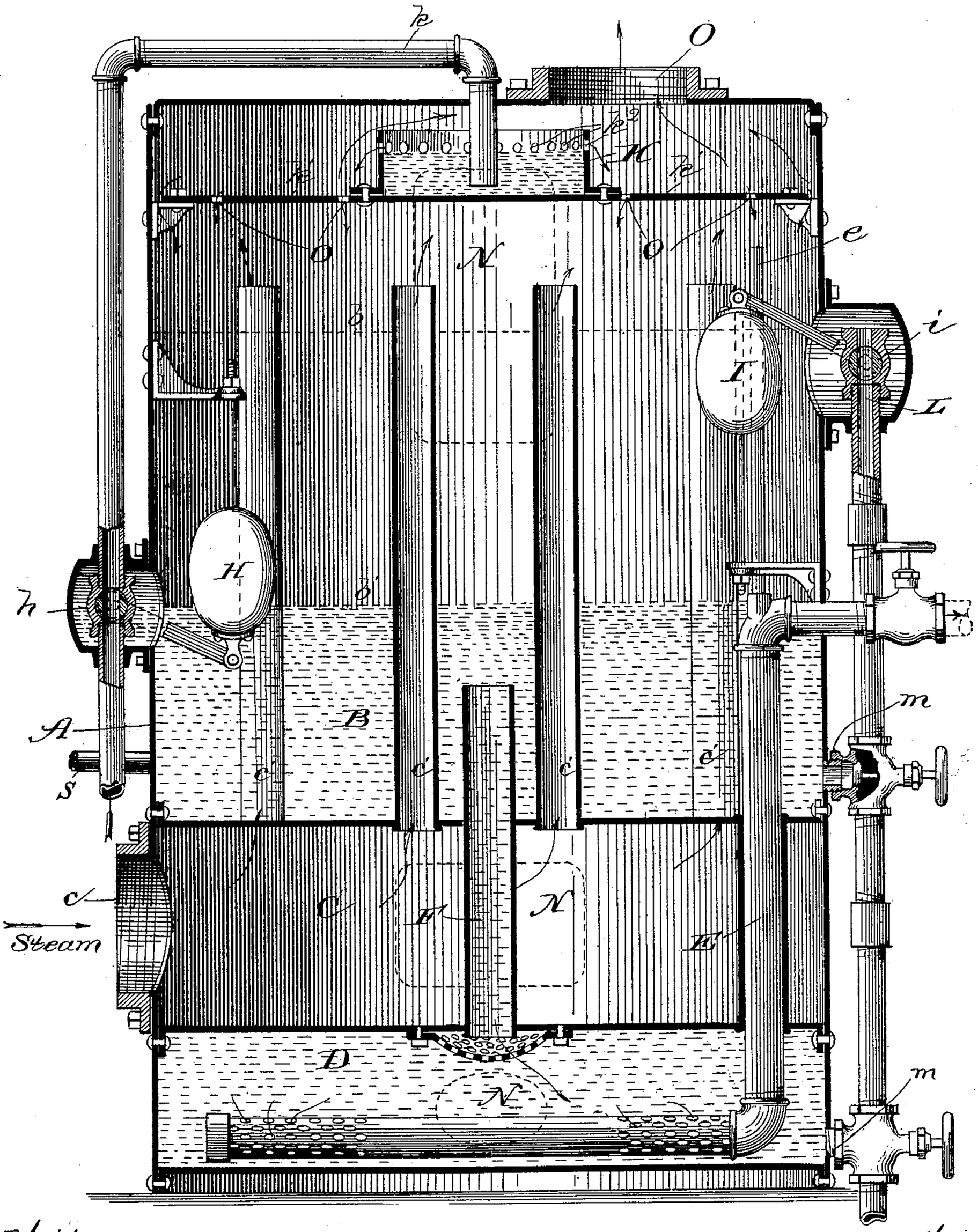
(No Model.)

C. E. FERREIRA.

FEED WATER HEATER AND PURIFIER.

No. 434,591. Patented Aug. 19, 1890.



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UNITED STATES PATENT OFFICE.

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FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 434,591, dated August 19, 1890.

Application filed September 20, 1889. Serial No. 324,516. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. FERREIRA, a citizen of the United States, residing at Morgan Park, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Feed-Water Heaters and Purifiers, of which the following is a specification.

The object of my invention, which is an improvement upon the one described in my patents of March 26, 1889, No. 400,319, and June 11, 1889, No. 405,154, is to provide for the heating and purifying of water, particularly for use in steam-boilers, the present improvement being adapted for use either as an open or as a pressure heater, and also calculated to take the place of the receiving-tanks used in connection with the present system of heating buildings; and the invention consists in the features and details of construction hereinafter described and claimed.

The accompanying drawing represents a vertical central section of my improved heater.

A is the shell or sides of the heater; B, a water-chamber; *b*, a line indicating the highest water-level, and *b'* the working water-level; C, the steam-chamber; *c*, an inlet for exhaust steam; A', pipes extending from the steam-chamber to a point above the highest water-level; D, a filtering-chamber; E, the suction feed-pipe; *e*, a pipe for the escape of vapor from the water in the feed-pipe; F, a pipe passing through the steam-chamber and connecting the chambers B and D; H, a ball-float, and *h* a valve to regulate the working water-level; I, a ball-float, and *i* a valve to prevent the water from rising above the upper ends of the pipes E; K, the receiving-vessel for the feed-water; *k*, an inlet-pipe for the introduction of water; *k'*, a perforated plate of nearly equal diameter with the interior of the shell and forming the bottom of the vessel K; K^2, perforations in the sides of such vessel; L, a drain or overflow for the scum and floating impurities, and also to carry off the water when it rises above the level indicated by the line *b;* M, an outlet for heavier impurities collecting in the water and filtering chambers; N, man-holes for access to the water, steam, and filtering chambers, and O an outlet for non-condensed steam; S, a pipe entering the water-chamber B, through which the condensation is returned from any heating system.

In constructing my improved feed-water heater I make a shell, preferably of metal of any size desired, such size varying with the boiler with which it is to be used. I divide this shell into chambers, as shown in the drawing, where the upper chamber is intended to receive the water to be heated, the chamber C, immediately beneath it, receives the steam, and the bottom chamber receives the heated and purified water. These chambers are of course to be separated from each other by water and steam tight partitions properly secured in place.

Connected with and opening into the steam-chamber is a series of vertical pipes *c'*. There may be as many of these pipes as desired; but in the preferred construction, which is that shown in the drawing, the pipes are placed in two concentric circles. These pipes extend upward nearly to the top of the chamber, and the steam passing through them of course heats the body of water in contact with them.

To introduce water into the heater, I provide the pipe *k*, furnished with a valve *h* and a float for opening same in the manner heretofore described. This pipe enters, preferably, at the top of the heater and discharges the water into the receiving-vessel K. To form this vessel, I provide a diaphragm *k'* at a point near the upper end of the heater. This diaphragm is of somewhat less diameter than the shell of the heater, thus leaving an annular space between it and such shell as shown in the drawing. To this plate I attach a thimble or collar. This thimble forms the sides of the receiving-vessel and the plate *k'* forms the bottom thereof. In the side of the vessel K, I provide a series of perforations k^2 for the escape of the water. The pipe *k* passes into this vessel and discharges the water at a point close to the plate *k'*. This latter plate is furthermore provided with perforations O, preferably arranged in two concentric circles in the relative position shown in the drawing, wherein the circles formed by the perforations are of somewhat greater diameter than those formed by the pipes *c'*, whereby the steam issuing from these pipes shall strike against the solid portion of the plate *k'*, and, being deflected sidewise, will pass up to the perforations O and through the annular space between the diaphragm and the heater. From

this construction it results that as the water is fed into the vessel K it comes immediately in contact with the hottest part of the diaphragm, and, being heated, rises in the vessel and passes through the perforations in the sides thereof, and thence through the perforations O into the water-chamber.

Owing to the relative positions of the perforations O and the pipes *c'*, as above set forth, the water entering the water-chamber will not be allowed to enter the pipes, but will pass between them, thus preventing any back-pressure.

Passing up from the filtering-chamber through the steam-chamber and to any height desired in the water-chamber, I provide the pipe F, intended to conduct the heated water to the filtering-chamber. I prefer to have this pipe for the overflow of water at the center and its upper end at a point about halfway between the bottom of the water-chamber and the working water-level, and I also prefer to place a strainer over the opening at the lower end of this pipe. I next provide the suction-pipe E. This pipe preferably passes in a horizontal direction across the bottom of the filtering-chamber, where it is provided with suitable perforations. It then passes vertically upward through the steam-chamber to a point near the working water-level, whence it passes horizontally out of the heater. This pipe is preferably provided with the pipe *e* for the escape of any vapor that may be in the water.

The exhaust-steam after passing out through the opening O at the top of the heater and being conducted through the heating system or to any other place in which it may be used, returns in a more or less condensed form and is introduced into the water-chamber at a point preferably below the working water-level by means of any suitable pipe. (Not shown.) This enables the water formed by condensation of the steam used for heating purposes to be brought directly back into the body of water, which body acts as a check and prevents the steam itself from escaping from the heating system. As the amount of condensed water thus fed into the heater varies from time to time, it becomes necessary to provide means to prevent the water rising above the upper ends of the pipes *e'* and then entering the same. To accomplish this I provide the drain-pipe L and the float connected with the valve *i*. When the water is below the level indicated by the line *b*, the valve *i* will remain closed; but when the water rises to this level it will carry the float up with it and open the valve *i*, thus allowing the water to be carried off.

The amount of water fed into this heater through the pipe *k* is regulated by the float H and the valve with which it is connected. If the water falls below the working-level indicated by line *b'*, the float will fall and open the valve until sufficient water has been fed into the heater to restore the proper level, when the rising of the float will close the valve.

The sediment or impurities in the water and filtering chamber may be removed or washed out from time to time, as necessary, by opening the drain-valves from the chambers and also through the man-holes therein.

The construction and operation of the various other parts will be readily understood from the drawing and from the descriptions contained in my patents above referred to, the claims of which cover several of the features of forms now shown.

The special advantages of the present form of the heater are its adaptability to be used either as an open or pressure heater, in its providing an improved method of feeding the water into the heater, and in its adaptability to supplant the receiving-tanks heretofore in use.

It will be understood that my present invention is adapted and intended to be used as a pressure or an open heater, or as both a pressure and open heater combined, as may be desired. I therefore have intended to describe particularly the parts which I consider to be an improvement on my former construction.

It will be understood that changes may be made in various parts or equivalents substituted therefor without departing from the spirit of my invention.

I claim—

1. In a feed-water heater and purifier, a receiving-vessel comprising a collar or thimble K, attached to a perforated diaphragm *k'*, substantially as described.

2. In a feed-water heater, the combination of a water-chamber provided with a water-inlet, a steam-chamber separated from such water-chamber, provided with a steam-inlet, pipes for conducting steam through the water-chamber and discharging it above the water-level, and a receiving-vessel placed above such pipes, into which the water to be heated is fed, substantially as described.

3. In a feed-water heater, the combination of a water-chamber provided with a water-inlet, a steam-chamber provided with a steam-inlet, pipes for conducting steam through the water-chamber and discharging it above the water-level, and a perforated diaphragm above the pipes, part of such diaphragm forming the bottom of a receiving-vessel, into which the water to be heated is fed, substantially as described.

4. In a feed-water heater, the combination of a water-chamber provided with a water-inlet, a steam-chamber separated from such water-chamber, provided with a steam-inlet, pipes for conducting steam through the water-chamber and discharging it above the water-level, and an automatic overflow for removing floating impurities, whereby the water is prevented from rising above the top of such pipes, substantially as described.

5. In a feed-water heater, the combination

of a water-chamber provided with a water-inlet, a steam-chamber provided with a steam-inlet, pipes for conducting steam through the water-chamber and discharging it above the water-level, means for preventing the water from rising above the tops of such pipes, and a receiving-vessel having perforated sides above such pipes, at a point near the bottom of which the water to be heated is introduced, substantially as described.

6. In a feed-water heater, the combination of a water-chamber provided with a water-inlet, a steam-chamber provided with a steam-inlet, pipes for conveying steam through the water-chamber and discharging it above the water-level, a horizontal perforated diaphragm placed above such pipes, and a perforated thimble secured to such diaphragm, forming a vessel into which the water to be heated is introduced, a filtering-chamber, and a horizontal suction-pipe passing along the bottom of such chamber, through the steam-chamber, and out of the heater for drawing off the water, substantially as described.

7. In a feed-water heater and purifier, a perforated diaphragm situated above the steam-pipes and forming the bottom of a vessel, into which the water is received and purified, substantially as described.

8. In a feed-water heater and purifier, a perforated diaphragm situated above the steam-pipes, and a collar or thimble secured thereto, forming a vessel, into the hottest part whereof the water is first received and wherein such water is purified, substantially as described.

9. In combination with a feed-water heater, a pipe connected with the heating system of a building and entering the heater at a point below the working water-level in the water-chamber, whereby water formed by condensation of the steam used for heating purposes may be conducted directly into the water-chamber, substantially as described.

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