No. 683,278. Patented Sept. 24, 1901.

E. W. HIGBEE.

APPARATUS FOR HEATING WATER.

(Application filed Apr. 2, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

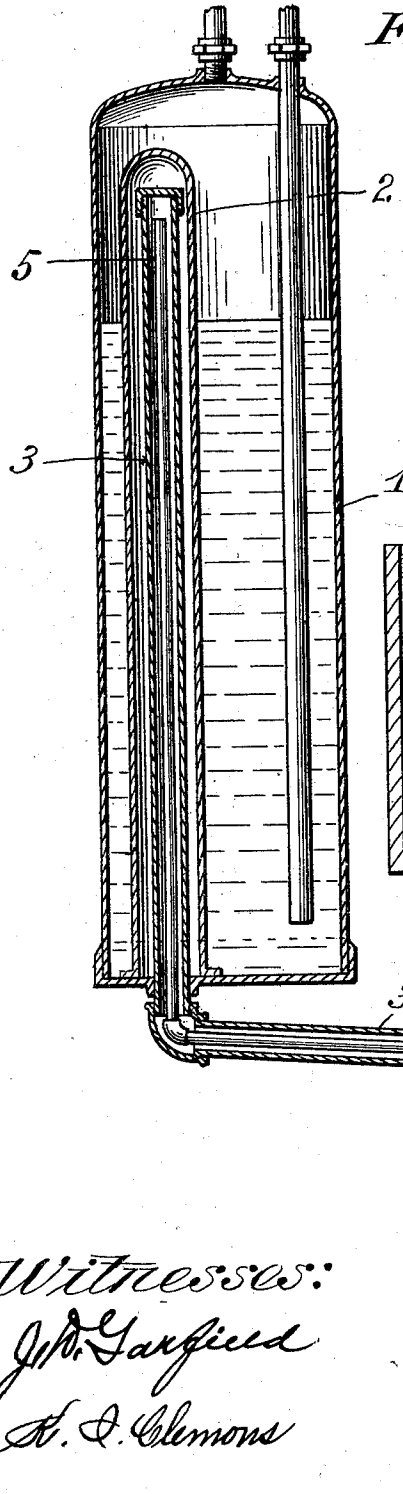
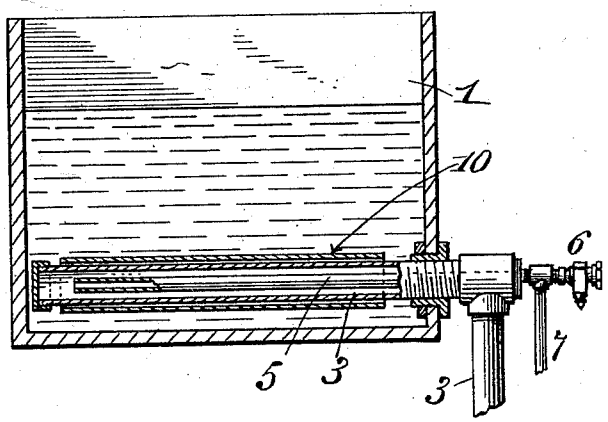


Fig. 4.



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Fig. 2.

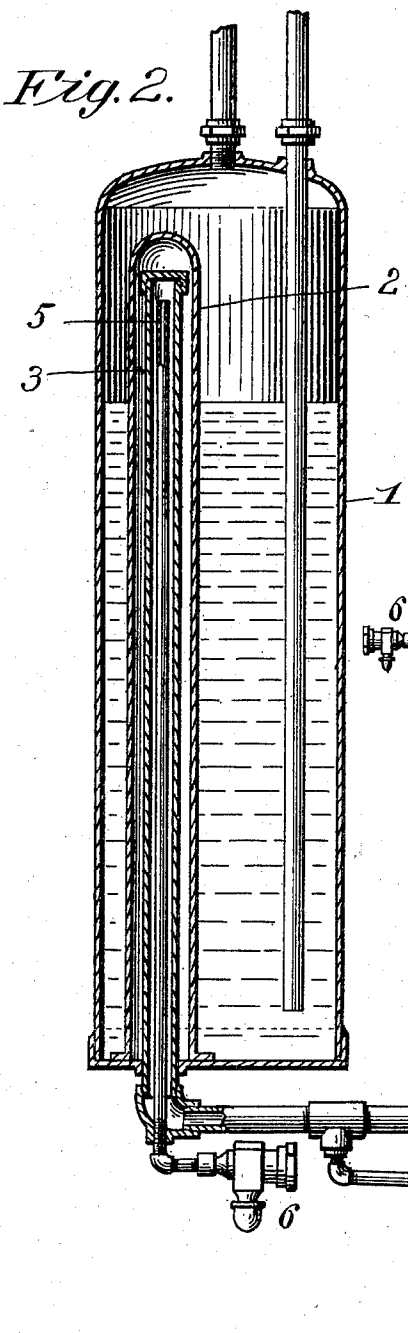
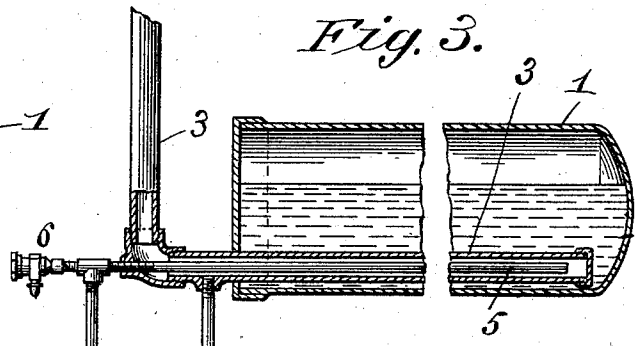


Fig. 3.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR HEATING WATER.

SPECIFICATION forming part of Letters Patent No. 683,278, dated September 24, 1901.

Application filed April 2, 1900. Serial No. 11,081. (No model.)

To all whom it may concern:

Be it known that I, EDWIN W. HIGBEE, a citizen of the United States, residing at Northampton, in the county of Hampshire and State of Massachusetts, have invented new and useful Improvements in Apparatus for Heating Water, of which the following is a specification.

This invention relates to water-heating apparatus, and is in the nature of an improvement on a construction patented by me on October 31, 1899, No. 636,141. In my said patent a steam-pipe provided with a jacket is run through a tank of water to be heated, the unjacketed end of the steam-pipe outside of the tank being provided with a thermostatic valve, which because of a fall in temperature due to the transfer of heat from the steam to the water, will open and permit steam to blow through said pipe, the contact of said steam with said valve effecting the closure of the same. The steam-pipe was thus kept continually supplied with hot steam, which imparted its heat through the jacket to the water. It was found in practice that the closed end of the steam-pipe outside of the tank and beyond it permitted the rapid condensation of steam, and consequently caused the valve on the end of said pipe to open much more frequently than it would otherwise have done. This of course results in a loss of time in heating a given quantity of water and in a loss of steam through the condensation of that which occupies the portion of the pipe beyond the tank.

This invention overcomes the above-recited objections and is directed to a construction which permits the inclosure of a pipe to which the automatic valve is attached, with the exception of a short portion of one end thereof, entirely within the steam-pipe, to the end that the latter must become reduced in temperature to the point at which the valve will operate before fresh steam can be supplied by said valve to the steam-pipe. This construction is, as in the case of my said prior patent, adapted particularly to the heating of water for household purposes by very low pressure steam.

In the drawings the application of this invention to a closed water-heater has only been shown; but it is obvious that it is fully applicable to any form of heater or receptacle, the invention lying in the construction and arrangement of a steam-pipe and its jacket and the drip-pipe, all as below set forth.

In the drawings forming part of this specification, Figure 1 represents a vertical sectional elevation of an ordinary hot-water boiler, showing connections embodying this invention between it and the steam-generator. Fig. 2 is a view similar to Fig. 1, but showing a slight modification of the preferred construction. Fig. 3 illustrates the application of the invention to a heater without the jacket for the steam-pipe. Fig. 4 shows a modified form of jacket for the steam-pipe.

Referring to the drawings, 1 indicates a hot-water heater or receptacle, the particular type shown herein representing the well-known metal boiler for household use; but this is only used as a convenient type, as obviously any form of water-receptacle, either open or closed, is equally well adapted to have this invention applied thereto. In the receptacle is located the vertical tube 2, closed at its upper end and secured to the bottom of said receptacle in such a manner as to exclude water therefrom. A steam-pipe 3 enters this jacket through a hole made in the bottom of the receptacle and extends from near the upper end of the jacket to a steam-generator 4. It is not necessary that the steam-pipe should be screwed into the bottom of the water-receptacle or that there should be a tight joint where the steam-pipe enters, though, preferably, the hole is made to freely admit the steam-pipe, which is supported in proper position from some outside point. It must be borne in mind that the part of the steam-pipe within the jacket is a "dead" end, as the upper end thereof is capped, and that to introduce steam therein a vent or opening therethrough is necessary, and this is provided by means of the vent-tube 5. This vent-tube may be located entirely within the steam-pipe 3, with the exception of a short portion thereof, to which the thermostatic valve is attached where the nature of the construction will permit it, and in that case extends from a point within the steam-generator, below the water-line thereof, up through said steam-pipe to a point near the upper closed end there-

of within the jacket, substantially as shown in Fig. 1. At any convenient point between the generator and the receptacle 1 a branch is taken from said vent-tube through the wall of the steam-pipe 3, and on the end of said branch is located the automatic valve 6, described above. This is the well-known Jenkins automatic valve, patented August 27, 1889, No. 409,685. The said branch of the vent-tube is usually taken out through an elbow, as shown in the drawings in Fig. 1.

From the above construction it is obvious (assuming that the valve 6 is open) that steam will pass up through the steam-pipe 3 to the end thereof and from thence down through the vent-pipe, out through the open valve 6, and the contact of the steam with the heat expansible member of the valve will cause the latter to close. Therefore not until the heat contained in said steam-pipe and vent-pipe have been dissipated through radiation will the valve again open to admit a fresh supply of steam into the steam-pipe. Whatever condensation takes place in the steam-pipe it will find its way back to the boiler if said steam-pipe can be given the proper pitch. Whatever condensation takes place within the vent-tube 5 will likewise find its way back to the boiler, and any condensation within the valve or its branch is provided for by the usual drip-cup found on valves of this type.

In Fig. 2 a slight modification of the construction of Fig. 1 is shown, and it consists in carrying the vent-tube only through that portion of the steam-pipe which lies within the receptacle 1 instead of carrying it back to the boiler in the said steam-pipe, and a drip-pipe 7 enters the steam-pipe near the point of its exit from the boiler and runs back to the steam-generator, entering the latter at a point below the water-line in the usual manner. This construction is better adapted to long reaches of pipe connections between the generator and the boiler, where it may not always be possible to get the proper pitch to the steam-pipe and where a pipe as small as is the vent-pipe in practice would free itself from accumulations of condensed water but imperfectly.

In certain cases where it is desired to use high-pressure steam for water-heating purposes the construction shown in Fig. 3 may be employed. In this construction the jacket is done away with entirely, but the same feature shown in Figs. 1 and 2 for providing a vent for the closed end of a steam-pipe is shown. In said Fig. 3 the drip from the steam-pipe is taken back to the generator through the pipe 8, and the vent-pipe 5 is provided with a drip-pipe 9 between the point where the vent-pipe enters the steam-pipe and the automatic valve. It is only possible to do away with the jacket around the steam-pipe when high-pressure steam is used for heating water; but even with high-pressure steam it would be impossible to run a dead end of a steam-pipe into a boiler or heater and get any circulation of steam therethrough without providing a vent for the closed extremity of the steam-pipe. This is most effectively provided for by the construction shown and described herein, and this construction is especially economical when controlled by an automatic valve, for by the use of said valve in connection with the vent-tube heat in the shape of a fresh supply of steam can only be admitted into the steam-pipe within the heater when the temperature has fallen low enough within that steam-pipe to cause the actuation of the valve, and the steam-pipe and vent-tube both lying within the heater all of their heat practically will be given up to the water which surrounds said steam-pipe, whereas in my prior patent, in which the vent-pipe was practically but a continuation of the steam-pipe, quite an appreciable amount of heat was lost through radiation from that part of the pipe lying beyond and outside of the water-receptacle.

In Fig. 4 is shown a modified form of a jacket which may be employed to provide a certain space between the steam-pipe and the body of the water. Said jacket instead of being so constructed as to exclude water from the interior thereof may consist simply of a piece of pipe 10, which fits loosely over said steam-pipe 3. A certain quantity of water will find its way in between the jacket and the pipe when the latter is cold; but as soon as steam enters the pipe whatever water lies between the pipe and jacket will be vaporized almost immediately and be driven out of each end of the jacket and enough will pass out to produce an equalization between the pressure of water on the ends of the jacket and the pressure of the vapor between the jacket and steam-pipe, and thus the greater part of the pipe will while steam is in the latter be protected against contact of the water therewith.

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

1. In combination with a water-receptacle, a steam-pipe in said receptacle having a closed inner end, a vent-pipe entering said steam-pipe at a point outside of said receptacle, and extending in said pipe nearly to the closed end thereof, said vent-pipe having communication with the outer atmosphere and a valve on the vent-pipe, outside of the steam-pipe, substantially as described.

2. The combination with a steam-generator and a water-receptacle of a steam-pipe extending from said generator to, and into said receptacle, the end of said pipe in the latter being closed; a vent-pipe extending from a point near the closed end of said steam-pipe, and within the latter, to a point in said generator below the water-line therein, a branch having communication with the outer atmosphere on said vent-pipe, and an automatic

valve on said branch, substantially as described.

3. The combination with a water-receptacle, of a steam-pipe therein having a closed inner end, a jacket for said pipe, whereby a space is maintained between said pipe and the water in the receptacle, a vent-tube having communication with the outer atmosphere and lying partly within said steam-pipe and partly outside thereof, and a valve on the outer portion of said tube, substantially as described.

4. The combination with a steam-generator of a water-receptacle, a steam-pipe therein having a closed end, a vent-pipe having communication with the outer atmosphere entering said steam-pipe at a point outside of said receptacle, and extending therein nearly to said closed end, an automatic valve on said vent-pipe outside of the steam-pipe, and a drip-pipe connected with the steam-pipe and extending to and entering said generator below the water-level thereof, substantially as described.

5. In a water-heater, the combination of a water-receptacle, a steam-pipe in said receptacle, a vent-pipe partly within said steam-pipe and projecting therefrom at a point outside of the water-receptacle, said vent-pipe having communication with the outer atmosphere, and a valve for governing the exit of said vent-pipe, substantially as described.

6. In a water-heater, the combination of a water-receptacle, a steam-pipe in said receptacle, a jacket for said steam-pipe, a vent-pipe having communication with the outer atmosphere partly within said steam-pipe and projecting therefrom at a point outside of the water-receptacle, and a valve for governing the exit of said vent-pipe, substantially as described.

7. In a water-heater, the combination of a water-receptacle, a steam-pipe entering said receptacle and arranged to discharge the water of condensation therefrom by gravity, a vent-pipe having communication with the outer atmosphere situated partly within the steam-pipe and projecting therefrom at a point outside of the water-receptacle and a valve for governing the exit of said vent-pipe, substantially as described.

8. In a water-heater, the combination of a water-receptacle, a steam-pipe entering said receptacle and arranged to discharge the water of condensation therefrom by gravity, a vent-pipe having communication with the outer atmosphere situated partly within the steam-pipe and projecting therefrom at a point outside of the water-receptacle, and an automatic valve for governing the exit of said vent-pipe, substantially as described.

9. In a water-heater, the combination of a water-receptacle, a steam-pipe entering said receptacle and arranged to discharge the water of condensation therefrom by gravity, a jacket for said steam-pipe, a vent-pipe having communication with the outer atmosphere situated partly within the steam-pipe and projecting therefrom at a point outside of the water-receptacle, and an automatic valve for governing the exit of said vent-pipe, substantially as described.

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