Oct. 9, 1928.

1,686,970

A. H. HOADLEY

WATER HEATER

Filed Nov. 28, 1927

Fig. 2.

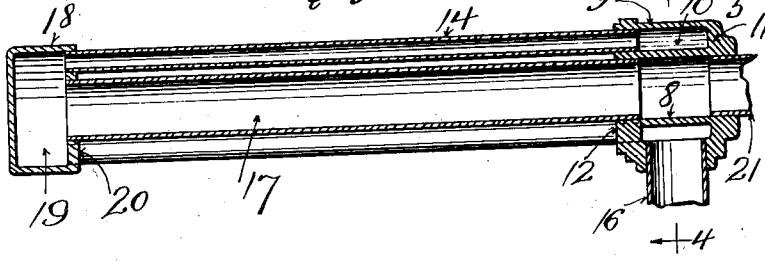


Fig. 4.

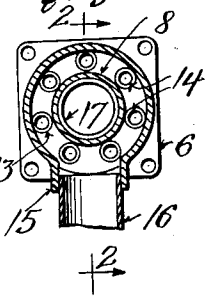


Fig. 3.

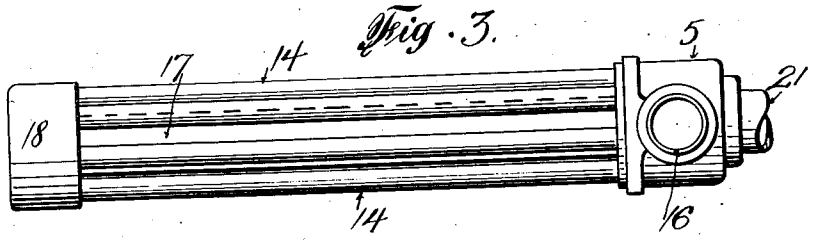


Fig. 1.

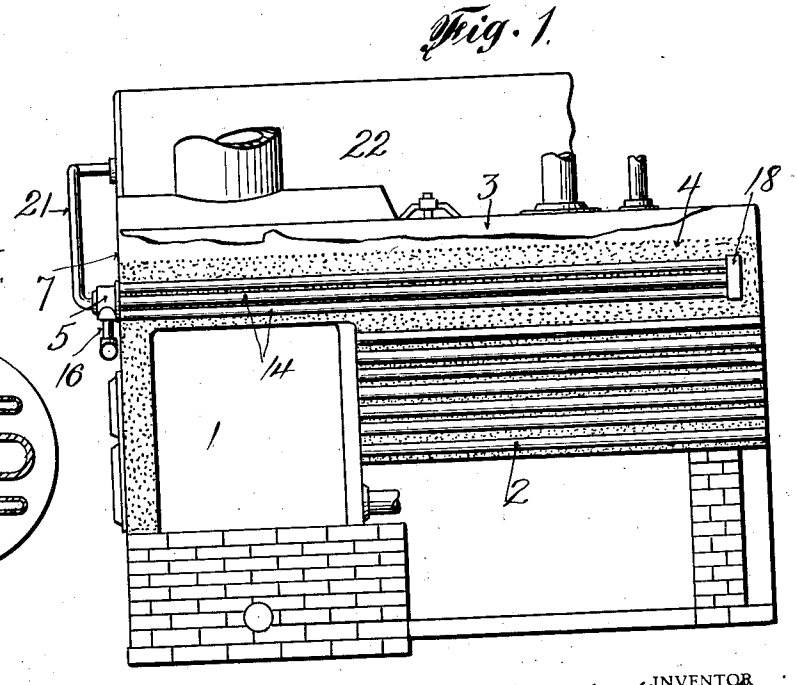
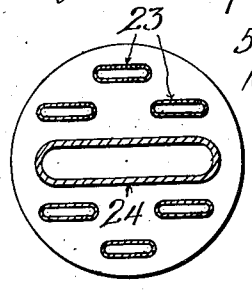


Fig. 5.



Alfred H. Hoadley
INVENTOR
BY
Charles G. Hensley
ATTORNEY

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UNITED STATES PATENT OFFICE.

ALFRED H. HOADLEY, OF NEW YORK, N. Y.

WATER HEATER.

Application filed November 28, 1927. Serial No. 236,099.

My invention relates to the type of water heater comprising a series of tubes connected together and adapted to be inserted into the water compartment of a steam boiler such as is used for generating steam in houses and apartment buildings. In heaters of this type the tubes are placed below the water level of the steam boiler in order that they shall be submerged in the water. Water is circulated in these tubes and is heated by contact with the water in which they are submerged, the water circulating through the tubes serving to provide the hot water supply for the house or apartment, thereby avoiding the necessity of employing a separate fire for the water heater. Various devices have been proposed for this purpose but the object of my present invention is to simplify the construction of such devices and to increase the efficiency thereof. One object of the invention is to provide a series of tubes arranged in close relation, the inner tube of the group being larger, and a series of tubes surrounding and close to the larger tube. The area of the inner tube is substantially the same or slightly greater than the combined areas of the smaller tubes surrounding it. The water flowing into the apparatus first passes through the relatively smaller tubes, thereby dividing the stream into a number of smaller streams, and the water, after passing through the smaller tubes, returns through the common larger inner tube. The several tubes are connected both at the inlet end by a header, and also at the opposite ends by a header, thereby avoiding the necessity for bending the tubes and at the same time permitting the combination of tubes above set forth. Other advantages will be apparent from the following detailed description of my invention.

In the drawings forming part of this application,

Figure 1 is an elevation of a steam boiler in which my invention is incorporated, a portion of the boiler being broken away to show the interior,

Figure 2 is a longitudinal sectional view of a portion of my improved water heater and is taken on the line 2—2 of Figure 4,

Figure 3 is an elevation thereof,

Figure 4 is a sectional view taken on the line 4—4 of Figure 2, and

Figure 5 is a sectional view showing a modified construction.

In Figure 1 I have shown the principal parts of a steam plant such as is used in heating apartment houses and other buildings in which my invention is adapted to be used. I have shown the fire box 1, the tubes 2 through which the products of combustion travel, and the boiler 3 which is adapted to contain the water to be heated. There is usually a space above the tubes 2 containing a body of water indicated as 4, and the present device is adapted to be associated with the boiler so that the tubes of the water heater are submerged in the water 4 below the water level, as shown in Figure 1.

In the construction shown in Figures 1 to 4 there is a header 5 which may be made of cast metal, if desired, and which consists of a body having a base or flange 6 which is adapted to be bolted to the front wall 7 of the steam boiler, a suitable gasket being provided to make a liquid tight joint. The body 5 also has inner and outer spaced walls 8, 9 forming between them a water chamber 10 surrounding the inner wall 8. One end of this chamber is closed by the end wall 11 of the body, and the other end is closed by a wall 12 spaced therefrom, and this latter wall is provided with a series of holes 13 into which are fitted the ends of a series of tubes 14. These tubes may be sealed to the wall 12 in any suitable manner, such as by brazing the tubes to the wall. There is a short tubular extension 15 formed as part of, or an extension of the wall 9, directed downwardly in Figure 4, and the water inlet pipe 16 is fitted to this tubular extension by means of a water tight joint which may be made by brazing the pipe 16 to the tubular extension 15. This pipe 16 which supplies the water to the device, may be connected with any suitable source of supply, such as the water feed pipe of the building. The water supplied through this pipe enters the chamber 10 and divides into a number of streams when it enters the several tubes 14.

There is a larger tube 17 having one end fitted within the bore of the annular wall 8 of the header, and it is preferably also brazed to this wall to form a liquid tight joint. The other ends of the various tubes are also connected by a header, as follows:

There is a circular header 18 forming a chamber 19 within it, and one wall 20 of this header is provided with a number of apertures corresponding in size with the ex-

terior diameter of each tube 14, the apertures being located to correspond with these various tubes. In addition, there is a larger central aperture in the wall 20 to receive one end of the larger tube 17. All of the tubes may be joined with the header by means of brazing to render the connections liquid proof.

It will be observed from the drawings that the several tubes 14 are arranged or grouped around the larger central tube 17. The several tubes 14 are each of smaller diameter than the central tube 17 and in the preferred form of my invention the cross sectional area of the central tube 17 is equal to or slightly greater than the combined areas of all of the several tubes 14. There is a pipe 21 fitted into the header 5 and suitably connected as by brazing, and this pipe serves as the outlet for the hot water and conducts it to the hot water collecting tank or reservoir 22.

The device is inserted into the steam boiler in the manner shown in Figure 1 and fresh water to be heated is supplied through the pipe 16 to the chamber 10 of the header 5. From this chamber the water passes into the several tubes 14 and flows through these in divided streams according to the number of such tubes, the direction of flow being from right to left in Figure 2. While the water is passing through these several tubes it is heated by conduction. That is to say, these tubes will be submerged in the water 4 of the steam boiler, which is itself heated by the fire in the fire box 1; the tubes 14 are thus heated, and the heat is conducted to the water passing through them. When the streams flowing through these tubes reach the header 18 they combine in the chamber 19, and the water then passes from this chamber through the inner and larger tube 17, moving from the left to the right in Figure 2, and the heated water passes out from the header 5 to the pipe 21 into the storage tank or reservoir 22 in which the hot water is stored for use.

As the water flowing through the heater in the first instance is divided into a number of streams corresponding to the number of tubes 14 it is quickly heated, and the return flow from all of these tubes takes place through the common return pipe 17 which is itself also submerged in the water 4. The heating action takes place principally, however, while the water is passing through the smaller tubes 14. The larger or return tube 17 has an inner cross sectional area approximately equal to, or slightly larger than the combined areas of the several tubes 14 in order to secure a free flow of the water through the several tubes. I mention the fact that the return tube 17 may have a cross sectional area slightly greater than the combined cross sectional areas of the tubes 14 because the water is heated as it passes to the header 18 and it is, therefore, expanded so that the return tube 17 by handling a slightly larger volume, will conduct the heated or expanded water received from the various tubes 14.

In Figure 5 I have shown a modified form of the invention in which the same headers may be used except that the openings to receive the several tubes 23 are oval in shape to correspond with the cross sectional shapes of these several tubes. The tubes 23 which are of oval cross section, as shown in this view, correspond in function with the tubes 14, of the first form, and they are clustered or grouped around a larger inner tube 24 which corresponds in function with the return tube 17 of the first form. In this construction the several tubes 23 first receive the water from the header 5 so that it passes through these in a plurality of streams and it returns through the tube 24. The latter has a cross sectional area equal to, or slightly greater than the combined cross sectional areas of the tubes 23. In this form of the invention, by reason of the shape of the tubes, there is a greater heating surface of each tube compared with the volume of water passing therethrough, than in the first form of the invention. The form shown in Figure 5 may be preferable where the volume of hot water required is less, or where the temperature of the hot water is to be greater than if the first form of the device were used.

Having described my invention, what I claim is:

1. A water heater of the type set forth comprising a plurality of spaced headers, a series of relatively small tubes, a common return tube of larger diameter than said first tubes, said several tubes being connected at opposite ends to said headers whereby the water flows first through said smaller tubes and returns in a common stream through said larger tube.

2. A water heater of the type set forth, comprising a plurality of spaced headers, a series of relatively small tubes, a common return tube having a cross sectional area corresponding substantially with the combined cross sectional areas of said first tubes, all of said tubes being connected at opposite ends to said headers, whereby the water flows first through said first tubes and returns in a common stream through said larger tube.

3. A water heater of the type set forth, comprising a plurality of spaced headers, a series of relatively small tubes, a relatively larger tube, said smaller tubes being arranged around said larger tube, all of said tubes being connected at opposite ends to said headers whereby the water flows first through said smaller tubes and returns in a common stream through said larger tube.

4. A water heater of the type set forth, comprising a plurality of spaced headers, a series of relatively small tubes, a larger, return tube having a cross sectional area substantially corresponding with the combined cross sectional areas of said smaller tubes, said smaller tubes being arranged around and adjacent to said return tube, all of said tubes being connected at opposite ends to said headers whereby the water flows first through said smaller tubes and returns in a common stream through said larger tube.

5. A water heater of the class set forth, comprising a plurality of spaced headers each having a collecting chamber, a series of relatively small tubes connected at opposite ends with said headers and communicating with the collecting chambers of both headers, a common return tube of larger diameter than said first tubes, said smaller tubes being grouped around and lying adjacent to said larger tube, said return tube being connected between said headers and communicating with the collecting chamber of one of said headers whereby the water flows first through said smaller tubes and returns in a common stream through said larger tube.

6. A water heater of the type set forth comprising a plurality of spaced headers, a series of relatively small tubes of oblong cross section, a relatively larger tube of oblong cross section around which said smaller tubes are arranged in close relation, all of said tubes being connected at opposite ends to said headers, whereby the water flows first through said smaller tubes and returns in a common stream through said larger tube.

7. A water heater of the type set forth comprising a header having spaced inner and outer annular walls forming a collecting chamber between them, end walls for closing the ends of said chamber, one of said end walls having a central outlet aligning with the bore of said annular inner wall and the other end wall having apertures therein, a second header having a collecting chamber including an end wall having apertures aligning with said apertures in said first header, tubes of relatively small diameter connected with the apertured walls of both headers, a tube of relatively larger diameter connected with the inner, annular wall of said first header and the apertured wall of said second header, the water in said collecting chamber being adapted to flow first through said tubes of relatively small diameter and to return in a common stream through said tube of larger diameter.

Signed at the city, county and State of New York the 11th day of November, 1927.

ALFRED H. HOADLEY.