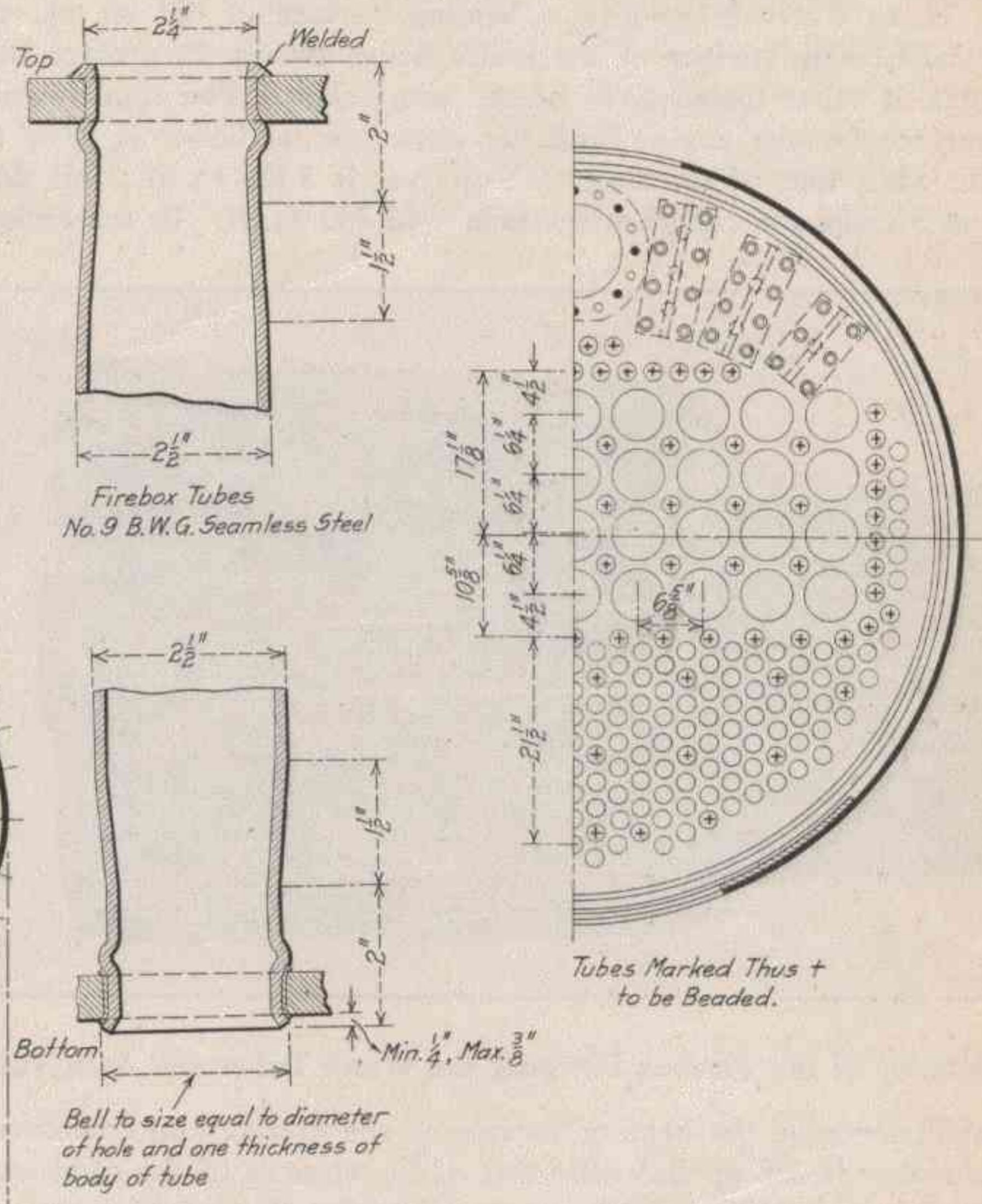
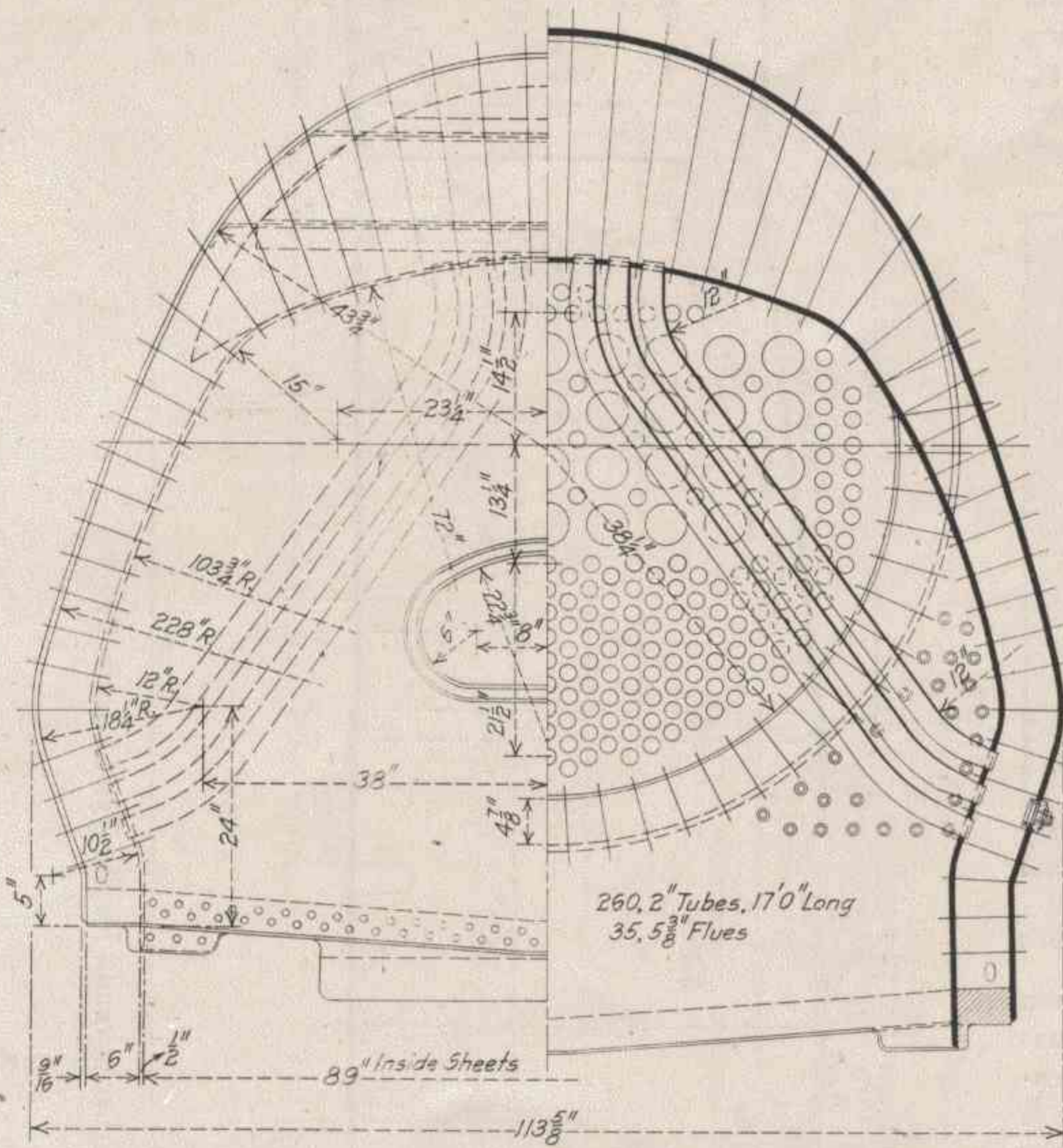


### LACKAWANNA LOCOMOTIVE WITH WATER TUBE FIREBOX

In December last the Delaware, Lackawanna & Western received from the Lima Locomotive Corporation a Pacific type locomotive similar to those described on page 657 of the *Railway Age Gazette* for October 9, 1914, but equipped with a special

As will be seen there are two nests of water tubes with 66 2½ in. outside diameter tubes in each. The cross section of the firebox shows the shape to which the side sheet is bent in order to permit a satisfactory connection between it and the lower ends of these water tubes, the bottom row of which is about 15 in. above the mud ring at the front end. The tubes are spaced at 4 in. centers and swing upward across the firebox space to the crown

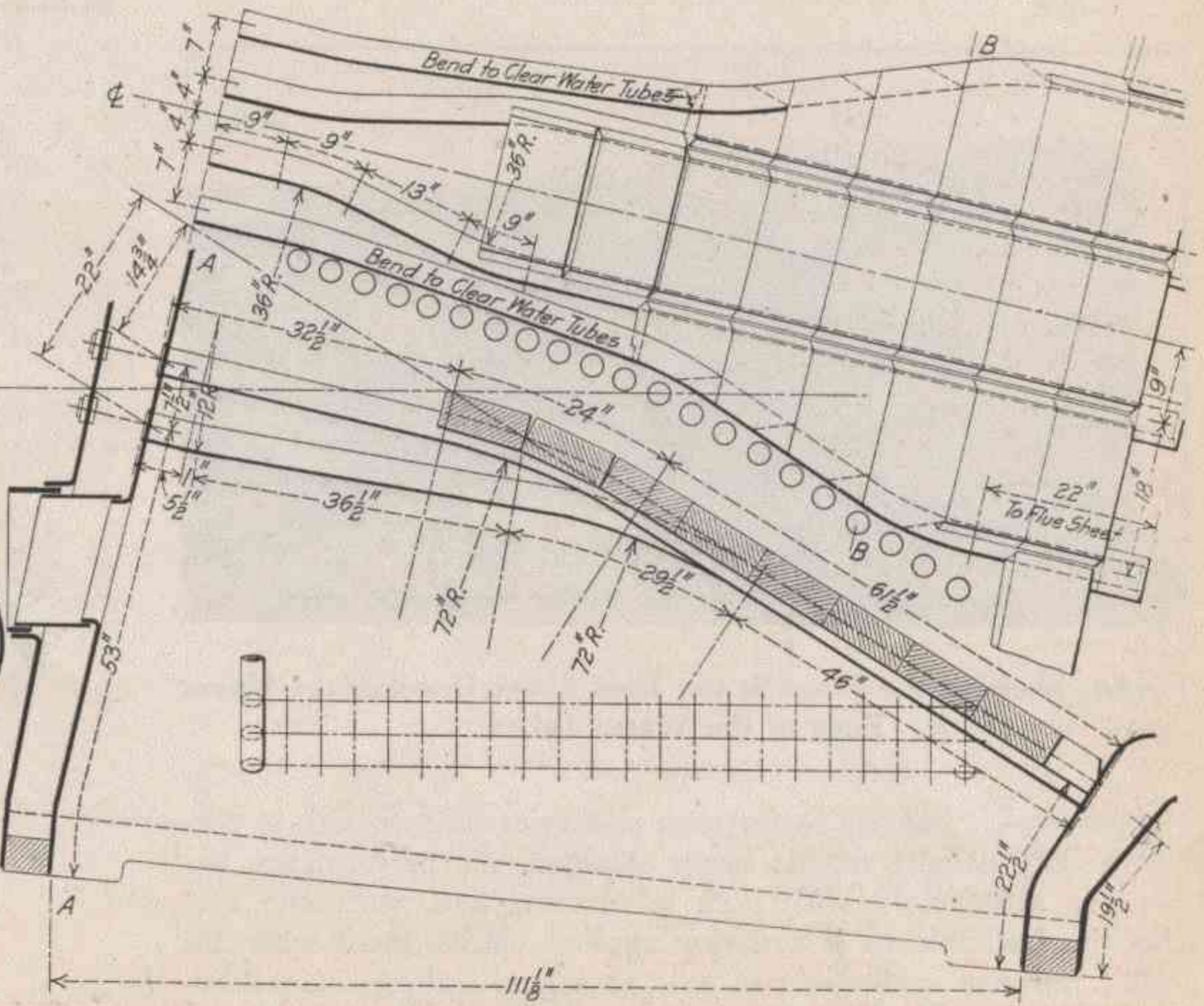
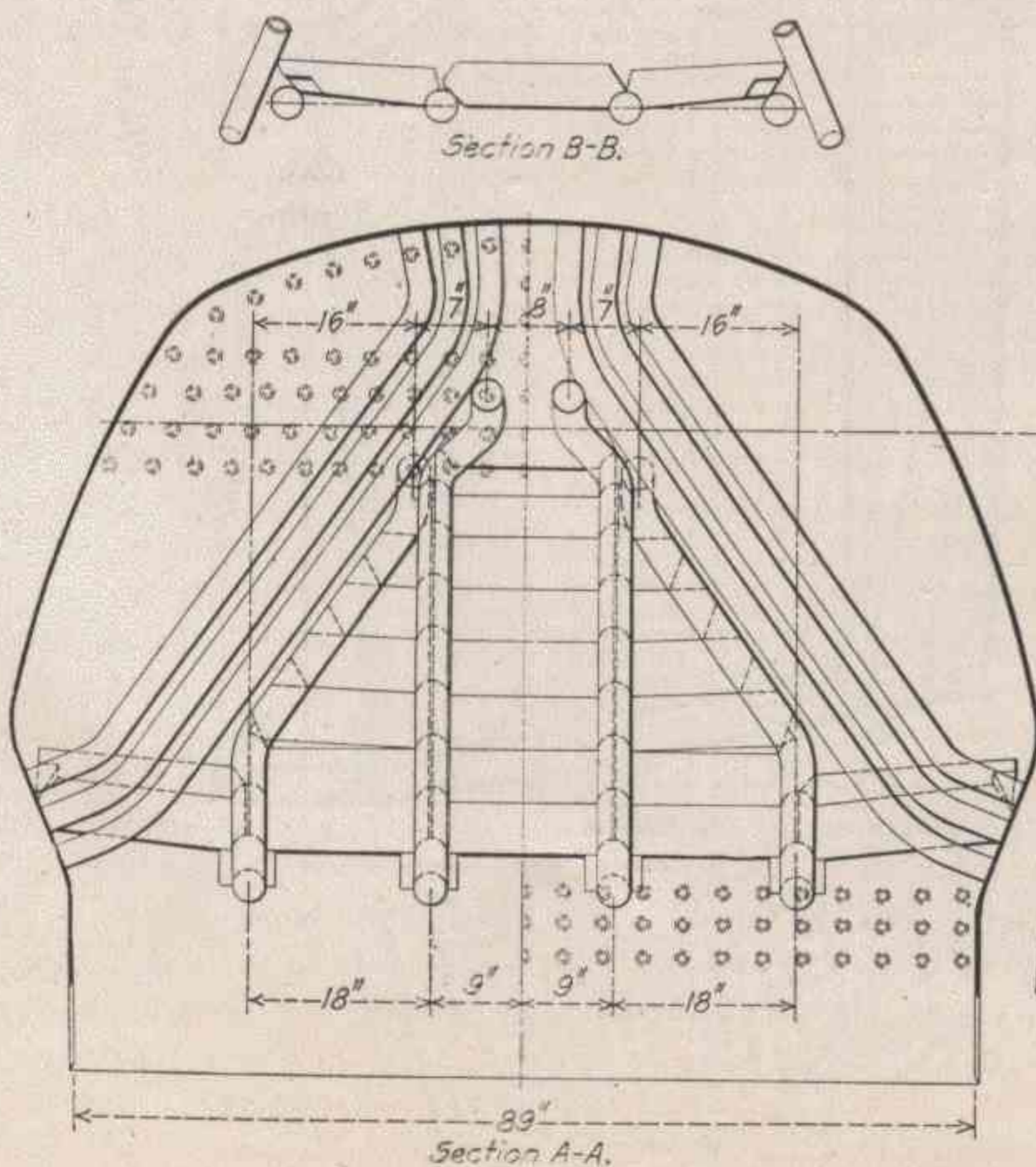


Cross Section Showing the Arrangement of the Tubes in the Firebox; in This Engine the Tubes Are Not Welded as Indicated

type of firebox, patented by S. S. Riegel, mechanical engineer of the Lackawanna.

sheet, in which the ends are inserted. Plugs for cleaning purposes are placed opposite the ends of the tubes in the outer shell sheets, both top and bottom. The method of securing a tight

Reference to the drawings will show the construction in detail.

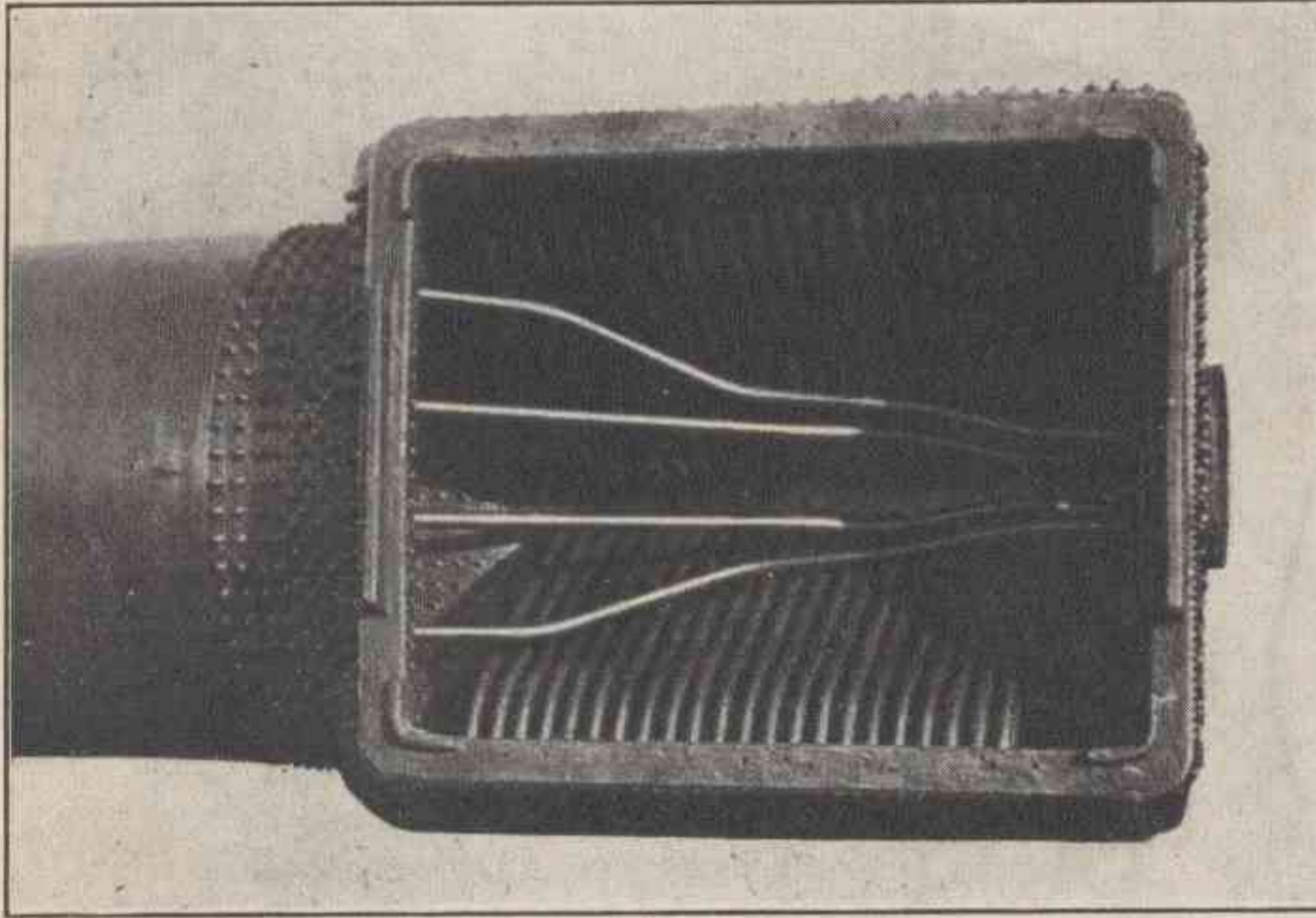


Arrangement of the Brick Arch in the Water Tube Firebox



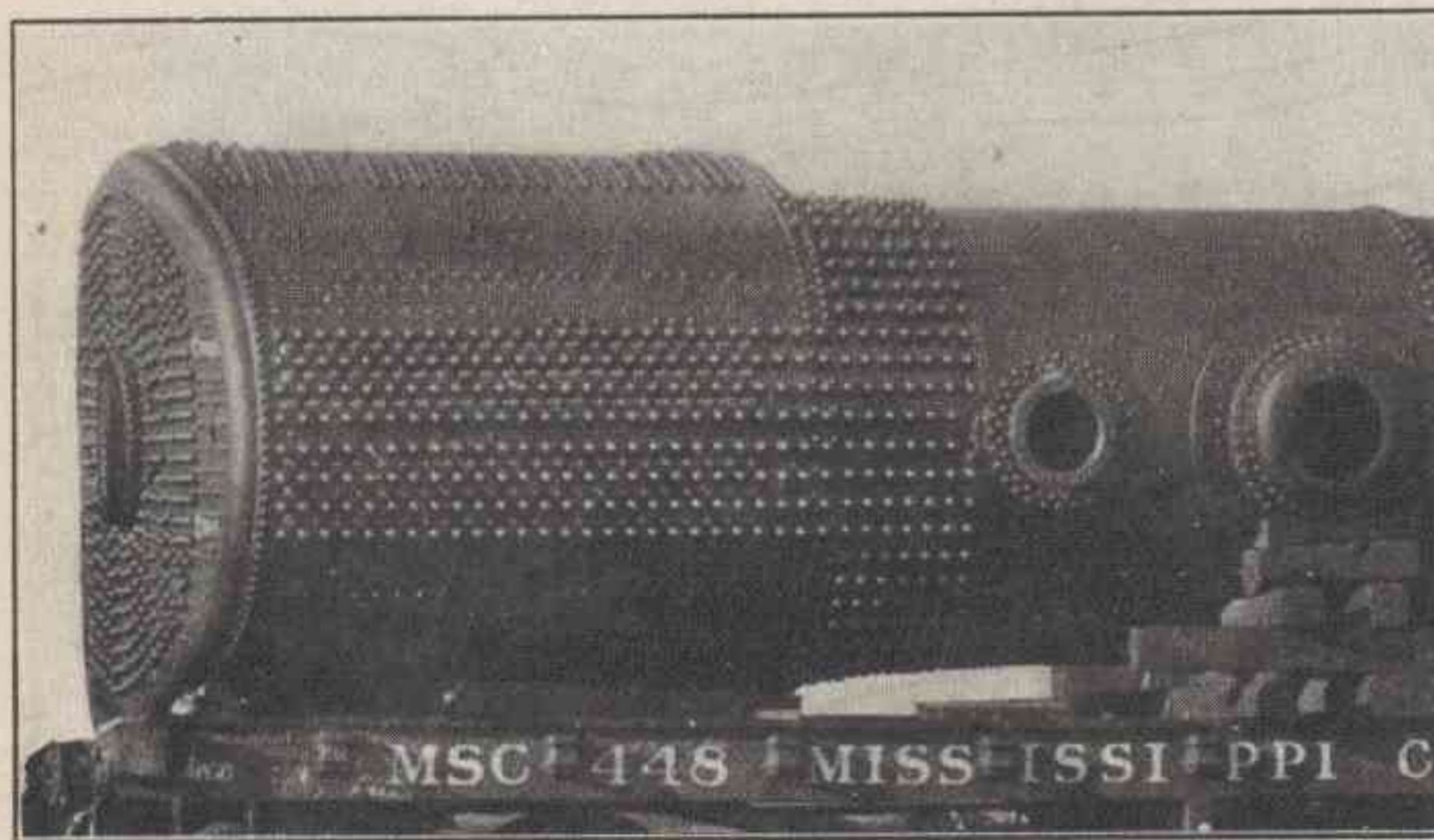
joint in the two sheets is shown in the drawing of the boiler cross sections, but in this instance the water tubes are not welded in as shown on the drawing. Instead they are prossered, belled and beaded and set without ferrules in the top sheet, while the bottom ends are set with a ferrule, prossered, expanded and belled. These tubes are made of seamless soft steel, tested to 2,000 lb. per sq. in. hydraulic pressure before application.

These water tubes give a heating surface of 471 sq. ft., the total heating surface of the boiler being 494 sq. ft. greater than that of other locomotives of the same class. The total heating surface for the engine with the experimental boiler is 3,960 sq. ft., while that of the sister locomotives is 3,466 sq. ft.; this does not include the superheater surface of 740 sq. ft. In the experi-



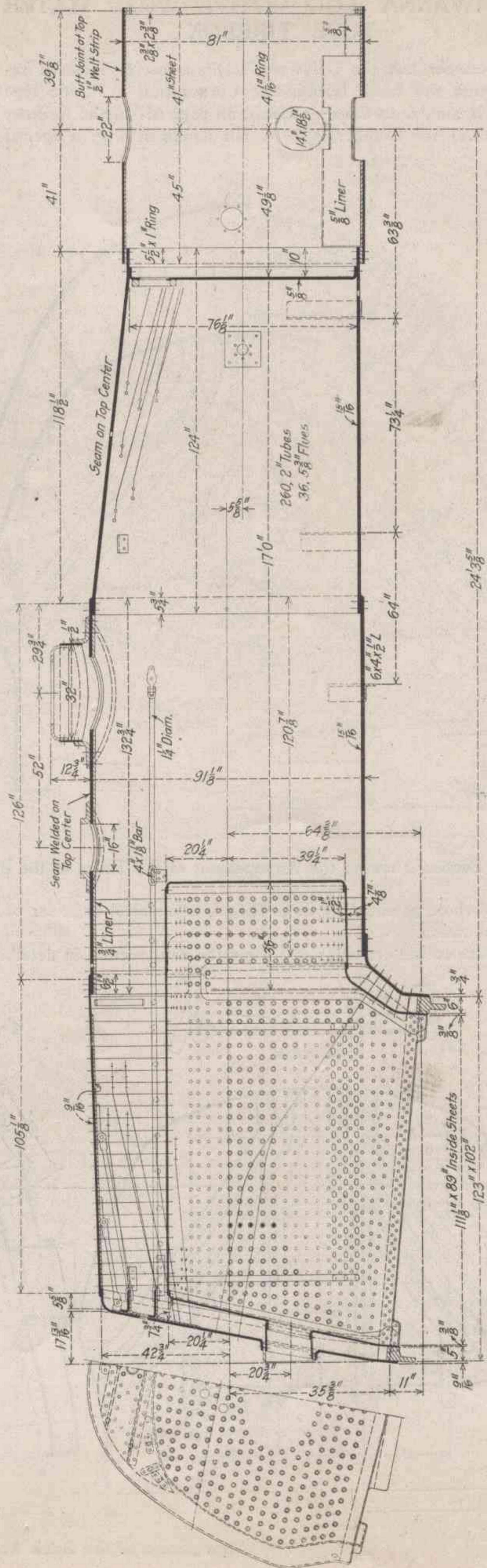
**Interior of the Firebox Showing the Water Tubes and Arch Tubes**  
 mental engine the heating surface of the firebox and combustion chamber is 288 sq. ft., while that of the engines of the same class is 267 sq. ft.; the tube heating surface for the experimental engine is 3,177 sq. ft., the same as that of the sister engines. A special application of the Security brick arch was made to the water tube firebox.

The object of the water tube construction was to obtain an improved circulation by providing definite cycles of circulation through these tubes in the zones of greatest heat intensity as well as to locate the heating surfaces to greatest advantage. While



**Firebox Showing the Plugs in the Roof Sheet Opposite the Upper Ends of the Water Tubes**

the locomotive has not so far been in service long enough to permit of any definite results being obtained, the performance has been so satisfactory with both bituminous and anthracite coal that the Lackawanna is ordering another engine fitted with this boiler, for use exclusively in fast passenger service. Considerable valuable information has been obtained showing its performance in comparison with the sister engines, and it is be-



**Water Tube Boiler of the Lackawanna Pacific Type Locomotive**



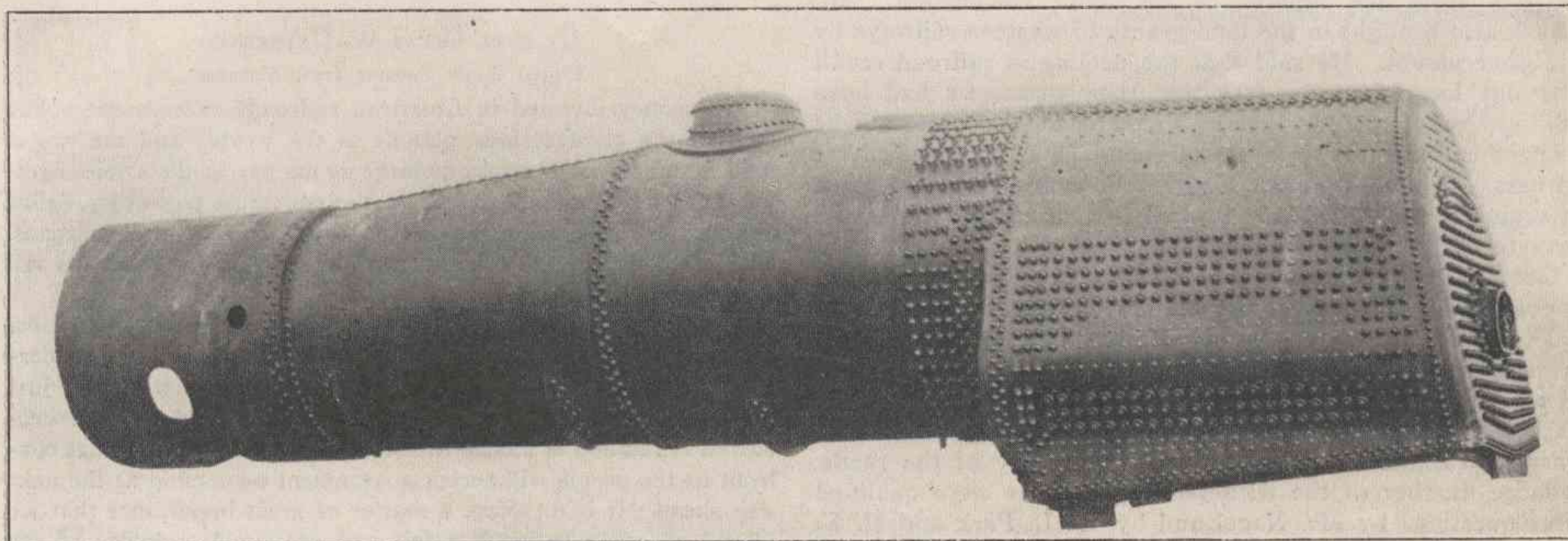
lieved that this type of boiler will be an entire success. Further tests are being conducted, and it is expected at a later date that interesting performance data will be available. While some of the data given in this article may differ from other published accounts, it is official and authentic.

A few of the principal dimensions are given in the following table:

Class .....	4-6-2
Gage .....	4 ft. 8½ in.
Diameter of driving wheels.....	69 in.
Tractive effort .....	43,200 lb.

## WAR BONUS FOR ENGLISH RAILWAYMEN

A large proportion of the conciliation board settlements between the English railways and their "wage-earning employees engaged in the manipulation of traffic," would have terminated on or about January 1. The National Union of Railwaymen and the Associated Societies of Locomotive Engineers and Firemen had already drafted new demands and asked principally an advance in wages of 5s. (\$1.25) a week. The war stopped negotiations, but other negotiations between the men and a committee

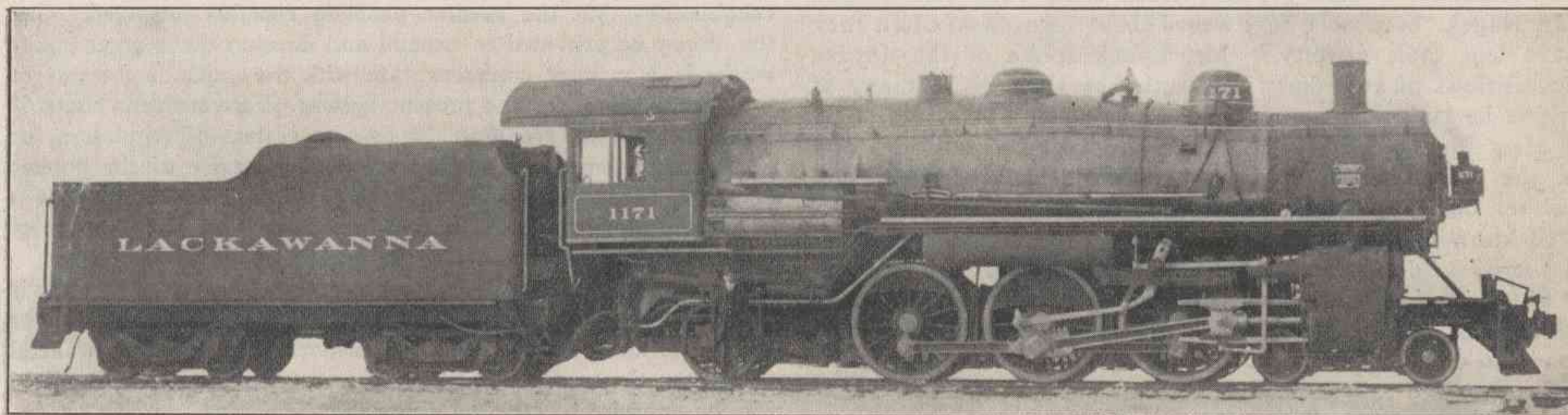


The Water Tube Boiler of the Lackawanna Pacific Type Locomotive

Cylinders .....	25 in. by 28 in.
Weight on leading truck.....	50,000 lb.
Weight on drivers.....	189,600 lb.
Weight on trailing truck.....	58,000 lb.
Total weight of engine in working ord.r.....	297,600 lb.
Coal capacity of tender.....	10 tons
Water capacity of tender.....	9,000 gal.
Total weight of tender loaded.....	165,500 lb.
Total weight of engine and tender.....	463,000 lb.
Rigid wheel base .....	13 ft.
Wheel base of engine.....	33 ft. 10 in.
Wheel base, engine and tender.....	66 ft. 4 in.
Boiler pressure .....	200 lb.
Grate area .....	69 sq. ft.
Diameter of boiler.....	78 in.
Firebox .....	89 in. by 111 in.

of general managers were completed on February 19 and 20, which call for large increases in the form of a war bonus.

A bonus of 3s. (75 cents) a week is paid to all employees 18 years of age and upwards, embraced in the conciliation scheme, whose standard rate of wages is under 30s. (\$7.50), and 2s. (50 cents) to employees whose standard rate of wages is 30s. or more; the first payment was made in the week commencing February 15. The arrangement is to remain in force during the continuance of the present agreement between the government and the railways, but is subject to review at the end of three



Pacific Type Locomotive on the Lackawanna, Fitted with a Boiler Which Has a Water Tube Firebox

Factor of adhesion.....	4.39
Water tubes, diam., gage and length, 2½ in., O. D.; seamless steel; No. 9; 6 ft. average	
Heating surface, firebox and combustion chamber..	288 sq. ft.
Heating surface, water tubes.....	471 sq. ft.
Heating surface, fire tubes.....	3,177 sq. ft.
Heating surface, arch tubes.....	24 sq. ft.
Total heating surface of firebox.....	783 sq. ft.
Total heating surface.....	3,960 sq. ft.
Superheater heating surface.....	740 sq. ft.

EXCAVATING ON THE PANAMA CANAL.—During January a total of 1,163,255 cu. yd. of excavating was done on the Panama canal—15,922 yd. by dry excavation and 1,147,333 yd. by wet excavation. To February 1, 1915, the total canal excavation by Americans was 230,262,028 cu. yd.

months. When notice is given by the government to terminate its control of the railways the latter are to give not less than two weeks' notice to the railway men to discontinue the bonus.

There will be an extension of the basis on which men in the various services will be admitted to the conciliation scheme, so that increases will also be made to the engine terminal forces and the signal and maintenance of way employees.

It is also expected that the Scottish railways and certain of the English lines not included in the conciliation scheme will make similar increases, and it is not unlikely that something will be done for the shop men, clerks, etc. The Railway Gazette (London) has estimated that if these services be included the total advances in wages will aggregate not less than \$16,000,000.