

No. 698,290.

Patented Apr. 22, 1902.

B. F. KELLEY.
FEED WATER HEATER.

(Application filed Jan. 24, 1902.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

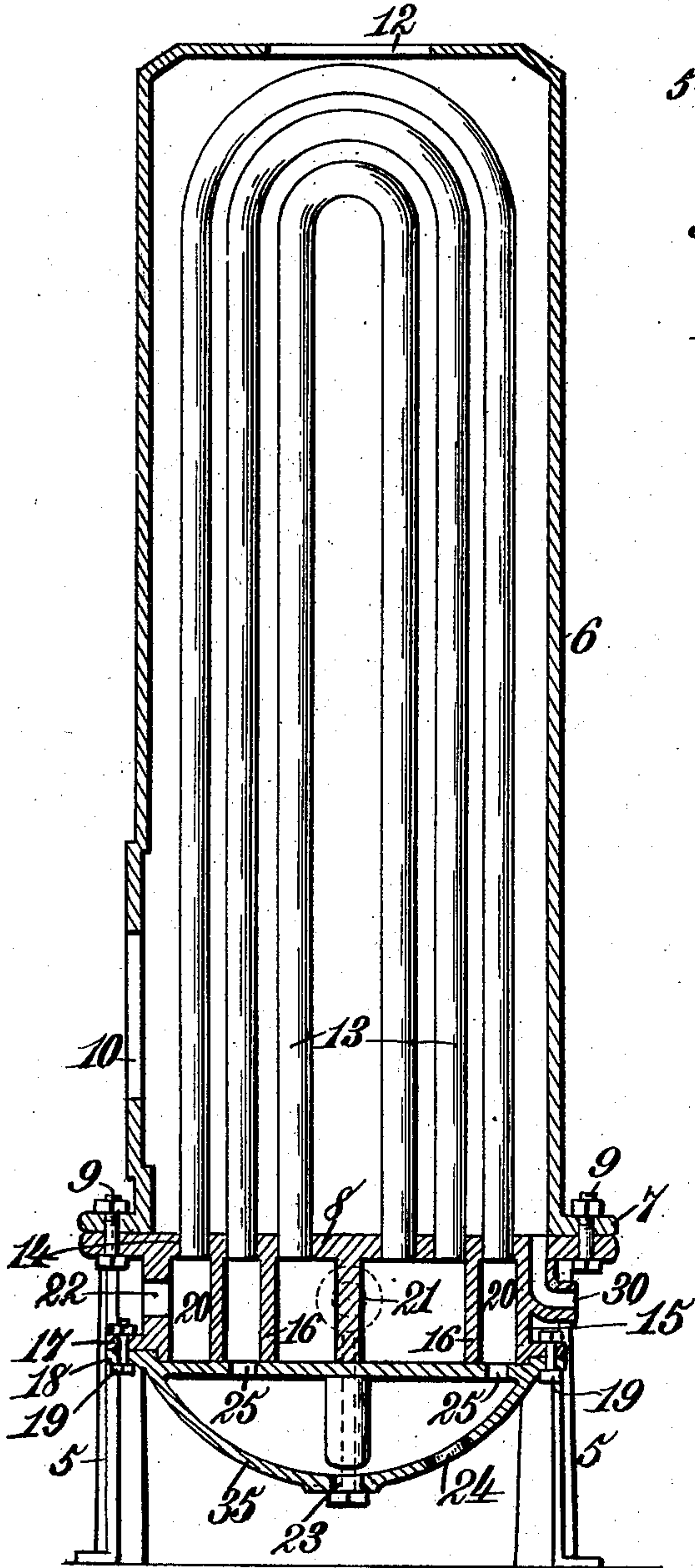


Fig. 4.

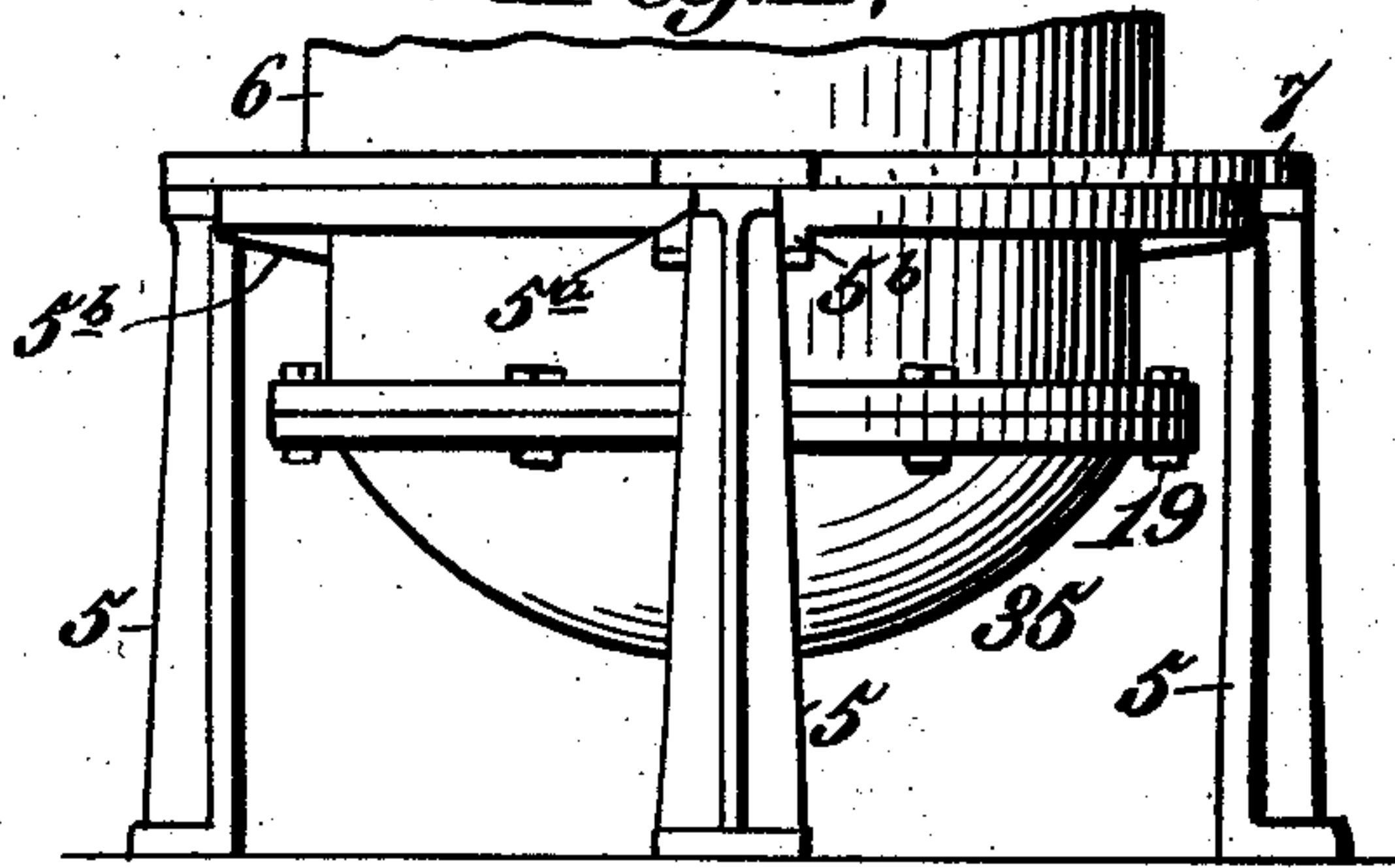
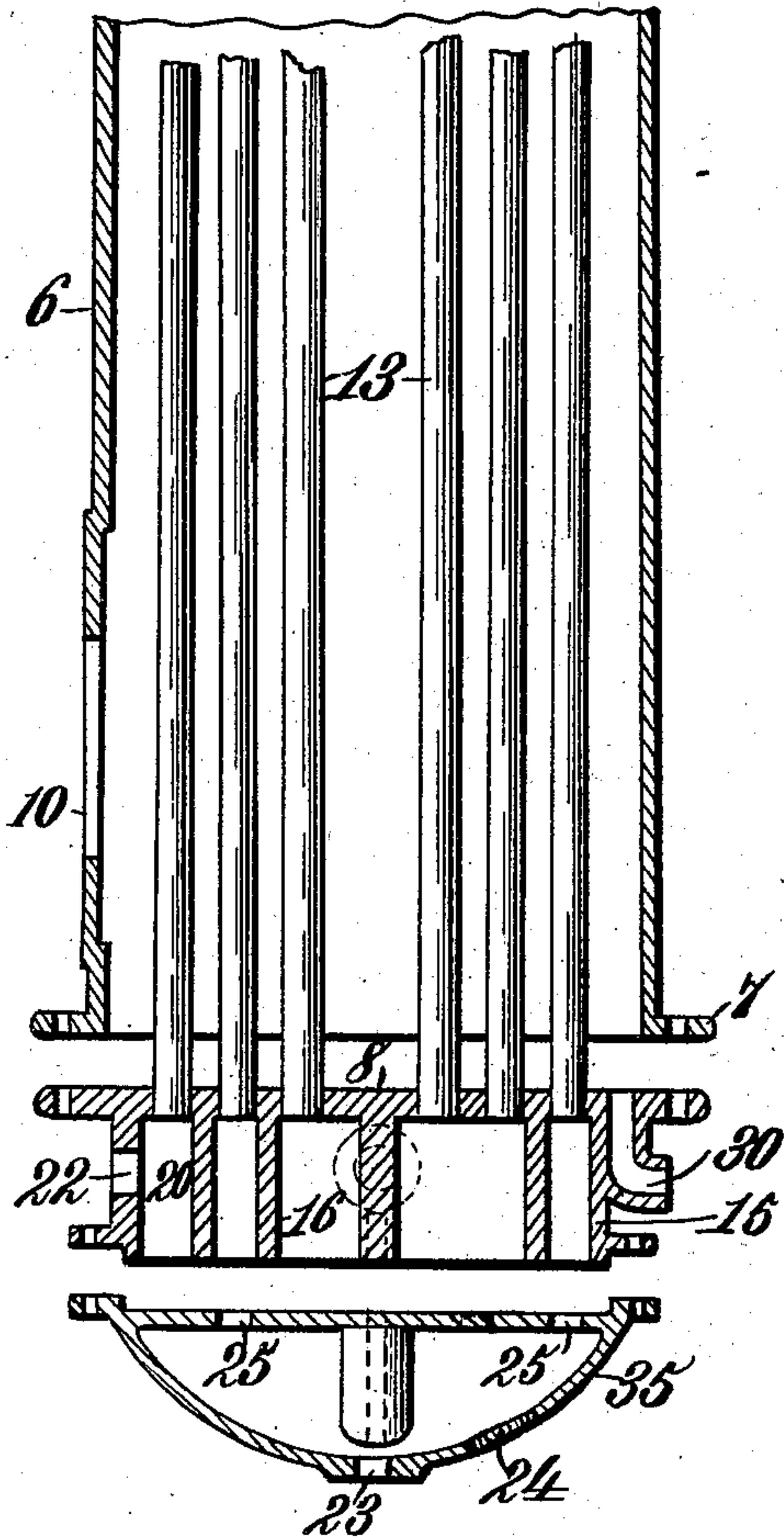


Fig. 2.



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No. 698,290.

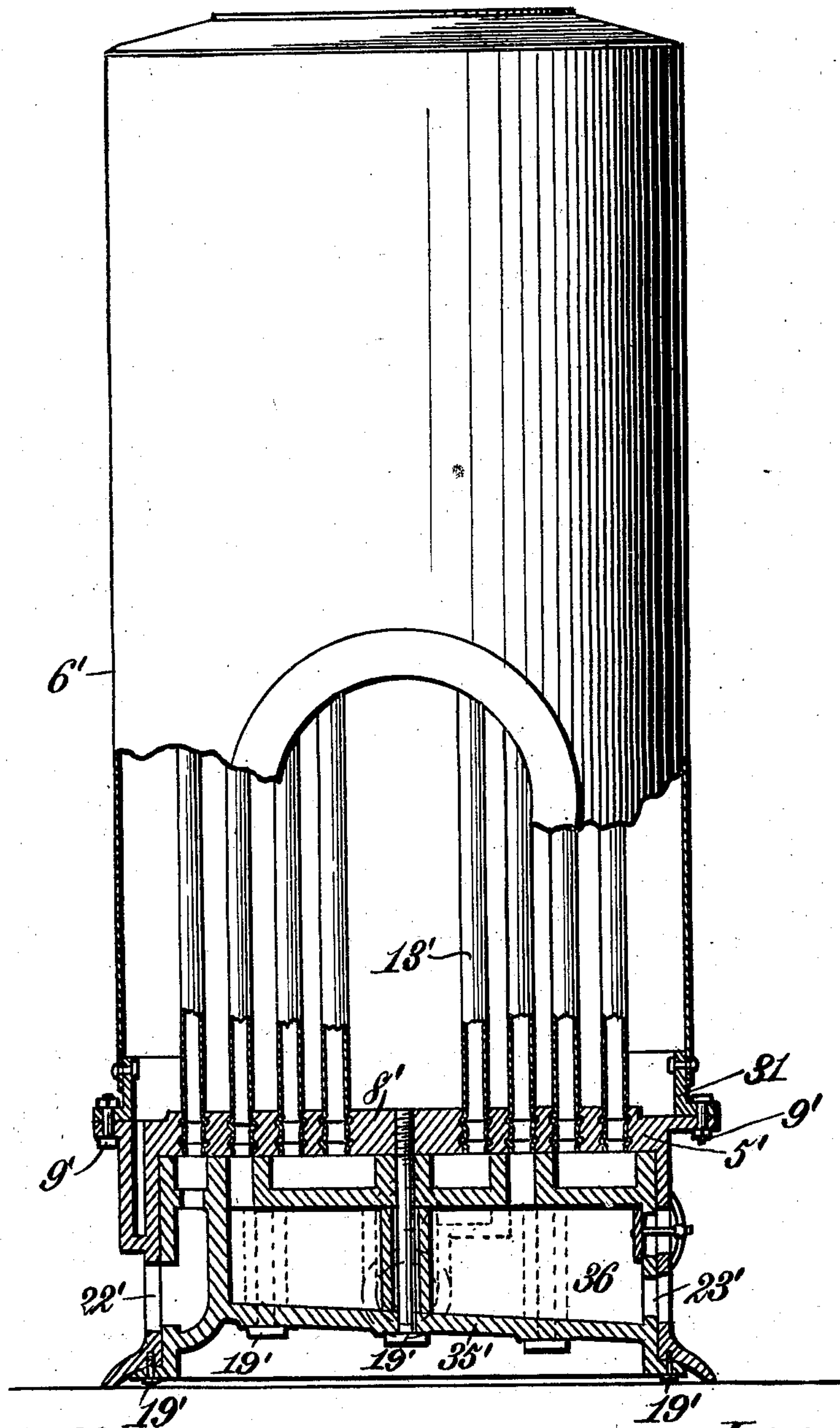
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2 Sheets—Sheet 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

BENJAMIN F. KELLEY, OF BROOKLYN, NEW YORK.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 698,290, dated April 22, 1902.

Application filed January 24, 1902. Serial No. 91,125. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. KELLEY, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to a feed-water heater, and the improvements are illustrated in connection with a device of this character substantially of the kind as shown in Letters Patent No. 586,498, granted to me July 13, 1898, and to which reference may be had.

The ordinary water-tube feed-water heater comprises in its construction a shell, a plate or tube-sheet into which the tubes are fastened, and a base, held together by a single set of bolts, and these bolts serve to secure both steam and water joints located usually one above the other. This construction possesses a disadvantage in that the upper joint, which is a steam one and upon which there is no pressure but great heat from the steam, is held tight by the same bolts that are employed to maintain the lower or water joint, which lower joint must sustain the entire boiler-pressure. Bolting together in this manner therefore causes extreme difficulty in holding either joint absolutely tight, as the expansion of the metal and bolts caused by the heat of the steam on the upper joint and the boiler-pressure and contraction of the bolts due to the chill of the water on the lower joint greatly strains and weakens the bolts, loosening them in time, and hence allowing the packing to be blown out of one or both joints. As it is necessary for the proper working of a heater that said joints be absolutely steam and water tight, respectively, great difficulty has heretofore been encountered in the manner pointed out. I overcome the disadvantage set forth by providing two sets of bolts for maintaining the respective steam and water joints, and both sets of bolts are arranged out of contact with the steam and water, respectively, so that they cannot be attacked thereby, as in case they are they would be caused to rust, and thereby weakened in a very short time.

The invention includes other objects and advantages, which with the foregoing will be set forth at length in the following description, while the novelty thereof will form the basis of the claims succeeding said description.

The invention is clearly illustrated in the accompanying drawings, forming a part of this specification, and in which—

Figures 1 and 2 are vertical cylindrical sections of the feed-water heater embracing the improvements, Fig. 2 showing the parts separated. Fig. 3 is a similar view showing a modified form of the apparatus. Fig. 4 is a detail view hereinafter more particularly described.

Like characters refer to like parts in all the figures of the drawings.

Referring to Figs. 1 and 2, the numeral 5 indicates legs for supporting the parts of the feed-water heater, hereinafter described, and 6 the shell thereof, into which steam is directed for heating the feed-water circulating in pipes inclosed by said shell. The said parts may be made of suitable material, and the shell, which is of substantially a cylindrical form, with open bottom, as is customary, is provided with an external annular flange 7. I provide four of the legs 5, although, of course, this is not essential, and the upper ends of said legs fit into equidistantly-disposed recesses 5^a in the under side of the flange 7, and said flange is braced at 5^b at opposite sides of the respective recesses to thereby strengthen the structure.

The tube sheet or plate is denoted by 8, and it forms the bottom of the shell 6, and hence of the steam-chamber, and said tube plate or sheet fits against and is bolted to the flange 7 of the shell 6, suitable packing generally being interposed between said parts, and is secured thereto by bolts 9.

The shell 6 has at or near its bottom an inlet 10 for the steam to heat the feed-water, which steam is generally exhaust, and at its top an outlet 12 for the discharge of such steam. The shell 6 and plate 8 therefore constitute a chamber in which steam can circulate to heat the tubes 13 and the water there-

in. Said tubes extend lengthwise of the shell and are of an inverted-U form, their branches being expanded or otherwise secured in perforations 14, which extend across the tube-sheet.

The tube-sheet 8 has a depending annular flange 15 and a series of depending walls 16. The depending annular flange 15 has an external circumferential flange 17, to which a similar flange 18 is secured by bolts 19, said flange being formed along the upper edge of a partly-spherical shell 35, the horizontal top of which constitutes the bottoms of the water chambers or compartments 20, through which the feed-water circulates, it being seen that the branches of the pipes open into the respective chambers or compartments 20. The feed-water enters into one of said chambers or compartments by the inlet 21 and is caused to circulate through the pipes 13, and finally enters the compartment 20 (shown at the left) and passes through the outlet 22, formed in the depending flange 15 in the usual manner. Pipes (not shown) can be fitted into the inlet and outlet openings, respectively, for supplying the feed-water to the apparatus and conducting the same in a heated condition therefrom for use.

The partly-spherical shell 35 constitutes a settling-chamber, it having a mud-blow at 23 in its bottom and a hole 24, through which the hand may be thrust to clean said settling chamber or shell, perforations 25 in the top of said shell affording communication between the same and two of the chambers or compartments 20.

The bolts 9 and 19, it will be seen, are entirely independent of each other and are located, respectively, outside of the steam and water chambers, so that they cannot possibly be reached by either the water or the steam, as in case they were the same would be subject to rust and their lives be materially shortened.

The tube sheet or plate 8 has at a suitable place a depending nozzle or tubular offset 30, serving as a drip to carry off the water of condensation from the inside of the shell 6.

In Fig. 3 I have illustrated a modified form of the heater. In this case the shell 6' is connected with the base 5' through the medium of an intermediate flanged ring 31, riveted or otherwise secured to said shell and forming an external annular flange at the bottom of said shell, which is bolted to a corresponding flange at the top of the base 5' and tube-sheet 8', the base 5' being in the form of a casing for inclosing parts of the heater. Said base contains a casting 35', chambered for the circulation of water, which also traverses the tubes 13', the branches of which are fitted into the tube-sheet 8'. The part 35' is secured to the base 5' and tube-sheet 8' by two sets of bolts, as 19', which serve to maintain a water-joint between said chambered cast-

ing 35' and the tube-sheet 8' and base 5', the water entering the inlet 21', traversing the chambered casting 35' and the tubes 13', and being discharged from the outlet 22'. The chamber or compartment 36 of the casting 35' serves as a settling-chamber, and the mud and sediment that accumulates in the same can be discharged through the blow-hole 23'. The steam-joint between the tube-sheet 8' and shell 6' is maintained by the bolts 9', which, it will be seen, pass through the flanges of the tube-sheet 8' and flanged ring 31.

The bolts 19' are in two sets, one of them being disposed within the other and the bolts constituting said inner set passing through cored openings in the casting 35' and also into the tube-sheet 8', the cored sleeves serving to prevent the contact of the water with said inner bolts 19'. It will be seen that the outer bolts 19', that serve in part to maintain the water-joint, and the bolts 9', located above the same, are arranged entirely outside of the apparatus, and hence cannot be reached by the water and steam.

The feed-water heater hereinbefore described consists simply of three main parts, a shell, a settling-chamber, and a sheet, into which the water-tubes are fitted. It is durable, as the strain due to expansion and contraction is overcome by the two sets of bolts. The parts are readily accessible and the heater can be taken apart for repairs, examined, and cleaned without disturbing the main pipes or stopping the operation of the plant, and all the parts are rigid and solid and the bolts which unite the parts are thoroughly protected.

In Fig. 2 of the drawings I have shown the manner of separating the parts, from which it will be seen that the part 35 can be removed without disturbing the tube-sheet 8 or the said part 35 and the tube-sheet 8 can be dropped together.

Having described the invention, what I claim is—

1. In a feed-water heater, a shell, a tube-sheet bolted to said shell, said parts being arranged to form a steam-chamber, the bolts serving to maintain a steam-tight joint, tubes connected with said tube-sheet, a settling-chamber, a flange depending from the tube-sheet, said flange being bolted to the settling-chamber, and said bolts serving to maintain a water-tight joint and being independent of the other bolts, and a plurality of chambers between said settling-chamber and the tube-sheet connected respectively with the tubes and settling-chamber.

2. In a feed-water heater, a shell having an external annular flange at its base, a tube-sheet bolted to said shell to form a steam-joint, and the bolts serving to maintain a steam-tight joint, tubes inclosed by the shell for the circulation of water and fitted into said tube-sheet, and the latter having a series

of depending walls, and a settling-chamber
bolted to said last-mentioned flange, and the
bolts serving to maintain a water-tight joint,
and said settling-chamber having a top ar-
5 ranged to fit against the lower edges of the
depending flange and the walls of the tube-
sheet.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit-
nesses.

BENJAMIN F. KELLEY.

Witnesses:

OLAF S. PEDERSEN,
GEORGE McDOWELL.