

Intelligent lubrication will not only reduce wire rope bills, but by preventing the insidious attacks of rust on the inner strands and the consequent unforseen breaks, it may actually avert a costly accident.—American Bulletin.

James J. Hill's Tribute to the Railroads

While the railways of the United States may have mistakes to answer for, they have created the most effective, useful, and by far the cheapest system of land transportation in the world. This has been accomplished with very little legislative aid, and against an immense volume of opposition and interference growing out of ignorance and misunderstanding. It is not an exaggeration to say that in the past history of this country the railway, next after the Christian religion and the public schools, has been the largest single contributing factor to the welfare and happiness of the people.—Railway and Locomotive Engineering.

Record for Lidgerwood Hoisting Engines

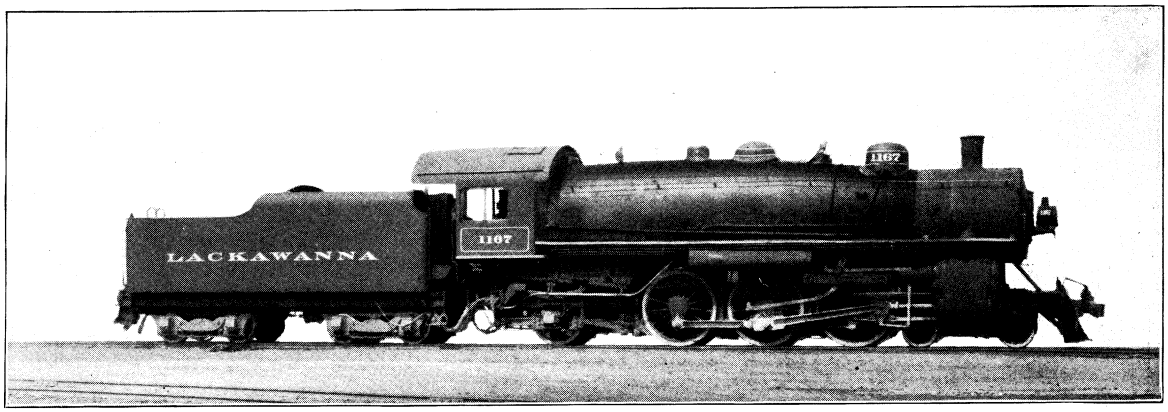
Probably the greatest record of hoisting engine production made by any one concern is that of the Lidegerwood Manufacturing Company, New York, who have built more than 37,000 steam and electric hoists during the forty odd years that they have been in business.

A comparison of the types of machines built today, with those of thirty years ago still in operation, is very interesting from an engineering standpoint as showing the improvements and advancement that have been made in hoisting machinery practice.

Lackawanna Pacific Type Freight Locomotives

Second Order of These Engines for Freight Service; Cylinders Include New Type of By-pass Drifting Valve

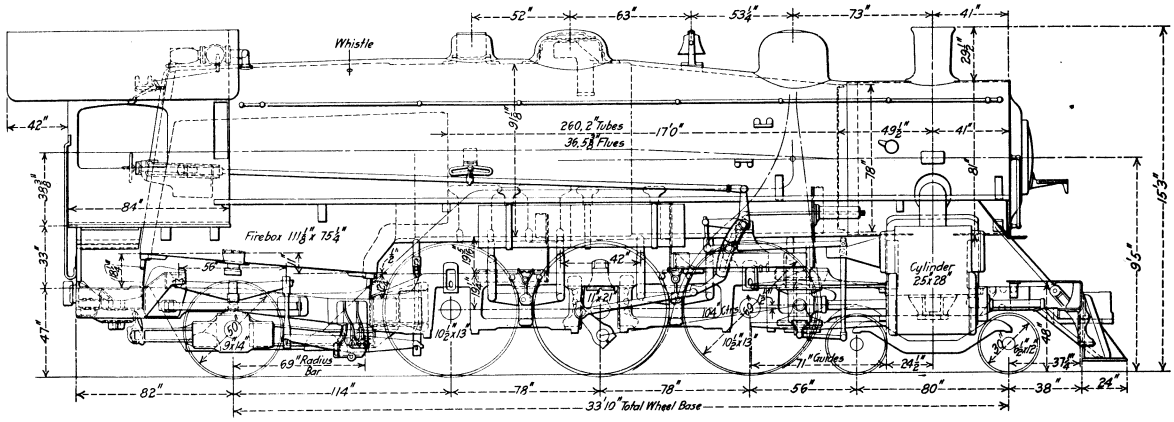
THE Delaware, Lackawanna & Western has recently received 14 Pacific type locomotives for fast freight service which were designed under the supervision of H. C. Manchester superintendent of motive power and equipment, and built by the Lima Locomotive Corporation.



Pacific Type Locomotive for Fast Freight Service

This is the second lot of Pacific type locomotives to be placed in freight service by the Lackawanna. The original locomotives which have been in service for about one year, were described in the *Daily Railway Age Gazette*, June 14, 1913. They have proven very satisfactory for this service and the same general design has been followed in the new engines.

The principal change in the new engines is the introduction of a 36-inch combustion chamber in the boiler with a consequent reduction in the length of tubes form 20 ft. to 17 ft. This change has necessitated the enlargement of the boiler at its greatest diameter and has slightly increased the weight with a decrease in total evaporative heating surface of 432 sq. ft. The superheater heating surface has been increased, however, and the total equivalent heating surface is only 234 sq. ft., or a little over 4 per cent less than that of the former engines. The better distribution of the heating surface should benefit the steaming qualities and add slightly to the locomotives' hauling capacity in the service for which they are designed.

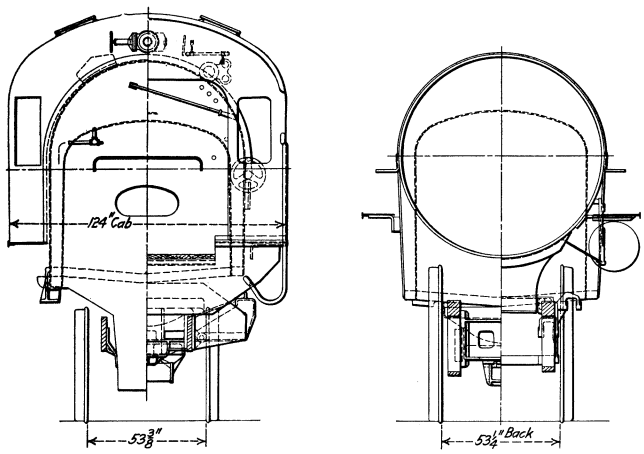


Side Elevation of Pacific Type Locomotive

The boilers are provided with auxiliary manhole domes. These offer a clear opening 16 in. in diameter so that the boiler may be entered and inspected without the removal of the throttle valve from the main dome. The cab turret is a special from of the single manifold type, so

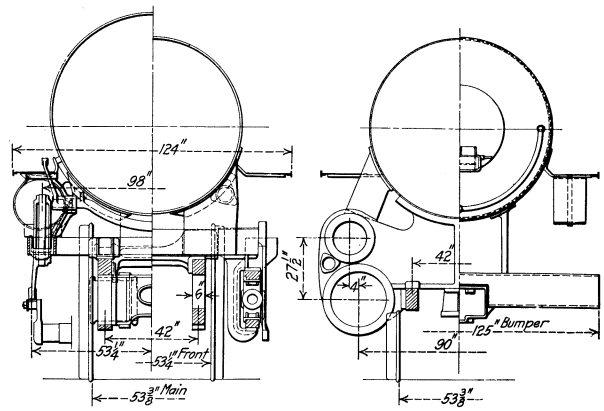
arranged that it can be removed for repairs with the full steam pressure on the boiler.

The cylinders are provided with the Lackawanna standard by-pass drifting valve arrangement recently developed and patented by H. C. Manchester, superintendent of motive power

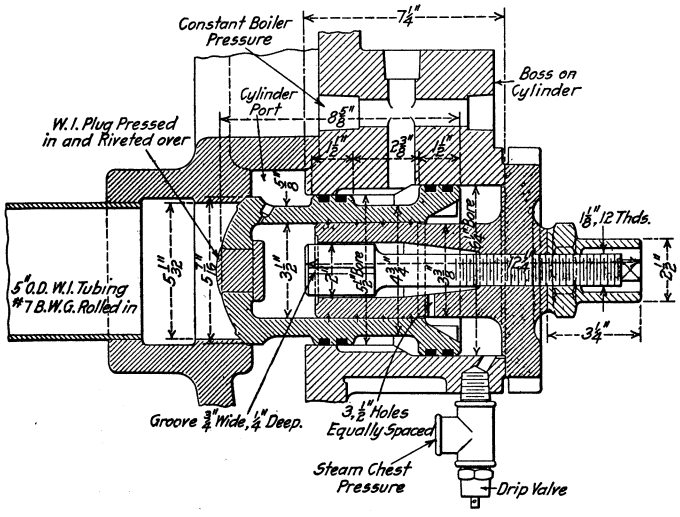


End Sections Pacific Type Locomotive

and equipment, and S. S. Riegel, mechanical engineer. It provides for the automatic delivery of steam directly from the boiler into the cylinders during periods of coasting, and also performs the ordinary function of a by-pass valve. The valves are of the piston type operating in chambers opening from the cylinder ports, the two ports on each cylinder being connected by a 5 in. wrought iron pipe, which serves as a by-pass. A sectional view through one of the valves and its chamber, slightly distorted for the sake of clearness, is shown in one of the engravings. Live steam from a globe valve in the cab is conducted through a 13-16 inch copper pipe into the annular chamber surrounding the valve. When the throttle is open and the engine is using steam, steam chest pressure is communicated to the chamber at the outer end of the valve through a pipe under the cylinder jacket leading from the live steam cavity at the center of the valve chamber. This pressure, acting against the end of the valve, holds it in the closed position as shown while the engine is working. As soon as the throttle is closed, however, the pressure is removed and the live steam pressure, acting on an effective area equal to the difference in the area of the smaller and larger pistons, forces the valve to the open position. In opening, the packing rings on the smaller or inner piston travel grooves leading from the annular chamber, thus admitting live steam directly into the entire cylinder space in sufficient quantities to maintain the temperature of the cylinder walls and to break up the vacuum. This prevents an inrush of air with the attendant carbonization of lubricating oil and damage to the cylinder



End Sections Pacific Type Locomotive



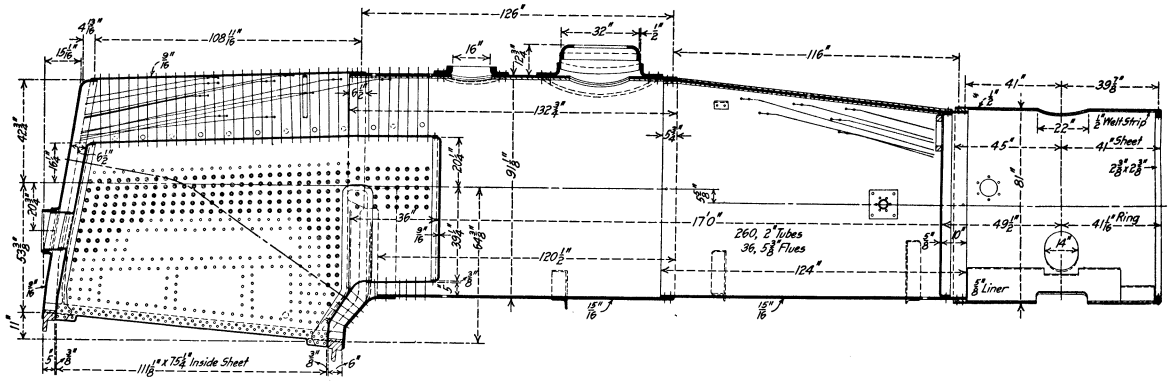
Section of By-pass Drifting Valve Chamber

walls. Engines equipped with this device are very free coasters and its use is claimed to have effected a considerable increase in the life of both cylinder and piston rod packing.

The main driving boxes used on these locomotives are 21 inches in length. The main pedestals are increased in width by means of steel castings between the frames. The engines are provided with the Woodard self-centering engine truck and the Miner friction draft gear has been included on the front end. Economy type grate shaker brackets, which insure against dropping of fuel through the deck, and low type tank wells are also used. The valves for these wells are operated from the ground and when closed permit blowing the water in the hose back into the tank, thus providing against freezing. Vanadium cast steel has been used in the frames. The principal dimensions and weights are given in the following table:

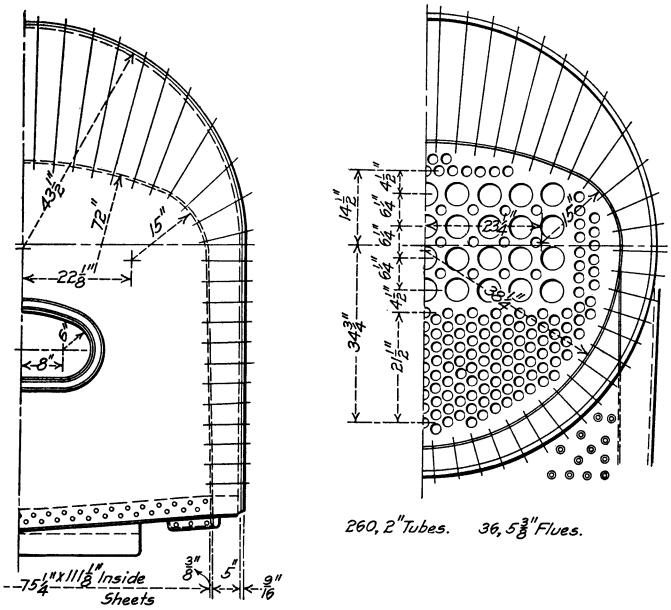
GENERAL DATA

Gage	4 ft. 8½ in.
Service	Freight
Fuel	Bit. coal
Tractive effort	43,200 lb.
Weight in working order	291,000 lb.
Weight on drivers	188,000 lb.
Weight on drivers ÷ total equivalent heating surface*	37.2
Total weight ÷ total equivalent heating surface*	57.5
Volume of both cylinders	15.9 cu. ft.
Total equivalent heating surface*÷ vol. cylinders	813.0



Boiler of the Delaware, Lackawanna & Western Fast Freight Pacific Type Locomotives

Weight of engine and tender in working order	456,500 lb.
Wheel base, driving	13 ft. 0 in.
Wheel base, total	33 ft. 10 in.
Wheel base, engine and tender	66 ft. 4 in.



Backhead and Section through the Boiler, showing Rear Tube Sheet

RATIOS

Weight on drivers ÷ tractive effort	4.35
Total weight ÷ tractive effort	6.74
Tractive effort × diam. drivers ÷ total equivalent heating surface*	589.3
Total equivalent heating surface* ÷ grate area	87.2
Grate area — vo. cylinders	3.7

CYLINDERS

Kind	Simple
Diameter and stroke	25 in. x 28in

VALVES

Kind	Piston
Greatest travel	6½ in.
Outside lap	11-16 in.
Inside clearance	3-16 in.
Lead in full gear	3-16 in.

WHEELS

Driving, diameter over tires	69 in.
Driving journals, main, diameter and length	11 in. by 21 in.
Driving journals, others, diameter and length	10½ in. by 13 in.
Engine truck wheels, diameter	30 in.
Engine truck journals	6½ in. by 12 in.
Trailing truck wheels, diameter	50 in.
Trailing truck journals	9 in. by 14 in.

BOILER

Style	E. W. T.
Working pressure	200 lb.
Outside diameter of first ring	78 in.
Firebox, length and width	111⅛ in. by 75¼ in.
Tubes, number and outside diam	265—2 in.
Flues, number and outside diam	36—5⅜ in.
Tubes, length	17 ft. 0 in.
Heating surface, tubes and flues	3,279 sq. ft.
Heating surface, firebox and combustion chamber	279 sq. ft.
Heating surface, total	3,558 sq. ft.
Superheater heating surface	1,000 sq. ft.
Total equivalent heating surface*	5,058 sq. ft.
Grate area	58 sq. ft.

TENDER

Tank	Water bottom
Weight	165,500 lb.
Water capacity	9,000 gal.
Coal capacity	10 tons

*Total equivalent heating surface = total evaporating heating surface × 1.5 times the superheater heating surface.—Railway Age Gazette.

FORMATION OF CLINKERS

This is a subject in which every man who has anything to do with running a locomotive should be interested. In the Locomotive Firemen and Enginemen's Magazine a letter from one of their readers was published with reply made by Mr. F. P. Roesch. By permission of this magazine we reprint it in the following:

"I am firing out of Dickson, Tenn., on a branch road known as the Centreville Branch, owned and operated by the N. C. & St. L. Railway, and, I suppose, like most all firemen, I am very much interested in my work, and especially in the economical use of fuel. I have been studying the fuel question from every viewpoint possible in order that I might save coal and, in saving coal, lighten my work. I am glad to say I have been greatly benefited by the numerous questions asked and answered through the Magazine. Now, as quite a number of our boys are asking questions. 'What is combustion, what is black smoke, what is meant by the term volatile matter?' etc., I would like to ask a few questions on the clinker, which, to my mind, is one of the greatest troubles that confront us today, and a question that should concern us more than all the above-asked questions, while they are all right and it is very instructive to know all these facts. However, if we were in possession of the knowledge of how to keep clinkers from forming on the grates we could then get the rapid chemical combination of our fuel and oxygen of the air, and could keep the temperature of our fire high enough at all times to burn the volatile matter and not let it pass off in the form of black smoke. So the questions I want to ask are these: What is a clinker; or, in other words, what is it composed of? What causes them to form on grates? Is it caused by engineer slipping engine when fire is light and green, or is it the way firemen place coal on grates; or is it the nature of the coal? Will firing too light cause clinkers to form the same as firing too heavy? How would you suggest to fire to keep clinkers from forming on grates?

"I will now give you an approximate analysis of our coal, also the clinker:

COAL

Moisture	1.63%
Volatile matter	33.65%
Fixed Carbon	48.43%
Ash	16.29%
Sulphur	4.16%

CLINKER

Silica	35.10%
Iron oxide F E^2 O^3	40.10%
Aluminum A L^2 O^3	22.28%
Lime Coa	2.25%
Magnesia	Trace

"I will appreciate any information you can give me on these questions."—E. S. P.

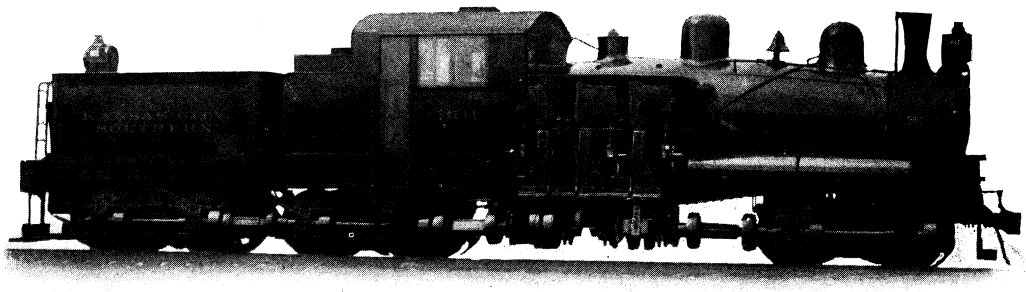
ANSWER.—The above is a very interesting letter, and the questions brought out are ones that have caused more discussion to no practical purpose before the Fuel Association and the Traveling Engineers' Association Convention than any other one subject. While all admit that they have more or less trouble with the formation of clinkers under certain conditions and when burning certain kinds of coal, yet few are prepared to state exactly what causes the clinker and what can be done to prevent it.

The analysis of the coal as shown in our correspondent's letter is evidently incorrect, as adding up the various percentages gives us 104.16. However, this would make no material difference as to the composition of the clinker that we are interested in. This shows 40 per per cent iron ozide, which, together with the silica, undoubtedly forms the greater part of the clinker. According to the accepted explanation as to the manner in which clinkers are formed, it has been stated that where coal contains a fairly high per cent of iron oxide, silica and sulphur, these substances have a tendency to melt, unite and run together in low temperatures, the sulphur having an affinity for the iron oxide, the silica acting as a flux. The best methods for the prevention of clinkers are to first refrain from shaking the grates while the fire is moderately light, or avoid the slipping of the engine when the fire is light, as either shaking the grates or slipping the engine under these conditions will cause the fire to be partially turned over, so that some of the fuel which has as yet reached the highest temperatures will be brought down to the grates, and the inrushing air will cause the formation of a clinker. If the fire can be gradually built up before starting to a point where it is moderately heavy, say four or five inches, and brought to a bright white heat, and the engine fired very light; that is, with but one of two scoops at a time after this, so as to maintain the fire in a bright condition, it will go far, according to the concensus of opinion of those familiar with the subject, towards pre-

(Continued on page 9)

Second Shay Locomotive for Kansas City Southern Railway

SWITCHING in the downtown district in Kansas City has been revolutionized by the Kansas City Southern Railway on its New Terminals on North-side by the installation of two monster geared locomotives. These locomotives are known as the "Shay Articulated Type" manufactured by the Lima Locomotive Corportation, Lima, Ohio.



Second Shay Locomotive furnished Kansas City Southern Railway
130 Ton, Cylinder 3—17 X18

The new terminal tracks extend up in May Street to a point south of Seventh Street, and thence under Eighth Street Metropolitan tracks where the Kansas City Southern will perform underground swtiching. On account of the excessive grade on May Street, which is 7 per cent, the work could not be successfully handled by any other type of locomotive. The new Shay locomotives are handling 200 tons up the May Street incline, and go around sixty degree uncompensated curves.

The Shay Articulated Geared Locomotive is especially designed for service of this character, and one of the most important features in connection with the operation of this type of locomotive, is the fact that it is under absolute control either in ascending or descending steep grades, also in turning the numerous excessive curves.

The illustration herein is that of the 130-ton size, which is the smaller of the two locomotives furnished, the other being a 160-ton. This type of locomotive is not like the ordinary locomotive as all the weight is on drivers, twelve in number, and useful for adhesion. This 130-ton, like the 160-ton first engine supplied this road, is equipped with all modern devices and is fitted for the use of oil as fuel, hence overcoming the smoke nuisance, cinders and sparks. "Safety First" is the slogan of this engine both in operating on the steep grades and sharp curves as well as danger from sparks and cinders in this congested wholesale district.

For the benefit of the engineers who will be interested in knowing something about the general proportions of the 130-ton Shay furnished the Kansas City Southern, we give the general dimensions, as follows:

Gauge	56½"
Service	Switching
Fuel	Oil
Tractive effort	59,000 lbs.
Weight in Average Working order	27,000 lbs.
Weight on Drivers	27,000 lbs.
Wheel, Rigid	72"
Wheel Base, Total	46' 10"
Cylinders, number	3
Cylinders, diam. and stroke	17" x 18"
Valves, kind	Slide
Type	Allen-Richardson
Greatest travel	4⅝"
Outside lap	29-32"
Inside lap	0
Lead	1-32"
Wheels, Diameter over tires	48"
Thickness of tires	3"
Driving Journals, diam. and length	7" x 8"
Boiler, Style	Extended Wagon Top
Working Pressure	200 lbs.
Outside diam. of first ring	62¼"
Firebox length and width	114"x61¼"
Firebox water space	4" x 4½"
Tubes, No. & outside diam.	308—3"
Tubes, length	13' 5"

(Continued on page 9)

Second Shay Locomotive for Kansas City Southern Railway

(Continued from page 7)

Heating Surface, tubes	2161
Heating Surface, firebox	178
Heating Surface, total	2339
Grate Area	48.5
Center of boiler above rail	99′⅜′
Water Capacity	4000 Gals.
Fuel Oil Capacity	1950 Gals.

Formation of Clinkers

(Continued from page 6)

venting the formation of clinkers. The hook must not be used under any circumstances. If banks form in the fire, coal should be fired around the banks and the banks gradually burned out. The grates should never be shaken violently but simply slightly rocked, enough to insure the passage of air through the fire. The grates should never be shaken even slightly when the engine is working at its hardest. It is also advisable to run with a fairly small nozzle, so that there will be a moderately hard draft on the fire at all times.

The Largest Building in the World

The largest building in the world is a prominent figure seen from our office windows. It is the Woolworth Building on Broadway, New York, extending from Barclay street to Park place. The building has 55 stories and the great tower rises 750 feet above the sidewalk. The main building is 29 stories high with two stories in the gables on the north and south front. Provision has been made for 34 elevators. The cubical contents of the building exceed 13,200,000 cubic feet. The caissons are bedded on solid rock from 110 to 130 feet below the sidewalk level. Some of the caissons are 19 feet in diameter.

The Singer Building is also visible from our office, and was for a number of years the tallest building in the city. It has 41 stories, and is 621 feet above the street level. Both buildings attract much attention.—Railway and Locomotive Engineering.

A Plant That Coughs

All have read of carnivorous plants, of laughing plants and of plants that weep, but who has heard of a plant that coughs? There is the authority of a French botanist, however, for the statement that a plant in various tropical regions actually possesses the power to cough in the most approved manner. The fruit of this plant resembles the common broad bean. It appears that the coughing plant is something of a crank, that it easily works itself into a rage, and that it has a curious horror of all dust. As soon as a few grains of dust are deposited on its leaves the air chambers that cover their faces and are the respiratory organs of the plant become filled with gas, swell, and end by driving out the gas with a slight explosion and a sound that resembles so much the cough of a child suffering from a cold as to carry a most uncanny sensation to the one beholding the phenomenon.

Why the Ocean Is Salty

The rivers of all the world pour their water into the sea sooner or later. They wash down vast quantities of solid matter and much matter in solution, of which the greater part is salt. This may be in such small amount that it is imperceptible in the river. The waters of the seas are evaporated by the sun, but none of the salt is taken up into the clouds. So the water that returns to the earth in rain contains no salt; but by the time it reaches the sea again, after soaking through the soil and flowing down the rivers, it has another load. Consequently the oceans are receiving salt all the time and never giving up any of it.

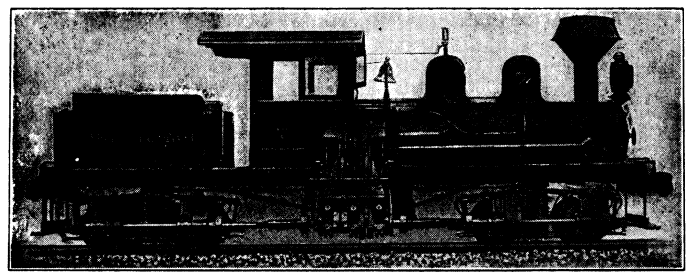
SECOND HAND LOCOMOTIVES

***

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	13	Shay	56½"	Georgia	0829
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

Write for full information and price on the above Equipment

THE LIMA EQUIPMENT CO.

LIMA, OHIO

INDEX TO ADVERTISERS AND WHAT THEY HAVE TO SELL

"American" Log Loader

Makes a Record

of 241,000 feet in 8 hours

This remarkable run was made by an "AMERICAN" Loader belonging to the Anaconda Copper Mining Company. Loading 241,640 feet meant picking up and loading 2,179 logs. The peak of the run was attained when, in two hours, 8 cars, holding 60,270 feet were loaded—29 cars were loaded during the 8 hour run.

"AMERICAN" Log Loaders

have simplified many a difficult logging problem and increased the profits.

There are several types of "AMERICAN" Loaders, each one specially fitted to work under certain conditions and, mark our words, one of them would certainly increase your profits, or make a losing operation pay.

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