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H. J. LONG

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WATER HEATER

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Fig. I.

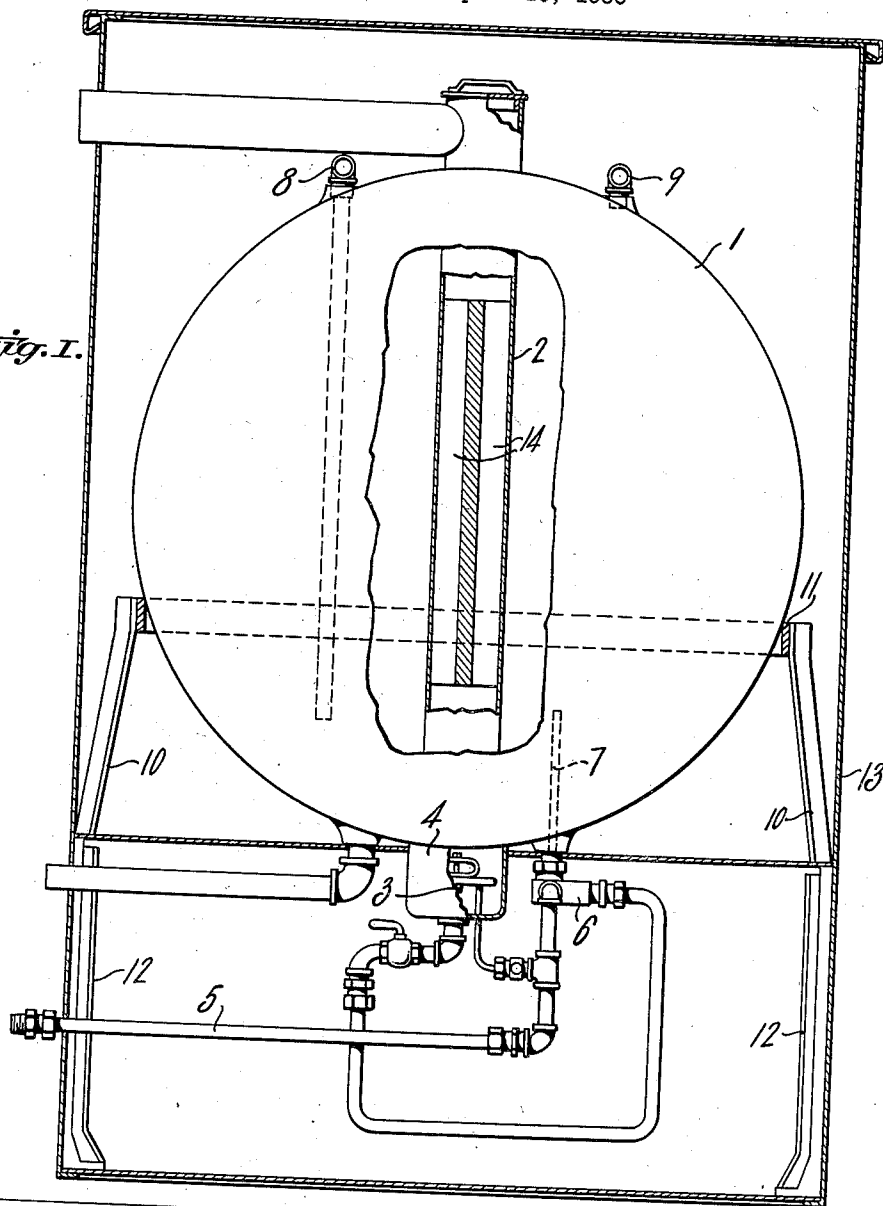


Fig. II.

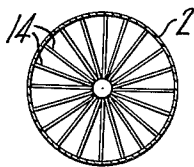
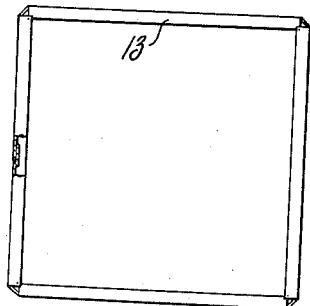


Fig. III.

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WATER HEATER

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2 Claims. (Cl. 122—156)

This invention relates to water heaters and particularly to water heaters of the type in which water in a storage tank is heated by means of products of combustion passing through or by means of combustion within a flue extending through the tank.

Water heaters of this type have an obvious advantage over water heaters commonly known as the bottom boiler type in which heat is supplied directly to the bottom of the storage tank, in that the heat absorbing surface being vertically disposed does not become covered with sediment which interferes with the transfer of heat to the water. They also possess an obvious advantage over water heaters of the type commonly known as side arm heaters in which a heating unit separate from the tank and connected thereto by suitable pipes is employed. The internal flue type obviously avoids the external heating unit and the additional piping and connections which such a structure involves.

On the other hand the side arm heater possesses an advantage over the internal flue type in that the circulation of water through the heating element is superior to the circulation over the heat absorbing surface of the internal flue. This is due to the fact that in the side arm heater, the heating unit is usually placed below the tank with the hot water inlet therefrom leading to the upper portion thereof and the cold water inlet leading to the lower portion thereof. Circulation through the heating unit is due to the difference in weight of the two columns of liquid so formed and it will be seen that the length of these columns is at least equal to the length of the tank.

In the internal flue type circulation of water over heat absorbing surface is effected solely by convection. The hot water immediately surrounding the flue tends to rise to the top of the tank, and produces some of the scouring action over this surface which is essential if good conduction of heat therethrough is to be obtained. The forces effecting this scouring action are, however, very small and it will be seen that in normal constructions they are far less effective than the scouring action of the water flowing through the heating coil of the side arm type heater.

It is a principal object of this invention to so improve the circulation within the tank of the internal flue type heater that in operation eddy currents will be set up which will provide continuously a scouring action over the flue surface within the tank, thereby greatly improving the transfer of heat therefrom. To this end I

employ in heaters of this type a tank which is spherical or substantially spherical so that currents set up initially by convection will continue to rotate within the tank without interference from the side walls thereof.

It is among other objects of this invention to provide a compact structure with pleasing external appearance which because of its low height may be positioned in a place no greater than that required for a kitchen range and therefore may be conveniently placed in the average kitchen without interference with the usual furnishings thereof.

The above and other objects and features of this invention will in part be further explained and in part be obvious to those skilled in the art from the following detailed description taken in conjunction with the accompanying drawing in which Fig. I illustrates a longitudinal section through a water heater constructed in accordance with this invention, parts being shown in side elevation; Fig. II illustrates a transverse section through the flue taken on line 2—2 of Fig. I; and Fig. III is a top view on a reduced scale of the sheet-metal, single-piece jacket.

Referring to the drawing, reference numeral 1 indicates a storage tank which as shown is of spherical construction having a central flue 2 extending vertically therethrough. Beneath the lower end of the flue the burner 3 is positioned in a closed chamber 4 which may be a continuation of the flue itself projecting below the tank. Fuel is supplied to the burner 3 by means of a supply pipe 5, the flow through which is controlled by the usual thermostatic valve 6, the element 7 of which projects into the lower portion of the tank. A cold water inlet 8 and a hot water outlet 9 are provided in accordance with conventional practice in such positions that cold water is supplied to the tank at the point adjacent the bottom thereof and hot water is conducted from the tank at a point adjacent the top thereof.

The tank is supported by a bracket structure 10 carrying band 11 surrounding the tank at a point somewhat below its greatest diameter. The bracket 10 is supported by standards 12, thus providing a support for the tank and associated burner which is entirely independent of an external casing 13. The casing 13 may therefore be made of relatively light sheet metal which is preferably formed from a single sheet bent to conform to the supporting structure and completely enclosing all parts of the heater.

In the operation of the device so far described

when the heater is started from cold the thermostatic valve 6 permits the flow of gas to the main burner 3, this burner being lighted by the usual pilot. The hot gases of combustion rise vertically through the flue 2, and the outer or water surface of this heats an annular column of water in the zone immediately surrounding the flue. This column tends to rise to the top of the tank. At the top it is deflected outwardly and gradually downwardly along the interior wall of the tank, and this wall has no sharp corners such as are present in conventional cylindrical tanks to break or interfere with this flow. The inertia of the moving water causes it to continue downwardly for some distance, forcing the cold water around the lower portion of the tank downwardly and inwardly toward the flue. As the heating continues, the eddy current so set up becomes cumulative and a relatively rapid flow of liquid over the surface of the flue 2 is effected, thus providing a scouring action over this surface which prevents the accumulation of bubbles and other skin effects which normally interfere with the transmission of heat through such surfaces. This eddy current also tends to equalize the temperature throughout the tank, so that while temperature at the top of the tank is normally higher than at the lower portion thereof, it will not be heated to excessive temperature while the water in the lower portion of the tank remains relatively cool. Because of this action the thermostat 7 may be set to operate valve 6 at somewhat higher temperature than is normal for heaters of this type, and the entire capacity of the tank will be effective in the storage of a relatively large quantity of water at a temperature desirable for domestic use.

In order to insure that the heat of the burner is fully absorbed by the walls of the flue this element is preferably constructed as a single casting having a plurality of inwardly extending, centrally united fins or as a built-up flue having such fins welded or brazed to the outer ring, as shown in Fig. III.

It will be obvious to those skilled in the art that in addition to the advantages above described,

water heaters constructed in accordance with the present invention possess a number of other desirable features. For example, the construction results in a heater of relatively low height, which compares to that of the average kitchen range and may conveniently be placed adjacent thereto. The broad, flat top then provides a convenient range table, thus conserving the kitchen space.

It will also be obvious that where a spherical tank is used as above disclosed, the volume per unit depth of the water surrounding the flue is greatest in the mid-portion of the tank, and that above the mid-portion the volume per unit depth decreases progressively. It will also be obvious that the flue 2 is so constructed as to be capable of transmitting heat equally throughout its length.

While there has been herein described but a single embodiment of my invention, other embodiments within the scope of the appended claims will be obvious to those skilled in the art.

Having described my invention, what I claim is:

1. In a water heater, a storage tank, a flue extending therethrough and in direct contact with the liquid contents of said tank throughout substantially the length of the tank, means to heat the internal surface of said flue, the upper interior wall of said tank curving outwardly and downwardly from said flue and the lower interior wall of said tank curving outwardly and upwardly from said flue to provide a smooth continuously curving surface free from obstruction to the convection currents set up around said flue.

2. In a water heater, a storage tank, a flue extending therethrough and in direct contact with the liquid contents of said tank throughout substantially the length of the tank, means to heat the internal surface of said flue, said tank being substantially spherical and said flue extending vertically therethrough whereby the interior wall of said tank provides a smooth continuously curving surface free from obstruction to the convection currents set up around said flue.

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