

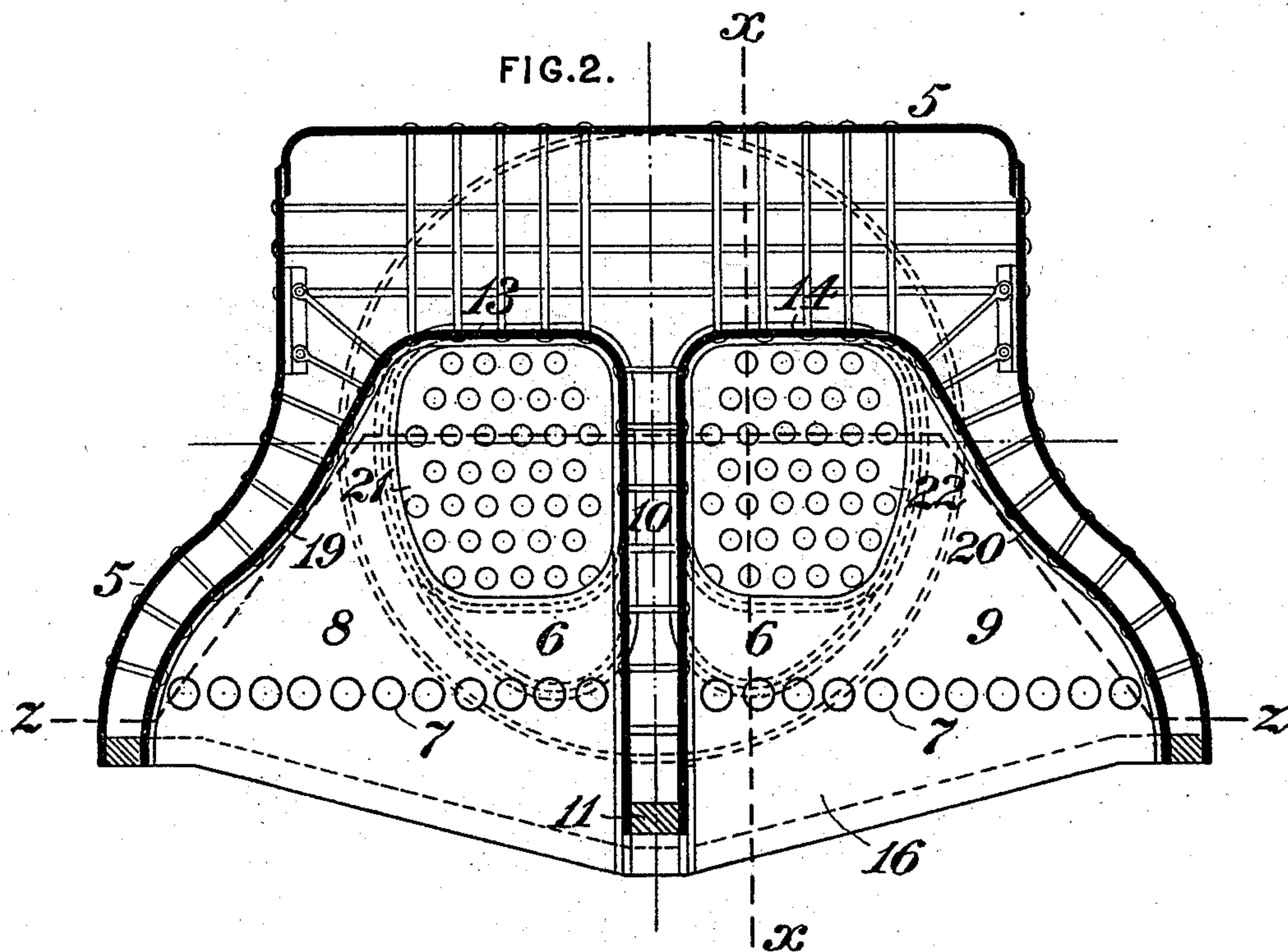
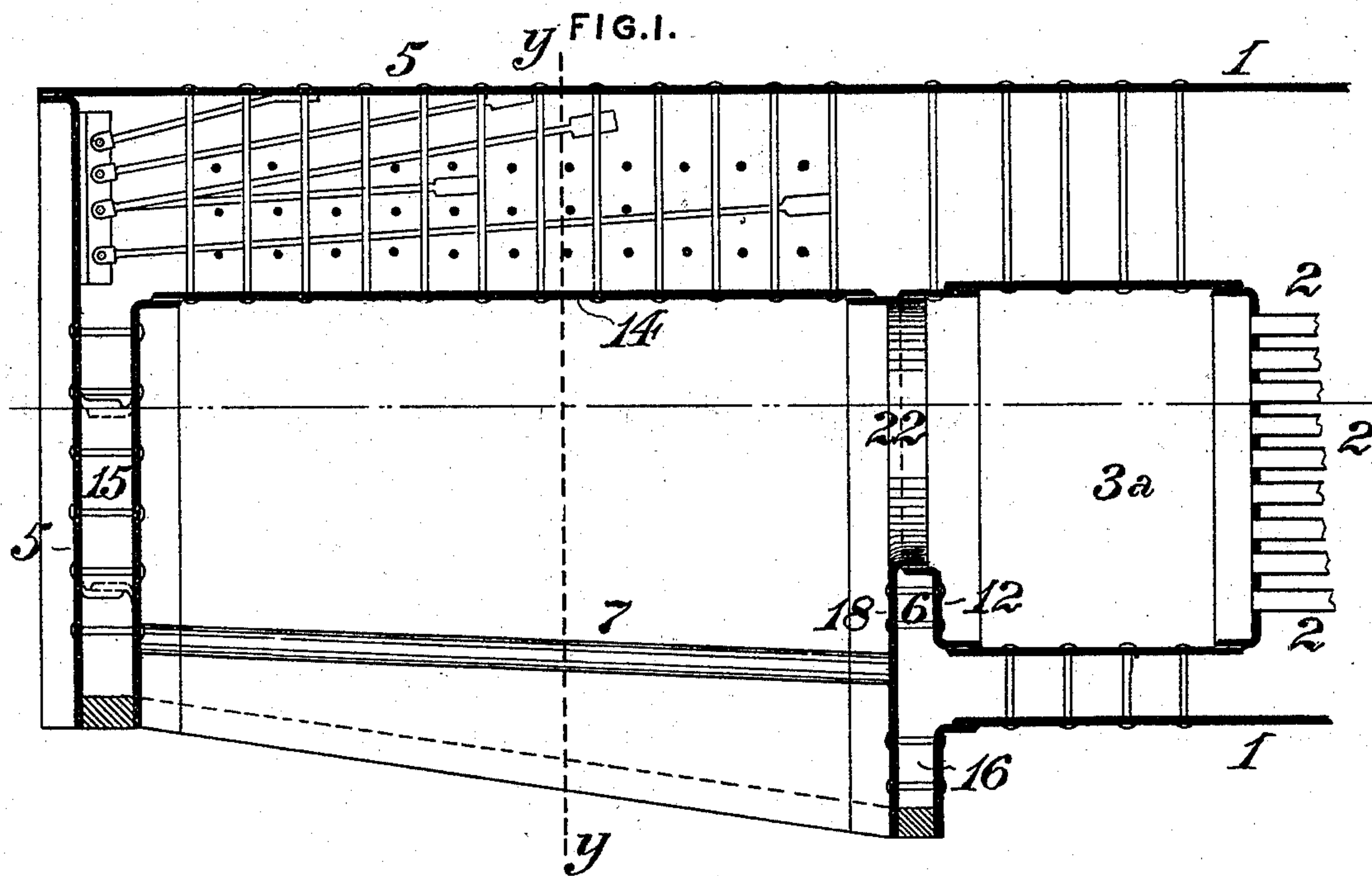
(No Model.)

4 Sheets—Sheet 1.

D. L. BARNES.  
LOCOMOTIVE BOILER.

No. 519,315.

Patented May 8, 1894.



WITNESSES:

T. J. Hogan.  
J. E. Gaither.

INVENTOR,

David L. Barnes.  
by J. Snowden Bell,  
Att'y.

(No Model.)

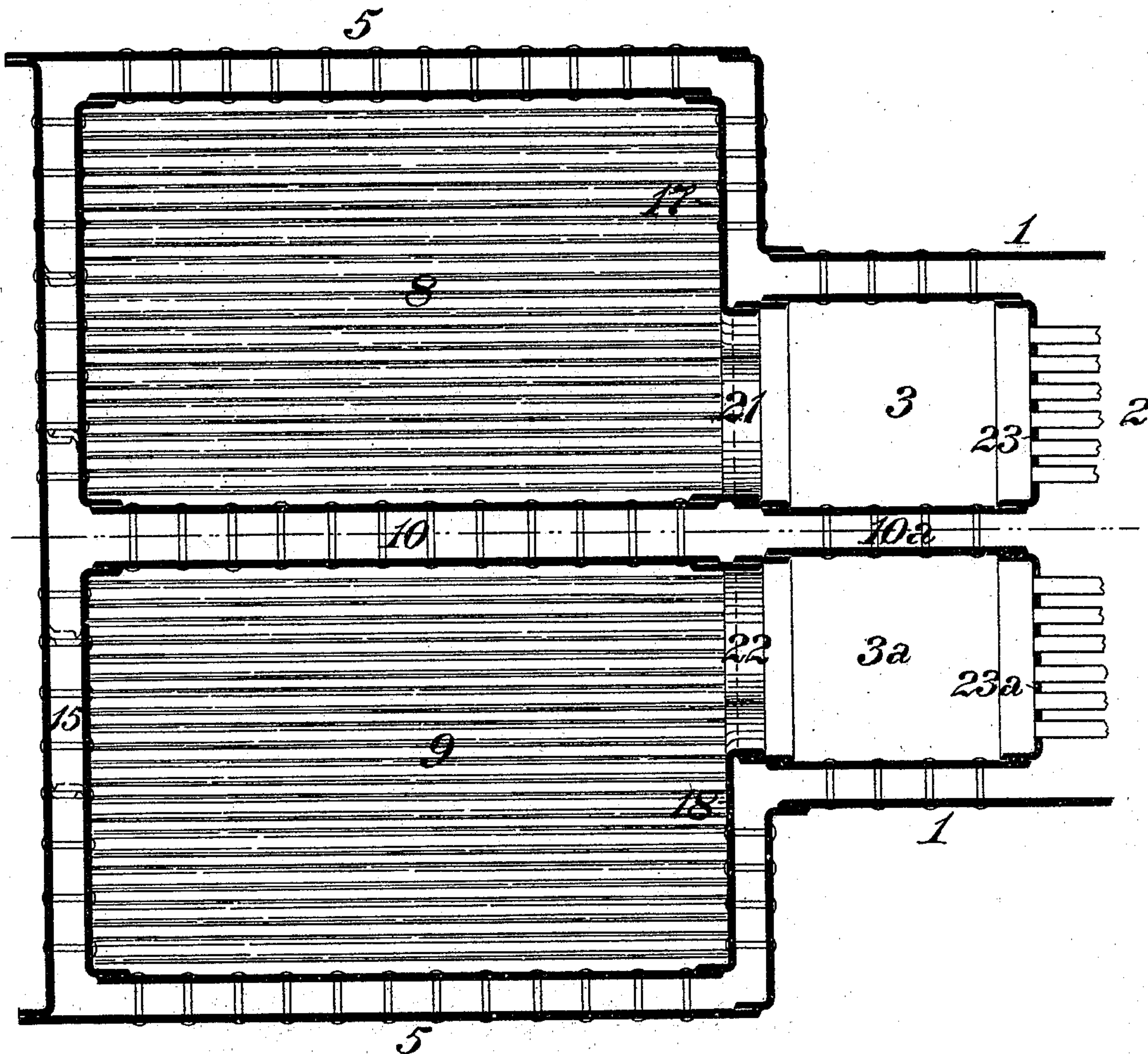
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FIG. 3.



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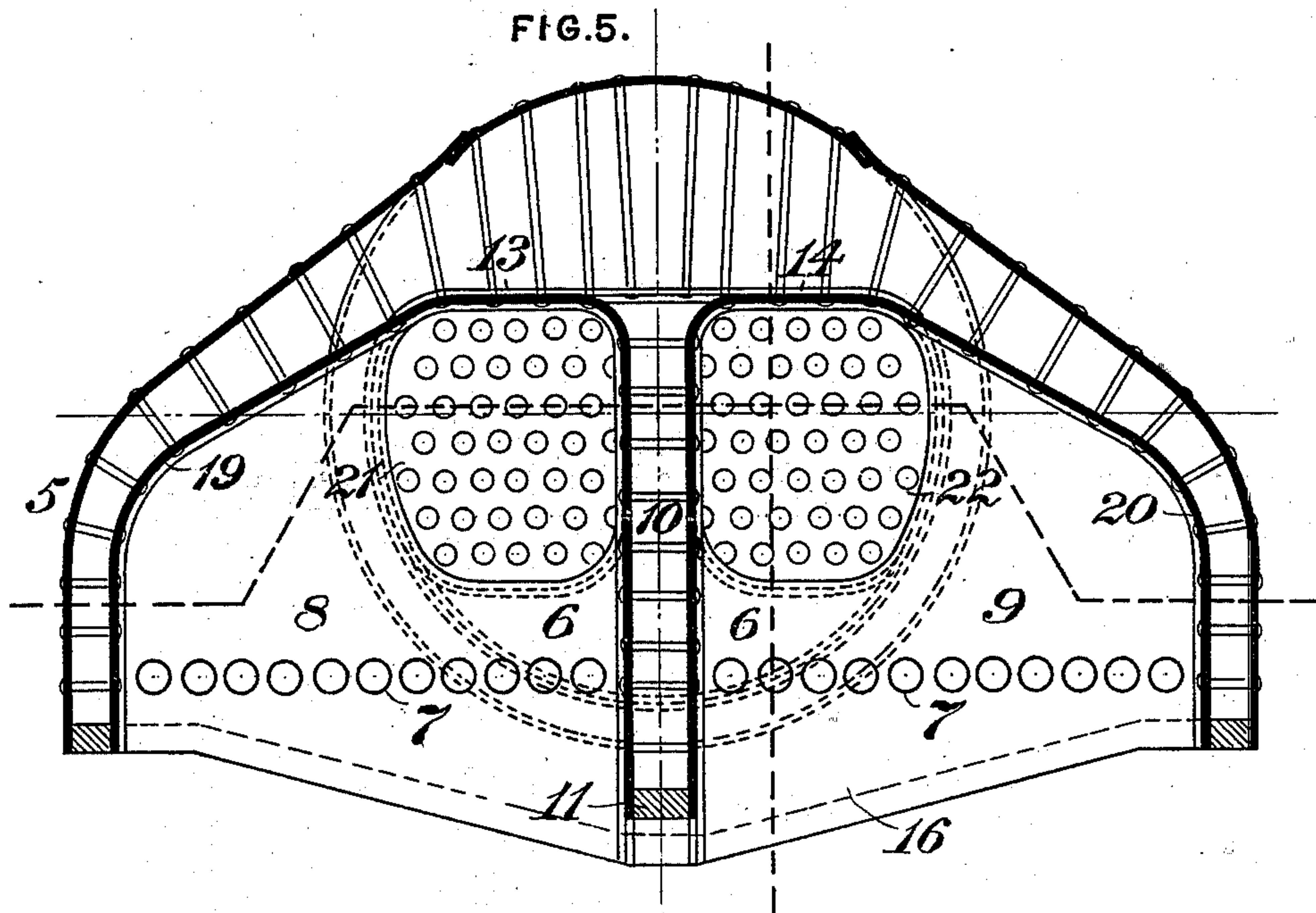
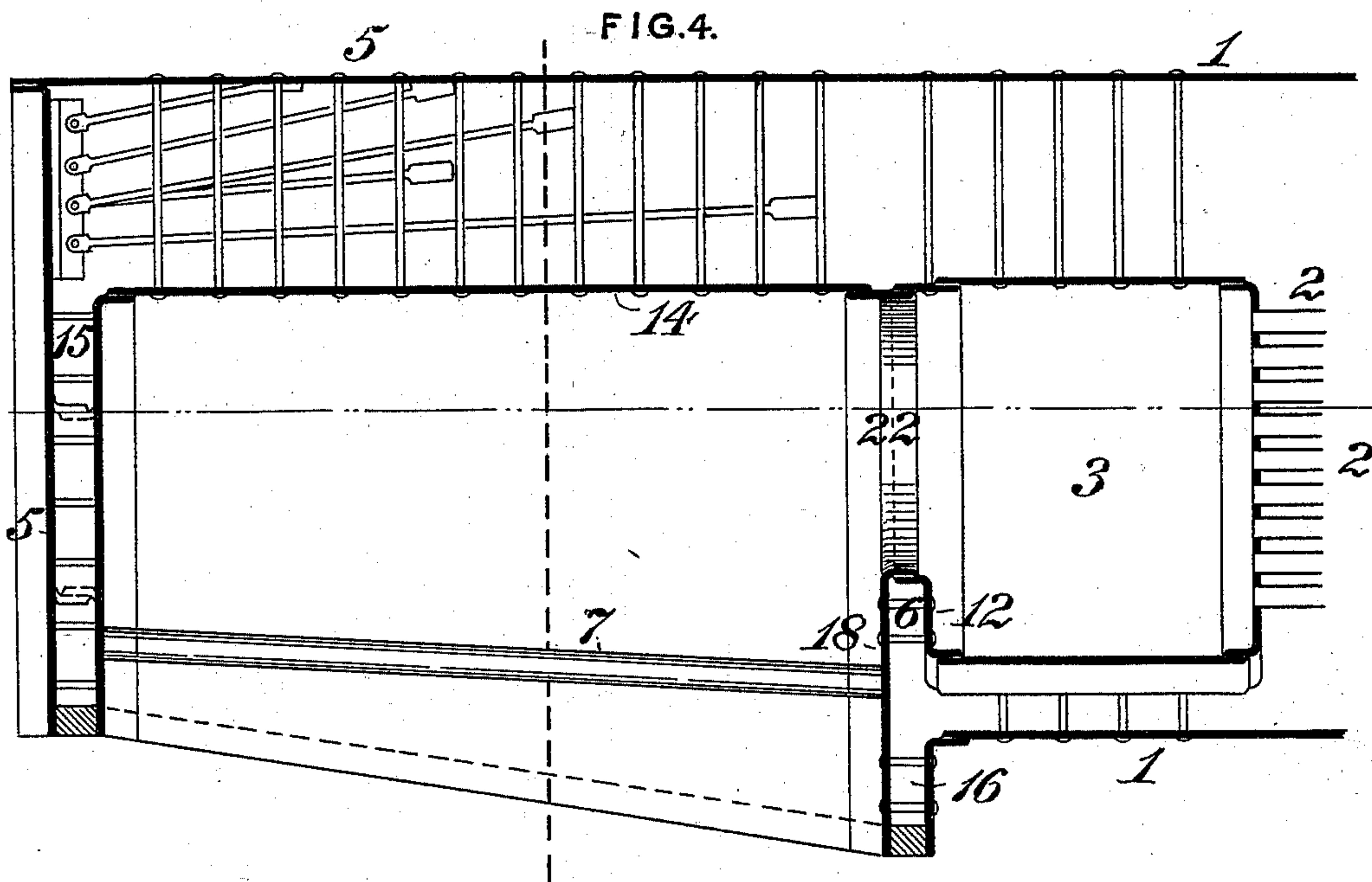
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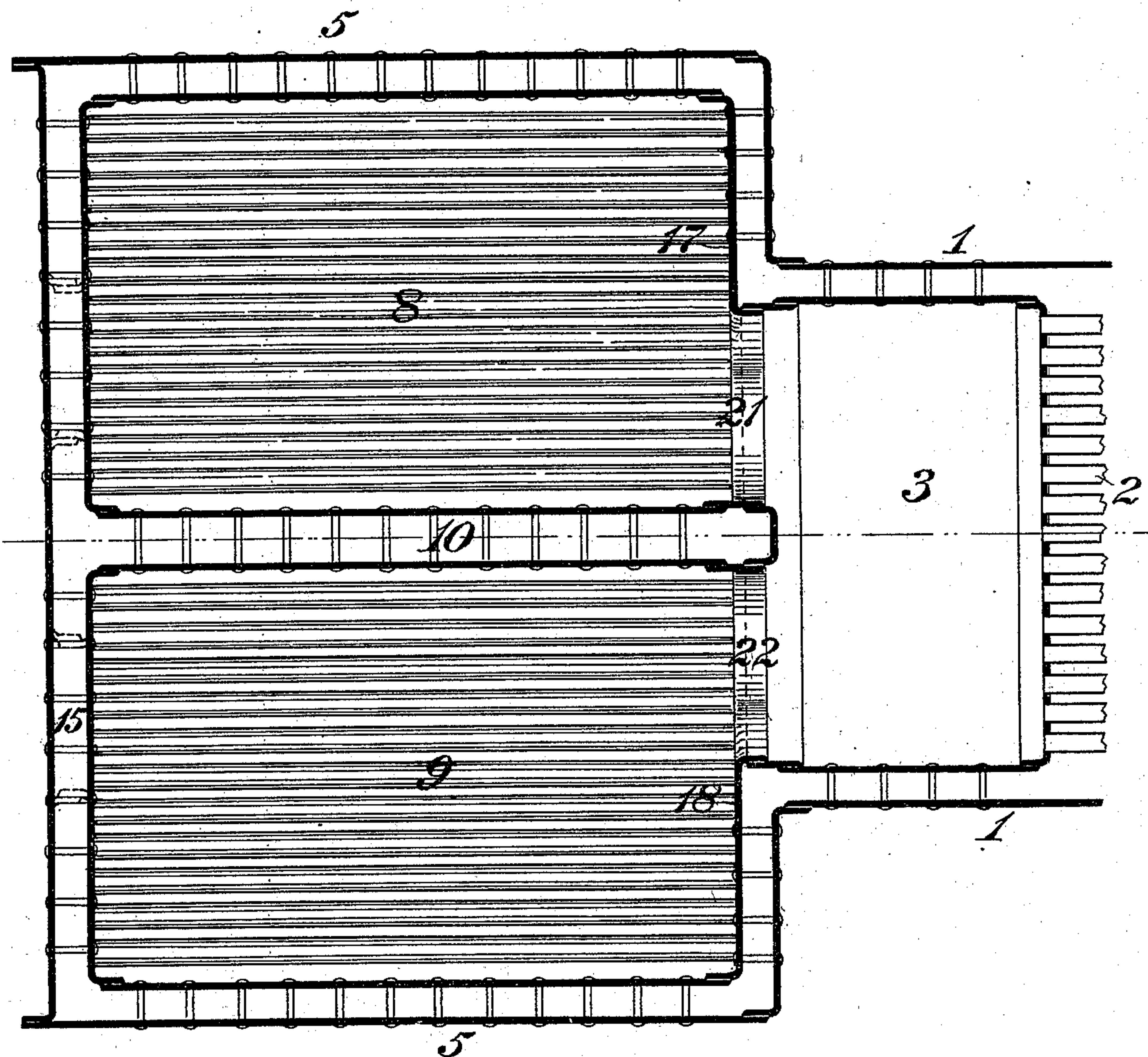
4 Sheets—Sheet 4.

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FIG. 6.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

DAVID L. BARNES, OF CHICAGO, ILLINOIS.

## LOCOMOTIVE-BOILER.

SPECIFICATION forming part of Letters Patent No. 519,315, dated May 8, 1894.

Application filed March 9, 1894. Serial No. 502,989. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID LEONARD BARNES, of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Locomotive-Boilers, of which improvement the following is a specification.

My invention relates to locomotive boilers of the wide fire-box type, and more particularly to those of the well known "Wooten" class, in which a laterally extended firebox and a combustion chamber are provided, instances of which construction, as applied in railroad service, are exemplified in Letters Patent of the United States Nos. 192,725, 254,581, and 291,120, dated July 3, 1877, March 7, 1882, and January 1, 1884, respectively.

The object of my invention is to provide a locomotive boiler of the type above specified, in which the recognized advantageous features of the existing construction shall be retained, with the addition of the provision of a material increase of firebox heating surface, a more perfect circulation of water, a reduction in the width of crown sheets, and special adaptability to the utilization of comparatively low grades of fuel.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a vertical longitudinal section, at the line  $x$ ,  $x$ , of Fig. 2, through the firebox and part of the waist of a locomotive boiler, illustrating an application of my invention; Fig. 2, a transverse section through the firebox, at the line  $y$ ,  $y$ , of Fig. 1; Fig. 3, a horizontal section, at the line  $z$ ,  $z$ , of Fig. 2; Figs. 4 and 5, sections similar to Figs. 1 and 2 respectively, but showing the firebox as provided with "radial" stays, instead of being of the "Belpaire" construction shown in Figs. 1 and 2, and Fig. 6, a horizontal section similar to Fig. 3, but showing a single combustion chamber instead of two independent combustion chambers as in the former case.

My invention is shown as applied in a locomotive boiler having a waist or cylindrical shell, 1, fitted with the ordinary series of fire tubes, 2, which extend from a combustion chamber or chambers, 3, 3<sup>a</sup>, within and at the rear end of the waist, to a smoke box (not shown in the drawings) at the front end there-

of. The firebox, 5, which is connected to the rear end of the waist, is extended laterally beyond the same, to any desired degree up to or within the maximum width admissible for passage over the road, and its bottom is preferably located, as shown, substantially in line with the bottom of the waist, or somewhat above it.

So far as above described, the construction accords with that heretofore employed, which, in the practice of my invention is supplemented as follows: At the rear end of the combustion chamber, 3, I provide a water wall, 6, which is open at bottom to the water space in the waist below the combustion chamber, and extends a sufficient distance above the bottom of the combustion chamber to serve as the forward boundary wall of the bed of fuel on the grate, 7. The interior of the firebox is divided into two separate and independent furnaces, 8, 9, by a central longitudinal water wall, 10, which is closed, at bottom, by a water space bar, 11, and, at its front end is open at bottom to the waist of the boiler and to the water wall 6. In the case of a double combustion chamber, as in Fig. 3, the central water wall is open to the waist at both top and bottom. The side sheets of the water wall, 10, are connected at their upper ends to the crown sheets, 13, 14, of the furnaces, 8 and 9, or may be made integral with the crown sheets as shown, and the water wall, 10, is open, at its top, to the space above said crown sheets, at the lower portion of its front end to the space within the water wall, 6, and, at its rear end, to the rear water space, 15, of the firebox. In the case of the double combustion chamber Fig. 3, the water wall 10 is connected at its front with the waist of the boiler. The water wall, 10, is made of gradually increasing depth from its rear to its front end, at which it meets, and is open to, at and adjacent to its bottom, a transverse water connection, 16, extending across the front end of the firebox, below and about in line with the water wall 6, and having its bottom downwardly inclined from each side of the firebox to the bottom of the central water wall 10.

The front sheets, 17, 18, of the furnaces, 8, 9, are flanged outwardly or forwardly, and riveted to the front sheet, 12, of the water wall 6, and are flanged in the opposite direc-



tion and riveted to the crown sheets, 13, 14, and side sheets, 19, 20, of the furnaces. When thus connected, large openings or passages, 21, 22, are formed above the top of the water wall 6, for the traverse of the products of combustion from the furnaces to the combustion chamber 3, and thence, through the tubes, 2, to the smoke box and stack. The top of the water wall 6, which is the bottom of the furnace discharge passages, 21, 22, is located so far above the front of the grate 7 that a fire of proper thickness may be maintained on the grate entirely below the discharge passages. The front sheet, 12, of the water wall 6, is flanged rearwardly, and riveted, through its rear flanges, to the front furnace sheets, 17, 18, and is flanged forwardly, and riveted, through its forward flanges, to the top and side sheets of the combustion chamber 3.

My improvement is not limited in application to any specific form of wide firebox boiler, nor affected by the system of staying which may be employed. Thus, for example, the firebox shown in Figs. 1 and 2 is of the "Belpaire" construction, while that of Figs. 4 and 5 is provided with what are known as "radial" stays. In each instance, however, the same members, in the same relation and combination, are employed in the application of my invention. It will, also, be obvious that crown stay bolts might, if preferred, be omitted, and ordinary crown bars substituted therefor.

In the instance in which two separate and independent combustion chambers, 3, 3<sup>a</sup>, are provided, said chambers communicate with the furnaces, 8, 9, respectively, by passages, 21, 22, and are separated one from the other by a forward extension, 10<sup>a</sup>, of the central water wall 10, the water space of said extension communicating with the waist of the boiler, and its side sheets being riveted to the rear tube sheets, 23, 23<sup>a</sup>.

It will be seen that a very material increase of firebox heating surface is provided by the central water wall, and that by the use of two independent furnaces, the fires may be kept in better condition than is practicable with a single and exceptionally large furnace. The system of alternate firing, which is practicable in the employment of two furnaces, is particularly desirable for the reduction of smoke in the utilization of low grade bituminous fuels. An effective circulation of water is afforded and promoted by the communication between the water space below the combustion chamber and that above the crown sheets of the furnaces, provided by the central water wall 10, and its connection with the water wall 6, and lower water connection 16.

I am aware that locomotive boilers having two separate and independent fireboxes, with a furnace in each firebox communicating with a combustion chamber, as exemplified in the Strong boiler, set forth in Patents

No. 266,551, dated October 24, 1882, and No. 304,973, dated September 9, 1884, were known prior to my invention, and such, and all other constructions involving the employment of more than one firebox or outer furnace casing, I therefore disclaim.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, in a locomotive boiler, of a firebox which is extended laterally to a greater width at base than at top, a longitudinal water wall forming the inner sides of two separate furnaces in said firebox and having the top of its water space in communication with the space above the crown sheets of both of said furnaces, a combustion chamber located within the waist of the boiler at its rear end, and a transverse water wall extending across the lower portion of the combustion chamber at its rear end and communicating with the water space below the combustion chamber and with the longitudinal water wall, substantially as set forth.

2. The combination, in a locomotive boiler, of a laterally extended firebox, a combustion chamber located within the waist of the boiler at its rear end, a transverse water wall extending across the lower portion of the combustion chamber and communicating at bottom with the water space below the same, a transverse water connection extending across the front of the firebox and communicating at top with the waist of the boiler, said water connection being downwardly inclined from the sides of the firebox to its center, and a longitudinal water wall forming two separate furnaces in the firebox, and downwardly inclined from the rear thereof to the transverse water wall and water connection, substantially as set forth.

3. The combination, in a locomotive boiler, of a laterally extended firebox, a combustion chamber located within the waist of the boiler at its rear end, a transverse water wall sheet having forwardly extending flanges at its top, sides, and bottom and riveted, through said flanges, to the adjacent sheets of the combustion chamber, and also having rearwardly extending flanges on its top, sides and at a level above its bottom, a longitudinal water wall forming two separate furnaces in the firebox, and communicating with the rear water space thereof, front furnace sheets, each having forwardly extending flanges riveted to the rearward flanges of the transverse water wall sheet, and rearwardly extending flanges, riveted to the sidesheets of the longitudinal water wall, and furnace crown and side sheets riveted to rearwardly extending flanges on the front furnace sheets, substantially as set forth.

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Witnesses:

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EMIL W. ROSENBERG.