R. B. LINCOLN, Jr.

Feed-Water Heater.

No. 211,166. Patented Jan. 7, 1879.

Fig. 1.

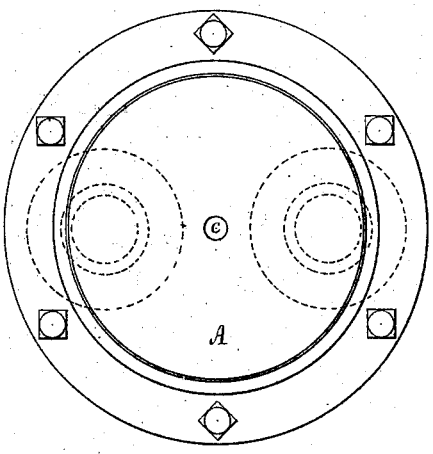


Fig. 3.

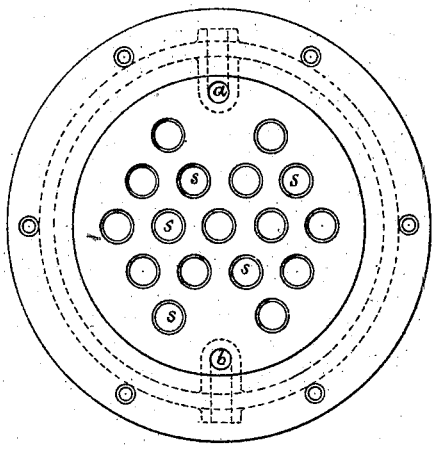


Fig. 2.

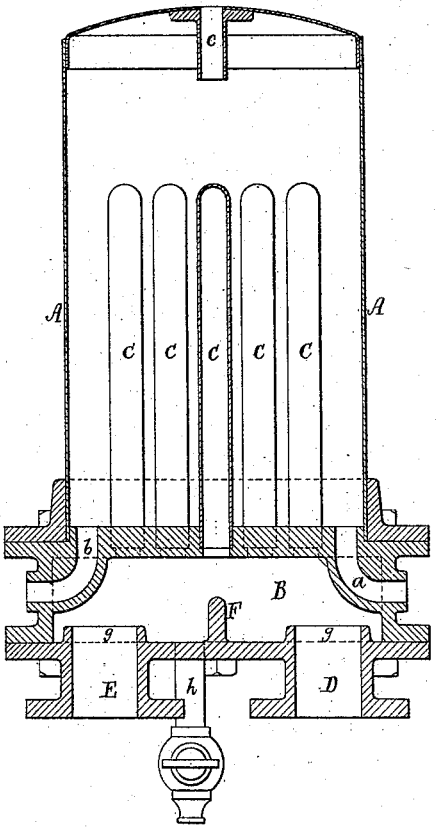
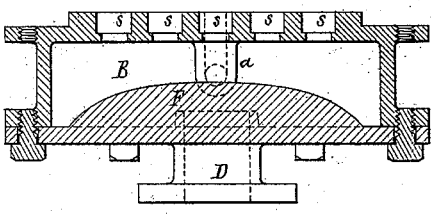


Fig. 4.



Witnesses.

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IMPROVEMENT IN FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **211,166,** dated January 7, 1879; application filed November 18, 1878.

To all whom it may concern:

Be it known that I, ROBERT B. LINCOLN, Jr., of Boston, of the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Feed-Water Heaters; and do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a top view, and Fig. 2 a vertical section, of such a heater embracing my invention. Fig. 3 is a top view of its tube-support plate; Fig. 4, a transverse section of such plate and the single steam-chamber beneath it.

This feed-water heater, though in some respects like others well known and in common use, differs therefrom in some essential particulars—that is to say, it has within its water-reservoir a stack of heat-radiating pipes, each of which, closed at top, opens at bottom into a single chamber arranged beneath and at right angles with it, and provided with a steam induct and educt and a deflecting-brace, arranged as represented. Furthermore, the said chamber also has the water-supply and the "blow-off" pipes or ducts of the reservoir of the heater extending through it from its sides upward to its top, whereby they not only answer their usual purposes, but as means of aiding in heating the water and of strengthening the said chamber, or re-enforcing it against the great pressure to which it is subjected while the heater may be in use. The deflecting-brace extending upward from the bottom of such chamber at its middle, though not entirely across it, serves not only as a re-enforce to the bottom, but as a means of deflecting the steam upward into the stack, thereby preventing all or most of such steam from readily passing out of the chamber without being first driven into the pipes of the stack. Furthermore, with my construction of feed-water heater, the waste-steam discharged into it from the engine is driven directly upward and forced or crowded into the pipes, whereby its heat is driven, as it were, laterally through them into the water. The steam does not pass into one and out the upper end of each pipe, as it does in many other feed-water heaters, but it enters and escapes at one end only of each pipe of the stack of radiating-tubes in the reservoir, the water of condensation dropping directly into the chamber below and flowing around the deflecting-brace and guards, and to and out of the auxiliary educt of such chamber. In practice the peculiar action of the steam in the radiating-pipes of my improved heater renders them very efficacious as radiators of heat.

In the drawings, A denotes the feed-water-heating reservoir, it being provided with an induct, *a*, and two educts, *b c*, the educt *c* being at the top of the chamber, as represented. Beneath the said reservoir is a hollow base or single chamber, B, having sockets *s* in its top for the reception of the lower ends or parts of a stack of upright tubes, C, each of which, closed at top and open at bottom, extends up into the reservoir A, and opens at bottom into the chamber B. This chamber B is provided with an induct, D, and an educt, E, extending from and opening through its bottom in manner as shown.

In the middle of the chamber, and between the induct D and educt E, is the deflecting-brace F, whose ends terminate at short distances from the opposite sides of the chamber. This brace projects upward from the bottom of the chamber to about half the height of the chamber, and answers the purposes hereinbefore enumerated.

The ducts *a b* are quadrantal, curved, or elbow pipes, extending from the top of the chamber to its sides in manner as represented, and they are to be cast in one piece with the said top and sides of the chamber. By this arrangement of them they not only become heated by the steam of the chamber, and thereby aid in heating the water when in or passing through them, but they serve as struts or braces to strengthen the top of the chamber, and thereby render it more capable of resisting the downward pressure to which it is subjected than it would be without them. Heretofore it has been the practice to arrange the induct and blow-off educt of the water-reservoir entirely above and outside of the steam-chamber.

I would remark that a stop-cock is usually applied to the blow-off educt *b*, to close and open such, as circumstances may require. The induct D and the educt E are provided with

tubular extensions or guards *g g*, that project upward into the chamber B, or above its bottom, in manner as shown. These guards are to prevent the water of condensation that may fall from the stack of pipes from passing into the said induct or educt, it being allowed to escape by an auxiliary educt or pipe, *h*, leading out of the said bottom, and provided with a stop-cock or means of closing it, as occasion may require.

I make no claim to a feed-water heater constructed as represented in the United States Patent No. 125,526, as I do not make use of a stack of curved or arched pipes, each of which opens into separate chambers.

I would observe that I am aware that in water-heaters having a stack of pipes opening upward out of a steam-chamber the induct and educt of the latter have been arranged to open out of the vertical sides of the chamber, whereby the steam in its passage through the chamber was carried or directed to pass transversely across the lower ends of the mouths of such pipes, in which case it could only get into the pipes by lateral expansion; but in my heater the induct and educt open directly out of the bottom of the chamber, and have their axes at right angles with such bottom, the tubes being also at right angles therewith, or with the top of the chamber. By such an arrangement the entering steam will be driven directly upward into the pipes and deflected downward from them into the educt, whereby the pipes will not only be heated to better advantage, but air that may be carried into them will be expelled from them.

What I claim as my invention in my improved feed-water heater is as follows, viz:

1. The single steam-chamber B, provided with an induct, D, and educt E, arranged to lead downward out of its bottom, as represented, in combination with the stack of radiating pipes C, open at their lower and closed at their upper ends, and arranged with such chamber and its induct and educt, and in the water-reservoir A, substantially as set forth.

2. The single steam-chamber B, provided with the deflecting-brace F, and with the induct D and educt E, arranged as shown, in combination with the stack of radiating pipes C, open at their lower and closed at their upper ends, and arranged with such chamber and its induct and educt, and in the water-reservoir A, substantially as set forth.

3. The single chamber B, provided with the steam-induct D and educt E, and having the water-induct *a* and blow-off *b* arranged in it (the said chamber) as represented, in combination with the reservoir A and its stack of pipes C, closed at their tops and open at their bottoms, all substantially as set forth.

4. The combination of the guards *g* and auxiliary educt *h* with the chamber B, the stack of pipes C, and the induct D and educt E, all arranged substantially as explained.

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Witnesses:
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