No. 742,303. PATENTED OCT. 27, 1903.

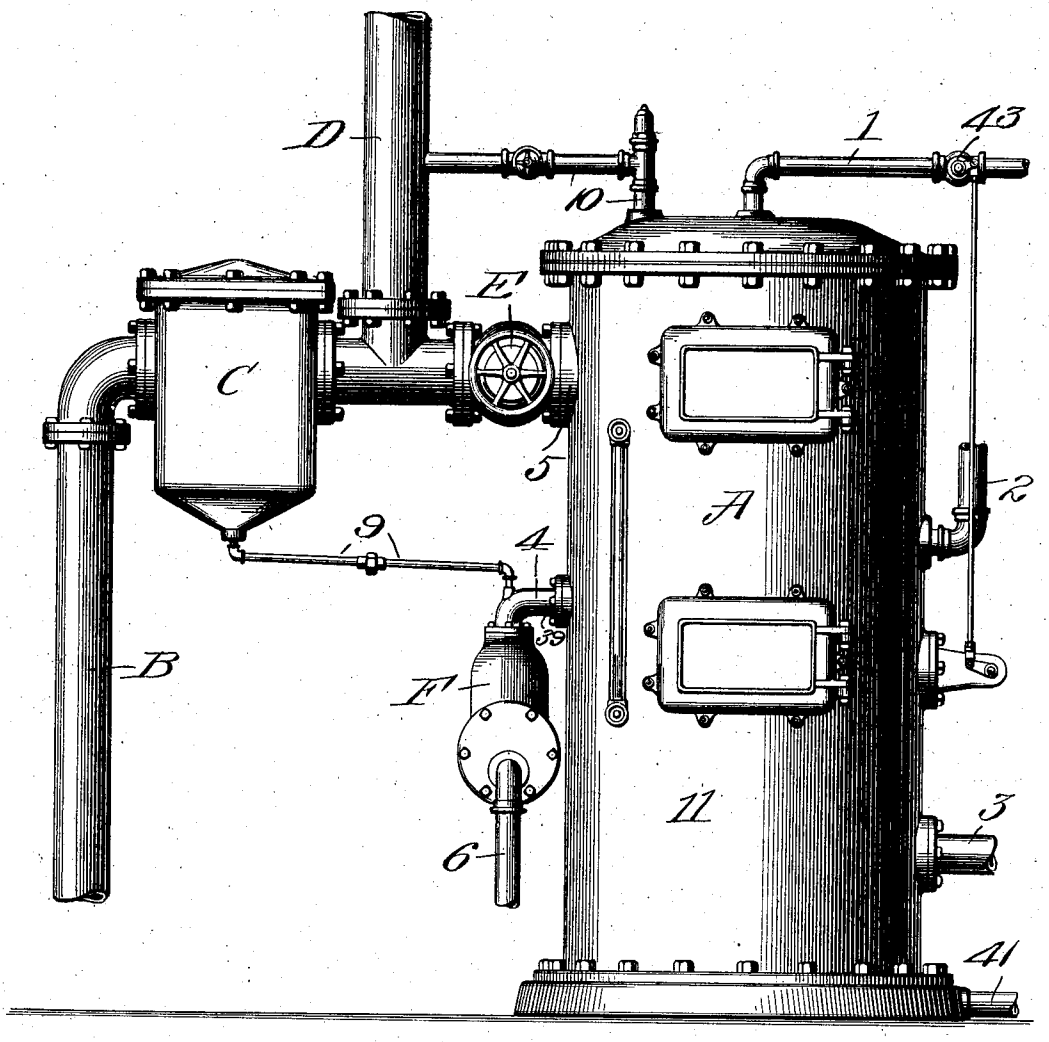
S. E. FLINT.

FEED WATER HEATER.

APPLICATION FILED FEB. 13, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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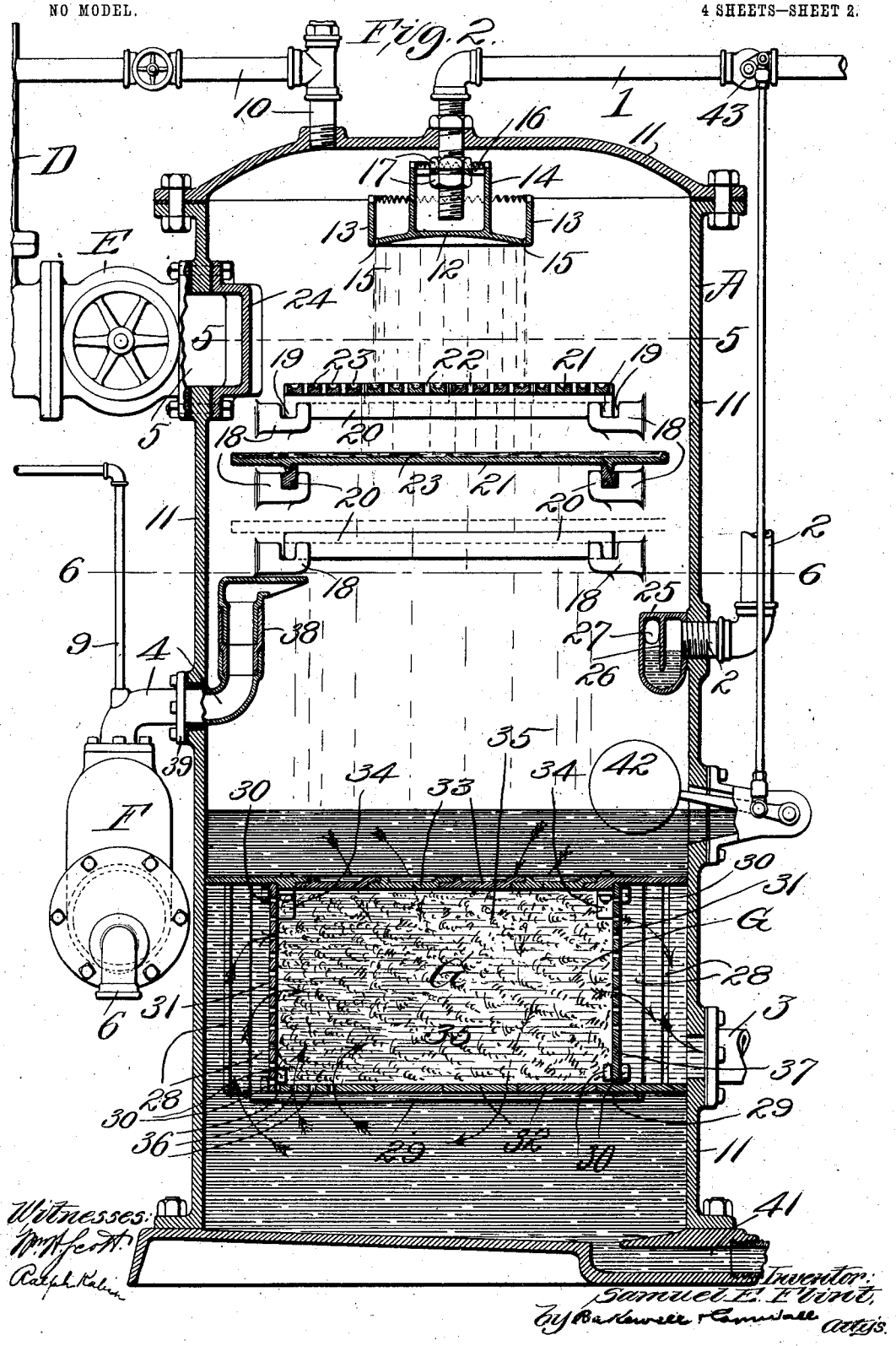
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APPLICATION FILED FEB. 13, 1903.

NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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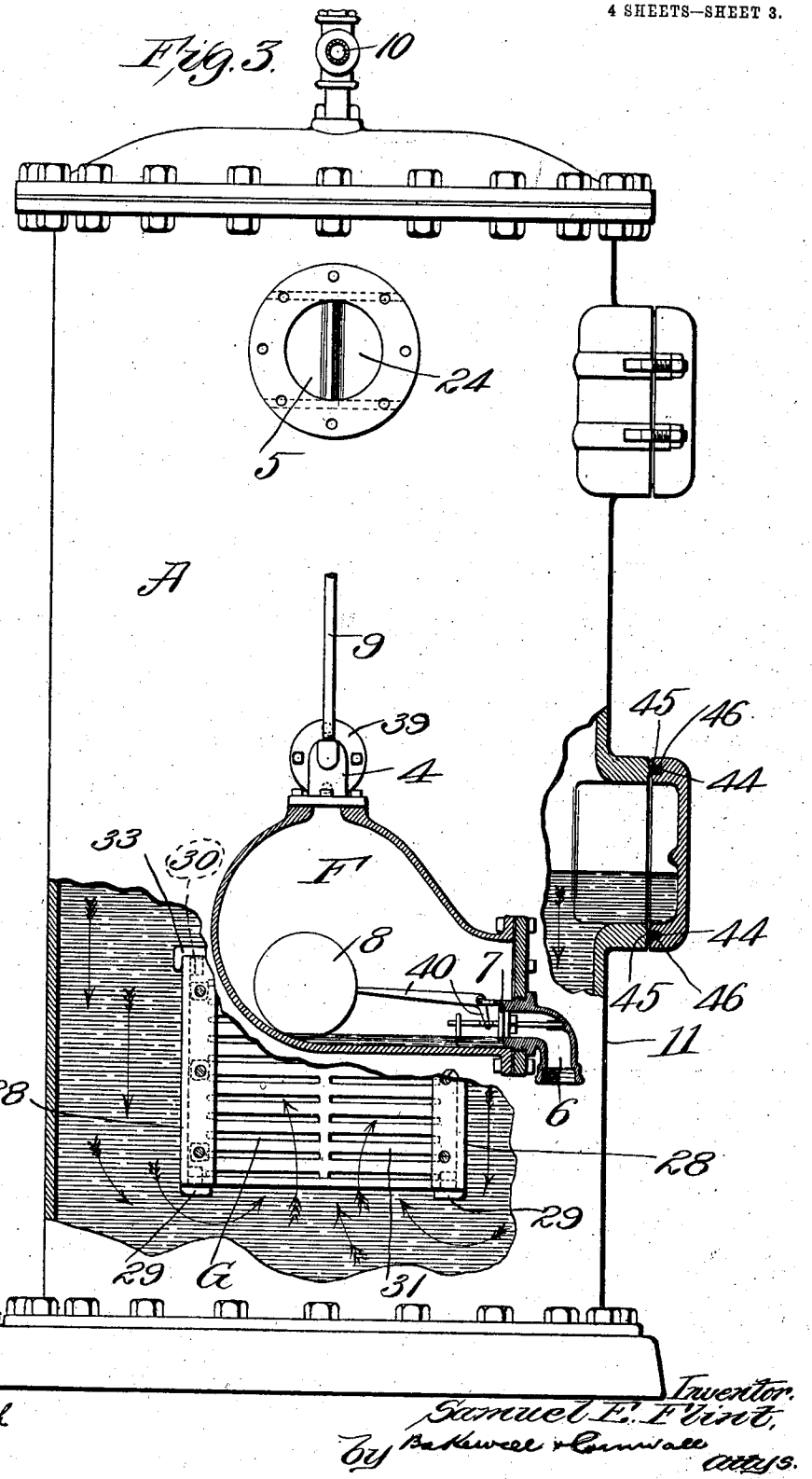
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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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No. 742,303. PATENTED OCT. 27, 1903.

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FEED WATER HEATER.

APPLICATION FILED FEB. 13, 1903.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4.

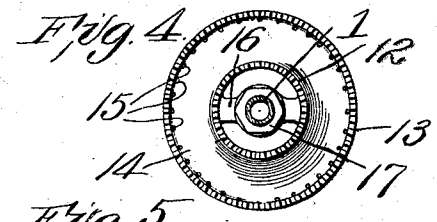


Fig. 5.

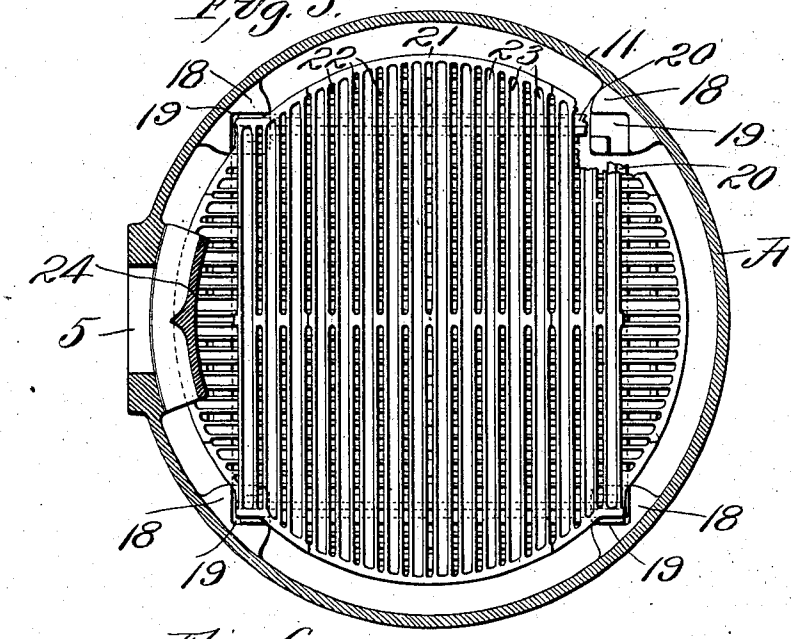
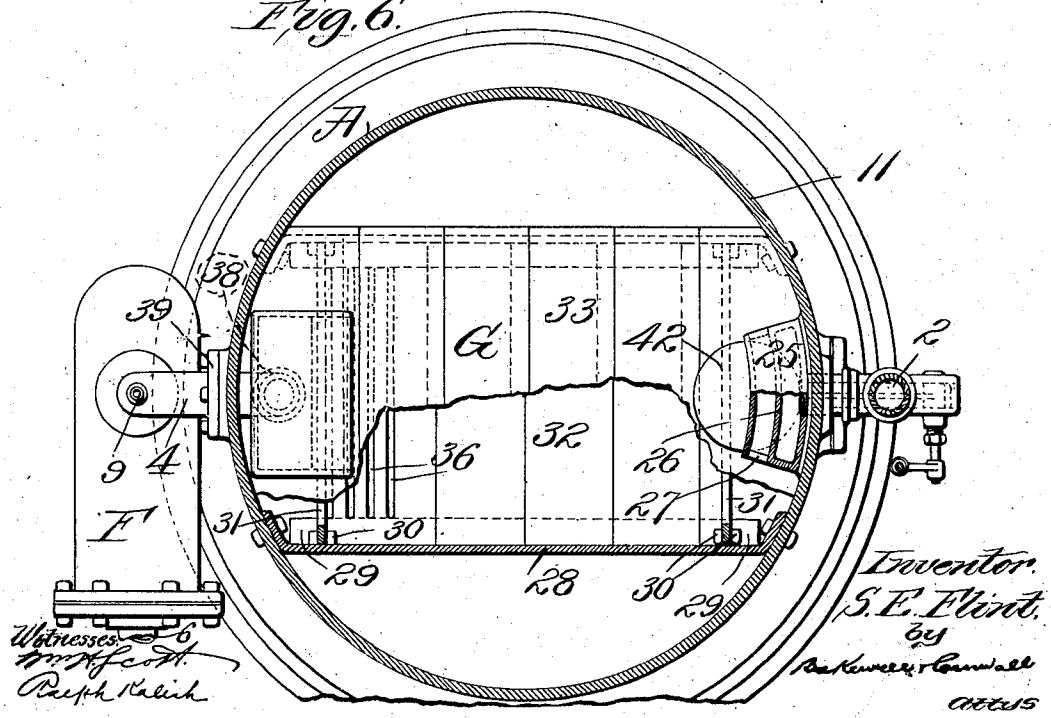


Fig. 6.



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No. 742,303. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

SAMUEL E. FLINT, OF ST. LOUIS, MISSOURI.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 742,303, dated October 27, 1903.

Application filed February 13, 1903. Serial No. 143,178. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. FLINT, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Feed-Water Heaters and Purifiers and Systems Including the Same, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a view showing the heater and purifier in its relation to the system including the same. Fig. 2 is a central vertical sectional elevation of the heater and purifier. Fig. 3 is an elevation at right angles to Fig. 2, a portion of the casing of the heater and purifier being broken away and the trap being shown in section. Fig. 4 is a top plan view of the water-distributing inlet-pan. Fig. 5 is a plan view, partly in section, on about the line 5 5 of Fig. 2, certain of the parts being broken away; and Fig. 6 is a plan view, partly in section, on about the line 6 6 of Fig. 2, certain of the parts being broken away.

My invention relates to feed-water heaters and purifiers and also to systems including feed-water heaters and purifiers.

My primary object is to provide means whereby the steam can be permitted to exhaust without passing through the heater and purifier, such exhaust-steam being cleansed and separated from the oil or other matter contained therein.

A further object is to provide means whereby the cleansed steam can be either permitted to exhaust without passing through the heater and purifier or supplied to the said heater and purifier.

A further object is to provide a heater and purifier with an improved construction of pan for receiving and distributing the water, to provide efficient inlets for the steam and for the return-water, to improve upon the water-distributing members, and to provide an efficient and readily-constructed filter.

To these ends and also to improve generally upon apparatus of the character indicated my invention consists in the various matters hereinafter described and claimed.

Referring now more particularly to the drawings, and at this time more especially to Fig. 1 thereof, A represents the feed-water heater and purifier, having an inlet 1 for the water, an inlet 2 for the return-water, an outlet 3, leading to the boiler, an overflow-pipe 4, and a steam-inlet 5. B is the steam-pipe through which steam is supplied to the heater, said pipe conveniently leading from the exhaust of the engine, and C is a steam-separator, which is located in the steam-supply pipe B outside of the heater and purifier. Intermediate said separator and said heater and purifier the steam-pipe B is provided with an exhaust-pipe D, which can lead to any suitable point—as, for example, to atmosphere or into a heating system—and intermediate said exhaust-pipe D and the said heater and purifier the steam-pipe is provided with a valve E. The overflow-pipe 4 from the heater and purifier preferably leads into a trap F, said trap having an outlet 6, which is controlled by a valve 7, (see Fig. 3,) this valve in turn being controlled by a float 8. The separator C also discharges into said trap, as through the pipe 9. A vent 10 leads from the interior of the heater and purifier and preferably discharges into the exhaust-pipe D.

From the foregoing it will be apparent that the steam passing through the pipe B is purified and separated before it reaches either the exhaust-pipe D or the heater and purifier A. Therefore if the valve E be opened cleansed steam will be supplied to the heater and purifier and will serve to heat the water therein, the steam condensing in said heater and purifier and the condensed steam being delivered from the heater and purifier to the boiler or other device supplied by said heater and purifier. The vent 10 permits a sufficient amount of air to escape from the heater and purifier to prevent air from clogging in the latter. If it be desired to open the heater and purifier for any purpose, such as for cleaning or repairing, it is not necessary to stop the engine, but only to close the valve E, the valve in the vent-pipe 10 also being closed if such vent-pipe opens into the pipe D, as shown, in which event the steam exhausted from the engine through the pipe B will merely exhaust through the pipe D, such steam, however, exhausting through the pipe

D being properly cleansed by the separator C before reaching the said exhaust-pipe. Therefore steam from the engine can either enter the heater and purifier or exhaust without entering said heater and purifier, the steam being properly cleansed in either event.

Passing now to a consideration of the details of construction of the heater and purifier, the water-inlet pipe 1 empties through the top of the casing 11 into a distributing-pan, which has a bottom plate 12, preferably convex upon its upper surface, and concentric vertical walls 13 and 14, which rise from said bottom plate, the end of the inlet-pipe extending into the cup-shaped space inclosed by the inner wall 14 some distance below the top of the wall, whereby a water seal is provided in a manner which will be readily apparent. Water discharged into the space inclosed by the said wall 14 overflows said wall and falls into the space between the same and the outer wall 13, said water discharging from said space between the walls 13 and 14 through suitable outlet-openings 15 through the bottom plate 12, these openings being preferably formed at or near the outer edge of said plate. The upper edges of the walls 13 and 14 are preferably serrated, as shown, in order to cause the water to be broken into streams in a manner which is well understood, the serrated edge of the wall 13 insuring delivery of water in thin streams, even though the discharge-openings 15 may become clogged or may prove inadequate. The distributing-pan is preferably supported upon the inlet-pipe, said pan being here shown as provided with a perforated cross-piece 16, connected to the circular wall 14, the inlet-pipe extending through the perforation of said cross-piece and having nuts 17, which clamp said cross-piece 16 between them. Below the said receiving and distributing pan are provided a vertical series of supports, these being here shown as lugs 18, projecting from the casing-wall 11, said lugs having channels 19, adapted to receive and support the ends of supporting cross-bars 20. Water-diffusing members are supported near their ends upon pairs of said cross-bars 20 and are here shown as comprising bars 21, which are spaced from each other in order to provide long slots 22, through which the water can fall in thin sheets. These bars 21 are preferably provided with channels 23 upon their upper surfaces, such channels not only serving to decrease the amount of metal necessary for a bar, thus decreasing its cost and weight, but also preventing a bar from warping during casting. Furthermore, the said channels serve to catch and retain a certain amount of water and to thus obstruct the passage of water through the heater, whereby the time during which the water in the heater is under the heating influence of the steam is increased. The water-distributing members are arranged one above the other, and the supporting cross-bars 20 of a given member are arranged at right angles to such bars of the neighboring water-diffusing member, the water-diffusing bars of a given member also being at right angles to the water-diffusing bars of a neighboring member. In this manner the water is separated into thin streams, and thus is fully brought under the heating action of the steam.

The steam-inlet 5 is at the upper portion of casing 11, and a deflector-plate 24 extends across said inlet, so that the incoming steam is not permitted to directly impinge against the falling water and force the same against the opposite side of the casing, but is discharged at the ends of said deflector-plate, as will be fully understood by reference to Fig. 5, and caused to flow along the wall of the casing.

The return water entering the casing through the inlet 2 is also deflected in order to prevent the same from directly impinging against the water falling through the heater and purifier. I have here shown the return-pipe 2 as emptying into a casing 25, which has a partition-wall 26 extending from its top to a point near its bottom and below the outlet of the pipe 2. This casing 25 has lateral discharge-openings 27 at a point above the lower end of the partition 26 and between said partition and the wall of the casing opposite that through which the pipe 2 discharges. Therefore the return water is deflected and discharged from the casing in a line which does not intersect the falling feed-water in the heater, while a water seal is formed in the lower portion of the casing 25 in a manner which will be readily apparent.

A filter G is provided in the lower portion of the casing 11. Extending between opposite sides of said casing are side filter-plates 28, which have flanged ends secured to the shell 11, and upon the bottom of said plates are inwardly-extending supporting-flanges 29. Supported upon said flanges and between suitable lugs 30, formed upon said side filter-plates, are end filter-plates 31, which are merely dropped into position. Bottom plates 32 extend between the said side plates 28 and rest upon the before-mentioned flanges 29, and top plates 33 rest upon the upper edges of said side plates 28 and are secured in position in any suitable manner, as by having certain of said top plates fastened to lugs 34 upon the side plates. These top plates extend from one side of the shell 11 to the other thereof, and the bottom plates extend from one side of the shell to what may be termed the "forward" end filter-wall 31, there being spaces between the sides of the filter and the shell, whereby water falling from above the filter must fall below the same. The end plates of the filter are perforated, as shown most clearly in Figs. 2 and 3, and the discharge-pipe 3 leads from the pure-water space formed by the shell, the top and bottom filter-plates, the side filter-plates, and the rear end plate. Suitable

filtering material 35 is placed between the filter-plates, and the water is drawn through this filtering material into the discharge-pipe 3 in a manner which will be apparent.

The filter above described can be readily assembled and its parts can be readily removed for repair, cleaning, or other purposes. I preferably provide openings 36 at the forward end of the bottom wall of the filter, so that the filter can be thoroughly washed without removing the same from the casing, any material upon the bottom wall of the filter flowing through the said bottom openings 36 during washing of said filter. Preferably the lower portion 37 of the rear end wall of the filter is imperforate, whereby any sediment which may be deposited in the filter and fall to the bottom thereof will not be drawn into the discharge-pipe 3.

The overflow-pipe 4 has an open end within the casing, and in this end can be placed any appropriate number of insertible pipe-sections 38. By means of these sections the height of the open end of the discharge can be varied at will, and the point at which the water will overflow can be thus adjustably regulated. The overflow-pipe preferably has a substantially horizontal portion and a bent inner end, and said horizontal portion is provided with a flange 39. Thus this overflow-pipe can be inserted through a suitable opening in the casing-wall, and its flange can be bolted or otherwise secured to said wall. The overflow-pipe empties into a trap F, which comprises a casing having the before-mentioned outlet 6 leading from its lower portion. The said outlet is controlled by the before-mentioned valve 7, and a bell-crank lever 40, suitably pivoted within the trap-casing, has one arm connected to said valve and its other arm provided with the float 8. The operation of the valve 7 will be readily understood.

The shell has at its bottom any well-known or convenient blow-out opening 41. A float 42 within the casing controls a valve 43 in the inlet-pipe 1 in a manner which will be readily apparent.

I prefer to provide the doors of the casing with a channel 44 in their faces which lie adjacent the casing-shell when said doors are in position, and in this channel I place a suitable packing 45, such as the usual rubber, a yielding packing 46, of hemp or the like, being placed in the channel, the packing firmly seating against the casing as the door is drawn in position, as will be well understood. By placing the channels in the door instead of in the shell of the casing I am enabled to produce the channels during the casting of the door, and thus avoid the time, labor, and expense incident to cutting such channels in the shell 11.

I am aware that minor changes in the construction, arrangement, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a feed-water heater and purifier, of a steam-delivery pipe therefor, an exhaust-pipe from said steam-delivery pipe, and a valve under the control of the operator and in said steam-delivery pipe intermediate said exhaust-pipe and said heater and purifier; substantially as described.

2. The combination with a feed-water heater and purifier, of a steam-delivery pipe therefor, a separator in said pipe, and an exhaust-pipe leading from said first-mentioned pipe intermediate said separator and said heater and purifier; substantially as described.

3. The combination with a feed-water heater and purifier, of a steam-delivery pipe therefor, a separator in said pipe, a discharge-pipe leading from said first-mentioned pipe intermediate said separator and said heater and purifier, and a valve in said first-mentioned pipe intermediate said exhaust-pipe and said heater and purifier; substantially as described.

4. In an apparatus of the character indicated, a plurality of distributing members provided with elongated slots for the passage of water, the slots in neighboring members being at different angles; substantially as described.

5. In an apparatus of the character indicated, a plurality of distributing members each of which is composed of a series of bars spaced from each other to produce water-passages between said bars, the said bars of neighboring distributing members being at different angles, whereby the bars of one distributing member extend transverse the said water-passages of the neighboring distributing member; substantially as described.

6. In an apparatus of the character indicated, a casing providing a water-heating chamber and having a water-inlet and a side steam-inlet across the latter of which the water falls, and a deflector within said chamber and adjacent its side wall provided with said steam-inlet, said deflector extending across the whole area of said steam-inlet and being spaced from said side wall at its ends, whereby incoming steam is directed around the chamber along its wall and not against the falling water; substantially as described.

7. In an apparatus of the character indicated, an overflow-pipe, and means for varying the height of the inlet-opening to said pipe and immovably supporting the portion of said pipe provided with said inlet-opening; substantially as described.

8. In an apparatus of the character indicated, an overflow-pipe, and removable sections adapted to be connected to the inlet end of said pipe; substantially as described.

9. In an apparatus of the character indicated, the combination with a casing, of side filter-plates secured to said casing, bottom filter-plates supported upon said side plates, and end filter-plates also supported upon said side plates; substantially as described.

10. In an apparatus of the character indicated, the combination with a casing, of side filter-plates secured to said casing and provided with supporting bottom flanges, bottom filter-plates supported upon said flanges, end filter-plates supported by said flanges and between lugs upon said side filter-plates, and top filter-plates supported upon said side filter-plates; substantially as described.

11. In an apparatus of the character indicated, the combination with a casing, of side filter-plates secured to said casing, bottom filter-plates supported upon said side plates, and end filter-plates also supported upon said side plates, the bottom of said filter having perforations near one end only; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 6th day of February, 1903.

SAMUEL E. FLINT.

Witnesses:
GALES P. MOORE,
GEORGE BAKEWELL.