T. MURPHY.

Feed-Water Heater.

No. 211,519. Patented Jan. 21, 1879.

Fig. 1

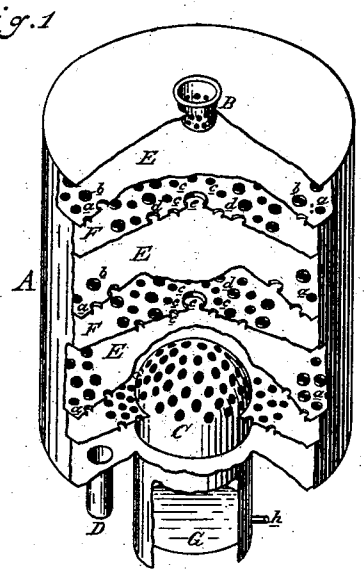


Fig. 2

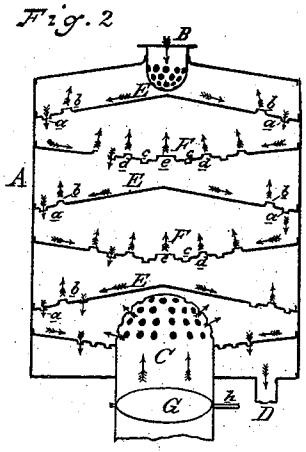


Fig. 3

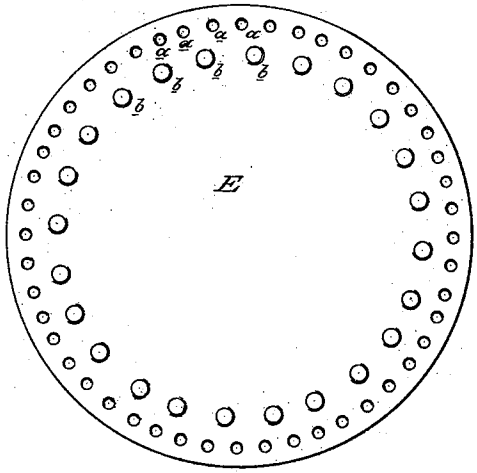
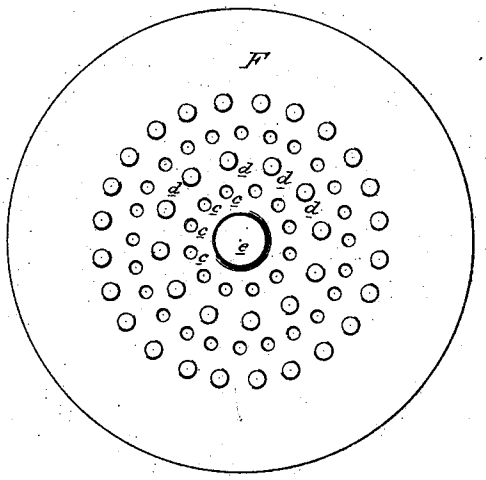


Fig. 4



Attest:

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UNITED STATES PATENT OFFICE.

THOMAS MURPHY, OF DETROIT, MICHIGAN.

IMPROVEMENT IN FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **211,519**, dated January 21, 1879; application filed July 22, 1878.

To all whom it may concern:

Be it known that I, THOMAS MURPHY, of Detroit, in the county of Wayne and State of Michigan, have invented an Improvement in Feed-Water Heaters, of which the following is a specification:

The nature of my invention relates to certain new and useful improvements in that class of devices employed to heat feed-water for steam-generators by means of steam and before the water is injected or forced into the boiler.

The invention consists in the peculiar construction and arrangement of the various parts, as more fully hereinafter described.

In the drawings, Figure 1 is a perspective view of my improved feed-water heater, with a portion of the shell broken out to show the interior arrangement of parts. Fig. 2 is a vertical central sectional elevation. Fig. 3 is a plan view of one of the conical diaphragms. Fig. 4 is a like view of one of the inverted conical diaphragms.

Like letters refer to like parts in each figure.

In the accompanying drawings, which form a part of this specification, A represents the shell or case of a heater, preferably cylindrical in form, provided with a water-inlet pipe, B, closed and perforated at its discharge end, as shown. It is also provided with a steam-inlet pipe, C, closed and perforated at its discharge end, and also with a water-outlet pipe, D, of the usual construction. E are flattened conical-shaped diaphragms secured within the shell, so as to divide it into water-tight compartments, and so arranged that the apex of the upper diaphragm will point directly to the center of the inlet-water pipe. Near the outer edge of these conical diaphragms there are punched from the upper side, so as to leave the burrs upon the under side, a series of small holes, *a;* and at a little distance inside this series of holes is another series of holes, *b*, punched from the under side, so as to leave the burrs upon the upper side. F are similarly-shaped diaphragms, inverted, and similarly secured in the shell, dividing the compartments made by the diaphragms E. Around the center of these diaphragms F is a series of holes, *c*, punched from the upper side, leaving the burrs projecting from the under side; and outside this series of holes is another series, *d*, punched from the under side, leaving the burrs projecting from the upper side. A circular opening, *e*, in the center of these diaphragms F also affords communication between the compartments immediately above and below them. These openings should be burred or flanged upon the upper side. The lower diaphragm embraces the steam-inlet pipe below the perforations in its discharge end, and the holes punched in this diaphragm are from the upper side, leaving the burrs projecting from its under side, and forms a chamber in the lower part of the shell, into which no steam can enter, and from which the water is drawn through the outlet-pipe D.

The steam-inlet pipe C is provided with a valve, G, of any suitable construction, which may be operated by hand by means of its stem *h* projecting through the pipe; or this stem may be connected to an eccentric, so as to open with each exhaust of the engine to admit the exhaust-steam, and close at once to prevent its escape by back-pressure from the water or other causes; or the valve may be so constructed as to be operated by the pulsations of the exhaust-steam.

In practice, the water enters at the top of the shell through the perforations in the end of the inlet-pipe, and is discharged upon the imperforated center of the upper diaphragm, and runs down the sides of the cone in a thin sheet and through the outer series of holes, being stopped from passing through the inner series of holes by the upwardly-projecting burrs. The water falls upon the imperforated outer portion of the next diaphragm below, and runs to the center series of holes, being prevented from passing through the outer series of holes by their upwardly-projecting burrs; and so on through each succeeding series of diaphragms until it is collected in the chamber at the bottom of the heater. At the same time the steam enters from below through the perforations in the discharge end of the steam-inlet pipe. The steam is discharged against the imperforated center of the lower conical diaphragm, and passes to the compartment above through the series of holes next the outer series, the downwardly-projecting burrs thereon preventing its passage through them; thence it passes upward through the succeed-

ing diaphragms, through these series of holes therein, the burrs of which project upward. Thus the water in thin sheets and small columns falling downward is brought into contact with the rising steam under similar conditions, and is highly heated by such contact before it reaches the chamber, from which it is drawn at the bottom. Any lime in the water will be found deposited upon the imperforated and upper portions of the diaphragms; and, if desired, suitable hand-holes may be arranged in the shell for the purpose of removing such deposit.

It will be observed that there is no outlet for steam from the shell, so that all the steam injected into my heater during its operation is condensed and returns with the heated water to the generator.

The area of the perforations in the end of the water-inlet pipe, and also perforations for the passage of water through the diaphragms, should equal the area of said inlet-pipe, and the perforations in the end of the steam-inlet pipe and the perforations in the diaphragms for the passage of steam should equal the area of said inlet-pipe. The area of the outlet-water pipe should be a little larger than the area of the inlet-water pipe, to allow of the passage of the water of condensation with the feed-water.

It will be seen from the operation of my improved heater that it is a feed-water heater, a lime-extractor, and a steam-condenser, all in one device.

I am aware that feed-water heaters have been and are now in use, provided with devices for bringing the falling water into contact with the rising steam, consequently I do not broadly claim such heaters; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In feed-water heaters, the combination of conical diaphragms with alternating inverted conical-shaped diaphragms, the former perforated near their edges, and the latter near their centers, substantially as and for the purposes described.

2. The combination, with the shell A, of the water-inlet pipe B, with closed perforated end, placed centrally in the top of such shell, the alternately-arranged conical diaphragms E F, perforated at their edges and centers, the steam-inlet pipe C, having closed perforated end and rising through the bottom of the shell, and the water-outlet D, all constructed and arranged substantially as described and shown.

THOS. MURPHY.

Witnesses:
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