

No. 832,419.

PATENTED OCT. 2, 1906.

S. S. RIEGEL.  
WATER TUBE BOILER.  
APPLICATION FILED NOV. 3, 1905.

2 SHEETS—SHEET 1.

Fig. 2.

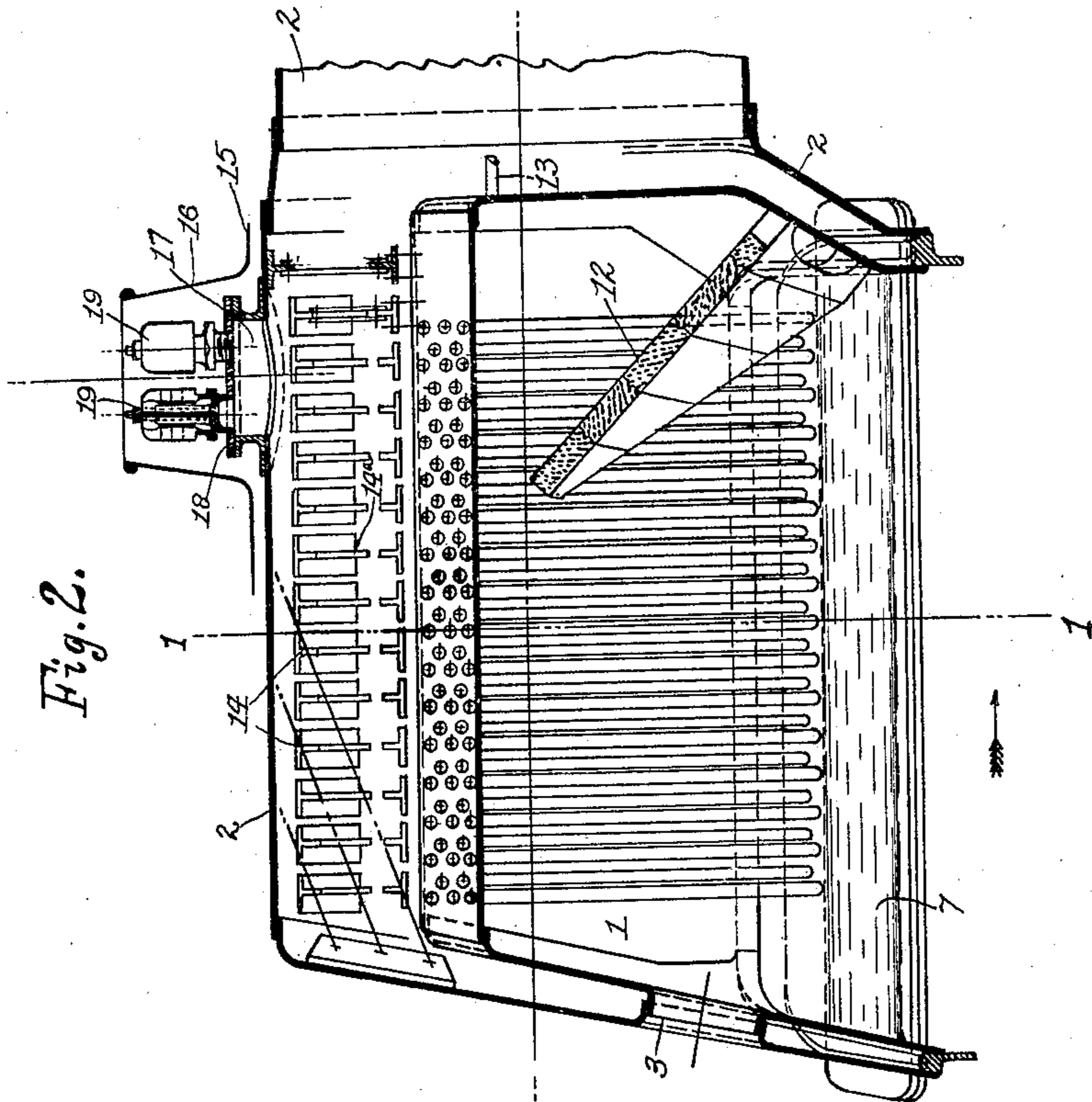
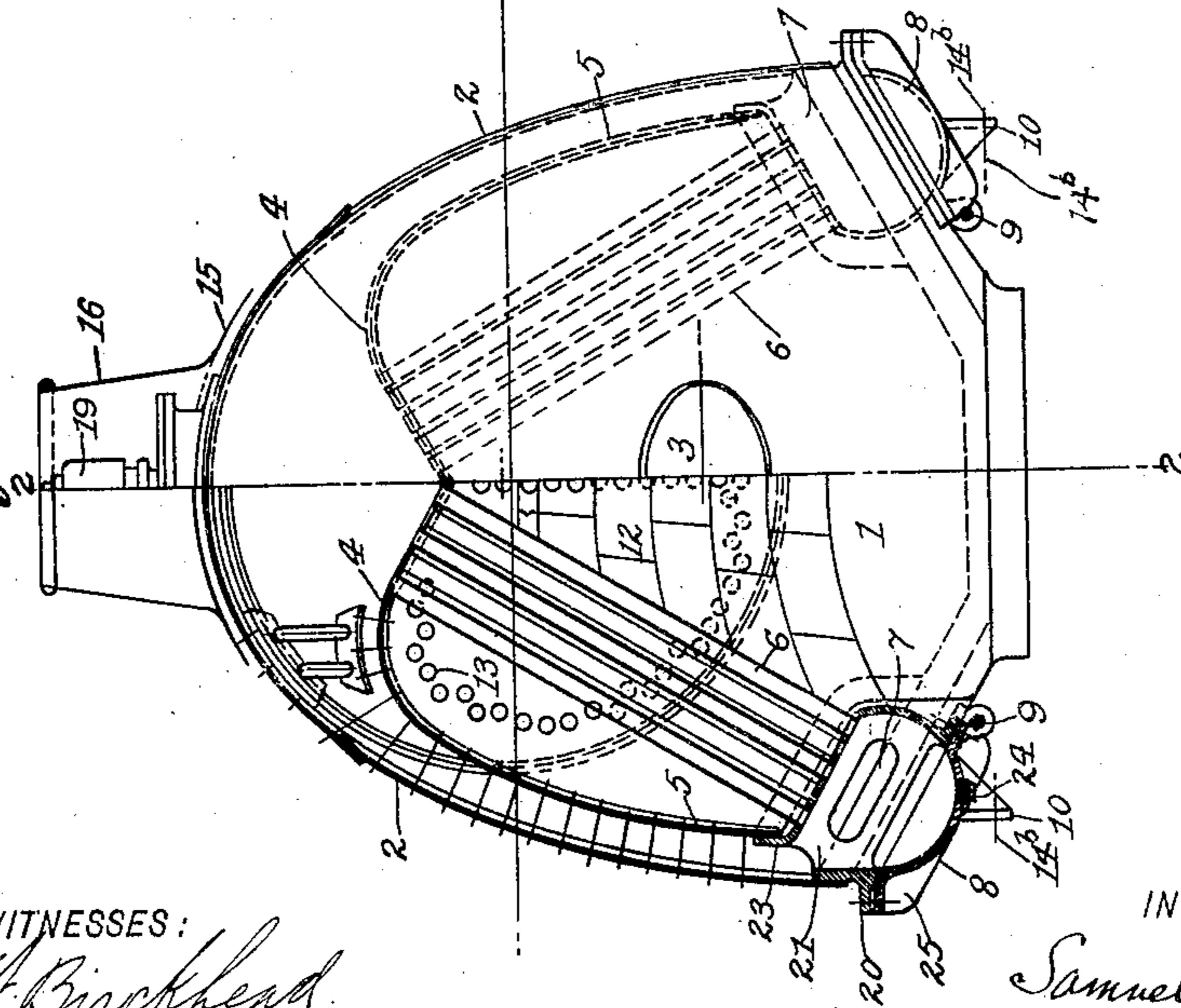


Fig. 1.



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2 SHEETS—SHEET 2.

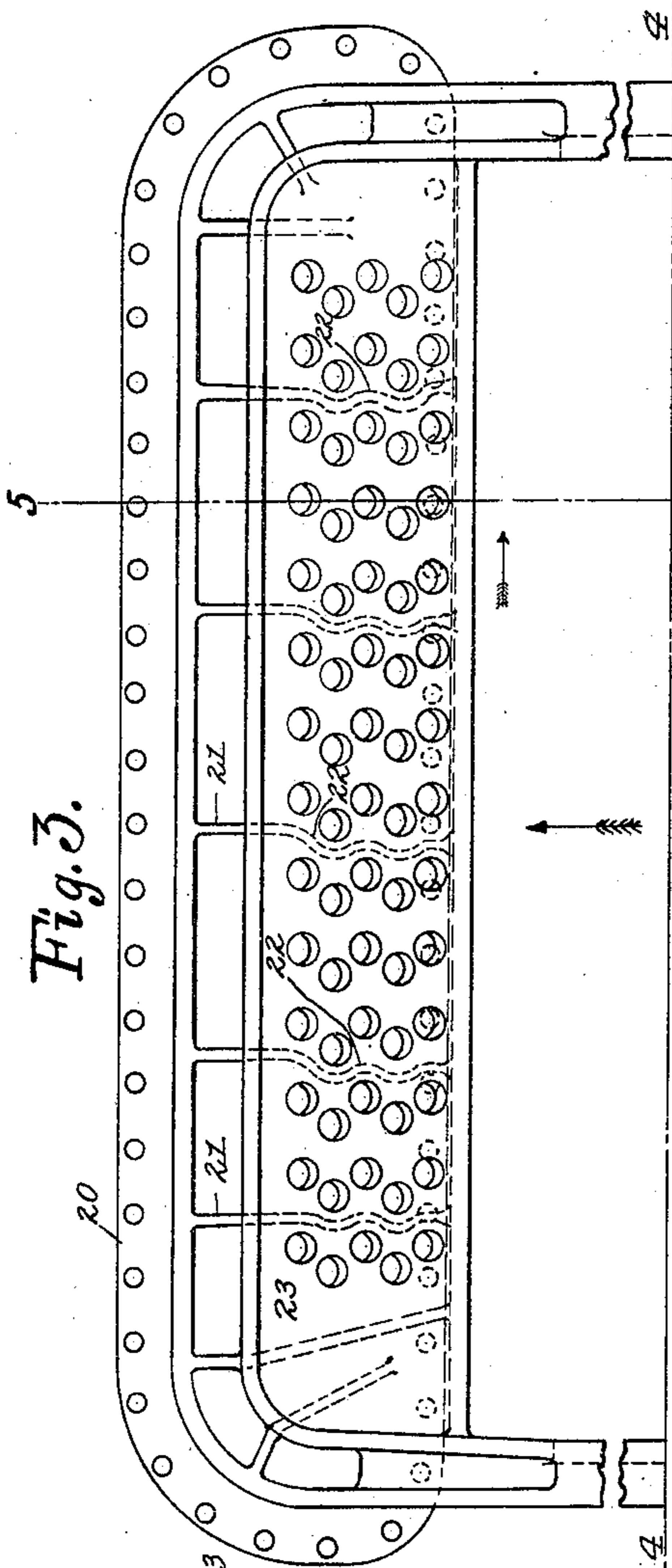


Fig. 3.

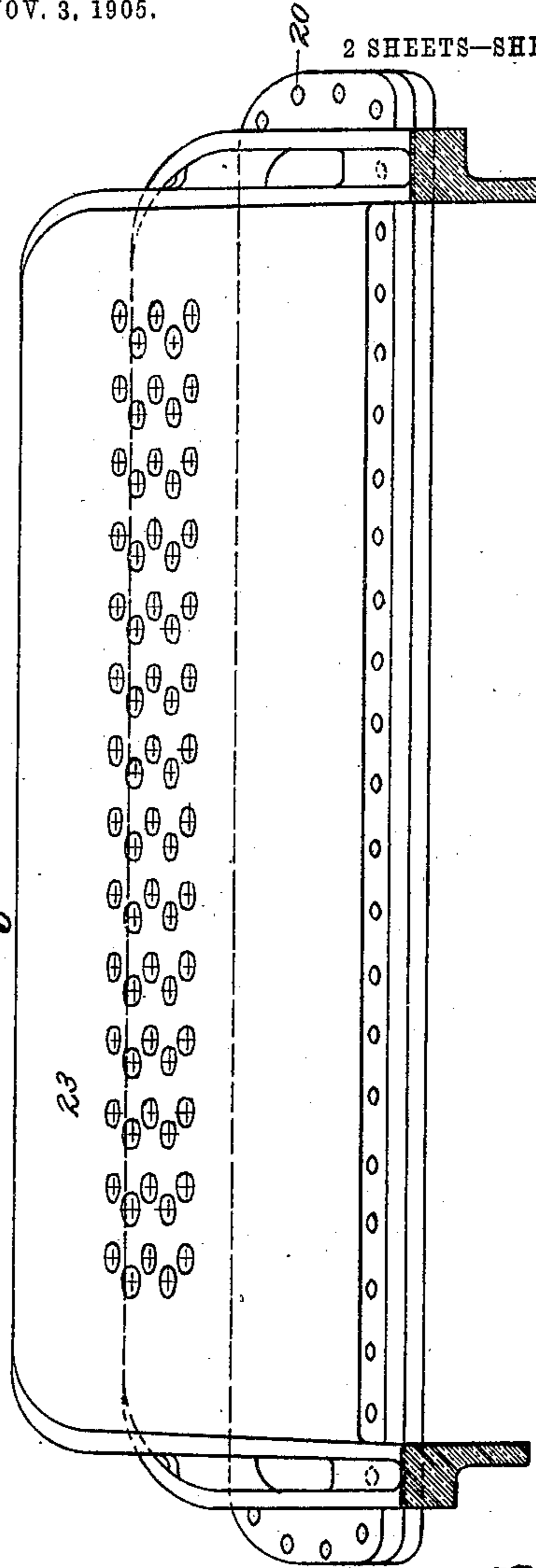


Fig. 4.

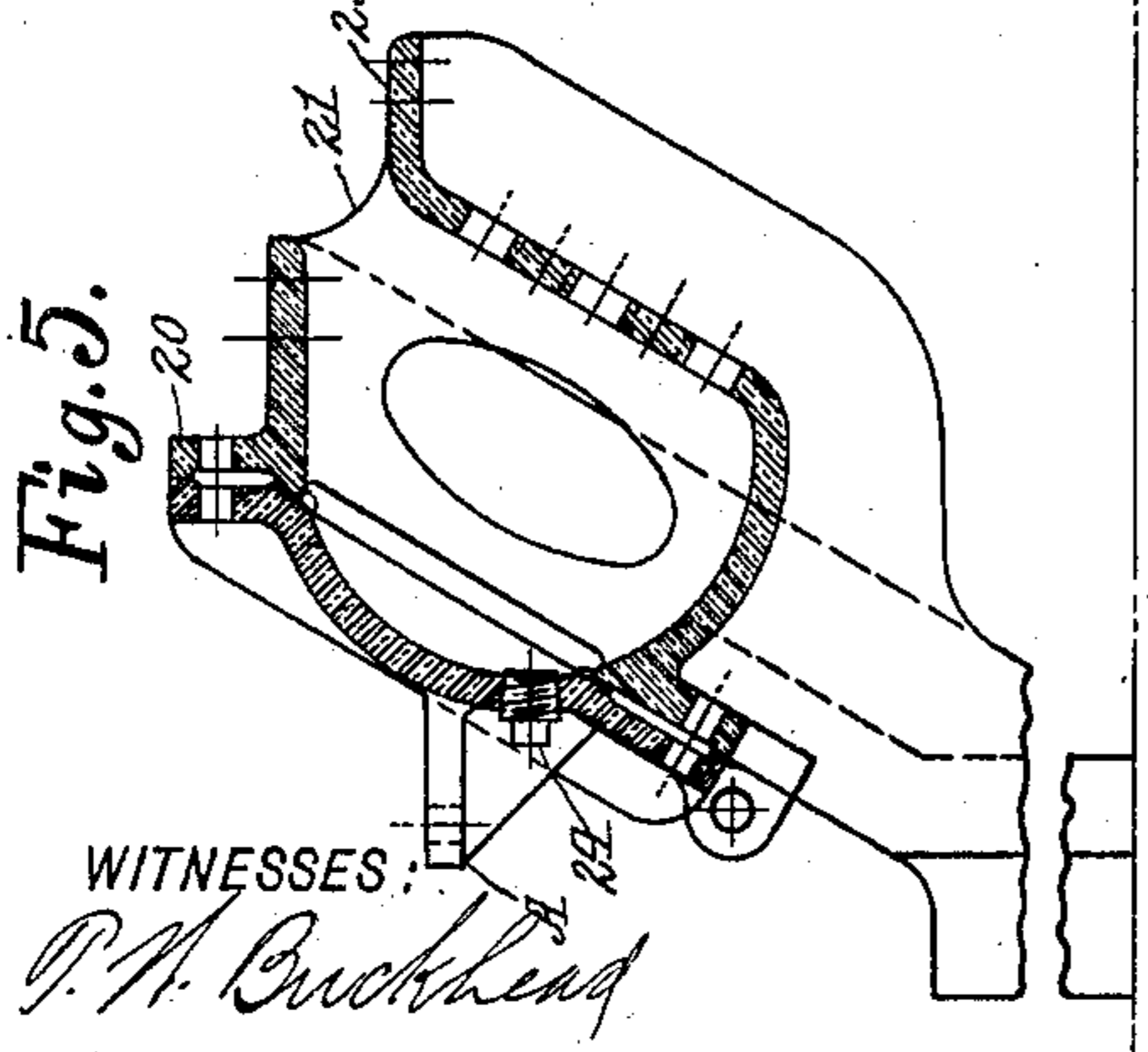


Fig. 5.

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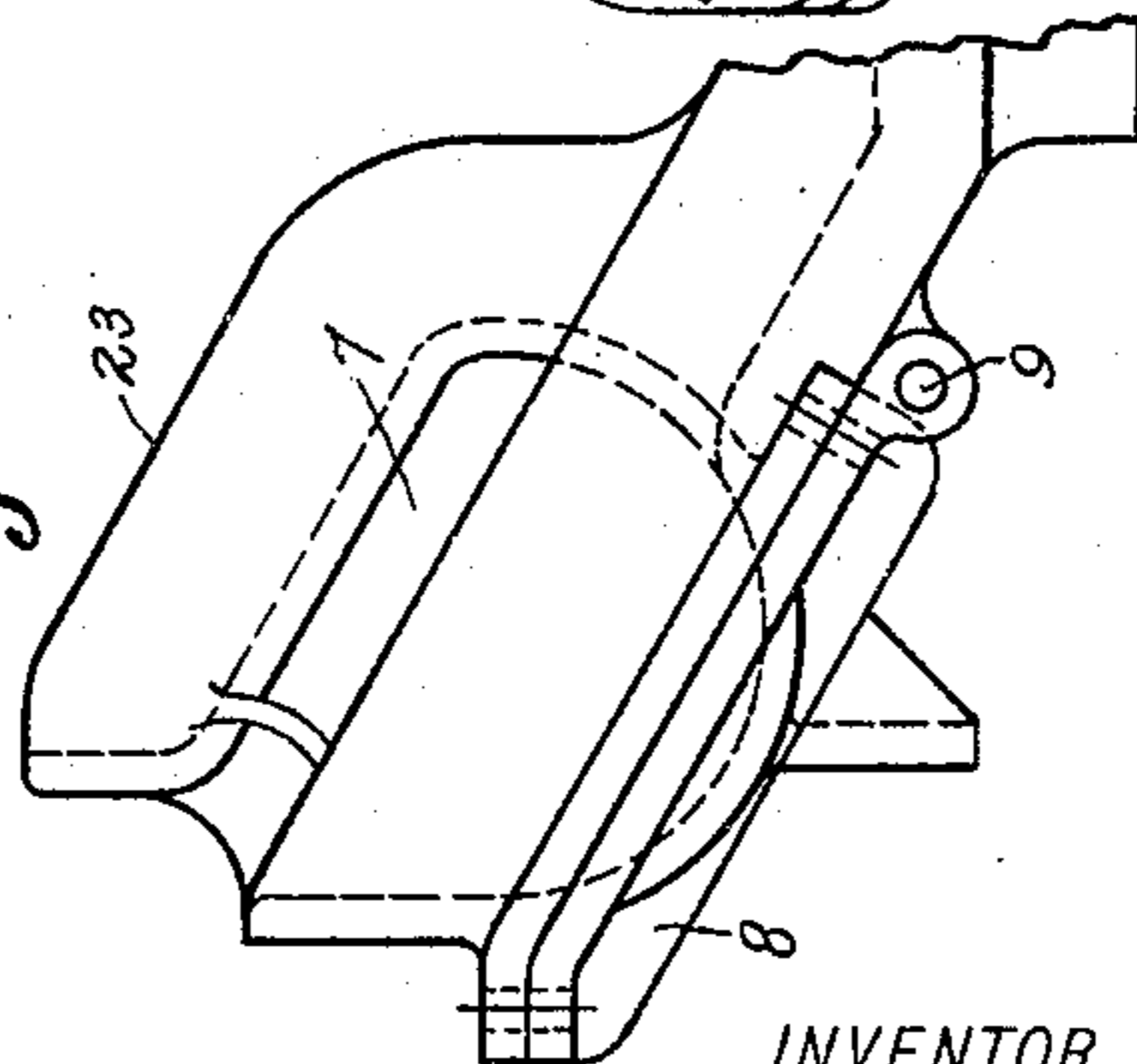


Fig. 6.

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# UNITED STATES PATENT OFFICE.

SAMUEL. S. RIEGEL, OF WASHINGTON, DISTRICT OF COLUMBIA.

## WATER-TUBE BOILER.

No. 832,419.

Specification of Letters Patent.

Patented Oct. 2, 1906.

Application filed November 3, 1905. Serial No. 285,746.

*To all whom it may concern:*

Be it known that I, SAMUEL S. RIEGEL, a citizen of the United States, and a resident of Washington, District of Columbia, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification.

My invention relates to water-tube boilers, and more especially to this type of boilers adapted for use as locomotive-boilers and is an improvement upon the constructions disclosed and covered by my Patent No. 694,786, dated March 4, 1902; but while my present improvements are especially adapted for use in locomotive-boilers, it is to be understood that they are not limited, necessarily, in their application to this kind of boiler, as they may be used with advantage upon stationary boilers of the same or similar type.

The objects of my present invention, are, first, to provide an improved form of mud-ring which shall possess maximum strength; second, one which can be more easily manufactured in that it can be cast or otherwise easily shaped and will therefore require practically no machine-work except that demanded where water-tight surfaces are formed; third, to provide such a mud-ring by use of which the application to a boiler, either old or new, is greatly facilitated; fourth, to so form such a mud-ring that access to the tubes terminating therein may be the more readily gained; fifth, to provide additional facility for access to the crown-sheet and the upper part of the tubes of the boiler terminating therein, and, lastly, to provide for the mounting of the safety-valves in the most convenient place.

With these objects in view my invention consists in the novel construction and details thereof, as hereinafter described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the drawings, Figure 1 is an end elevation with half in section on the line 1 1, Fig. 2, showing the application of my improvements to a locomotive-boiler. Fig. 2 is a central longitudinal section on the line 2 2, Fig. 1, the front part and the smoke-box of the boiler being omitted. Fig. 3 is a plan view of the improved mud-ring. Fig. 4 is a side elevation thereof having the usual front and back solid portions in section, taken on the line 4 4, Fig. 3, and looking in the direction of the arrow. Fig. 5 is a transverse section thereof on the line 5 5, Fig. 3, looking in

the direction of the arrow; and Fig. 6 is an end elevation of said mud-ring, as shown in Fig. 4.

Referring to the drawings, in which the same reference characters relate to the same or corresponding parts in all the views, the numeral 1 indicates the fire-box of a locomotive-boiler of the type shown in my prior patent, the said boiler structure and fire-box being inclosed by an outer shell 2, provided at the rear with the usual fire-door 3. The fire-box is inclosed by the usual flue and door sheets and by the crown-sheet 4, preferably dished as shown, and downwardly-extending side sheets 5, the lower ends of which are secured to flanges projecting upwardly from the plate or wall 23 of the mud-ring 7. These side sheets 5, instead of being bent inwardly and forming a part of said mud-ring, as in my prior patent, terminate in portions having but a slight curvature, so that the securing edges which contact with the flange 23 of the mud-ring 7 are substantially straight. This manner of connecting the side sheets 5 with the mud-ring materially reduces the cost of construction and simplifies the same since it dispenses with the necessity of dishing or bending the side sheets at this point, as in the prior patent, and permits the casting of the mud-ring or the formation of said mud-ring in sections by the simplest known methods. This arrangement of tubes in two groups inclined toward each other, forming a triangular structure with its apex at the end portion of the crown-sheet, provides for the circulation of water from the lower part of the boiler, into which it is preferably introduced, through the hottest part of the combustion-chamber to the boiler-space above the crown-sheet, in the latter of which the said tubes terminate, as in the prior construction and other boilers of this type.

The mud-ring 7 is so cast as to form water-pockets at sides, (see Figs. 3, 4, 5, and 6,) where, it will be observed, the said ring is shown open at its lower portion at each side and at the upper side it communicates with water-spaces between the external sheet and side sheets of the fire-box, thus providing the circulation through the tubes, water-spaces, and ring. The mud-ring is further provided with a plurality of strengthening or staying ribs 21, any suitable number of which may be used to give sufficient strength to the mud-ring, said staying-ribs being corrugated, as shown in Fig. 3, to clear the tubes in the top

plate 23 of the mud-ring, and these stay-ribs are foraminous to permit circulation and decrease weight, if desired. The tubes are shown in staggered lay-out, but may be  
 5 straight in lay-out, in which event they would preferably be straight throughout. The lower part of the mud-ring is provided with a flange 20, to which a corresponding  
 10 flange on the cap 8 is bolted, said cap being preferably pivotally connected at 9 to lugs cast or otherwise secured to the lower part of the mud-ring, so that when it is desired to inspect the boiler through the mud-ring or to gain access thereto for the purpose of cleaning or repairing the tubes it will not be necessary to entirely remove the cap for this purpose, as the cap may be unbolted, thereby releasing said cap and permitting it to swing from said pivotal connection. The cap is  
 20 also preferably provided with cleaning-plugs 24, closing blow-out openings, and with a suitable number of external strengthening-ribs 25, if desired. In order to give additional strength and to further stay the structure, especially at the bottom, I preferably provide the cap with the depending lugs 10, through which are passed stay-rods 14<sup>b</sup> from side to side of the ring, thus staying and supporting not only the caps in proper position,  
 30 but giving additional staying to the boiler structure, particularly the lower part. The boiler is provided with other staying-rods of the ordinary and structural types 14 and 14<sup>a</sup>, as indicated in Fig. 2.

35 The fire-box is preferably provided with a baffle-wall 12, of fire-brick or other suitable fireproof material, for the purpose of deflecting the products of combustion around, through, and between the tubes, thereby compelling  
 40 the products of combustion to travel over a greater area of the tubes than when permitted to pass directly through the fire-box and the fire-tubes 13 to the smoke-box. In order to provide additional means for gaining  
 45 access to the upper part above the fire-box and the water-tubes for inspection, repair, or other purposes, I provide a manhole 17, covered by a manhole-plate 18, surrounded by an open top drum 16, the wall of which is  
 50 bent upwardly from the outer casing 15, with which these boilers are usually provided. For greater convenience in mounting, as well as providing means for inclosing the same when so situated, I utilize the manhole-cover  
 55 18 for mounting the pop safety-valves 19 thereon. These valves are thus screened from view, which adds to the attractiveness of the boiler, while by so mounting them upon the manhole-cover additional openings through the boiler-shell are avoided, a reduction in the number of which openings is manifestly a desirable thing in boilers of this type  
 60 as well as other types of boilers.

While I have shown the mud-ring with the  
 65 stay-ribs cast integral therewith, and such is

the preferable construction, it will be understood that these ribs may be separate and secured to the sides and top of the mud-ring without departing from the spirit of my invention, and, further, that the mud-ring may  
 70 be built up in any suitable way should it be desired to assemble it from separate parts.

With the mud-ring constructed as above described it will be evident that the construction of the boiler is greatly facilitated,  
 75 because the amount of dishing or bending of the side sheets is so considerably reduced as to eliminate the greater part of such bending, as hereinbefore described, and the reverse curves needed in prior constructions are practically eliminated. Furthermore, the making of the mud-ring in the form described permits the provision of stays or stay-ribs in the ring either integrally cast therewith or otherwise secured thereto, and as a consequence thereof not only is the construction work of assembling a boiler materially simplified and thereby lessened in cost, but the application of the mud-ring and the cooperating parts to the fire-box of a locomotive-  
 85 boiler of the types referred to, as well as to other water-tube boilers, is so materially simplified as to result in a like reduction of cost in time and labor.

While I have shown the mud-ring as applied to but one of the several forms of fire-boxes illustrated in my prior patented boiler, it will be understood that the said mud-ring as well as the other details of the present invention are applicable to all of the forms  
 95 shown in said prior patent and without any material alteration in the arrangement of the tubes and their cooperating parts as well as to other water-tube boilers of the same or similar type. The various joints may be  
 100 provided with suitable metallic packings of any well-known form, if desired or necessary.

I claim as my invention—

1. In a water-tube boiler of the locomotive or like type, the combination with an external shell having a fire-box therein, a portion of whose surface is inclined, and fire-tubes extending between the fire-box and the external shell, of a series of water-tubes on each side of the central longitudinal axis of the boiler inclined upwardly toward each other, said tubes communicating with openings in various parts of the surface of the fire-box, a cast mud-ring at the bottom of the fire-box and, on each side thereof, communicating  
 110 with the water-space on the sides of the fire-box and having a top plate in which the lower ends of the tubes terminate, and flanged extensions to which the side sheets of the fire-box and shell are connected, substantially as described.  
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2. In a water-tube boiler of the locomotive or like type, the combination with an external shell having a fire-box therein, a portion of whose surface is inclined and fire-tubes ex-  
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 125  
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tending between the fire-box and the external shell, of a series of water-tubes on each side of the central longitudinal axis of the boiler inclined upwardly toward each other, said tubes communicating with openings in various parts of the surface of the fire-box, a cast mud-ring at the bottom of the fire-box and, on each side thereof, communicating with the water-space on each side of the fire-box and having a top plate in which the lower ends of the tubes terminate, and flanged extensions to which the side sheets of the fire-box and shell are connected, and a cover-plate inclosing said bottom of the mud-ring, substantially as described.

3. In a water-tube boiler of the locomotive or like type, the combination with an external shell having a fire-box therein, a portion of whose surface is inclined and fire-tubes extending between the fire-box and the external shell, of a series of water-tubes on each side of the central longitudinal axis of the boiler inclined upwardly toward each other, said tubes communicating with openings in various parts of the surface of the fire-box, a mud-ring extending around the fire-box, and, on each side thereof, communicating with the water-space on each side of the fire-box and having top plates in which the lower ends of the tubes terminate and flanged extensions to which the side sheets of the fire-box are connected, and cover-plates inclosing said bottom portions of the mud-ring hinged to each side of the mud-ring, substantially as described.

4. In a water-tube boiler of the locomotive or like type, the combination with an external shell having a fire-box therein, a portion of whose surface is inclined and fire-tubes extending between the fire-box and the external shell, of a series of water-tubes on each side of the central longitudinal axis of the boiler inclined upwardly toward each other, said tubes communicating with openings in various parts of the surface of the fire-box, a mud-ring extending around the bottom of the fire-box, and, on each side thereof, communicating with the water-space on each side of the fire-box and having top plates in which the lower ends of the tubes terminate and flanged extensions to which the side sheets and shell of the fire-box are connected, and cover-plates inclosing the bottom openings of the mud-ring hinged to each side of the mud-ring, said cover-plate having lugs thereon and stay-rods passing from said lugs on one side of the boiler to the other to the lugs on the cover-plate of the other side of the boiler, substantially as described.

5. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet and downwardly-extending side sheets inclosing the fire-box, and having a series of tubes on each side of the longitudinal axis of

the boiler inclined upwardly toward each other and terminating at their upper ends in a crown-sheet, of a cast mud-ring at the bottom of the fire-box, having a flanged connection with the side sheets of the fire-box and its outer wall secured to the external shell of the boiler, said mud-ring having openings at the sides communicating with water-spaces at the sides of the fire-box and openings at the bottom thereof, with cover-plates closing said openings, substantially as described.

6. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet and downwardly-extending side sheets inclosing the fire-box, and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in the crown-sheet, a cast mud-ring at the bottom of the fire-box and having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell of the boiler, said mud-ring having openings at the sides communicating with water-spaces at the sides of the fire-box, stays extending at intervals transversely across said mud-ring, and an opening at the bottom thereof, with a cover-plate closing said opening, substantially as described.

7. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet and downwardly-extending side sheets inclosing said fire-box, and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in the crown-sheet, of a mud-ring at the bottom of the fire-box having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell at the bottom, said mud-ring having openings at the sides communicating with water-spaces at the sides of the fire-box, foraminous stay-ribs extending at intervals transversely across said mud-ring, and openings at the bottom thereof with cover-plates closing said openings, substantially as described.

8. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet and downwardly-extending side sheets inclosing said fire-box, and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in the crown-sheet, of a mud-ring at the bottom of the fire-box having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell of the boiler, said mud-ring having openings at the sides communicating with water-spaces at the sides of the fire-box and foraminous stay-ribs extending at intervals transversely

across said mud-ring whose walls adjacent to the water-tube openings in the top plate of the mud-ring are corrugated to clear said openings, and openings at the bottom of said mud-ring with cover-plates closing said openings, substantially as described.

9. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet and downwardly-extending side sheets inclosing said fire-box, and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in a crown-sheet, of a mud-ring cast in one piece at the bottom of the fire-box and having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell at the bottom, said mud-ring having openings at the sides communicating with water-spaces at the sides of the fire-box, foraminous stay-ribs extending at intervals transversely across said mud-ring, and openings at the bottom thereof with cover-plates closing said openings, substantially as described.

10. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet and downwardly-extending side sheets inclosing said fire-box, and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in a crown-sheet, of an integral mud-ring at the bottom of the fire-box having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell at the bottom, said mud-ring comprising openings at the sides communicating with water-spaces at the sides of the fire-box, foraminous stay-ribs extending at intervals transversely across said mud-ring, and openings at the bottom thereof with cover-plates closing said openings, substantially as described.

11. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell comprising a crown-sheet

and downwardly-extending side sheets inclosing said fire-box, and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in a crown-sheet, of an integral mud-ring at the bottom of the fire-box having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell at the bottom, said mud-ring comprising openings at the side communicating with water-spaces at the sides of the fire-box, foraminous stay-ribs extending at intervals transversely across said mud-ring, and openings at the bottom thereof with cover-plates pivotally hinged to each side of the mud-ring, said cover-plates closing said openings, substantially as described.

12. In a water-tube boiler structure of the locomotive or like type, the combination with an external shell, comprising a crown-sheet, downwardly-extending side sheets, inclosing said fire-box and having a series of tubes on each side of the longitudinal axis of the boiler inclined upwardly toward each other and terminating at their upper ends in a crown-sheet, of an integral mud-ring at the bottom of the fire-box having flanged connections with the side sheets of the fire-box and its outer walls secured to the external shell at the bottom, said mud-ring comprising openings at the sides communicating with water-spaces at the sides of the fire-box, foraminous stay-ribs extending at intervals transversely across said mud-ring, and openings at the bottom thereof with cover-plates closing said openings, and provided with lugs and stay-rods extending transversely across the boiler and connecting said lugs, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL S. RIEGEL.

Witnesses:

C. W. FOWLER,  
R. T. FRAZIER.