No. 708,028. Patented Sept. 2, 1902.

J. E. CRAWLEY.

FEED WATER HEATER AND PURIFIER.

(Application filed May 12, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

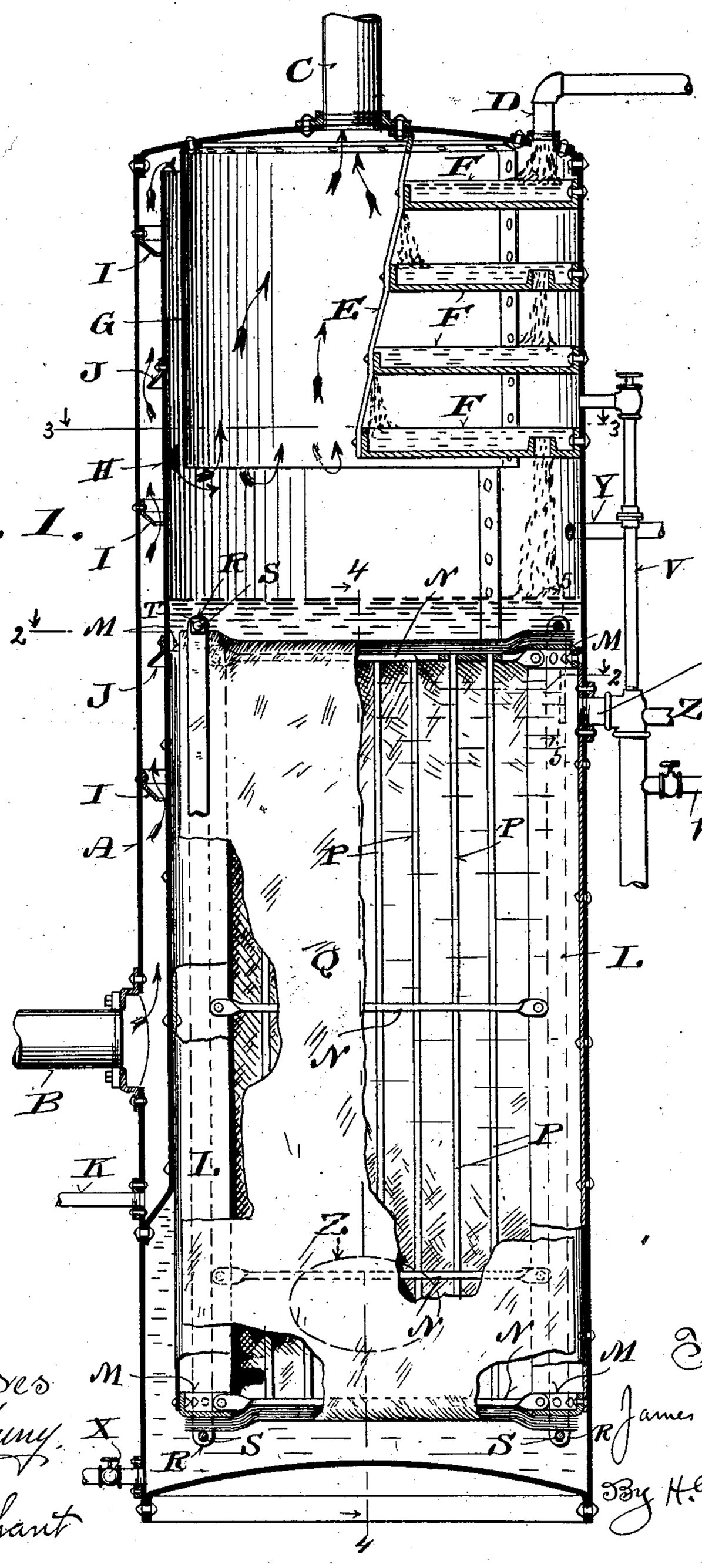

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Fig. 2.

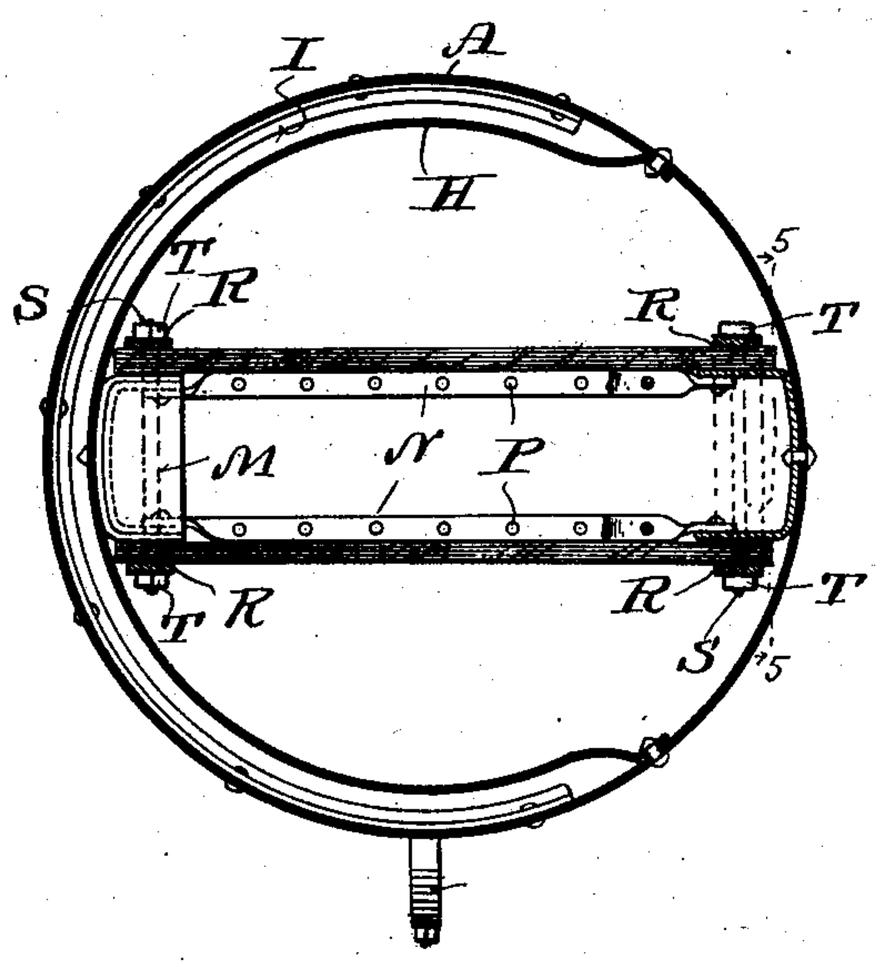


Fig. 3.

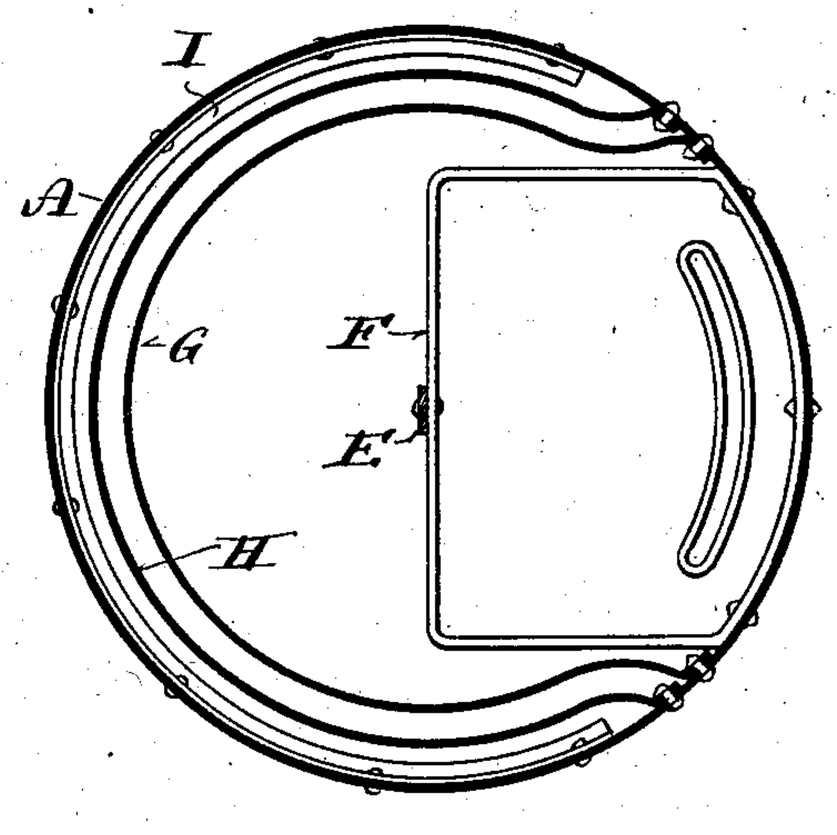


Fig. 5.

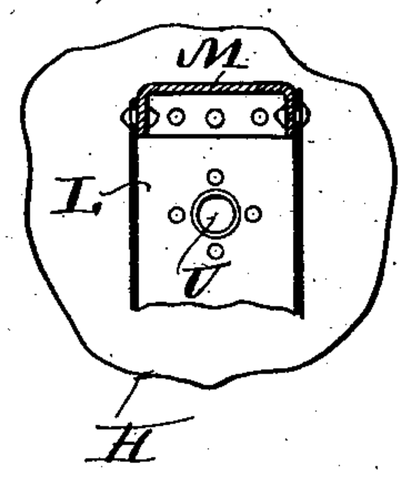
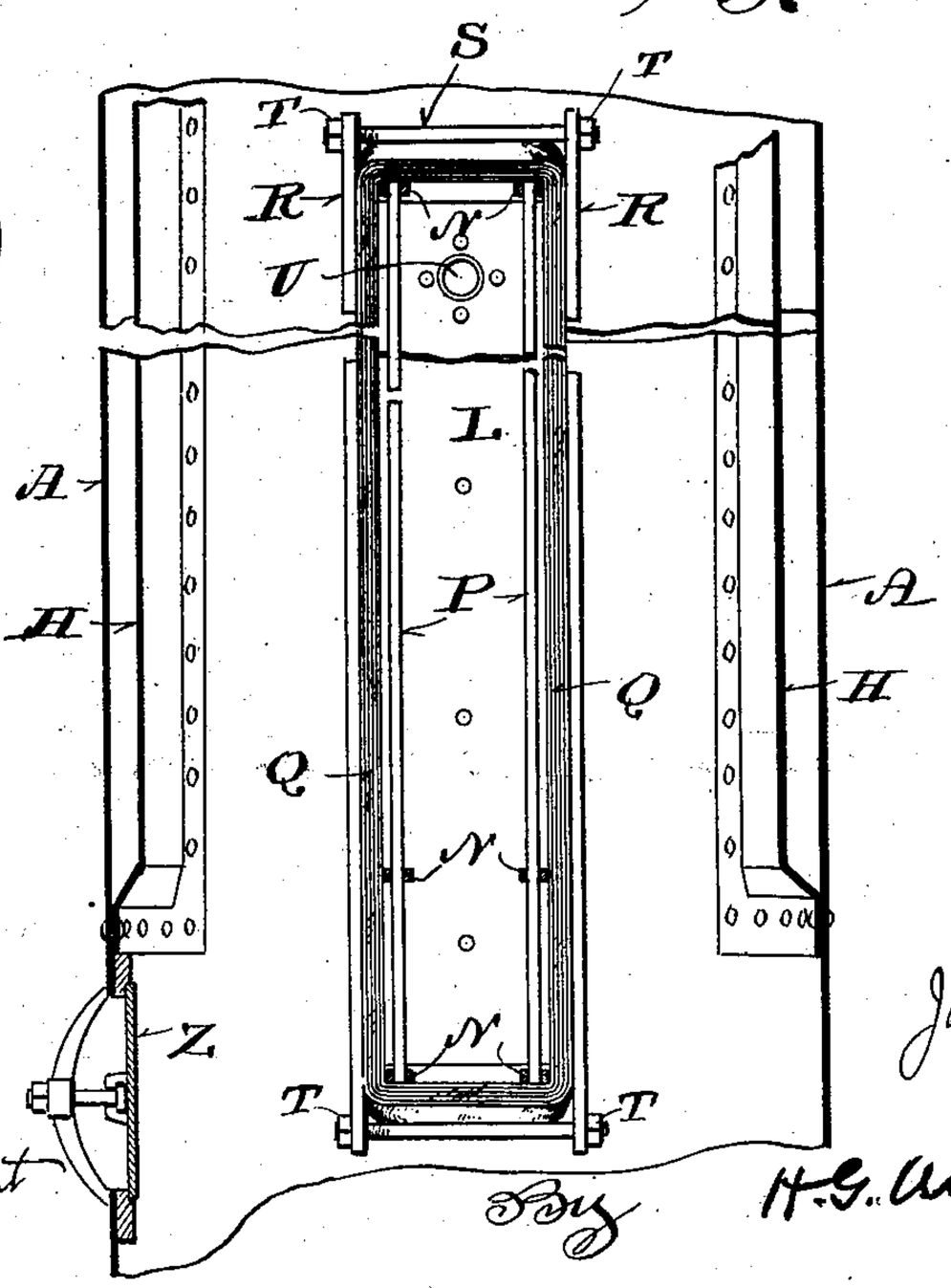


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES E. CRAWLEY, OF MILWAUKEE, WISCONSIN.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 708,028, dated September 2, 1902.

Application filed May 12, 1902. Serial No. 106,887. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. CRAWLEY, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Feed-Water Heaters and Purifiers; and I do hereby declare that the following is a full, clear, and exact description thereof.

The improvements consist in certain peculiarities of construction and combination of parts, hereinafter particularly set forth with reference to the accompanying drawings and subsequently claimed, the object of the invention being to provide simple, economical, and efficient apparatus for heating and purifying feed-water for steam-boilers.

Figure 1 of the drawings represents a vertical section of a feed-water heater and purifier embodying my improvements; Figs. 2 and 3, horizontal sectional views of the same, respectively indicated by lines 2 2 and 3 3 in the first figure; Fig. 4, a vertical sectional view of a portion of the heater indicated by line 4 4 in said first figure; and Fig. 5, a fragmentary view, in vertical section, indicated by line 5 5 in the second figure.

Referring by letter to the drawings, A indicates a vertical cylinder of any suitable dimensions having a steam-inlet pipe B coupled to its wall below the middle distance of its length, and a steam-outlet pipe C is coupled to the upper head of the cylinder, preferably central of the same. A water-inlet pipe D is also coupled to the upper cylinder-head, and riveted or otherwise suitably secured to the cylinder-wall and a brace E, depending from said cylinder-head, are a series of shallow pans F, of gradually-increasing width in descending order, these pans being alternately provided with upwardly-flanged bottom outlets. Water overflows the rim of each solid bottom pan into a pan having a bottom outlet and then overflows the flange of said outlet, the water in all the pans being exposed to a current of steam within the confines of a baffle-plate G, riveted or otherwise secured to the wall and upper head of the cylinder parallel to a shell H, likewise connected to the cylinder-wall and closed at its lower end below the steam-inlet pipe B aforesaid. The steam has its flow from pipe B into space between cylinder A and shell H, then between said shell and baffle-plate G into the area bounded by said baffle-plate, from whence it escapes through outlet-pipe C in connection with the upper head of said cylinder. Deflectors I J, made fast to the cylinder-wall and the shell H at intervals in a vertical direction, extend alternately in opposite directions within the steam-space between said wall and shell. By means of the deflectors a separation of oil from the steam is effected, and the products of condensation on said deflectors escape through a pipe K, coupled to the cylinder adjacent to the bottom of the shell therein. The water exposed in the pans F to the current of purified steam is heated to a high temperature sufficient to cause separation and precipitation of material ordinarily held in solution therewith, and the heated water finds its way through a filter arranged within the confines of shell H to extend below the same, the lower end of said filter being adjacent to the bottom or lower end of the cylinder.

The filter herein shown consists of a skeleton frame comprising a pair of opposite vertical channel-plates L, one of which is riveted or otherwise suitably secured to the cylinder-wall and the other to shell H; end caps M, similarly secured to the plates; horizontal bars N, made fast at their ends to the inturned edges of said plates at intervals in a vertical direction, and vertical rods P, engaging apertures at intervals lengthwise of the bars; a web of pliable strainer material Q, preferably burlap, wound several times on the frame lengthwise thereof; straps R, facing the strainer material parallel to the channel-plates of said frame; bolts S, extending through the straps, and clamp-nuts T, run on the screw-threaded ends of the bolts. Coupled to the cylinder, in communication with the interior of the filter through one of its channel-plates, is a pipe U, that conveys the filtered water to a boiler-feed pump or injector, and a valve-controlled equalizing-pipe V connects the former pipe with the cylinder above the lower end of the baffle-plate above specified. A valve-controlled clean-out pipe W is coupled to pipe U, and a valve-controlled drain-pipe X is coupled to cylinder A below the filter, said cylinder being also pro-

vided with an overflow Y between the lower one of the pans F and the upper end of the filter. The equalizing-pipe is normally open and the clean-out pipe normally closed; but when the filter becomes foul said equalizing-pipe is closed and the clean-out and drain pipes W X are opened, water under pressure, followed by steam, being let into said filter through the pipes U, to which said clean-out pipe is coupled. The washing and steaming operations will effectually clean the filter of the material separated from the feed-water, this material being run off through the drain-pipe of the cylinder. A manhole having a closure Z is provided in the cylinder below shell H, and whenever necessary the old strainer material may be removed from the filter-frame and new strainer material substituted. A pipe Z′, herein shown in connection with the pipe U, leads to the usual chamber, (not shown,) in which a float is utilized to control a valve (not shown) in connection with the water-inlet pipe D, above specified.

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

1. A feed-water heater and purifier having an inner filter comprising a skeleton frame consisting of a pair of opposite vertical end-capped channel-plates, horizontal bars connected at their ends to edges of the channel-plates, vertical rods in connection with each series of bars at intervals lengthwise of same; pliable strainer material wrapped on the frame from end to end thereof, and means for clamping the strainer material against said channel-plates of said frame.

2. A feed-water heater and purifier having an inner filter comprising a skeleton frame consisting of a pair of vertical end-capped channel-plates, horizontal bars connected at their ends to edges of the channel-plates, vertical rods in connection with each series of bars at intervals lengthwise of same; pliable strainer material wrapped on the frame from end to end thereof, straps in pairs facing the strainer material parallel to said channel-plates of said frame, bolts extending through each pair of straps above and below the strainer material, and clamp-nuts run on the bolts.

3. A feed-water heater and purifier comprising an outer vertical cylinder having a lower steam-inlet and upper steam-outlet, a shell in connection with the cylinder inside the same forming therewith a steam-space open at the upper end, deflectors fast to said cylinder and shell at intervals within the adjacent steam-space, a drain-pipe for said steam-space, a baffle-plate depending from the upper cylinder-head parallel to the shell within the confines of same, means for collecting and temporarily holding water in suspension within the confines of the baffle-plate, a filter below said baffle-plate, and a feed-pump pipe in connection with the filter.

4. A feed-water heater and purifier comprising an outer vertical cylinder having a lower steam-inlet and upper steam-outlet, a shell in connection with the cylinder inside the same forming therewith a steam-space having deflectors arranged at intervals therein, a drain-pipe for said steam-space, a baffle-plate depending from the upper cylinder-head parallel to the shell within the confines of same, means for collecting and temporarily holding water in suspension within the confines of the baffle-plate, a filter below said baffle-plate, a feed-pump pipe in connection with the filter, and an equalizing-pipe connecting the feed-pump pipe with the cylinder above the lower end of said baffle-plate.

5. A feed-water heater and purifier comprising an outer vertical cylinder having a lower steam-inlet and upper steam-outlet, a shell in connection with the cylinder inside the same forming therewith a steam-space having deflectors arranged at intervals therein, a drain-pipe for said steam-space, a baffle-plate depending from the upper cylinder-head parallel to the shell within the confines of same, pans of gradually-increasing width in descending order supported within the confines of the baffle-plate under a water-inlet, these pans being alternately provided with bottom outlets having upwardly-extending flanges, a filter below said baffle-plate, and a feed-pump pipe in connection with the filter.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

JAMES E. CRAWLEY.

Witnesses:
N. E. OLIPHANT,
B. C. ROLOFF.