W. LOWE.

FEED WATER-HEATER.

No. 191,868. Patented June 12, 1877.

Fig. 1.

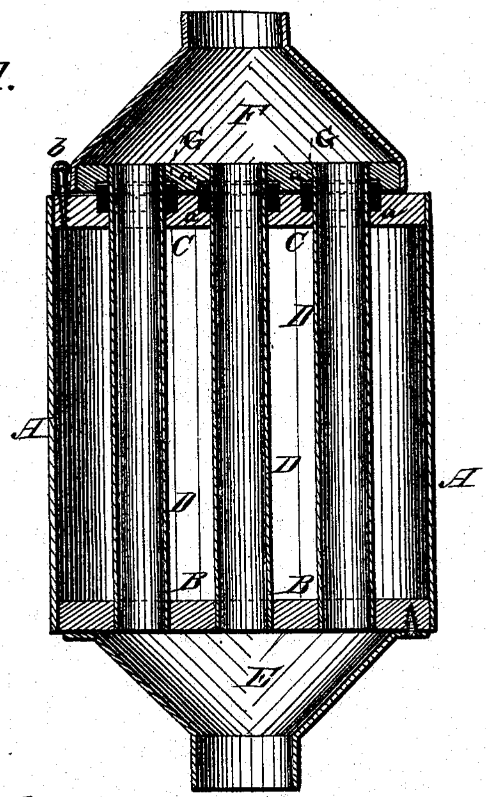


Fig. 2.

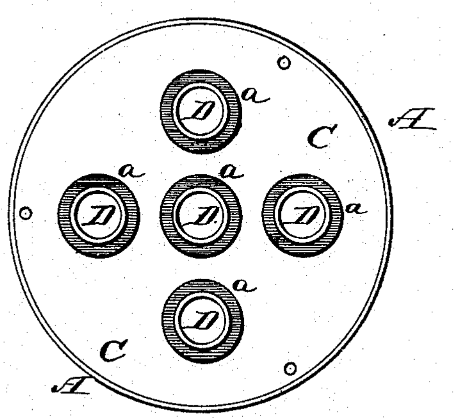
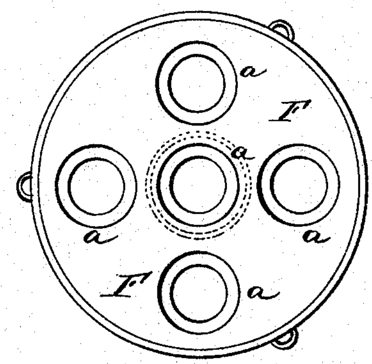


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM LOWE, OF BRIDGEPORT, CONNECTICUT.

IMPROVEMENT IN FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **191,868**, dated June 12, 1877; application filed May 18, 1877.

To all whom it may concern:

Be it known that I, WILLIAM LOWE, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Feed-Water Heaters; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form a part of this specification.

The nature of my invention consists in so constructing feed-water and other water heaters with straight tubes that the tubes can expand and contract to correspond with the varying temperatures of the tubes and shell, and also to produce a simple and reliable heater, and one that can be easily repaired at small cost by an ordinary mechanic.

In the annexed drawing, which fully illustrates my invention, Figure 1 is a central vertical section. Fig. 2 is a plan view with nozzle F removed, and Fig. 3 is a bottom view of said nozzle F.

A represents the shell of the heater. B and C are the heads of the same. D D are the longitudinal tubes through the shell, E the steam-nozzle, and F the combined steam-nozzle and follower.

The tubes D D are fastened at one end permanently in the head B, and fit at the other end freely in the head C and head of the follower-nozzle F. The tube-holes of both these heads are countersunk, as shown at *a*, on the opposite or adjacent faces of said heads, and in the corresponding countersinks are placed packing-rings or sleeves G, surrounding the tubes D at that point. These packings are compressed by screwing down the follower F onto the head C by means of screws or bolts *b*, which makes a tight joint around the tubes in said head and follower, and permits the tubes to expand and contract through said packings, the other ends of the tubes being permanently fastened in the head B.

The heater is preferably placed vertically, and the water admitted into the shell at the bottom, and taken out at the top to the boiler, or for other purposes.

The steam is also preferably admitted at the top through the tubes, and passed out at the bottom, as thereby very hot water is secured at the top, and comparatively cool and quiet water at the bottom, which tends to permit the deposit of much of the sediment in the water.

Heaters of this class, with the straight tubes fastened at both ends, are not reliable, because of the damaging strain caused by the differential expansion and contraction of the shell and tubes caused by their unequal temperatures. This difficulty has been attempted to be overcome by various means. For instance, the tubes have been bent out of a straight line; but this only partly overcomes the difficulty, while it increases the cost of the heater, and renders repairs and the renewal of tubes more difficult, as such bent tubes cannot be taken out and put in through the tube-holes, and one of the heads must to taken out. So it is also in heaters which have the tubes bent into a bow, and both ends fastened in the same head. This head must come out to get new tubes in.

All this is entirely obviated in my invention, and any ordinary mechanic can easily repair the heater at small cost when necessary.

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

1. In a feed-water or other water heater, the combination of the shell A with heads B and C, the straight tubes D fastened permanently in one head, and passing through the other head loosely, and also through a follower, with packings G surrounding the tubes, substantially as shown and described, whereby the tubes are allowed to expand and contract through said packings, head, and follower, as herein set forth.

2. The combined steam-nozzle and follower F, in combination with the head C, countersinks *a*, tubes D, and packings G, substantially as and for the purposes herein set forth.

WILLIAM LOWE.

In presence of—
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