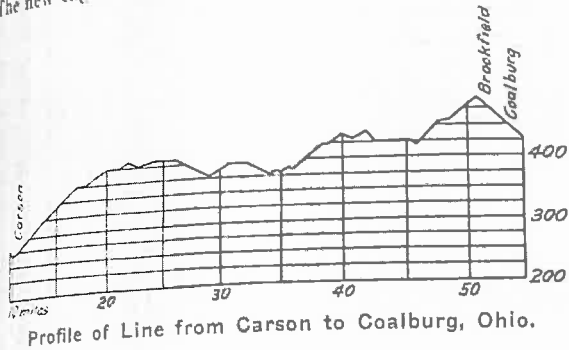


# POWERFUL MIKADOS FOR THE LAKE SHORE.

They Are the Heaviest of Their Type and Include Several Interesting Improvements in the Design of the Details.

Heavy freight service on the Lake Shore & Michigan Southern has been handled by superheater consolidation locomotives; after a careful study of the situation it was decided to order twenty Mikados from the American Locomotive Company. Although the tractive effort has been increased but 22½ per cent., as compared with the consolidation locomotives, the tonnage rating for main line work gives the new Mikados 4,300 lbs., while the superheater consolidation locomotives are rated at 3,200 tons. This is an increase of nearly 35 per cent. The new engines have a total weight of 322,000 lbs., and with a

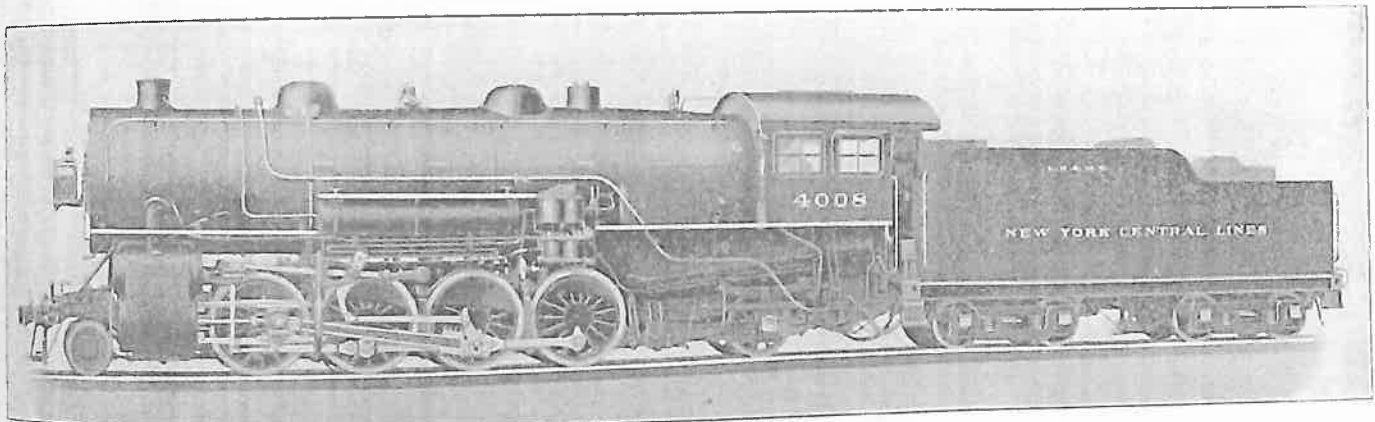


steam pressure of 190 lbs. the tractive effort is 56,000 lbs. It is the practice of this company to use a fairly high ratio of weight on drivers to tractive effort (4.37 in this case), for the purpose of giving ample adhesion when the tires have been worn nearly to the limit. The importance of this feature will be readily understood when it is considered that if the tires are worn 2 in.,

are 25 in. x 32 in., steam pressure 200 lbs. and the drivers 63 in. in diameter. They are equipped with superheaters having about 600 sq. ft. of superheating surface and the evaporating heating surface of the boiler is 3,023.1 sq. ft. On the eastern division out of Collinwood, the consolidations have a tonnage rating of 3,200 tons, while the Mikados are given 4,300 tons. Out of Seneca, the consolidations have a rating of 2,600 tons, while the Mikados are given 3,500 tons. On the Franklin division, out of Youngstown, the consolidations are given 3,400 tons and the Mikados 4,300 tons, while on the Toledo division the consolidations have 3,000 tons and the Mikados 3,500 tons.

In addition to the increase in power which would be expected with a larger engine, there has also been a notable economy of coal and water. Records taken from the Eastern and Michigan divisions give a somewhat unfair comparison which, however, indicates what may be expected under ordinary operating conditions. The average for three trips of a superheater consolidation locomotive having a total weight of 241,000 lbs. showed that it burned 15.9 tons of coal per trip of about 130 miles when hauling a 60-car train of 2,335 tons. This makes 8.17 miles per ton of coal, or 19,100 ton-miles per ton of coal. The average of three trips over the same division with a Mikado was 12.85 tons of coal when hauling a train that averaged 70 cars of 3,203 tons. This is 10.1 miles per ton of coal and 32,400 ton-miles per ton of coal.

A number of new features of a minor, but important, nature have been included in the design, some of them being used on this locomotive for the first time. They include the MacBain auxiliary lubricator valve, Franklin pneumatic fire doors, feed water connections, cold water sprinklers, radial buffers, a special



Heaviest Mikado Locomotive; Lake Shore & Michigan Southern.

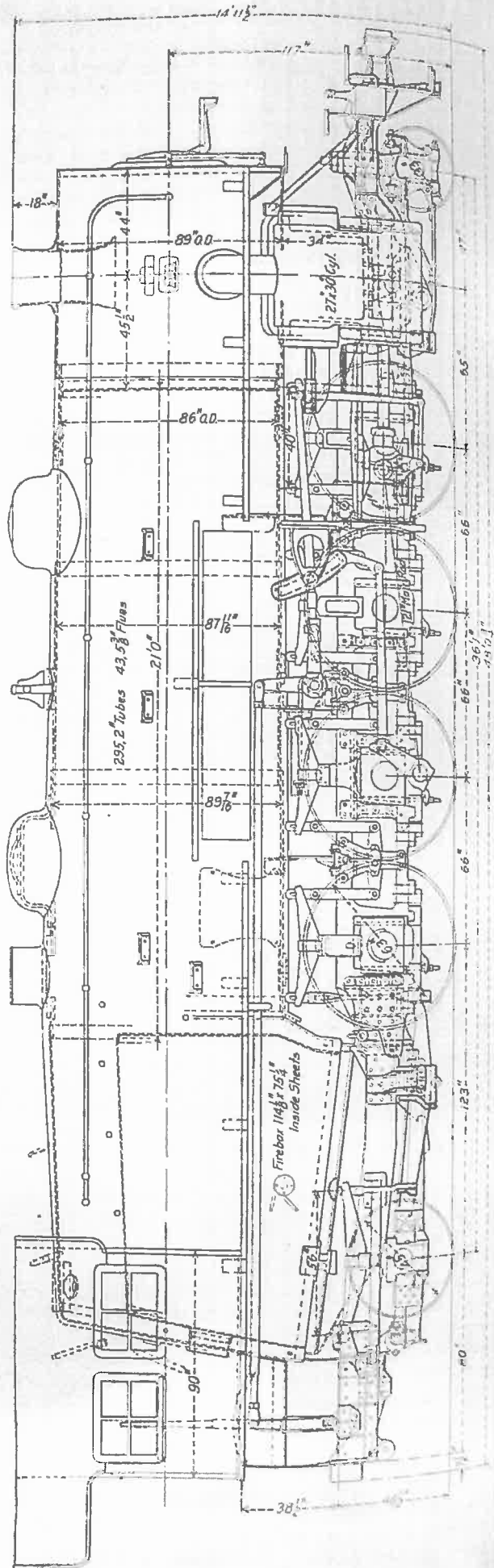
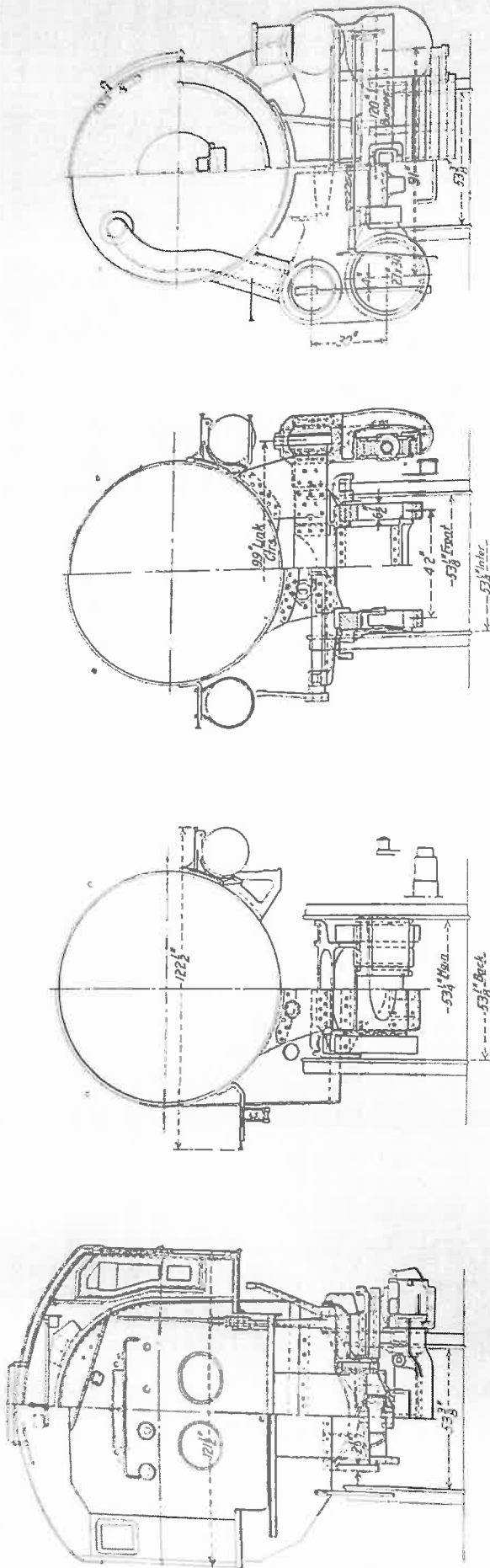
thus reducing the diameter of the wheels by 4 in., and if at the same time the cylinders have increased ½ in. in diameter, the tractive effort will be raised to nearly 62,000 lbs. This reduces the factor of adhesion from 4.37 to 3.95.

An idea of the power of these locomotives can probably best be obtained from a knowledge of the trains they are hauling on the road. A profile of the section between Carson and Coalburg, Ohio, is shown in one of the illustrations. The maximum grade in the direction in which the test runs were made is 16 ft. to the mile. The average train for three runs over this section contained 100 cars having a tonnage of 6,345 tons and was hauled at an average speed, excluding delays, of 14.58 miles per hour. These, of course, are test runs, but a comparison of the tonnage rating of these locomotives and the consolidations in regular service over various divisions, shows what they are doing in every day work. The consolidations with which they are to be compared have a total weight of 239,500 lbs., of which 214,400 lbs. is on drivers. The tractive effort is 45,800 lbs., the cylinders

design of pipe clamp, a new water glass shield, and very long main driving boxes.

Vanadium steel is used for the main frame, driving springs, piston rods, main and side rods, driving axles, trailer springs and main rod straps, as well as for the links, link blocks, pins and bushings in the motion work of ten of the locomotives. The cylinders are also made of cast iron with a content of vanadium alloy.

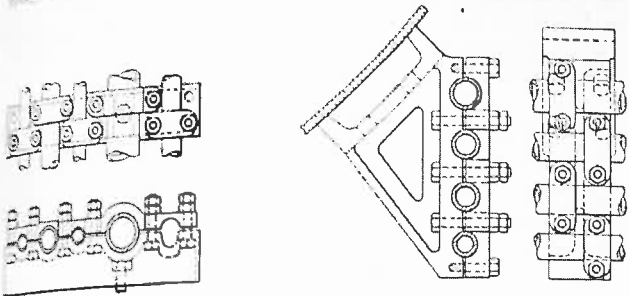
The firebox is of a normal radial stay arrangement, with two fire doors, and does not include a combustion chamber. Two inch tubes, 21 ft. in length, are used. The superheater elements are included in forty-three 5¼ in. superheater flues. An inspection manhole, 16¼ in. in diameter, is located just back of the dome and about 2 ft. ahead of the back tube sheet. The cover plate of the inspection manhole carries the safety valve. The stringent requirements of the boiler inspection law make it necessary to frequently enter the interior of the boiler and since, when this is done through the ordinary dome, it requires



Heavy and Powerful Mikado (2-8-2 Type) Locomotive for the Lake Shore & Michigan Southern.

May 2, 1913.

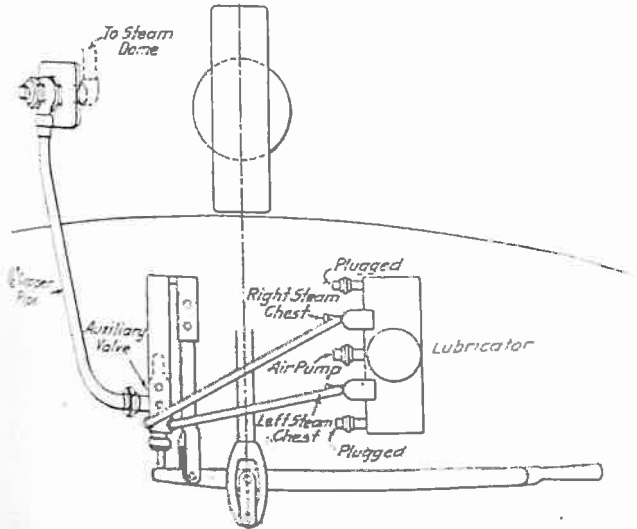
the removal of the throttle stand pipe, this auxiliary manhole is an improvement that is welcomed by the inspector. One of the engines are equipped with the O'Connor type of fire door flange and all have a full installation of flexible stay-bolts with the exception of six longitudinal rows of button head spiral stays at the top of the crown sheet. There are four 2 in. combustion tubes placed in each side water leg. These permit air to enter the firebox over the top of the fuel bed and thus promote combustion. Vanadium cast iron is used in the cylinders, which are cast integral with the saddles and are interchangeable, right and left.



Ayers Pipe Clamp.

Both the cylinders and valves are bushed with Hunt-Spiller gun iron and the piston and valve packing rings and the crosshead shoes are made of the same material.

The locomotives are equipped with an arrangement for forcing the oil through the feed pipes when the throttle is open that was designed by D. R. MacBain, superintendent of motive power. It employs a valve that is held seated by a spring and is so located and arranged that its extending stem will be forced inward by an extension on the throttle lever when the latter is open. This unseats the valve and allows a passage for steam directly from the boiler to the oil pipes leading from the lubricator to each cylinder. It insures the proper lubrication of both

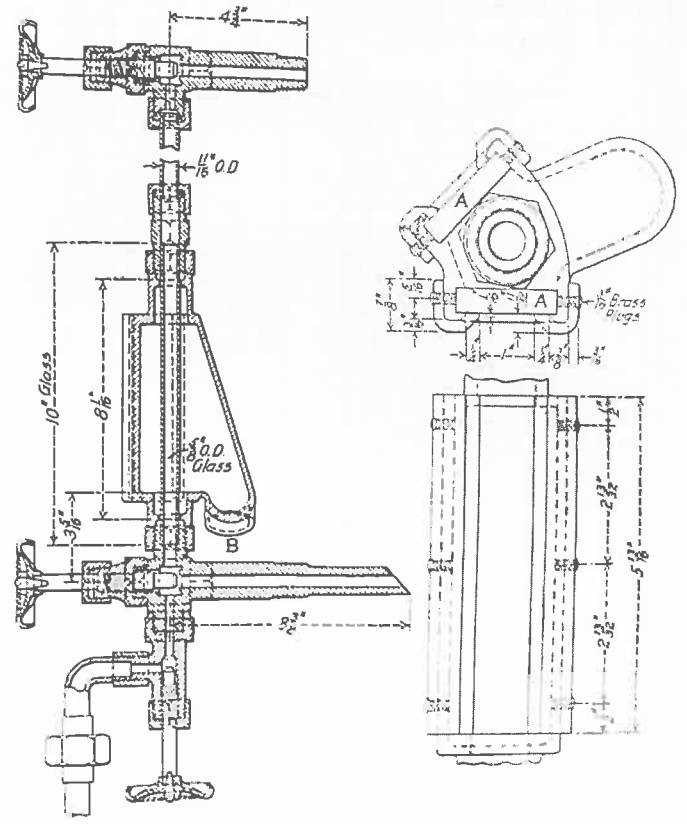


MacBain Auxiliary Lubricator Valve.

cylinders as soon as the throttle is open, but when the latter is closed the lubricator will feed in the ordinary way only. Special designs of pipe clamps have been prepared by A. R. Ayers, general mechanical engineer of the New York Central Lines West of Buffalo, which not only hold them firmly in place but provide a separate clamp for each pipe so that one may be removed without disturbing the others. The arrangement is most substantial and the pipes will not be subjected to the vibration which so often leads to failure at the joints. Furthermore, the pipe fitters have a definite alignment to work to, as the piping is laid out in the drawing room, and each pipe is in a definite place and can only be attached in that place. This not only makes

the work much easier for the pipe fitters, but prevents them doing their work in a haphazard manner.

A new design of water glass shield has recently been made standard on this road. It completely encloses the water glass, the only outlet being at the point marked B in the illustration, from which a pipe leads downward through the floor of the cab. There are two glass plates marked A, which are 13-16 in. x 6 in. x 13-32 in. and are set at an angle of 45 degrees to each other in the shield. This shield completely protects the water glass from danger of accident by external means and also prevents any accidents in case the glass should break of itself, as the steam and water will pass down through the outlet pipe to the outside of the cab and there will be no opportunity for small pieces of glass to fly. As will be seen, it offers no obstruction to the ready application of a new glass when necessary.



Water Glass Shield Used on the Lake Shore Mikados.

General dimensions, weights and ratios of these locomotives are shown in the following table:

General Data.	
Tractive effort	56,000 lbs.
Weight in working order	322,000 lbs.
Weight on drivers	245,000 lbs.
Weight on leading truck	27,500 lbs.
Weight on trailing truck	49,500 lbs.
Weight of engine and tender in working order	477,000 lbs.
Wheel base, driving	16 ft. 6 in.
Wheel base, engine and tender	111 ft. 10 1/2 in.
Cylinders.	
Kind	Simple
Diameter and stroke	27 in. x 30 in.
Valves.	
Kind	Piston
Diameter	16 in.
Greatest travel	7 in.
Outside lap	4 in.
Inside clearance	9 in.
Lead	1 1/2 in.
Wheels.	
Driving, diameter over tires	63 in.
Driving journals, main, diameter and length	11 1/2 x 22 in.
Driving journals, others, diameter and length	11 x 12 in.
Engine truck wheels, diameter	35 in.
Engine truck journals	6 x 12 in.
Trailing truck wheels, diameter	45 in.
Trailing truck journals	8 x 18 in.
Boiler.	
Working pressure	190 lbs.
Outside diameter of first ring	66 in.