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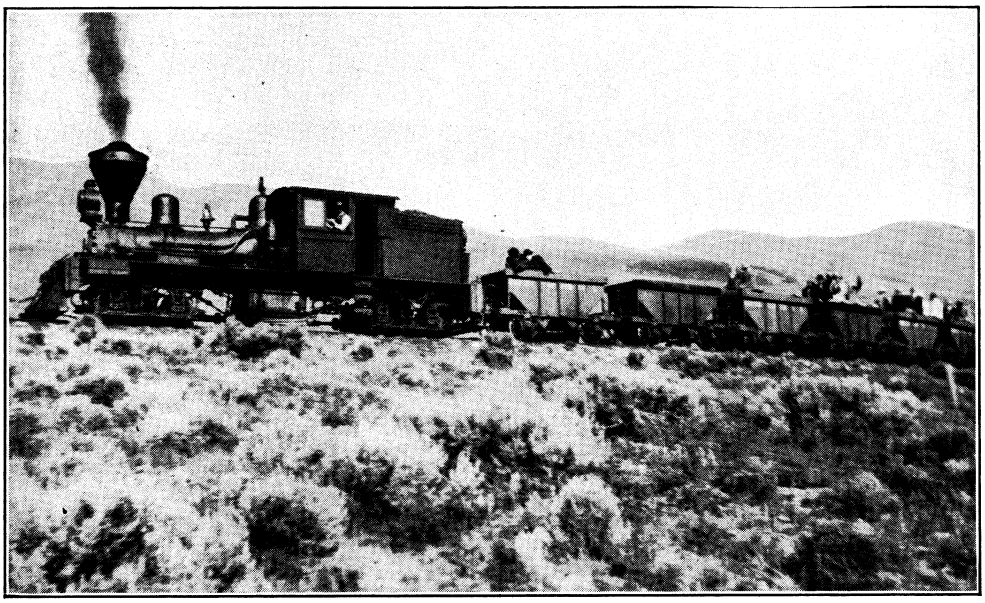
SHAY Locomotives



24-ton Shay Locomotive on Empire Copper Co. Railroad. This road contains 6 per cent combined with 34 degree curves.

Are Particularly Adapted for All Around Heavy Work

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.

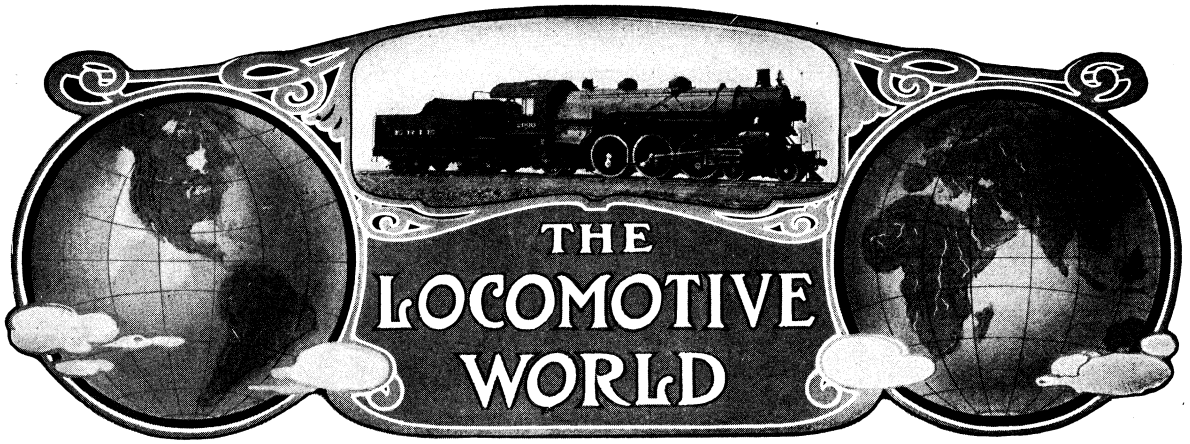
We've an unusually attractive catalog about Lima Locomotives. Shall we forward a copy?

Lima Locomotive Corporation

Builders of

Locomotives of All Types

Lima, Ohio



VOL. 8, No. 8 LIMA, OHIO December, 1915

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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NOTICE TO ADVERTISERS
Advertising rates furnished upon application. Change in advertisements intended for a particular issue should reack 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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THE policy adopted by the editor of The :ocomotive World is to give the users of Locomotives on private railroad lines some valuable pointers in each issue, which may be of value in either maintaining or operating their equipment. Request is hereby made to engineers running locomotives on private lines to contribute short articles which they think may be of interest to their fellow-workers, as frequently one man operating a locomotive will run up against certain difficulties and overcome same by well thought out method, which would not occur to some other engineer. All of us are at times subject to misfortunes, and we are always glad to have the experience of our fellowmen in endeavoring to remedy such difficulties as we may encounter.

The Charter Oak Was a White Oak

There has long been somewhat of a dispute regarding the species of oak which sheltered Connecticut's charter at a very critical period of our Colonial history. The tree was old and hollow on that memorable night of October 31, 1687, but it stood until blown down by a furious storm in 1854.

There are a number of oak trees in New England which are reputed to be direct descendants from the Charter Oak, but curiously enough some of them are red oaks and some white oaks. In Putnam park in Connecticut is a white oak which to all appearances is not over twenty-five or thirty years old but it is labeled a "chip of the old block" and claimed to be from a Charter Oak acorn. Probably the wood of no other tree has been so eagerly sought after as that of the Charter Oak and, if rumor is to be credited, there is enough so-called Charter Oak material to make half a dozen sturdy oaks as large as the original. It is evident that there has been a bit of faking somewhere.

It has been pretty generally agreed that the Charter Oak was a white oak, but it appears that no one realized that the matter could be definitely settled by an examination of an authentic piece of the wood. Such specimens have been preserved in the State Library Building at Hartford, and a recent inspection of them by a wood technologist showed that there was no longer any reason to question that the Charter Oak was a true white oak (*Quercus alba*). The features distinguishing the two groups of oaks are so distinct and reliable that to the careful observer with a good hand lens no cause for uncertainty exists.

—*Hardwood Recood.*

Unique Industrial Development Among the Clouds Near Crestmont.

(Manufacturers Record)

Newport, Tenn., Nov. 30.

AMONG the hills that form the Great Smoky range at the end of the 21-mile Tennessee & North Carolina Railroad, that gives it touch with the outer world through Newport, rests Crestmont.

It has a population of about 400. It has no macadamized roads, but boasts one thoroughfare of native dirt *in situ*, along which are the dwellings of most of the residents. Crestmont has no Mayor, council, taxation or politics. It has a bountiful and wholesome water supply, electric lights, modern sanitary requirements, telephones, a United States postoffice, a general store, a general medical practitioner, a barber shop, a clubhouse, and enjoys the privilege of being the private possession of the Champion Lumber Co.

In May the Champion Lumber Co. underwent a change in stock ownership, following which H. I. Miller of New York became president. Up to this time Crestmont had been doing each day its alloted task of converting hemlock and spruce logs into 150,000 board feet—whenever it got the logs—in the two band and one resaw mill and its planing-mill adjunct. Soon after Mr. Miller's accession there was a meeting of the directors and the announcement that the company intended to improve its property at both Crestmont, in Haywood county, about three miles from the Tennessee line, and at Sunburst, its other plant, 40 miles distant in the direction of Canton. In brief, it was stated that the company would spend $750,000 on improvements.

An army of carpenters, millwrights, painters, plumbers, etc., at once began to do things. They had to provide accommodations for themselves. A bunkhouse with 14 rooms, and with a lavatory and two bathrooms, was run up and additional space added to the hotel diningroom. Other bunk and boarding houses were built. New dwellings, with electric lights, telephones and sanitary appliances were built, offices remodeled and refurnished, the hotel added to and rearranged and the living accommodation all over town made more comfortable, modern and adequate. Nor were the children neglected, for a liberal extension was added to the meeting-house, used for both religious and school purposes, and it was equipped with school desks and paraphernalia of the latest pattern.

In the manufacturing department radical improvements were carried out, to the end of increased production and more economical handling. The sawmill was practically reset; a new lath mill installed to better rework slabs and a new conveyor built to carry waste to fire dump or such of the waste as in future would be burned. The improvements included a box factory to convert a large percentage of the previous waste into box shooks. This factory occupies one-half of a building of mill construction, 160x200 feet. It will have everything for the manufacture of all kinds of boxes knocked down for shipment. In the other 80x200 feet of the building is a planing mill with capacity of 200,000 feet in 10 hours. Its equipment included 30-inch and 15-inch matcher, 15-inch surfacer, 15-inch combined matcher and resaw, 12-inch moulder gang edger, horizontal twin resaw and band ripsaw. Each machine in both factory and planing mill will be electrically driven by individual dynamo, the power being derived from an Allis-Chalmers 625-kilowatt steam turbine supplied by a pair of boilers 84 inches in diameter by 20 feet long at 150 pounds pressure.

Other construction work included a new supply warehouse and various yard offices, etc. At the height of this activity there were 510 persons on the Crestmont payroll. There were 400 more at Sunburst and several hundreds in the woods. At Sunburst a planing mill duplicating the Crestmont plant has been erected and equipped. It was said, on what seemed authority, that during the month about 2000 men were in the employ of the company, counting the two plants and the woods force and including contractors.

The Champion company has the timber rights over 100,000 acres. This is estimated to give Crestmont a 17 years' cut and Sunburst a 15 years' cut. The mountain lumberman reckons growth other than hemlock or spruce as hardwood. Thus buckeye, birch, maple, bass, hickory, chestnut, poplar, the oaks, etc., are so classed and run to about 25 per cent. of the whole. The chief output of the mill is hemlock and spruce, or spruce pine and balsam, as these woods are called in this country.

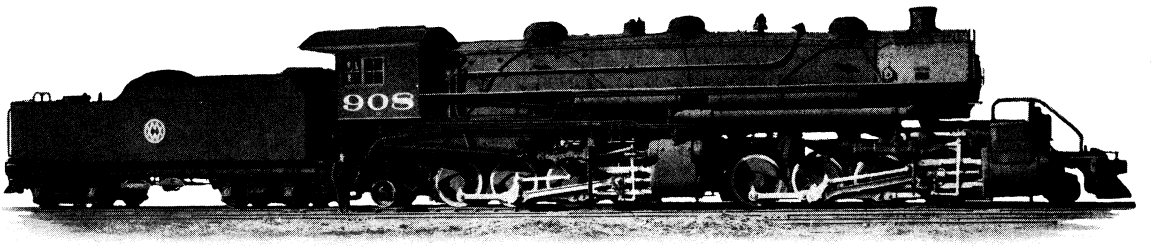
As these are mountain top woods, the cut can be reached only by means of switchbacks at designated points along the 20 miles of standad gauge railroad that has been built from the mill into the hills. Shay locomotives are available on the inevitably heavy grades, and of these there are six, mostly of the heaviest type. These operate 35 new Magor timber cars of the newest pattern, built for this company, and nine of the old design, or 44 in all. The laden cars are as-

(Continued on page 9)

Big Mallet Locomotives for Western Maryland Ry.

FOR heavy freight service on the Western Maryland R. R. the Lima Locomotive Corporation has lately designed and built fifteen Mallet type locomotives with 2-8-8-2 wheel arrangement. Ten of these can be described as follows:

They are among the heaviest and most powerful of their class and were designed to suit specifications prepared by Mr. H. R. Warnock, Supt. Motive Power of the Western Maryland R. R. for hauling trains of 200 tons on the heavy grades and sharp curves of that company's mountain divisions. The cylinders of these locomotives are 26″ and 40″ diameter respectively for the high and low pressure engines. The piston stroke is 30″ applied to driving wheels 52″ diameter giving, with 210 lb. boiler pressure, a maximum tractive power of 106000 lbs. while working compound. They are fitted with the "SIMPLEX" intercepting valve which allows a simpling feature temporarily raising the tractive power to 127000 lbs. The weight on drivers is 445000 lbs. and the consequent factors of adhesion are 4.19 compound and 3.52 simple.



Mallet Locomotive for Western Maryland Railway

H. R. Warnock, Sup't Motive Power G. F. Weiseickel, M. M.

The most interesting features of the design are the details of compounding and steam distribution, which differ considerably from any engines of the same type previously built.

The intercepting valve is of the simplest form yet devised and is arranged in a chamber casting independent of the cylinders. This arrangement allows a very simple design of high pressure cylinder, the right and left hand section of which are interchangeable and reversible, a feature never before accomplished in a Mallet engine having a separate exhaust for the high pressure cylinders. The location of the intercepting valve chamber is transverse instead of fore and aft and the internal parts of the valve can be readily reached for examination or replacement without going between the frames. This feature should be particularly valuable from a maintenance standpoint. The details of articulated steam joint have been simplified by making all ball rings and packing interchangeable between all steam and exhaust joints, while the rings themselves are of simplified design in interchangeable pairs for each joint.

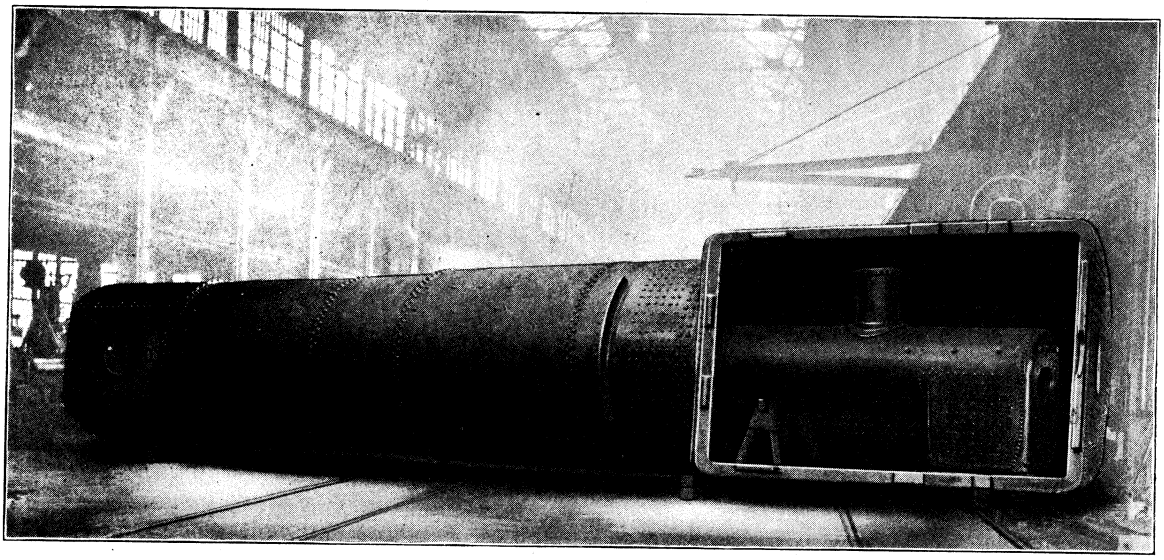
The steam distribution is by two sets of Baker valve gear actuated by a Ragonnet reversing engine and the valves are set to give 90% full gear cut-off in the high pressure cylinders with 83% full gear cut-off in the low pressure ones. The high and low pressure valve gears are coupled by a device known as the Economy Expansion Regulator, the first installation of which occurs on these engines. This device consists of a "controlled" scotch yoke on the connecting shaft which slows up the cutting off of the low pressure engine by automatically reducing the throw of the connecting shaft arm. When the high pressure engine is "hooked up" the cut-off decreases more rapidly than does the cut-off of the low pressure engine with any given amount of movement of the reverse lever. This arrangement is intended to keep the work of the high and low pressure engines more nearly equal at all running speeds.

These locomotives are also the first ones to be equipped with the long main journals on both units, a construction not heretofore considered possible on Mallet engines on account of obstructions by the receiver pipes and firebox suspension. The front truck is of the now well known Economy type with center bearing equalized with the front drivers. The rear truck is also of the Economy type with constant resistance cams but it is modified to obtain side

bearing features in connection with the equalization to the rear driving wheels. This feature is accomplished by a hollow centre pin guide and by a bearing yoke applied over the bolster allowing perfect freedom for swiveling and swinging and at the same time giving the necessary stability to the engine not obtainable by a centre-bearing trailing truck.

The boiler is of the conical wagon top type 92″ diameter outside of its smallest ring and 102″ diameter at its largest one. The barrel is made 24′ long over the tube sheets and is fitted with a combustion chamber 48″ deep. The firebox proper is divided by a Gaines wall giving a grate length of 120″ and a total length of 150″ thus providing an additional combustion space as well as the barrel chamber. The entire arrangement is fitted with Gaines-American combined arch bricks having air ducts to improve combustion.

Articulation is by a single hinge pin located ahead of the high pressure cylinders and connections to the frames by spring tension "trim rods". Weight is distributed to the low pressure unit by a pair of sliding saddles fitted with adjustable bearing plates. Springs are applied to the front, or auxiliary saddle for the purpose of exerting transverse pressure to obtain proper alignment of the low pressure unit on straight track.



View of Conical Wagon Top Boiler with Ordinary Firebox showing boiler for 13-ton Locomotive Sitting in Firebox.

The clearance dimensions of the engine are 16 feet in height and 11′4″ in width, allowing ample running boards, steps and handholds in spite of the unusual diametric dimensions of the boiler.

The engine wheel base is 56′8″ total, of which 40′8″ is driving wheel base with 15′ rigid base in each unit. The total wheel base of engine and tender is 91′1½″ while the total overall length is 101′10½″.

To obtain maximim capacity for these engines they must necessarily be mechanically fired and they are accordingly fitted with Standard Stokers of the scatter or overfeed type. This stoker has no back head attachments and allows plenty of room in the cab for operating fixtures making a roomy and comfortable engine for the crew. Emergency firing can be done by hand through a Franklin Automatic door.

The grates are mechanically operated in two principal sections while the ash pans are of the hopper type with air operated slides. The brakes are Westinghouse 6-ET supplied with air by two 8½″ cross-compound pumps and having reservoirs of 100000 cu. in. capacity. A Chambers throttle with drifting attachment is located in the main dome, while an auxiliary dome of "man-hole" type is provided for the safety valves and for purposes of inspection.

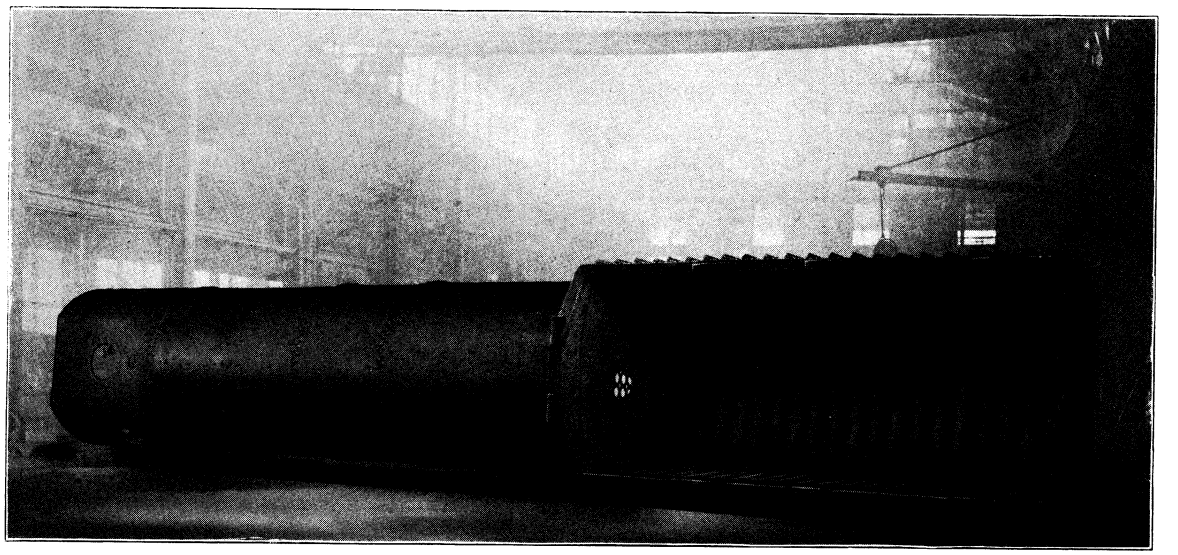
Five locomotives of the total order of fifteen are equipped with Jacob-Shupert fireboxes and differ only from the other ten in the style and dimensions of the boiler with such other

differences in the structural parts as are necessary for properly mounting the special boilers on the frame structure.

A detailed description of the boiler follows:

The straight top type has been adopted as best suited for the extra long firebox provided and the diameters are respectively 92" and 96" of the smallest and largest outside courses. The tubes are identical in number and diameter with the regular boilers but are of less length the dimension over tube plates being 22'05⅝". The firebox is 219½" long by 89⅜" wide and its forward section is used as a combustion chamber of the Gaines type, there being no barrel combustion chamber. The effective length of the box at the grate line is 144" giving 98.3 sq. ft. of grate area.

The total evaporative surface is 5477 sq. ft. which with a superheating surface of 1310 sq. ft. gives an equivalent heating surface of 7442 sq. ft. when rated in the usual manner.



Straight Top Boiler with Jacob-Schupert Firebox

All fifteen locomotives have identical tenders. These are of 10500 gal. tank capacity and carry 15 tons of soft coal with screw conveyors in the fuel pit. The frame is of heavy section steel channels strongly braced and the entire structure is carried on two Economy tender trucks having 6" x 11" journals and 33" diameter wheels.

The illustrations herein show completed engine conical wagon top boiler with ordinary firebox and boiler with Jacob-Schupert firebox, used on these locomotives.

A description of the operation of Simplex system of compounding is given in the following:

The compound locomotive has always had a bad name in respect to "blows" and steam leaks to the atmosphere, making it difficult or impossible during cold weather for the engineer to see track or signals. This is evidenced by the frequent appearance of illustrations in railway periodicals showing an engine, apparently emerging from a fog-bank, with some such title as "A compound hard at work", etc. This difficulty is not at all imaginary, as anyone familiar with the various types now in use or obsolete, will testify, and has been one of the greatest causes of prejudice against even the most efficient of these machines.

One of the principal objects of the herein described system is the reduction of the number of sources of this complaint—first, by conveying all the various vents, drains and relief discharges to the exhaust passage and thence to the stack, and second, the reduction of the number of steam joints, and the simplification of their form, so that they may be maintained in proper condition without difficulty.

Other claims are the general simplification of the now complicated and cumbersome castings, such as the High Pressure cylinders, which in this system are made interchangeable, right and left, and the accessibility of all parts, such as the intercepting valve.

The system consists of five (5) separate and distinct features or improvements, any one or which may be used separately or all of which may be used upon one engine, namely:

1. Intercepting and separate exhaust valve.
2. Operating or simpling valve and location of same.
3. Arrangement of High Pressure cylinders.
4. Intercepting valve chamber.
5. Improvements in the Low Pressure cylinder.

While the improvements herein described are intended principally for use upon engines of the Mallet type, items 1, 2 and 5 are also applicable to cross-compound locomotives, and when so applied will operate as successfully in every respect.

I. INTERCEPTING VALVES

The novel features of this device consists of

1. The combination of intercepting and separate exhaust valves in one integral piece.
2. The combination of the operating piston and cylinder with dash pot piston and cylinder.
3. The entire cutting off of the supply of live steam to the reducing valve when working compound.
4. The two flexible sections of the main stem enabling all parts to accommodate themselves to slight inaccuracies in workmanship and obviate sticking.
5. The conduction of all bleeders from balancing or pressure chambers to one cavity which is pipes to the separate exhaust passage.
6. Absolute symmetry of all joints to heads, etc., enabling them to be made and maintained tight.
7. Absence of all ground or gasket joints to atmosphere for holding steam under pressure when working compound.
8. In most automatic intercepting valves, a considerable preliminary reduction of receiver pressure is necessary in changing from compound to simple, making the device useless to prevent stalling. In this valve, since the change is effected by direct pressure on the operating piston, it is entirely *independent* of receiver pressure. Therefore, *no* preliminary reduction is necessary.
9. In another well known type it is impossible to regulate the power of High Pressure cylinder when working simple in the most desirable manner, i. e. by reduction in the size of the separate exhaust nozzle, since the back pressure would unbalance the valve and cause it to flutter. This fluttering allows live steam to escape to the separate exhaust passage.

   This condition does not obtain in the type under consideration since it cannot be unbalanced. Therefore, the complete control of the power of the high pressure engine in simple working can be regulated by the area of the separate exhaust nozzle, the power of the low pressure being controlled in usual manner by the proper proportioning of the reducing valve.
10. The manufacture of the valve is greatly facilitated and the cost reduced by its every part being *perfectly circular or cylindrical* enabling all work to be done upon a lathe and drill press. The castings contain no irregular internal cores, and are extremely simple in form.
11. The valve being non-automatic is *not sensitive to exact balance of pressure* as on all automatic valves, there being an ample *reserve of power for moving the valve in either direction*, thereby overcoming the resistence caused by core sand cinders or lack of lubrication which would cause all automatic valves to become inoperative.
12. The entire valve on account of the several combinations of functions in one device, occupies much less space than any valve in use.
13. The *entire valve* mechanism including the separate exhaust valve is removed in one mass by taking off a single cover.
14. The venting of the valve to the separate exhaust passage has a beneficial effect upon working of the engine, since the back pressure in this passage has a slight but appreciable tendency to vary the cutting off pressure of the reducing valve —when engine is working hardest, the pressure in the separate exhaust chamber is highest, causing the reducing valve to deliver steam to the low pressure cylinders at a higher pressure, the better maintaining the balance of power between the two engines.

15. Another distinct advantage in the system is that the separate valve remains absolutely closed when drifting, whereas in engines with independent separate exhaust valves, the vacuum produced by the H. P. cylinders causes it to open and close, serving as an air valve which draws its supply from the smoke box. This results in drawing cinders in to the H. P. cylinders and into the intercepting valve itself. Also the constant fluttering of the valve causes it to wear very rapidly. As the Mallet type is used principally on mountain divisions, drifting a considerable portion of the mileage, this wearing out of the separate exhaust valve has been one of the principal objections to the compound systems now in vogue. These valves when removed are invariably dry and blackened by gases and the seats and wings badly worn. In case they are not frequently simpled, the separate exhaust pipe will be found plugged with cinders.

II. SIMPLING VALVE AND LOCATION OF SAME.

Mallet engines should always be started simple—and usually are. The train can be started more easily, and with less destructive effect to draft gear, and the engine can be more quickly stopped in case of accidents to couplers, etc. Therefore, the automatic feature of an intercepting valve is merely a "talking point" when applied to the Mallet type. But, if the simpling valve is to be used frequently, it should be conveniently placed and, therefore, must be very small and compact, that there may always be room for it on the backhead of the boiler, just inside, and on a level with the engineer's brake valve. The *location* as shown, instead of on top of the boiler head, where it must be sought for among a lot of hot pipes, and the *form* of valve as used for this purpose, are the only new features of the device. The valve itself is not new, as it is used for brake valves and many other purposes. The valve is *plainly marked, showing simple and compound positions.*

III. ARRANGEMENT OF HIGH PRESSURE CYLINDERS.

By removing the intercepting valve from the high pressure cylinder saddle, and placing it in a separate casting, called an intercepting valve chamber, a highly simplified cylinder casting is the result with the following advantages:

1. MANUFACTURE. It now costs about double the regular price to mould high pressure cylinders containing intercepting valve chambers. In this type, the cost will be less, if anything, than a simple cylinder. Loss of casting will not entail as great a monetary loss as the old type, and the losses will be lower. It is much easier to bore out the intercepting valve chamber in a small casting than when it is integral with the cylinder. No more joints are required, as by this method the receiver connecting pipe is done away with.

2. The cylinders are intercheangeable right and left.

IV. INTERCEPTING VALVE CHAMBER.

In order, principally, to greatly simplify the construction of the high pressure cylinders, also to render the intercepting valve more accessible for cleaning and repairs, the valve in a separate casting, placed transversly of the engine in front of the high pressure cylinder saddle, communicating with same through two passages with ground ball joints, for the passage of the high pressure exhaust. After passing the intercepting valve, the high pressure exhaust steam is either admitted direct to the receiver pipe, the ball and socket joint of which is contained in the lower part of this casting, or is allowed to pass out through the separate exhaust pipe, according as the intercepting valve is in compound or simple position. In addition to the support formed by its bolting to the High Pressure saddle, by the joint flanges, it is rigidly supported to the hinge casting, H. P. frames or boiler whichever is most convenient.

V. IMPROVEMENTS IN THE LOW PRESSURE CYLINDER.

This consists of the elimination of two leaks or blows to the atmosphere which on account of the location of the low pressure cylinders at the front of the engine are the source of much annoyance, not to say danger in obstructing the view of the engineer. The first is the discharge of the receiver pressure relief valve. This valve is a necessity in all compound engines, since, should the reducing valve stick from any cause, such as core sand from the cylinder castings in a new engine, full boiler pressure might be brought to bear upon the large low pressure pistons, resulting in over stressing the working parts and frame of the engine. When this valve pops to the atmosphere in cold weather, the entire engine is enveloped in steam for some minutes. The improvenent in this respect consists in causing the valve to discharge into the exhaust passage. At the same time,

the spring and the device for regulating the popping point are readily accessible, the spring being entirely removed from the heat of the steam. The second improvement consists in venting the passage intermediate of the by-pass valves (when the Mellin, Sheedy or other similar by-pass valves are used) to the exhaust passage instead of to the atmosphere. These valves leak more or less and as a result there is a continual discharge from the pipe when the engine is working. The venting of these valves in this manner is not new, having been tried and abandoned because of the grimming up of the valves from contact with the exhaust gases. The new feature in this case consists of a ball check to prevent the ingress of these gases when drifting.

The general dimensions follow:

GENERAL DATA	ENGINE 901	ENGINE 911
Gauge	4′ 8½″	4′ 8½″
Service	Freight	Freight
Fuel	Soft Coal	Soft Coal
Tractive Power compound	106000 lb.	106000.lb.
" " simple	127000 lb.	127000 lb.
Weight in working odrer	495000 lb.	495000 lb.
" on drivers	445000 lb.	445000 lb.
Adhesive factor, compound	4.19	4.19
" " simple	3.52	3.52
Wheel base, engine	56′ 8″	56′ 8″
" " driving	40′ 8″	40′ 8″
" " rigid	15′ 0″	15′ 0″
" " engine and tender	91′ 1½″	91′ 1½″
CYLINDERS		
High pressure diameter	26″	26″
Low " "	40″	40″
Piston stroke	30″	30″
VALVES		
Type, high pressure	American Semi-plug	American Semi-plug
Diameter	14″	14″
Maximum travel	6½″	6½″
Steam lap	15/16	15/16
Exhaust clearance	¼	¼
Lead in full gear	⅛″	⅛″
Type, low pressure	Jack Wilson Slide	Jack Wilson slide
Steam port length	29″	29″
Maximum travel	5″	5″
Steam lap	1″	1″
Exhaust clearance	⅜″	⅜″
Lead in full gear	⅛″	⅛″
WHEELS		
Driving, diam over tires	52″	52″
" thickness of tires	3½″	3½″
Main journals, size	11″x20″	11″x20″
Other " "	9″x12″	9″x12″
Engine truck wheel diameter	30″	30″
" " journals	6″x12″	6″x12″
Trailing truck wheel diameter	30″	30″
" " journals	6″x12″	6″x12″
BOILER		
Type	Conical Wagon Top	Straight Top*
Working pressure	210 lb	210 lb.
Outside diameter, first ring	92″	92″
" " largest ring	102″	96″
Firebox length by width	150″x96¼″	219½″x89⅜″
Effective length of firebox	120″	144″
Mud ring width, front	5″	5″
" " " sides and back	4½″—4½″	4″—5″
Tubes, number and diameter	266—2¼″	266—2¼″

*Jacob-Shupert Firebox

Flues, number and diameter	45—5½"	45—5½"
Tubes and flues, length	24' 0"	22' 9⅝"
Gaines combustion chamber, length	26½"	64½"
Barrel " " "	48"	None
Heating surface, firebox	360.sq. ft	398 sq. ft.
" " arch tubes	44 sq. ft.	59 sq. ft.
" " tubes	3747	3614
" " flues	1550	1406
" " total evaporative	5701 sq. ft.	5477 sq. ft.
Superheating surface	1380 sq. ft.	1310 sq. ft.
Equivalent heating surface	7771 sq. ft.	7442 sq. ft.
Grate area	80 sq. ft.	89.3 sq. ft.
Front end arrangement	Mudge-Slater	Mudge-Slater
Smoke stack-diam	20"	20"
" " height over all	16' 0"	16' 0"
Centre of boiler above rail	10' 0"	10' 0"
RATIOS		
Tractive effort × diam. drivers by equivalent heating surface	710	742
Equivalent heating surface ÷ grate area	97	83
Firebox heating surface ÷ equivalent heating surface, per cent	46.4	53.5
Weight on drivers ÷ equivalent heating surface	58	60
Total weight ÷ equivalent heating surface	63.7	66.5
Volume of one high pressure cylinder plus 1 low pressure cylinder	31.03 cu. ft	31.03 cu. ft
Equivalent heating surface ÷ combined cylinder volume	250	240
Grate area ÷ combined cyl. volume	2.58	2.88
TENDER		
Tank—type	Water bottom	Water bottom
Frame—type	Built-up	Built-up
Truck—type	Ecomony	Economy
Tank capacity	10500 gals.	10500 gals.
Fuel capacity	15 tons	15 tonx
Screw conveyor for	Standard stoker	Standard stoker
Wheel diameter	33"	33"
Journal sizes	6"x11"	6"x11"
Weight, fully loaded	190000 lbs.	190000 lbs.

(Continued from page 2)

sembled at the Bottoms, about four miles out from the various camps, and there made up into trains of seven cars. A powerful Shay takes the train, very slowly and carefully, down the steep grades and around the sharp curves to the log pond siding, where the logs are dumped. Some nine camps have been opened along the road, but not all are operated at this time. Other new camps are being established. The highest camp is No. 9. Viewed from No. 4, some eight miles from the mill, No. 9 seems to rest on the summit of Mt. Guyot. In reality, it is some 2000 feet from the top; high enough, at any rate, for comfortable railroading when it is remembered that Guyot rears its crest 6636 feet above tide and ranks next to Mitchell, with its 6711 feet the highest point east of the Mississippi River. Since Crestmont stands at an altitude of 1800 feet, and camp 9 is 2900 feet higher, of 3600 feet above sea level, this is probably the highest lumber camp in the Eastern timber-cutting country.

The timber road follows the course of Big Creek, which, rising near Guyot, tumbles precipitously along its rocky and tortuous length to join its waters with Pigeon River, about three miles westward of Crestmont. It flows through a narrow valley that only occasionally widens into a flat; walled in by hills that seem to rise with almost vertical acclivity, there is afforded the railroad builder but scant foothold for his rails. It is on these steep hillsides that the lumber jack, locally known to fame as a "wood hick," with the aid of spiked boots and a due proportion of nerve, cuts with axe and saw into the massive butts or mighty hemlock and spruce for the saw logs. He will

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Iron and Steel Production.

The prophecies of the ironmasters of the generation are coming true. Twenty years ago predictions were made that there would be an annual output of 40,000,000 tons of pig iron and 50,000,000 tons of crude steel within 25 years. Today the country is producing pig metal at the rate of 37,500,000 tons a year and the output of steel ingots is approximately the same. Before many months production will reach 40,000,000 tons annually, but it would require 12 months of sustained prosperity, like the present, to make possible the production of 40,000,000 tons of either iron or steel in a single period of 12 consecutive months.—*Railway and Locomotive Engineering.*

Trade Literature

The recent publication issued by The Wm. Powell Co. of Cincinnati, Ohio, is a twenty page booklet on their "White Star Valve". This book briefly, but completely, discusses the function of these valves, and illustrates in sectional the several types made by the Wm. Powell Co. The booklet contains full information as to contrsuction, operation and prices. Requests for copies to the company, by mail, will be gladly acceeded to.

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not, if he can avoid it, allow the log to slip down the declivity, for, as has happened, should it so start with any momentum it may travel 1000 feet or more, ripping up or smashing everything in its path, and only coming to rest after tearing up the railroad track or burying itself in a bank. E. J. Smith, the company's wood superintendent, cited an instance where a log that had been trimmed of its top branches slipped down the hill, and, after racing some 200 feet, burried its butt 20 feet in the bank of a ravine. The butt was allowed to remain, but the rest of the tree went for a saw log.

The Champion company employs the most modern method of conveying the logs from the woods to the mill. Steam skidders, stationed at desirable points along the railroad, haul out the logs in slings which travel on a so called "bicycle," riding a steel cable stretched as taut as possible between a mast on the skidder and a suitable anchorage in the woods. The logs are dumped alongside the railroad later to be gathered up by the steam loader and piled on the cars. The newest of these skidders is at camp 4, and has only lately been placed in service. It was built by the Lidgerwood Manufacturing Co., New York, and is said to be the largest in use and to have cost $28,000. It is a skidder and loader combined, and from its 60-foot mast it operates a maximum length of 4000 feet of 1½-inch steel rope, of which 3000 feet is at present paid out and stretches for that distance up into the woods. From where it has fallen the saw log is hauled to the cableway by choker lines of 100 feet and longer, hitched onto the main hauling rope. When four or five such logs are assembled a sling is passed around them and the journey to the railroad completed. Oxen and horses and mules sometimes are employed in assembling the logs, a business that is fraught with danger to man and beast. The hauling is performed along a runway which, with use, becomes so slick that very little impetus gives the logs an ever-increasing momentum that outspeeds the best pace of the animals and finally outruns them. To safeguard men and animals when this happens, pits, or "jay holes," as the woodsmen dub them, are sunk, and into these the animal motor power and its human operator drop in safety from the resistless rush of the logs overhead.

As the improvements progressed conjectures were made as to the reason for the expenditure of so large a sum as three quarters of a million dollars in improvements at a time when the lumber market was not especially active. When asked about this P. C. Thede, the company's general manager, said that the company was preparing for the future rather than looking to the persent in making this expenditure at this time. FRANK J. KELLY.

THE SHAY LOCOMOTIVE

By H. L. BEE

I have railroaded most of my life-time
I've worked engines most every way,
But of all the engines I ever worked on
There's none to compare with the Shay.

Old man Shay invented this engine,
In Eighteen and Seventy Nine,
Since that time they've sold the world over,
And we find every Shay doing fine.

From Thirteen to a Hundred and Sixty tons
With crank set at 180 degree,
When we hit a grade that is seven per cent
The Shay it pulls just to suit me.

Stevenson made the first engine,
But he's not a man of today;
Hisrecordshowsbrightbuthe'dbeennearerright
If he had invented a Shay.

G. Bruce Kittle's a man I admire,
I met him while out on the road,
We've talked of the Shay and how it is built
And how it will handle a load.

He has traveled the whole world over,
And he is a well known man,
He will sell you the Shay Locomotive—
He has sold lots of them in Japan.

He loves to see every one prosper
At home and over the wave,
He will not go into the War-zone,
It means death, hell and the grave.

He's a man that is strictly neutral,
He's going to be neutral still,
For he finds in the Ten Commandments
Where the Lord says, "Thou shalt not kill".

Now how can a man ever doubt this
And why shouldn't he keep away?
For he is a well known Honorable man
That is selling the well known Shay.

There is no skew gear in this engine
The road may be steep or leveled,
It's power is a wonder wherever it be
And remember that it is straight beveled.

They use the Shay in the U. S. A.
Because they work so fine;
They run them on the C. & O.
And twenty nine main lines.

Of course there's other steam pots,
We know will pull a little;
But they can't compare with the good old Shay
That is sold by G. Bruce Kittle.

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