(No Model.)

J. L. HUNTER.

FEED WATER HEATER.

No. 398,966. Patented Mar. 5, 1889.

FIG. 1.

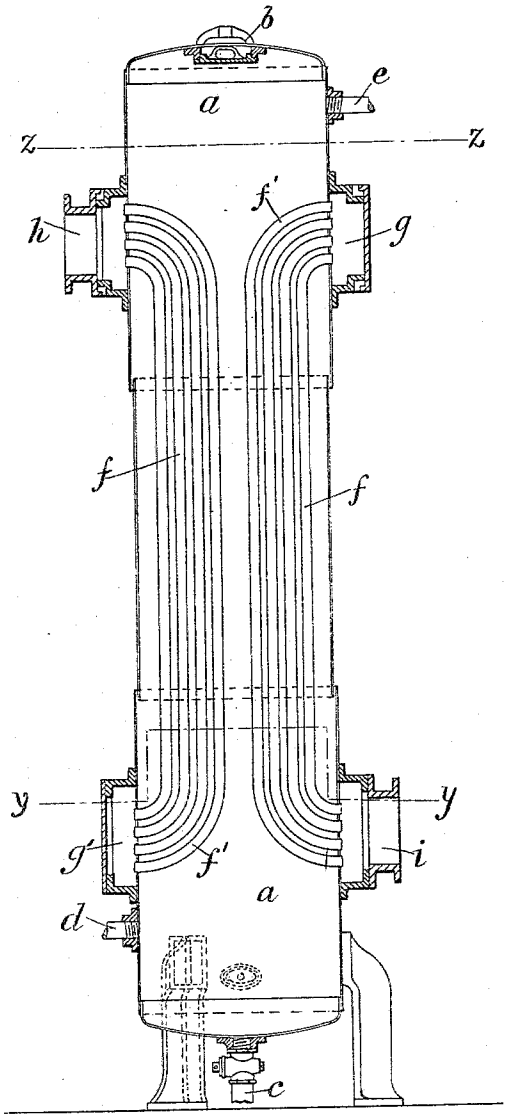


FIG. 2.

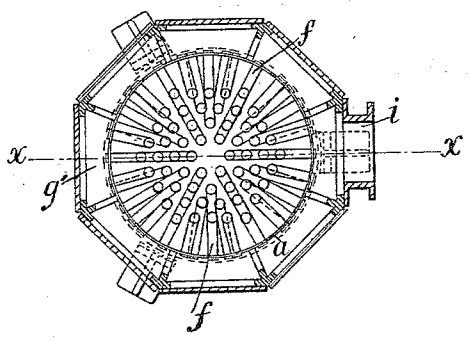
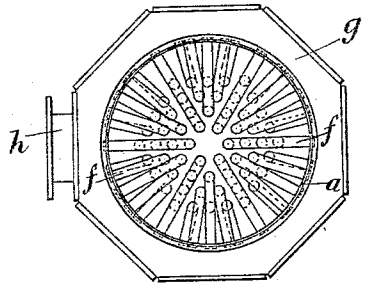


FIG. 3.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JOSEPH L. HUNTER, OF PITTSBURG, PENNSYLVANIA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 398,966, dated March 5, 1889.

Application filed September 11, 1888. Serial No. 285,145. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. HUNTER, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Feed-Water Heaters; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to feed-water heaters, and is especially adapted for the purpose of heating feed-water for steam-boilers by means of exhaust steam, although I do not desire to limit it to this particular use.

I will now describe my invention so that others skilled in the art may manufacture and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of the heater on the line *x x* of Fig. 2. Fig. 2 is a cross-section on the line *y y* of Fig. 1. Fig. 3 is a like view on the line *z z* of Fig. 1.

Like letters of reference indicate like parts wherever they occur.

In the drawings, *a* represents a cylindrical boiler or water-tank having at its upper end a man-hole, *b*, and at its lower end a blow-off, *c*. Near the bottom of the heater *a* is a water feed-inlet, *d*, and near the upper end of the heater *a* is a water-outlet, *e*, which communicates with the steam-boiler by a suitable pipe. Situate within the cylinder *a* are heating-pipes *f*, which are straight and vertical through the major portion of their length, but are curved at the ends, as at *f'*, and lead radially into the annular chambers *g g'* outside of the cylinder *a*, one of the chambers being at the upper portion of the cylinder and the other at the lower portion. Communicating with the chamber *g*, at the upper portion of the cylinder *a*, is an exhaust-steam inlet, *h*, by which the exhaust-steam is fed to the heating-pipes, and opening from the chamber *g'*, at the lower portion of the cylinder *a*, is an exhaust-steam outlet, *i*.

The operation is as follows: Water is admitted to the cylinder *a* through the feed-inlet *d* and passes out of the cylinder or heater through the water-outlet *e*. The exhaust-steam, passing through the pipes *f*, communicates its heat to the water within the heater.

I am aware that feed-water heaters for steam-boilers having curved pipes situate within a cylindrical case are not new, and I do not desire to claim the same broadly. The advantages of my improvement are, however, cheapness of construction and a direct course for the steam through the pipe on a straight line, excepting where the curvature at the ends of the heating-pipes prevents such an obstruction to the passage of the steam as would be caused by a sharp angle.

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

As an improvement in feed-water heaters, a water-tank, *a*, annular steam-chambers *g g'*, arranged outside of and encircling the water-tank, and steam-heating pipes straight and vertical through their major portion, curved at their ends, and extending radially into the steam-chambers, substantially as and for the purpose described.

In testimony whereof I have hereunto set my hand this 25th day of July, A. D. 1888.

JOSEPH L. HUNTER.

Witnesses:
CHAS. A. MACKEY,
W. B. CORWIN.