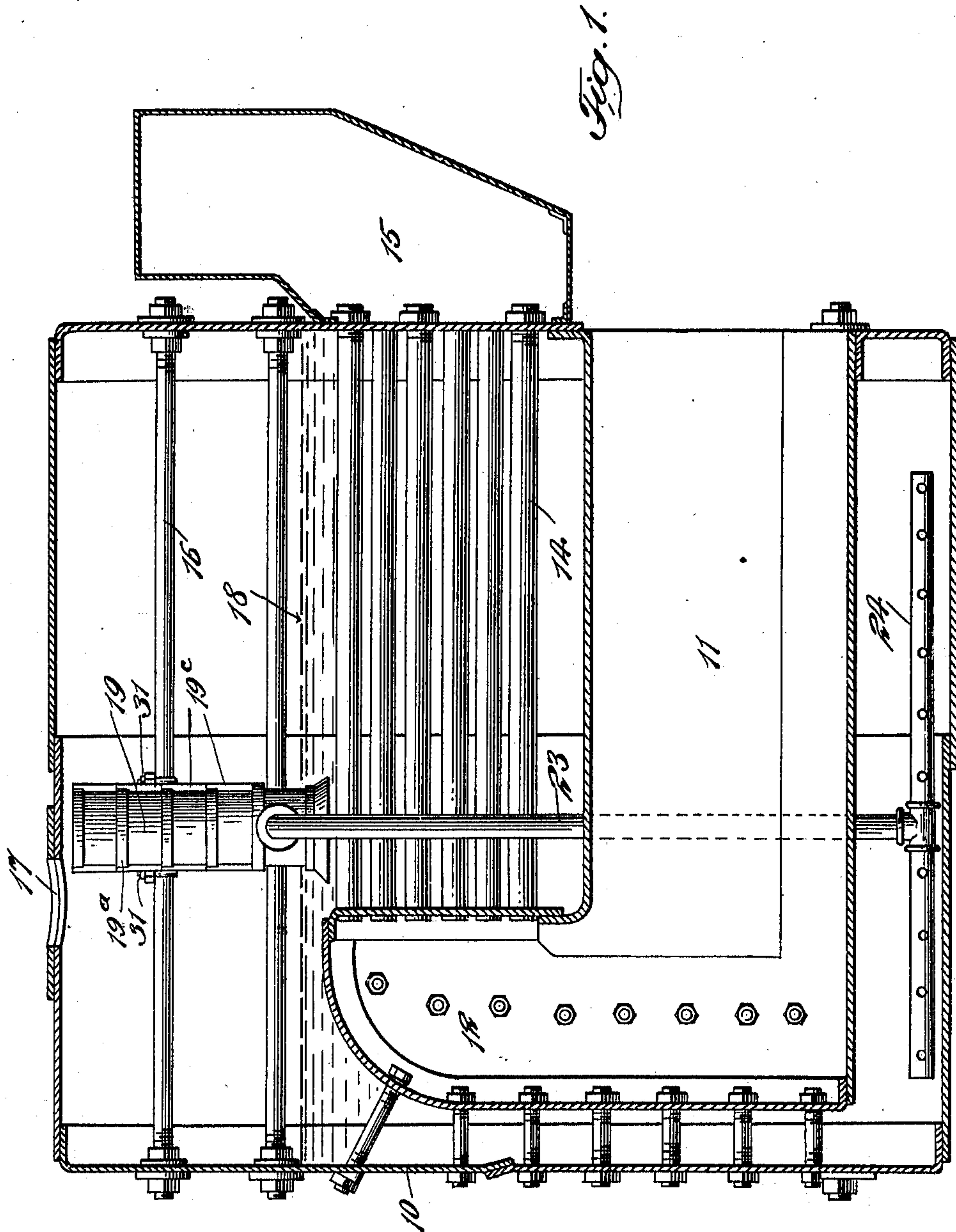


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BOILER CIRCULATOR.
APPLICATION FILED JUNE 21, 1910.

993,566.

Patented May 30, 1911.

2 SHEETS-SHEET 1



Witnesses:
Julius H. Smith
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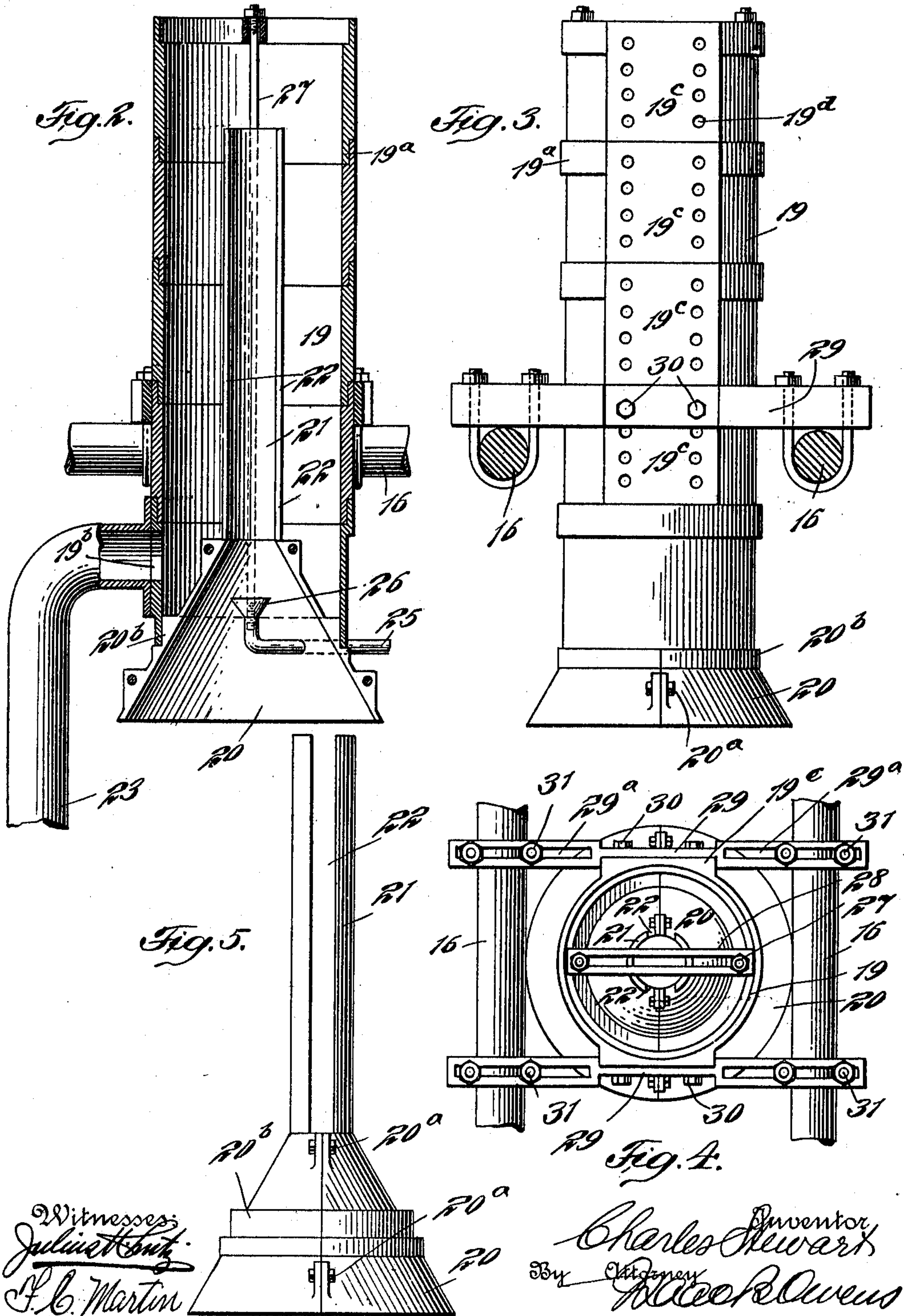
Charles Stewart Inventor
By *Alfred Owens* Attorney

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UNITED STATES PATENT OFFICE.

CHARLES STEWART, OF BROOKLYN, NEW YORK.

BOILER-CIRCULATOR.

993,566.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed June 21, 1910. Serial No. 568,185.

To all whom it may concern:

Be it known that I, CHARLES STEWART, of the borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Boiler-Circulators, of which the following is a full, clear, and exact specification, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to means for reducing the circulation of water in boilers, particularly those of the Scotch type where the water lies in a considerable mass around the furnace and fire tubes.

The invention resides in certain special features of construction and organization of parts which will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is now had to the accompanying drawings which represent, as an example, the preferred embodiment of my invention and, in which drawings—

Figure 1 is a longitudinal section of a boiler of the Scotch type showing my invention applied; Fig. 2 is an enlarged vertical section of the circulator proper; Fig. 3 is a side elevation thereof showing the boiler stays in sections; Fig. 4 is a plan view of the invention, showing its relation to the stays; and Fig. 5 is an elevation of the conical collector and tube.

In Fig. 1, 10 indicates the boiler shell, 11 the furnace, 12 the back connection, 14 the fire or return tubes, 15 the up-take, and 16 the stays, all of which is illustrated as of the conventional construction. Such boilers are provided with manholes in various situations according to the make of the boiler and to the conditions of its insulations. Of these manholes one is indicated at 17 in the drawings. One of the difficult problems encountered by my invention is the provision of a construction which, notwithstanding the variations and uncertainties concerning the manholes, will allow the circulator to be introduced conveniently and properly and securely mounted. In operation the water lies in the boiler around the furnace and tubes at approximately the level indicated by the broken line in Fig. 1.

My improved boiler circulator comprises a vertically disposed chamber 19, closed at its bottom by an upwardly tapering collector

20. This collector is open at its ends and mounts a tube 21 which stands vertically and centrally in the chamber 19 and has one or more vertical slots 22 extending throughout its length. From the lower part of the chamber 19 a tube 23 passes downward to the bottom of the boiler and is preferably provided with a horizontally disposed branch 24 having numerous perforations for the outlet of the water. The chamber 19 and collector 20 are placed in the hottest portion of the boiler, namely, over the tubes 14 in such a manner that the lower end of the collector is submerged in the upper portion of the body of water in the boiler.

25 indicates a small pipe passing from the exterior of the boiler and communicating with a source of steam independent of the particular boiler to which the circulator is applied. This tube 25 passes through the collector 20 and terminates in a flaring upwardly disposed nozzle 26 located in the axial center of the tube 21.

In operation, when fire is started in the boiler and the water is cold, live steam is admitted through the tube 25. This steam escaping by the nozzle 26 produces an injector-like action in the throat of the collector 20 and water in the top of the boiler which is now becoming warm is raised through the pipe 21 and accumulates in the chamber 19 above the water level. As the water thus accumulates, it flows by gravity through the tube 23, circulating to the bottom of the boiler. This keeps the temperature of the water uniform during the warming up periods. The steam escaping from the nozzle 26 passes up out of the top of the tube 21, while the water flows through the slots 22 in said tube at various elevations. The tube 25 is, of course, provided with a suitable valve (not shown) to control the steam flow. In the practical installation of my invention, for example, on shipboard, to which it is especially applicable, the tube 25 will be connected with the donkey-boiler in which steam is almost invariably maintained constantly. When steam is raised in the main boiler, to which the circulator is applied, the pipe 25 is closed and the operation of the circulator becomes normal. This normal operation consists in the ebullition of the water near the surface thereof, which causes the steam to rise in the conical collector 20 and by reason of the form thereof an upward circulation of steam and water

takes place in the constricted throat of the collector. This rises in the tube 21 as before described, the steam passing up through and out of the tube 21 and the water flowing out through the slots therein at various points according to the level of water maintained in the chamber. This water accumulating in the chamber 19 flows down through the pipe 23 and escapes at the bottom. By reason of the invention therefore the hottest water at the top of the boiler is collected by operations going on in the boiler itself and flows down to the bottom where the water is coolest. It then rises by natural circulation and in this manner the temperature in the boiler is kept uniform throughout.

In addition to the novel features concerning the collector and slotted tube and the exciting pipe 25, my invention involves important features of construction, which allow me to adapt it to numerous varying situations and to place it easily and securely in position. According to this, the collector 20 is cast in two sections divided along its vertical center and the tube 21 is cast integral with these sections, the slots 22 in such tube being formed by spaces between the vertical edges of the sections of the tube. The sections of the collector are fastened together by bolts 20^a extending through ears on the sections and the collector is formed with an annular seat 20^b for the chamber. In this connection it is pointed out that while I prefer to slot the tube 21 the same effect may be produced by a series of orifices at different points the length of the tube and I consider this together with various other obvious modifications as well within the purview of my invention.

The chamber 19 is constructed in a number of horizontal sections, preferably of cast metal, and engaged one with the other by flanges 19^a shown in Figs. 2 and 3. The lowermost section is rested on the seat 20^b and all of the sections are held in engagement and fastened on the collector by tie-rods 27 passing through a bar 28 at the top and screwing into the seat 20^b of the collector. The lowermost section of the chamber is formed with a case and opening 19^b to accommodate the pipe 23.

The circulator is mounted and held in the boiler through the medium of the stay-rods 16 which are to be found in all boilers of the type to which my invention is applicable. To admit of this the sections of the chamber 19, or at least the upper sections, are cast with plane faces 19^c having numerous tapped holes 19^d. These faces are adapted to be engaged by supporting bars 29 provided with bolts 30 which are engaged with such of the openings 19^d as may be convenient under the circumstances of each particular installation. Of these supporting bars 29, two are provided for each boiler circulator

and they extend horizontally between the two adjacent stay rods 16 bearing thereon. The ends of the bars are vertically slotted as indicated at 29^a to accommodate U-bolts 31 which clamp the bars to the stay rods. This, it will be seen, rigidly mounts the circulator in position and by reason of the sectional formation and the other peculiar features pointed out I am allowed to introduce the circulator into a boiler of any arrangement, assembling the parts within the boiler and finally clamping them thoroughly in place.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. A boiler circulator having an upwardly tapered collector adapted to stand with its open lower end submerged but near the surface of the water, a chamber above the collector, the chamber extending above the water level in the boiler, a tube communicating with the open upper end of the collector and extending vertically in the chamber, said tube having a vertically disposed water outlet along its length and having its upper end open for the escape of steam, and a connection extending above the water line downward to the lower part of the boiler.

2. A boiler circulator having an upwardly tapered collector adapted to stand with its open lower end submerged but near the surface of the water, a chamber above the collector, the chamber extending above the water level in the boiler, a tube communicating with the open upper end of the collector and extending vertically in the chamber, said tube having a vertically disposed water outlet and having its upper end open for the escape of steam, a connection extending from the chamber above the water line downward to the lower part of the boiler, and an exciting tube passing from without the boiler into and discharging at the throat of the collector.

3. A boiler circulator having a chamber extending above the water level, a connection extending from the chamber above the water level downward to the lower part of the boiler, means for raising water in the chamber by the ebullition of the water in the boiler and an exciting tube passing from without the boiler and discharging into said means for raising the water.

4. A boiler circulator comprising a chamber, means attached thereto and engaging the stay rods of the boiler to mount the chamber with a part at least above the water level, a connection from the chamber above the water level to the lower part of the boiler and means for raising water in the chamber by the ebullition of the boiler.

5. A boiler circulator having a chamber formed of horizontal superimposed sections, a collector at the bottom on which said sec-

tions are mounted, means for tightening the sections on the collector, a connection from the chamber above the water line to the lower part of the boiler and means for mounting the circulator into position.

6. A boiler circulator comprising a chamber, means for raising water within, a connection from the chamber above the water line to the lower part of the boiler, supporting bars, and means for adjustably fastening them to the sides of the chamber, said bars extending horizontally into engagement with the stay rods of the boiler.

7. A boiler circulator comprising a chamber, means for raising water within, a con-

nection from the chamber above the water line to the lower part of the boiler, supporting bars, means for adjustably fastening them to the sides of the chamber, said bars extending horizontally into engagement with the stay rods of the boiler, and means for fastening said supporting bars to the stay rods.

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

CHARLES STEWART.

Witnesses:

F. C. MARTIN,

B. BIGGE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
