R. BERRYMAN.

HEATER AND CONDENSER.

No. 184,323. Patented Nov. 14, 1876.

Fig. 2.

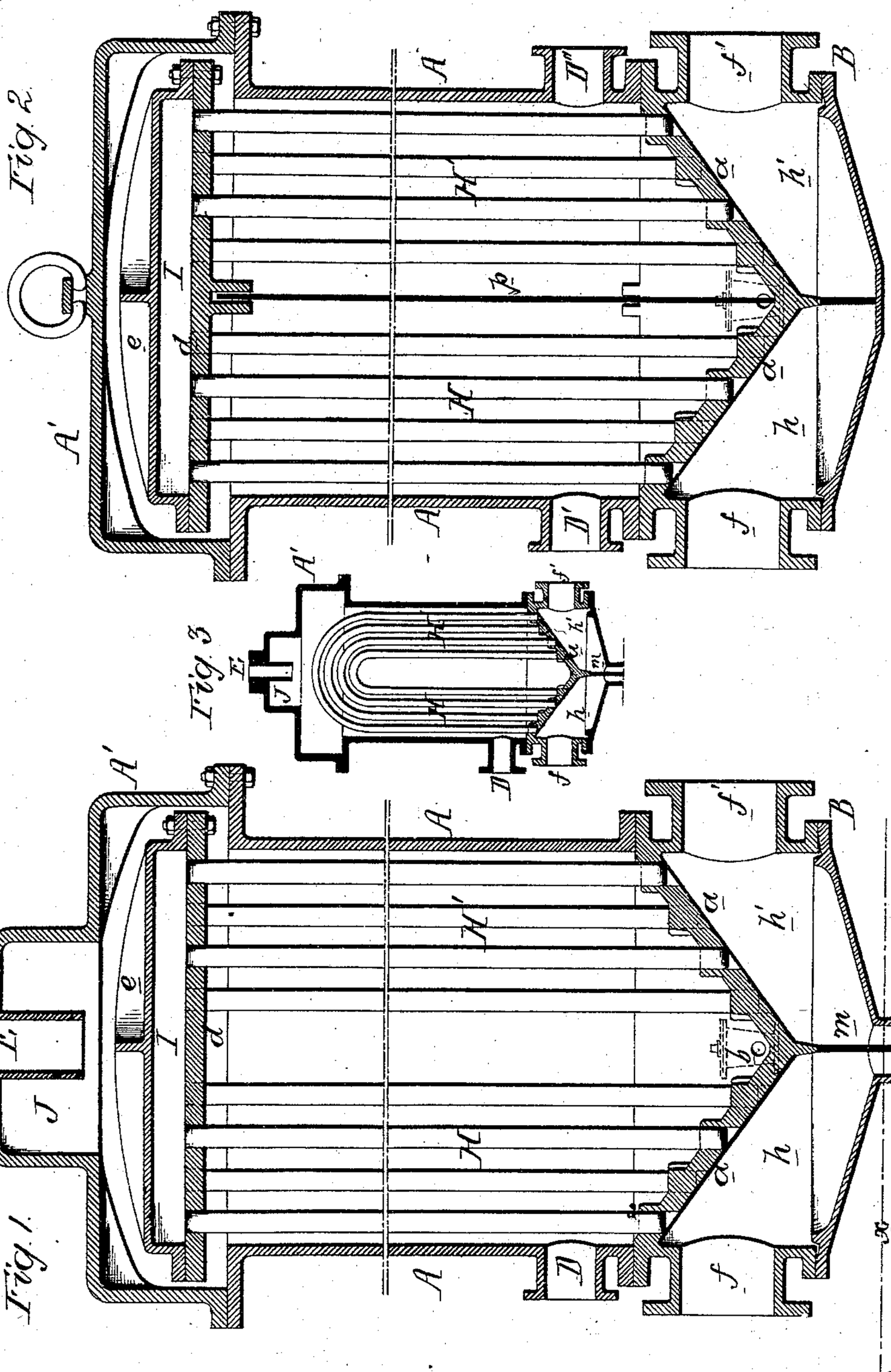

Fig. 3.

Fig. 1.

Witnesses
Thomas McIlvain
Henry Howson Jr

Robert Berryman
by his attorneys.
Howson and Son

UNITED STATES PATENT OFFICE.

ROBERT BERRYMAN, OF HARTFORD, CONNECTICUT.

IMPROVEMENT IN HEATERS AND CONDENSERS.

Specification forming part of Letters Patent No. **184,323**, dated November 14, 1876; application filed August 21, 1876.

To all whom it may concern:

Be it known that I, ROBERT BERRYMAN, of Hartford, Connecticut, have invented certain Improvements in Feed-Water Heaters, of which the following is a specification:

My invention relates to improvements in that class of feed-water heaters and surface-condensers in which the steam passes upward and downward through systems of vertical tubes contained in a casing within which water is caused to circulate in contact with the said tubes; and the main objects of my invention are to maintain the interior of the casing free from mud and other sediment, to prevent the straining of the tubes and their joints by their expansion and contraction, and, in the case of the feed-water heater, to insure the comparatively steady discharge of the feed-water from the same.

In the accompanying drawing, Figure 1 is a vertical section of a feed-water heater with my improvements; Fig. 2, a vertical section, representing the application of my improvements to a surface-condenser; Fig. 3, a section illustrating the application of my improvements to the feed-water heater for which Letters Patent No. 125,526 were granted to me April 9, 1872.

In Fig. 1 the exterior casing of the heater consists of the body A, cap or cover A′, and base B, the whole being secured together in the manner too clearly illustrated in the drawing to need description. The top *a* of the base is made in the form of an inverted cone or other equivalent shape, so that there shall be in the middle a depression or receptacle, in which mud or other refuse matter may accumulate prior to being discharged at intervals through a blow-off cock communicating with the outlet *b*. By this arrangement the interior of the casing may be always maintained in a cleanly condition.

The lower ends of the two sets of tubes H H′ are secured to this top *a* of the base, the upper ends being secured to the lower portion of the hollow tube-plate I, which is, in the present instance, composed of two plates, *d e*, secured together, a chamber being formed between the said plates for the passage of steam from one set of tubes to the other. This hollow tube-plate is supported entirely by the tubes, and is free to move within the cap A′ in obedience to the expansion or contraction of the tubes, which, together with the joints, are thus relieved from the strains to which they would be subjected if both ends of the tubes were secured to unyielding plates.

The cold water enters the casing through the branch D, and, after circulating freely in contact with the two sets of tubes, passes upward between the edges of the hollow tube-plate and the cap A′, and thence through the outlet-pipe E, which extends downward into the cap A′, and thus forms an air-chamber, J, which insures a comparatively steady discharge of the hot water from the interior of the casing. The exhaust steam passes through the branch *f* into the compartment *h* of the base, thence upward through the set H of tubes through the hollow tube-plate, down the set H′ of tubes into compartment *h′* of the base, and through the outlet *f′*.

The two compartments *h h′* are formed in the base by a partition, *m*, which extends downward into the waste-pipe P below the level *x* of water always maintained in the said pipe by the upward bending of the outer end of the same, the water thus serving to prevent communication between the two compartments, and the pipe serving to carry off the water of condensation from both.

The mud-receptacle and the air-chamber above described are features which may be readily applied to the feed-water heater for which Letters Patent No. 125,526 were granted to me April 9, 1872, as will be readily understood by reference to Fig. 3, in which a system of tubes, bent, as shown, takes the place of the tubes combined with the free hollow tube-plate, which I prefer to the plan illustrated and described in the said patent. Fig. 2 shows my improvements applied to a surface-condenser. The only respects in which this structure differs from that above described is the absence from the condenser of the discharge-pipe and air-chamber at the top and the waste-pipe P at the bottom, and the presence, in the condenser, of a partition, *p*, extending from the top *a* of the base to the hollow tube-plate I. Water is forced through the branch D′ into that portion of the interior of the condenser to the left of the partition *p*,

where it is brought into intimate contact with the set H of tubes, the water passing over the partition, and downward, and in contact with the other set of tubes to the right of the partition, and, finally, passing off through the branch D″.

The exhaust steam from the engine enters the compartment *h* of the base through the branch *f*, passes upward through the set H of tubes, through the hollow tube-plate I, down through the set H′ of tubes into the compartment *h′*, and thence, through the branch *f′*, to the air-pump.

I claim as my invention—

1. The combination, in a feed-water heater or condenser, of the body A and the tubes H H′, with the base B, having a chamber or chambers communicating with the tubes, and having a top, *a*, depressed in the center, as set forth.

2. The combination, in a feed-water heater or condenser, of two sets of vertical tubes, with a hollow tube-plate carried solely by the said tubes and forming a communication between the two sets, all substantially as and for the purpose described.

3. The combination, in a tubular feed-water heater, of an air-chamber, J, at the top of the heater, with a water-discharge pipe, E, extending downward into the said chamber, as specified.

4. The combination of the base B of the feed-water heater, the bent waste-pipe P, and the partition *m*, separating the base into compartments and extending downward into the said waste-pipe, all substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT BERRYMAN.

Witnesses:

HENRY HOWSON, Jr.,

HARRY SMITH.