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THE LOCOMOTIVE WORLD

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THE FRANKLIN TYPE AND PRINTING COMPANY

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Operating Shay Locomotives

By Frank M. Leland*

SINCE others may have a railroad resembling ours, and may be interested in hearing of the difficulties encountered in operating in winter time, there may be some point in telling the way we overcome many of them.

This road is seven miles long, starting from our smeltery, where it connects with the Oregon Short Line tracks. The altitude is 5800 feet. Our mine is 4¼ miles in an air line from the smelting works, but requires 7 miles of railroad to reach it. The altitude at the mine is 7700 feet, and our heaviest grade is 9%; but most of our grades are about 6%. Our curves are mostly level, and the sharpest one has a radius of about 130 feet.

We have two Shay locomotives weighing 31 tons each when ready for the road. The gage of the track is 36 in. The lower four miles is laid with 60 lb rail, but I suppose the old company ran short of money when building, for it laid the upper three miles with 25 lb. rail.

One of our many troubles is the crawling of the rails down hill; and no matter how hard we try to hold them, about every three months we must go over our various switches and saw out a piece and put in "dutchmen" above. We find that the 25 lb. rail is a little light, but by putting heavy ties with 2 ft. centers it answers very well. If I were to build a road for engines of this size I would use not less than 35 lb. rail; but this, I think, would be amply heavy.

We have a great deal of trouble with drifting snow; in fact in some places after we have cleared the road we can step from the top of the cab to the snow bank. We have cured this drifting in some places, and materially lessened it in others, by putting in snow fences, using the slabs from our saw mill for that purpose. It is wonderful to see how they will check the piling up of snow on the track.

In the Journal of May 3, 1913, p. 895, there are four illustrations showing some of our operations in winter. The snow plow we had at that time was a home-made affair, consisting of an old boiler plate straightened out and mounted on a flat car, with a shelter built over it for the protection of the men. We had under this car a V-shaped flanger which we handled with levers operated by two men inside, and to make the car stay on the track we loaded it down with 4 or 5 tons of old car

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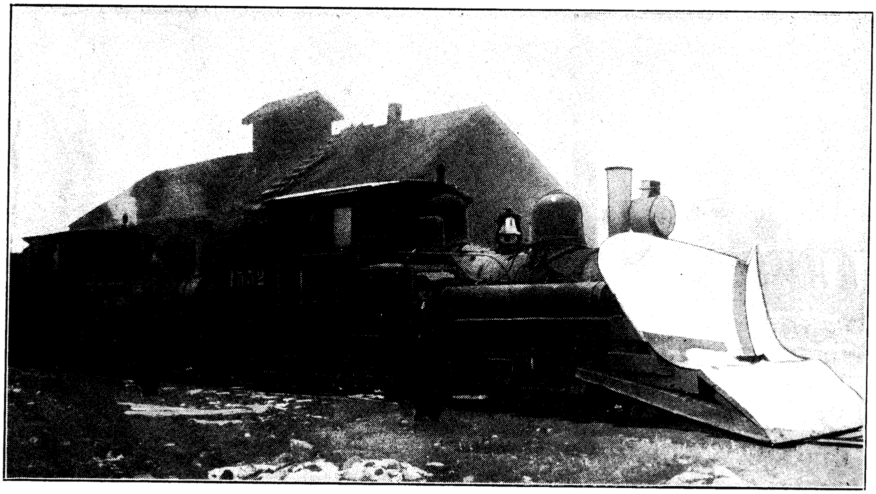
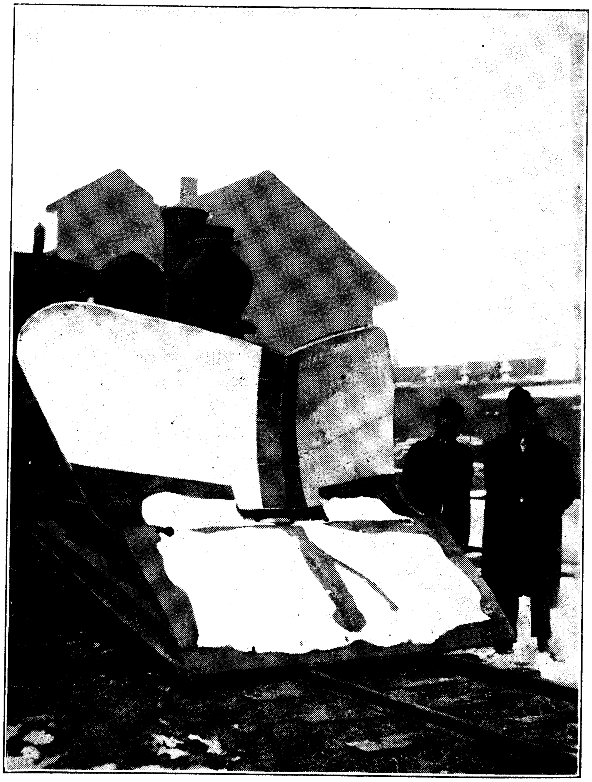
*President Empire Copper Co., Mackay, Idaho.



Two Shay Locomotives, the front of one equipped with the "Butterfly" Snow Plow designed and built at the Empire Copper Co.'s Plant, Mackay, Idaho

wheels. It was a crude affair, and while we managed to clear the track with it several times during each winter, it was expensive to operate and had a habit of getting off the track and folding up like a jack-knife, and we had to keep three men on the plow with a stove to keep them from freezing. Sometimes when the engineer hit the snow a little too hard, the stove would break loose and the car wheels would start ahead, and it kept the men busy getting out of harm's way.

We conceived the idea of building a plow and fastening it to the front of one of the engines. We tried this; but not having a flanger the snow would pack on the rails and cause a lot of trouble. We then designed a V-shaped flanger which we put immediately behind the plow, and to save labor we took an old brake cylinder from a car and put a head in it so as to apply the air on either side of the piston. We then connected it up with some valves in the cab. The engineer could then apply pressure to the flanger with compressed air, and when it was necessary to pick it up going over frogs, switches or any obstruction, he applied air to the other end, lifting it. With these improved methods we can plow with the regular crew, and when the snow is especially heavy we couple the other engine on behind, and it is a mighty big snow-bank that we cannot go through. Of the accompanying photographs, one shows the two engines and the other a front view of the plow. Our boys call it the "butterfly". It was devised by our master mechanic, E. L. Thornton, and except for a rotary, it is the best arrangement I have ever seen for bucking snow. Some years ago I thought we might afford a rotary, which would, no doubt, be a fine thing for our pur-



A close view of the "Butterfly" Snow Plow pose, but upon getting prices and finding that we would be set back about $18,000 I concluded that we would struggle along for a few years longer with our home made devices.

Clearing the Brakeshoes

I will give a few little kinks that we have figured out for ourselves. Often when a train stands over night at the mine the snow will blow on the cars when the wheels are warm and keep thawing and then freezing until the brakeshoes and wheels are a mass of ice. It would be impossible to start down the hill with a train in this condition, and to pick away the ice would take all day for half a dozen men, so we obtained about 40 ft. of ½ in. flexible, metallic tubing. It may be seen in the illustration coiled around the sand box. We run the engine along side the train, and in half an hour, by using steam, we have the ice and snow thawed away from the brakeshoes. It is an inexpensive process, and without it we could hardly operate in winter. Another thing we found—and no doubt some of your readers have had the same trouble—is that the snow packs in the gears of the engine. Grease seems to have no effect, as the snow will fly in and soon the gears become so full that the pinion is crowded away from the gears and the result is a broken shaft. We studied this condition a long while and almost made up our minds that we could not run in winter. I then thought that possibly other people might have a solution for the trouble, so I paid a visit to the Bingham & Garfield R. R., and took the matter up with John Hughes, who was the master mechanic. His solution was to use on the gears, common coal tar instead of oil. He also told me—and I have verified the truth of the statement—that the gears so lubricated would last about three times as long as when oil or grease is used. It puts a gloss on the metal, and it is surprising how long they will run. In winter time the snow will positively fall out of the gears. We have run through snow banks in which the gears were actually buried, and when we came out the packed snow would fall right out of the teeth. This leads me to say that were I running open gears at any place or for any purpose where they required lubrication, I should use coal tar.

During our first year we had much trouble with our eccentric straps, which run at high speed. Those furnished by the manufacturers were cast iron lined with babbitt, and about every two months we would have the engine in the shop rebabbitting the straps. If we used a babbitt hard enough to wear any length of time it would break and work out. If we used it soft enough so that it would not break, it was a case of frequent rebabbitting and reboring. One day I sent an eccentric strap to Salt Lake City and had a pattern made and six straps cast in phosphor bronze. I think the initial expense was about $30.00. We bored them out, leaving four Russian-iron shims in the flanges, and tried them out. They did so well that we immediately ordered another set and put them on the other engine. The first set has now been on for about four years, and we have only taken out two of the shims from each strap. It is surprising how much time and money this investment has saved us, and I think any readers who are using the cast-iron ones lined with babbitt will find it greatly to their advantage to use the kind we do and exclude the babbitt.

Our road runs for its entire length through sagebrush or timber and in summer it gets very dry. During the first two years of operation we were continually starting fires in the timber and brush. Our worst fire lasted three days and we had as many as 40 men working to put it out. We tired of this and purchased the Hunter stacks, made by the Lima people, and since that time have never had a fire. We use them only in the summer, because the engines do not steam quite as well with them as they do with a straight stack.

Removing Weeds from the Track

The weeds on our track give us a great deal of trouble. The sun shines from four o'clock in the morning until eight o'clock at night, and the weeds grow fast. We formerly kept four men employed almost continuously for about four months during the summer to keep the weeds under control, otherwise the brake beams would throw them over on the rails, and then it meant a runaway. When you have a hundred tons of train pushing on your engine it is hard to hold unless you have a good rail. The writer thought there might be something cheaper than this and wrote John A. Hill, President of the Hill Publishing Co., who put us wise to a patent liquid weed killer. We buy every spring two 100 gal. tanks of this, dilute it with 20 times its volume of water and put it on the track with a sprinkler which we made ourselves. The weeds come up very little. About 60 days later we go over it again and this is the end of it for that year. We save between $900 and $1000 a year by using this weed killer.

Should anyone desire to know anything about about the various things I have mentioned or anything pertaining to the operation of a Shay road we would be very glad to impart what little information wo have gathered and should any one desire to copy any of our improvements we should be glad to have him come here and we will afford every facility for him to acquire information.—*The Engineering and Mining Journal.*

How European Ports Beat Us In Development Work.

In some respects the United States, with all of its achievements, does things on a very picayunish plan. This is especially true in regard to its waterways and its harbors. When we contemplate the spending of a few million dollars on the improvement of a harbor we talk of it as though a wonderful thing were being done. Even South American countries put us to shame in the vast expenditures which they make for harbor improvement as compared with the beggarly expenditures that most American ports make. The 1914 report of the Harbor Commisisoners of Montreal gives the following statement as the amount in round numbers expended for the development of the ports named and the creation of facilities for traffic:

London	$200,000,000
Liverpool	155,000,000
Hamburg	115,000,000
Manchester	100,000,000
Newcastle	90,000,000
Antwerp	60,000,000
Glasgow	50,000,000
Rotterdam	50,000,000
Bristol	40,000,000
Marseilles	40,000,000
Havre	30,000,000
Southampton	30,000,000
Genoa, 1903-1911	25,000,000
Montreal	25,000,000

—*Manufacturers' Record.*

Powell Appliances for Automobiles, Motor Trucks, etc.

These well known manufacturers of steam fittings and accessories of all kinds have for many years past made a point of issuing at frequent intervals a series of booklets which not only illustrate their goods and list prices, but give details and particulars as well, not generally found in catalogues, thus obviating the necessity of writing the manufacturers for information. The latest published in the series is entitled The Powell Appliances for Automobiles, Trucks, Motor Boats, Gas, Gasoline and Oil Engines, and is, if possible, an improvement on its predecessors. It is prepared with the usual painstaking attention to valuable details, and is not only remarkably complete and well arranged but is of a convenient size for handling, is very clearly and distinctly printed on fine stock. Among the lines enumerated are The Powell Generator Valves, Gasoline Strainers, Priming Cups, Gasoline Cocks, Relief Cocks, Air Cocks, Hand Air, and Oil Pumps, Multiple Oilers, Lubricators, Oil Cups, Grease Cups, Whistles, Whistle Valves, Brass Fittings, Unions, Needle Point Valves, etc.

A feature for which The Wm. Powell Co. has long been noted, is their celebrated "White Star" Valves. They are prepared at all times to furnish non-corrosive valves, cocks and fittings at special prices. The Wm. Powell Co., Cincinnati, Ohio, solicit inquiries and have a competent engineering department constantly designing and working on special requirements. In addition to the appliances described in the booklet they manufacture a general line of valves and fittings for any industrial plant. All articles bearing the Powell trade mark are sold and guaranteed as to their mechanical perfection and superior workmanship.

Value of Wood Taken from National Forests

Of the 688,922,000 board feet of timber cut on the national forests during the fiscal year ended June 30, 1915, according to statistics just compiled by the United States forest service, 123,168,000 feet was taken under free-use permits given to settlers and others living in or near national forests. There were 40,000 free-use permitees, and the value of the timber they cut was $206,464.13. The remainder, or 565,754,000 board feet, was cut under sales contracts, for the most part with lumber operators, but including 19,246,000 feet sold at cost to farmers and settlers, as required by a special provision of law. The prices received for all sold timber varied from 50 cents to $4 per thousand feet, and the total value was $1,179,448.39. The statement shows that the forests of Alaska are furnishing a large amount of timber for local consumption. More than 37,000,000 feet, according to the forest srevice, was cut under sales contracts during the fiscal year in the two national forests of Alaska, and it is estimated that the quantity taken under the free-use privilege amounts to at least 10 per cent of that cut under sales. No figures are available on the Alaskan free-use cut, however, as residents of the territory are allowed, on account of the relative sparsity of the population, to take all the timber they need for personal use without going through any formalities.—*Railway Review.*

The Injector

In the early days of railways the boilers of the locomotives were supplied with water by means of force-pumps worked by hand-levers; afterwards the pumps were worked by either eccentrics, or rods attached to the cross-heads, and on the London and South Western Railway an independent donkey pump was employed to feed the boiler, and at the present time some of the Brighton Company's engines are fed with water by means of a water pump, working in connection with the Westinghouse air-brake pump.

Many of the "locomotive" readers will remember the time very well when engines had two pumps, and in order to supply water to the boiler it was necessary to run several times backwards and forwards for about a quarter of a mile to fill up the boiler.

They will also, no doubt, well remember seeing "single" wheeled engines standing in the sheds, with their tender brakes hard on, slipping upon oiled rails, in order to pump water into the boiler.

In 1858, Mr. H. J. Giffard, a French engineer, took out a patent for the "Injector"; he had discovered that the motion imparted by a jet of steam to a surrounding column of water was sufficient to force it into the boiler from which the steam was taken, and even into another boiler having a higher pressure.

When Mr. Giffard tried to introduce his new injector, locomotive engineers laughed at him; he was told to read about the first laws of motion, and that he must be mad to suppose that steam from one part of a boiler could force its way back into another part of the same boiler; he could not even obtain authority to try an injector on a locomotive until 1859, and then he was only granted permission as a favor and with a view to "let him prove his idea would not work," and thus put a stop to his constant letters and applications.

However, the injector worked successfully, and the water entered the boiler, but even then people would not believe it.

Mr. Giffard explained that the action of his injector was similar to that of the blast-pipe in a locomotive; the rush of steam in that case formed a partial vacuum into which air was forced by the atmospheric pressure of about 15 lbs. per square inch.

To explain his theory, Giffard took a pressure of 100 lbs. per square inch and showed that a column of water 2 3-10 feet high pressed upon its base with a force of 1 lb per square in., therefore 100 lbs. pressure is equal to a pipe of water 230 feet high.

Water from the bottom of a pipe 230 feet high would rush out at a speed of 12½ feet per second, that is equal to no less a pace than 83 miles an hour.

Let it be clearly understood that a boiler having a pressure of 100 lbs. per square inch is just balanced by a jet of water rushing at 83 miles an hour; it then becomes certain that to overcome the steam in the boiler it is only necessary to increase the speed of the water to above 83 miles an hour, and the water will force itself into the boiler.

The scientific tests that demonstrated that an injector would force water into a boiler did not by any means end the controversy concerning the utility and efficiency of the injector. For years after it was first introduced many of the enginemen considered it a mysterious apparatus whose source of action no one understood. Many years ago, when the writer was engaged on nightwork in an enginehouse in Scotland he found two enginemen doing some mysterious work on an engine housed on the place. It was found that they took the injector apart, thinking that they could find some secret appliance that made the apparatus work, and they were very much disappointed and disgusted to find nothing but a tube inside. Still for years there continued to be a strong opposition to injectors among enginemen.

In this country the engineers on many railroads insisted that every locomotive they ran should have at least one water pump. In the cold regions during the winter much difficulty was experienced in keeping the pump pipes from freezing, but still the enginemen would insist on pumps being provided. On one day five engines came to the headquarters where the writer was in charge, with pumps and pipes fractured with the frost, and all the injectors were intact. Pumps were then discarded in spite of violent protest, and no more pumps were applied on that railroad system.—*Railway and Locomotive Engineering.*

A Code System

"Now, Silas," said the speaker, "I want you to be present when I deliver this speech." "Yassuh." "I want you to start the laughter and applause. Every time I take a drink of water, you applaud, and every time I wipes my forehead with my handkerchief,you laugh" "You better switch them signals, boss. It's a heap mo' liable to make me laugh to see you standin' up dar deliberately takin' a drink o' water."—*Ideal Power.*

Fireless Locomotives

By W. A. Blum

A description of the fireless or steam storage locomotives as used by the National Cash Register Company may be of interest to readers of the Dodge Idea.

German engineers have for some time been taking advantage of the economy possible in the use of a steam storage locomotive as a means of performing switching service in and about industrial plants. Electric and compressed air locomotives have been used for this service exclusively where it was not desirable to use the ordinary steam locomotive.

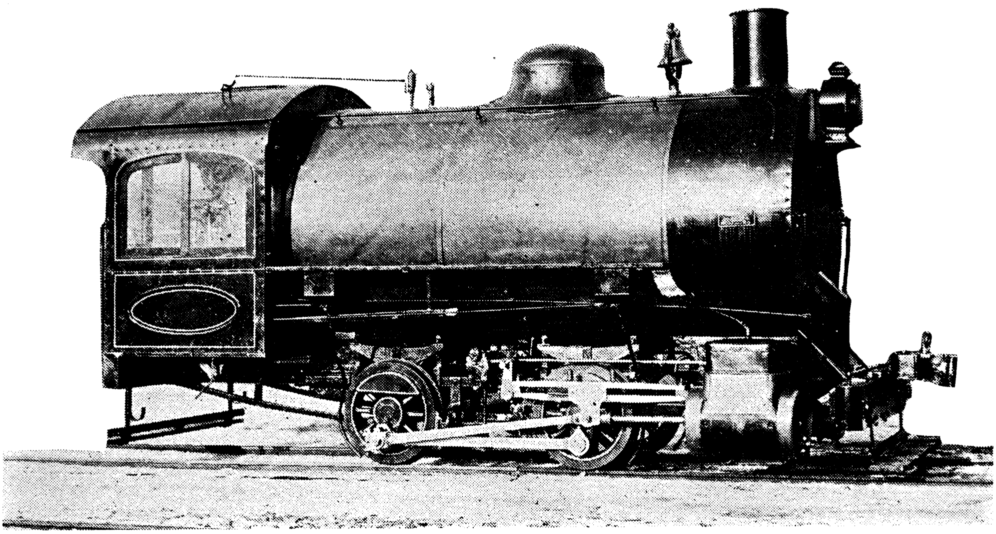
The Lima Locomotive Corporation, Lima, Ohio, have built three of these for The National Cash Register Company, Dayton, Ohio, which are believed to be the first machines of this character built and adapted to shunting service in this country.

This type of locomotive differs from the ordinary, in being without a boiler and no means of providing fire. It consists essentially of a large tank, seven feet in diameter and sixteen feet long, fitted only with such apparatus as is required for the control of the flow of steam to the cylinders. The capacity of the tank is 530 cubic feet and has mounted on it a thirty-inch steel dome, inside of which the usual form of throttle valve is placed and from which a four-inch steam pipe leads thru a reducing valve to the steam chests.

Within the tank for the purpose of reducing as much as possible the surging of the water from one end to the other and thus disturbing the equalization of the weight on the drivers, there are placed three large three-eighth-inch steel baffle plates with restricted openings, by which means undesirable rocking of the engine is avoided.

A two inch magnesia insulation is used on the outside of the tank to reduce the loss from radiation as much as possible, over which is placed the usual metal lagging.

Compressed air tanks, suspended under the running boards, charged from the plant equipment, are used to operate the automatic bell ringer, the sand distribution and the emergency brake (ordinarily there is a powerful hand brake used). An Edison storage battery furnishes the current for the electric headlights.



One of the Fireless or Steam Storage Locomotives, owned by The National Cash Register Co., Dayton, O.

In preparing the engine for operation the practice is to fill the tank about half full of water, after which steam from the power plant is charged into the tank thru a two-inch perforated charging pipe located well below the water level. By the time the pressure between the boiler plant and the locomotive is equalized, which is about 150 pounds, the water level in the tank will be considerably raised and the temperature of same will be nearly equal to that of the steam by which it is charged, or about 370 degrees Fahrenheit. The pressure at the cylinders is reduced to about 60 or 65 pounds per square inch by means of the reducing valve previously referred to, the cylinders being made sufficiently large, 18 inches in diameter by 18-inch stroke.

As the steam is used the pressure in the tank becomes less, allowing the water to gradually evaporate and maintain a steam supply until it has been depleted to the point where it is no longer effective. The period of service available for one charge of the engine varies from two to three hours, depending, of course, on the number and weight of cars handled. The large diameter of the cylinders makes it possible to move the engine under its own power at very low pressure, which enables the engine to return to the power house for recharging, even though its capacity for doing effective work has been exhausted. It requires about twenty minutes for the charging.

The exhaust from the cylinders is carried out thru the stack, resembling very closely the usual type for small locomotives in which there is mounted an exhaust head for the purpose of extracting the water of condensation from the vapor before being discharged to the atmosphere.

The wheel base of the engine is 72 inches, the wheels are 36 inches in diameter and the total weight when fully charged is about 77, 500 pounds, all of which, of course, is on the drivers.

These engines are used for switching purposes on more than two miles of track about the factory; are economical, in requiring but one man to engineer, on each; "no boiler troubles," and the steam for them is generated in our boiler plant under the very best conditions, with high-grade water tube boilers and stokers and the best of coal.—*The Dodge Idea.*

Railway Mileage of the World

The railway mileage of the United States, including Alaska with its 653 miles, amounts to 254,870 miles. The earth, being about 8,000 miles in diameter, has a circumference at the equator of about 25,000 miles. The railways of the United States if strung together would, roughly speaking, go around the world ten times.

Germany is quoted with 39,513 miles; Russia in Europe has 38,563 miles; India has 34, 572; France has 31,537 miles; the Dominion of Canada is credited with 29,233 miles; Austria-Hungary, 28,641; Great Britain, 23,385; Argentina, 20,593; Mexico, 15,805; Brazil, 15,491; Italy, 10,933; Spain, 9,517; Sweden, 8,984; and Japan, 6,811 miles of railroad.

Looked at from another point of view, the mileage of this continent comes to 335,992, while the other countries mentioned here amount to 232,656 miles. This means that out of the 568,648 total miles of all these countries, the continents of North and South America have more than half the total by about two turns around the world. If the total mileage goes around the earth about 22½ times, America has about 13 windings as against about 11 of the others.

The mileage under British conrtol comes to 87,190 miles, which would give a belt of 3½ coils around the earth's equator. In this resume the Cape-to-Cairo Railway, and indeed the African and Australian railways, have not been counted, nor those of New Zealand, Egypt and the other British territories and protectorates. These would probably extend the last half turn around the world, making four in all, or about 100,000 miles.

Ore Mined in United States Shows Sharp Decline for 1914

The quantity of crude iron ore mined in the United States in 1914 amounted to 41,439,761 long tons, as compared with 61,980,437 long tons mined in 1913, a decrease of 20,540,676 long tons, or 33.14 per cent, as reported by E. F. Burchard, of the U. S. Geological Survey. The quantity of iron ore shipped from the mine (marketed) in the United States in 1914 amounted to 39,714,290 long tons, valued at $71,905,079, as compared with 59,643,098 long tons, valued at $130,905,558,marketed in 1913. This represents a decrease in quantity of 19, 928,818 long tons, or 33.41 per cent, and in value of $59,000,479, or 45.07 per cent. The average price of ore per ton for the whole country in 1914 was $1.81, as compared with $2.19 in 1913. These quantities of ore, both mined and marketed, include the iron ore used for fluxing other metallic ores at smelters in the middle and western states, but the marketed ore does not include the iron ore sold for the manufacture of paint. The quantity of iron ore marketed for paint manufacture in 1914 amounted to 18,452 long tons, valued at $46,995. The ore reported as sold for fluxing purposes other than in the manufacture of pig iron amounted to 42,677 long tons, valued at $114,985, in 1914, as compared with 62,842 long tons, valued at $235,588, in 1913. The domestic iron ore actually marketed for the manufacture of pig iron amounted in 1914 to 39,671,603 long tons, valued at $71,790,094, as compared with 59,580,256 long tons, valued at $130,669,970, in 1913.

Iron ore was mined in 27 states in 1914, as campared with 28 states in 1913, no commercial production having been reported from Texas in 1914. Of these states, four—Idaho, Montana, Nevada and Utah—produced ore for flux only; part of Colorado's production was for fluxing and part for pig iron; the remaining states produced iron for blast furnace use only, except small tonnages for paint from Georgia, Michigan, New York, Pennsylvania and Wisconsin.

The five states producing the largest quantity of iron ore are Minnesota, Michigan, Alabama, Wisconsin and New York, the first three of which produced more than 1,000,000 tons each.

IRON ORE MINED IN THE UNITED STATES IN 1913 AND 1914

State	Quantity 1913	(long tons). 1914
Minnestoa	$38,658,793	$21,946,901
Michigan	12,841,093	10,796,200
Alabama	5,215,740	4,838,959
Wisconsin	1,018,272	886,512
New York	1,459,628	785,377
Pennsylvania	489,056	406,326
Virginia	483,843	378,520
Wyoming	537,111	366,962
New Jersey	325,305	350,135
Tennessee	370,002	330,214
New Mexico	164,085	81,980
Georgia	155,236	67,722
North Carolina	69,235	57,667
Missouri	39,354	37,554
Kentucky	3,400	21,400
Utah	14,690	*
Colorado	*	10,464
Connecticut	*	9,149
Massachusetts	*	7,600
West Virginia	7,808	6,530
Maryland	*	6,369
Ohio	7,849	5,138
Montana	2,475	*
California	2,092	1,282
†Other States	115,370	40,800
Total	61,980,437	41,439,761

*Included in Other States.

†In 1913: Colorado, Connecticut, Idaho, Maryland, Massachusetts, Mississippi, Nevada and Texas. In 1914: Idaho, Mississippi Montana, Nevada and Utah.

The Minnesota ranges are still producing more iron ore than is produced in the rest of the states together, having furnished 52.96 per cent of the total for the United States in 1914, as compared with 62.37 per cent in 1913. The Lake Superior district, comprising all the mines in Minnesota and Michigan and those in Northern Wisconsin, mined 33,540,403 long tons in 1914, or 80.94 per cent of the total production.

Ore shipments from the Lake Superior mines as shown by statistics compiled by *The Iron Trade Review* were 32,729,726 tons in 1914 and 49,947,116 tons in 1913.—*The Iron Trade Review.*

Da Stronga Man

You skeeny leetle office man
  Dat keepa da books,
Why do you geeve Italian
  Sooch ogly looks?
Today w'en from your deener-time
  I see you com',
You sneered at me baycause dat I'm
  So plain an' domb.
W'en een da street I sat to eat,
  An' you went by.
I s'pose dat you was full weeth meat
  An' cake an' pie.
I saw you sneer an' shak' your head
  At w'at I gat:
Som' onion, halfa loafa bread
  An' wan tomat'!

You skeeny leetle office man
  Dat keepa da books,
Who was eet made dees granda lan'?
  Eh? Stylish cooks?
Com'! tak' dat leetle pen for me
  You use so wal,
An' mak' som' figures now an' see
  Eef you can tal
How manny railroads, mines an' streets
  An' buildin's high,
Was made by men dat fed on meats
  An' cake an' pie;
Den count how manny workers fed
  On w'at I gat:
Som' onion, halfa loafa bread
  An' wan tomat'!

(C-1914, Evening Bulletin) —*T. A. Daly*

Effect of Wetting the Coal

In talking with a very intelligent engineer on various methods of getting the best work out of a locomotive, he put the question, "Is it better to fire with dry coal or with the coal wet? Some men say," he continued, "that the wetter the coal, the hotter the fire it will make, and they refer to the example of the blacksmith who from time immemorial has been in the habit of wetting his coal to help in getting an intense heat. This is done, everybody admits, and it would not be done if the blacksmith did not find that the practice helped him. It looks, however, as if the firebox of a locomotive acted differently from a blacksmith's forge, and I scarcely think that the cases are exactly the same. I know when there is much snow mixed with the coal that it is hard making an engine steam, and snow ought to intensify the heat if water does so. It is common sense to think that water dampens and cools a fire, and I take no stock in wet coal acting the opposite way when thrown into a firebox, the blacksmith practices notwithstanding."

Decidedly our friend was right. Strange as it may appear, there is a widespread but erroneous impression that wetting the coal fed to a locomotive firebox intensifies the heat of the fire. This, no doubt, arises from the practice of the blacksmith alluded to, but the blacksmith wets his coal to form an outside shell which keeps the heat concentrated about the forging, not that he imagines that wet coal will create more heat than dry coal. When wet coal is thrown into a furnace, a portion of the heat already generated is wasted evaporating the water before the coal can begin to perform its functions of fuel. Every pound of water thrown into the firebox with the coal has to be evaporated, just the same as the water employed in steam making, and coal has to be wasted in doing the operation. Evaporating water in a firebox has some disadvantage peculiar to itself, and the practice would be less common if those who encourage it fully realized the great waste of heat that results. Wetting the coal to some extent is necessary to keep the men in the cab from getting blinded with dust, and it sometimes gives sufficient adhesion to stack coal to keep the finer particles from going direct from the scoop into the flues. But to suppose that any increase of heat could result from coal being saturated with water is the mistake of silly ignorance.
—*Railway and Locomotive Engineering.*

Cannon Made from Shay Locomotive Axles

The following story told by Mr. Thomas Sturgis of Richmond Hill, Long Island, N. Y., will no doubt be interesting to the user of Shay locomotives. No doubt all users are quite familiar with the good qualities of the Shay locomotive, but few would ever expect that parts from the Shay would be used to make guns.

"While with the Madero Lumber Co., of Chihuahua, Mexico, in the summer of 1911 I met Francisco I. Madero and his aid Guiseppi Garibaldi who had retreated there after their defeat at Casas Grandes. They had no connon and were very anxious to get some, and at that time there was an embargo on arms from the states.

Among the company's locomotives were five or six Shays and I suggested to Garibaldi taking a couple of axles from one that was dismantled in the yard, turning them down and boring them out in our machine shop, which they did. Working night and day they bored a hole 2½ inches in diameter, improvised breech blocks, shrunk three bands of steel around the breeches and mounted them on heavy cart wheels.

The guns were smooth bore and shot a solid iron ball a mile and a half. The guns were used at the taking of Juarez and proved effective against the cathedral and the thick adobe buildings of that place."

No Slouch

The men in the Pullman smoker were arguing about the great inventors. One said Stephenson, who invented the locomotive, and made fast travel possible, was the greatest. Another declared it was the man who invented the compass, which enabled men to navigate the seas. Another contended for Edison. Still another for the Wrights. Finally one of them turned to a little man who had remained silent.

"Whom do you think?"

"Vell," he said, with a hopeful smile, "the man who invented **interest** was no slouch."

—*Lightning Line.*

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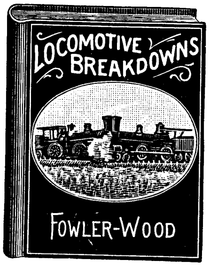

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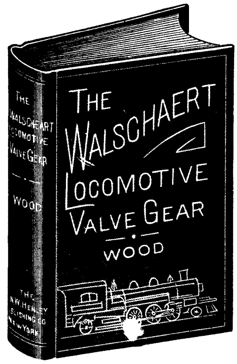

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FIG. 1023
With Loose Pin Feed

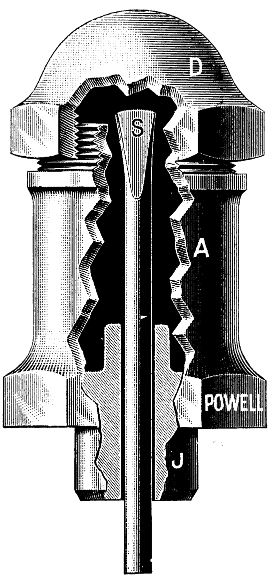
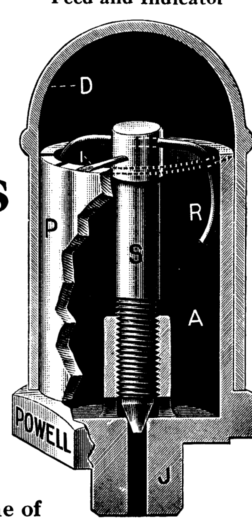


FIG. 1022
With Spring Adjustmet Feed and Indicator



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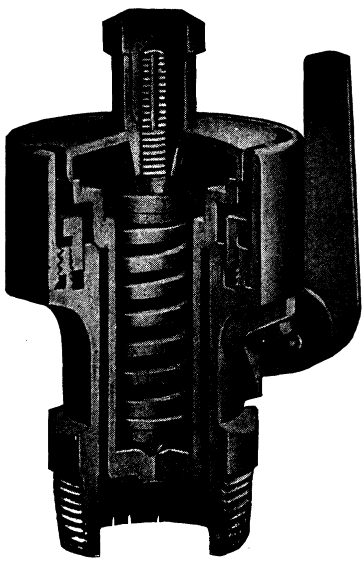

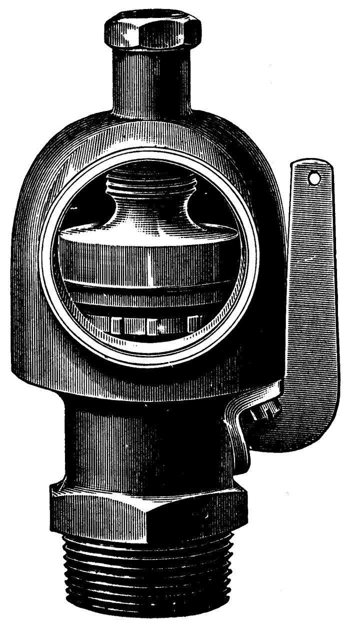

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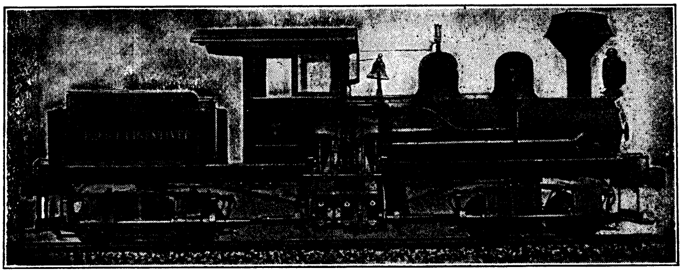

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PARTIAL LIST OF SECOND-HAND LOCOMOTIVES

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1	65	Shay	56½″	New Mexico	0831
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
1	45	Shay	56½″	Vermont	142
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