June 7, 1932. W. T. ROWE 1,862,065

ELECTRIC WATER HEATER

Filed July 9, 1930

Fig. 1.

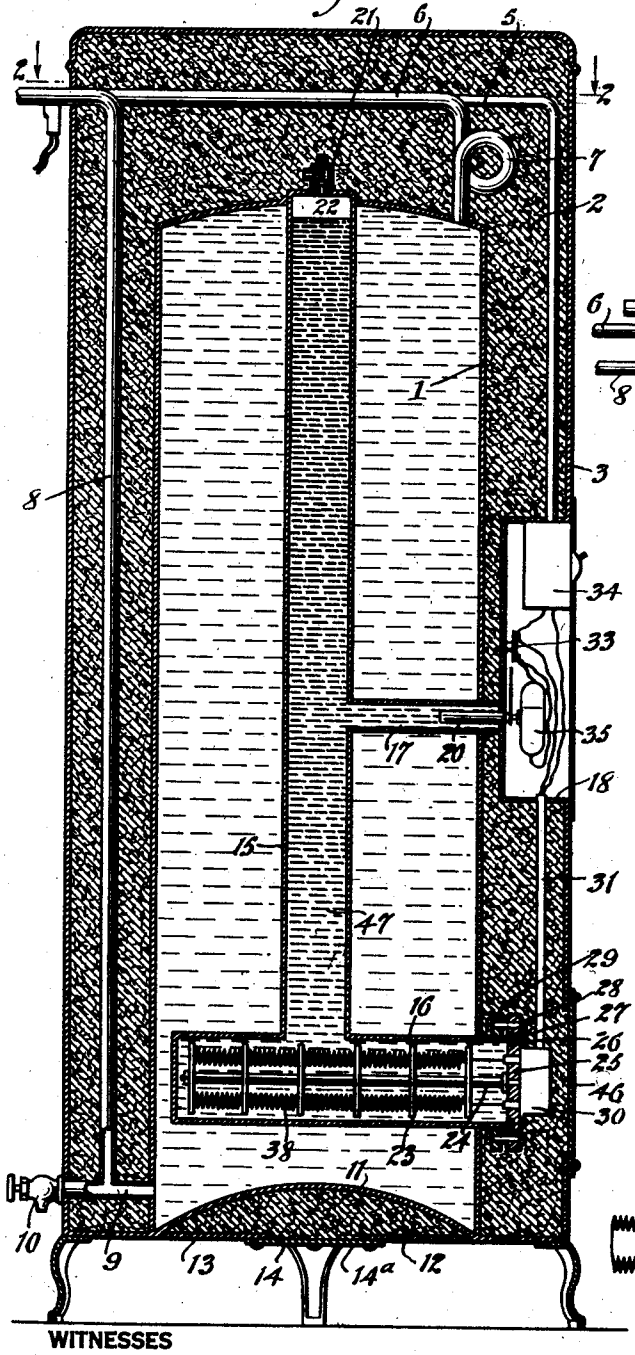


Fig. 2.

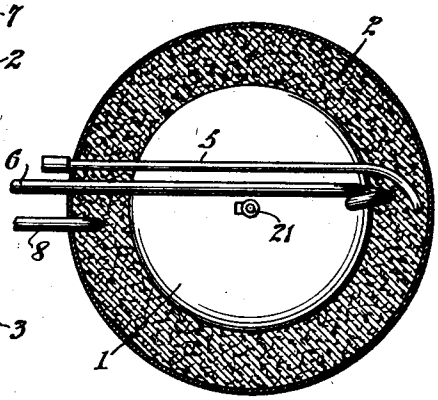
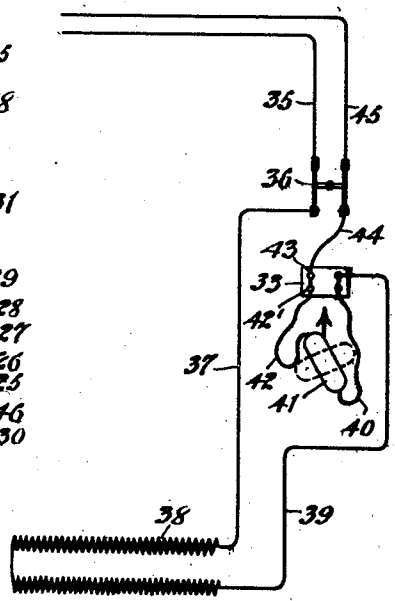


Fig. 3.



WITNESSES

Edw. Thorpe

A. L. Kitchin

INVENTOR

Walter T. Rowe

BY

ATTORNEY

Patented June 7, 1932 1,862,065

UNITED STATES PATENT OFFICE

WALTER T. ROWE, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO ELECTRO-MATIC MFG. CO. INC., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY

ELECTRIC WATER HEATER

Application filed July 9, 1930. Serial No. 466,822.

This invention relates to electric water heaters and has for an object to provide an improved construction wherein there is practically no loss of heat except through the discharge of water, the parts being so formed and insulated as to hold the heat against dissipation for a comparatively long time.

Another object of the invention is to provide an electric hot water heater wherein the heating unit is readily removable and associated with means for distributing the heat throughout the length of the boiler.

A further object of the invention is to provide an electric hot water heater including an elongated boiler having a tube extending from adjacent the top to adjacent the bottom and merging into an enlargement or container at the bottom adapted to receive an electric heater, the container and tube being adapted to carry oil so that heat from the heating unit may be distributed throughout the length of the boiler.

A further object more specifically is to provide a hot water boiler with an insulating covering of appreciable thickness and with the hot water lead out pipe embedded in the insulating material and formed with a turn or coil for preventing radiation of heat through the lead out pipe.

In the accompanying drawing:

Figure 1 is a longitudinal vertical sectional view of an electrically heated hot water boiler, the same disclosing an embodiment of the invention;

Fig. 2 is a sectional view through Fig. 1, approximately on the line 2—2;

Fig. 3 is a diagram showing an electric circuit used in the structure illustrated in Fig. 1.

Referring to the accompanying drawing by numeral, 1 indicates a boiler which may be of any size and shape but preferably is tubular and appreciably longer than its diameter. Surrounding the boiler 1, is a comparatively thick layer of insulating material 2. This insulating material may be asbestos, fiber, or any other desired insulating material which will last an indefinite time. An outside shell 3 covers the heat insulating covering 2, said shell being provided with a removable cap 4 secured in place in any desired manner, as, for instance, by screws. It will be noted that the distance between the top of the boiler 1 and the cover or cap 4 is greater than the distance between the boiler and casing or at any other point. This is in order to accommodate an electric cable 5 and also an outlet hot water pipe 6. The pipe 6 is provided with at least one turn 7, whereby a trap is provided so that there will be practically no radiation of heat through the pipe 6, but a free flow of water is naturally permitted, as the pipe 6 is connected to the top of the boiler 1. An inlet pipe 8 enters near the point where the pipe 6 extends through the casing and then extends downwardly through the center of the insulating material 2 until it merges into the pipe 9. The pipe 9 extends from the boiler 1 near the bottom to a point exterior of the shell or casing 3, whereby water may freely enter the boiler through the pipe 8 when the water pressure is turned on, and when the water pressure is turned off water may be readily drained from the boiler 1 through the valve 10. This arrangement also permits the boiler 1 to be easily cleaned. For instance, when the water is turned off by a valve (not shown) water in the boiler 1 may be drained off through the valve 10. After this has been done, the valve 10 may be closed and the water again turned on quickly so that it may violently enter the boiler 1 and wash the bottom, stirring up the sediment, so that when the water is again turned off, the sediment and water just inserted may be drawn off through the valve 10. When the expression "water" is used in the specification and claims, it is to be understood that this term will include any liquid.

Preferably the boiler 1 is provided with an upwardly bowed bottom 11 so that a supply of heat insulated material 12 may be used and held in place by a suitable plate 13. An opening 14 is provided, said opening being normally closed by a removable plate 14*a*. In this way, the entire surface of the boiler 1 is covered by insulation of an appreciable thickness so that there will be practically no dissipation of heat through radiation.

In order to heat the water in the boiler, a tube 15 preferably of some appreciable diameter is provided and this tube merges into an enlargement or container 16 near the bottom of the boiler. The enlargement 16 may be in the form of a tube with one end extending through the boiler 1 and to which it is secured by welding. A branch pipe 17 is connected to the pipe 15 at a desired point and extends also through the boiler to which it is welded. The pipe 17 extends to a metal box 18 to which it is preferably welded, although not necessarily so. However, the connection is oil-tight, and the casing or box 18 is provided with an opening 19 through which a thermostat 20 is adapted to extend. The detail construction of the thermostat 20 and its connection to the box 18 is old and therefore forms no part of the present invention. However, it is to be noted that the parts are connected so that oil cannot pass through the pipe 17 to the box 18.

The upper end of the pipe 15 preferably extends a very short distance through the upper end of the boiler 1 and is welded thereto. An outwardly opening check valve 21 is connected with the upper end of the pipe 15 so that when too much pressure is created in the pipe 15, the oil escapes past the valve 21 into the packing 2. Usually there is just sufficient oil to fill the pipe 15 and associated parts, with a small vacuum space 22 left to take care of expansion. However, in case the oil should be heated excessively and expansion should be great, the valve 21 affords a ready relief so that no damage will be done.

Arranged in the enlargement or container 16 is an electric heating element 23, which may be of any desired or preferable type. This heating element is mounted on a standard 24 rigidly secured in any desired manner to the metal plate 25, which is really a cap fitting over the end of the container 16. Preferably the end of the container 16 is annular and the cap 25 is provided with an annular groove 26 carrying a lead washer 27 which is pressed tightly against the end of the container 16 through the action of bolts 28 pulling the cap 25 into position. The flange 29 may be formed in any desired manner, but preferably the end of the container 16 is threaded exteriorly and the flange 29 is threaded interiorly and screwed onto the end of the container so as to present a flange for accommodating the bolts 28. A suitable cap or box 30 is provided, said box being hollow and adapted to receive the terminals of the heating element 32, which terminals are connected to wires in a cable 31, and these wires are connected to an electric connecting box 33 which in turn is connected to the hand switch 34 and to the automatic switch 35. The automatic switch 35 is an old structure as far as this invention is concerned and therefore forms no part of the invention except in combination.

From the hand switch 34, the supply wires are arranged in the cable 5 and extend to a suitable point to be connected to suitable bus wires carrying current. As shown in Fig. 3, the current may enter through wire 35, for instance, pass through the hand switch 36, and then through wire 37 to the winding 38 of the heating element 23. From the winding 38, a wire 39 extends to one binding post of the box 33, and this binding post is connected to a second binding post carrying a wire 40, which wire is connected to one end of the automatic switch member 41. This member consists generally of a glass tube partly filled with mercury and connected to the thermostat 20 so that when the thermostat 20 is heated to a certain extent, it will rotate the member 41 to an opposite angle to that shown in Fig. 3, whereupon the circuit will be broken within the member 41 and will remain broken as long as the thermostat 20 holds the member 41 in the dotted position shown in Fig. 3. A wire 42 extends from one end of the member 41 to a binding post 42.' This binding post is also connected with a binding post 43. A wire 44 extends from the binding post 43 to the switch 36 and a suitable lead out wire 45 completes the circuit to the supply. It is, of course, evident that some other form of manually actuated switch may be used and also some other form of automatically actuated switch may be used, but these have been shown in order to indicate how the device acts automatically and also how the device may be controlled manually.

When the heating element 23 burns out and a new one is necessary, the plate 46 may be removed and then part of the packing and finally the plate 25 together with the heating element. A new element is then substituted and the packing and plate restored, the heater then being in condition for further action.

It will be noted that the pipe 15, container 16 and pipe 17 are all filled with oil 47 so that when current is supplied to the heating element 23, the heat will be circulated or dissipated through the oil and thence through the walls of the members 15, 16 and 17. In this way, the heat is dissipated into the water over a large surface and throughout substantially the entire length of the boiler.

When the device is to be installed, the pipes 6 and 8 are connected up to the usual water system, the pipe 8 being connected to the water supply system while pipe 6 is connected to the hot water distributing system. The wires in the cable 5 are connected to a suitable source of current and then the water is turned on to the boiler. A soon as the boiler has been filled with water, the switch 34 may be turned on and the water will be heated in due time.

When the water reaches a certain temperature, as, for instance, 150°, the thermostat will rotate the switch member 41 and thus open the circuit. If no hot water is drawn off, the temperature will remain around 150° for quite a long time by reason of the heat insulation 2. When the temperature of the water is lowered several degrees, the thermostat 20 will move gradually backward and permit the circuit to be closed by the member 41, whereupon current will be again supplied to the heating unit 23. As soon as the water has reached the desired temperature, as, for instance, 150°, the thermostat 20 will again turn off the current. It will be evident that the current may be turned off manually at any time by the proper actuation of the switch 34.

The device may be connected to any suitable electrical supply but it is aimed to be used in connection with electrical supply wires which sometimes carry a heavy load and sometimes a light load commonly known as an off-peak load. By providing a proper automatic clock mechanism now on the market, the current may be automatically turned on at the off-peak load time and turned off at the beginning of the high-peak load time. In this way current is being used only during off-peak load time and, consequently, in most places the cost of electricity is much smaller than were the current on high-peak load time period. By reason of the extra heavy insulation this may be done as the heat produced in the water is retained and unless drawn off will remain almost stationary for a long period of time, as, for instance, twelve to twenty-four hours. It is, of course, evident that current could be turned on to the device at any time and continually retained turned on as the automatic switch mechanism 41 would take care of the proper admission of the current to the heating unit 23.

What I claim is:

1. An electric water heater, including a boiler adapted to contain water, a substantially T-shaped oil-carrying container arranged within said boiler with the crosshead extending transversely of the boiler with one end of the crosshead extending through the boiler and a central post extending longitudinally of the boiler; an electric heating element arranged in the head of the T-shaped member, a removable cover by that part of the cross head that extends to the boiler, said cover being adapted to be removed for permitting insertion and removal of said heating element and means for turning on and off current to said heating element.

2. An electric water heater, including a boiler adapted to contain water, an inlet pipe for directing water to the bottom of the boiler, an outlet pipe connected to the upper end of the boiler, said outlet pipe having a loop therein near the boiler, a layer of heat insulation covering said boiler, said loop and part of the inlet pipe, and means including an electric heater for heating the water in said boiler, said loop in said outlet pipe trapping the hot water in the boiler against radiation through the outlet pipe.

3. An electric water heater, comprising a boiler member adapted to contain water, a tube extending from the top of the boiler to near the bottom, a container merging into said tube at the lower end thereof, said container having a tubular outlet extending through the boiler, a heating element fitting into said container, said heating element being provided with a cap fitting against said tubular outlet for closing the same, a heat distributing liquid arranged in said tube and said container, and means for supplying electricity to said heating element.

4. An electrically heated hot water heater, including a boiler adapted to contain water to be heated, a container arranged adjacent the bottom of the boiler, said container extending through one of the side walls of the boiler for providing an inlet, a hollow member extending upwardly from said container, said hollow member being provided with a branch extending through the side wall of the boiler at a point above the container, an electric heating unit normally positioned in said container, said heating element being provided with a cap acting to close said inlet, said container, hollow member and branch being filled with oil, a thermostat extending into said branch and heated by oil therefrom, and a switch controlled by said thermostat for turning on and off current to said electric heating unit.

5. An electric water heater, including a boiler adapted to contain water, a container arranged adjacent the bottom of the boiler, said container being provided with an outlet extending through the boiler, a hollow member extending upwardly from said container, said hollow member and container being adapted to be filled with oil, a heating element fitting into said container and movable through said outlet to be placed in position or removed, said heating element having an end acting as a cap for said outlet, and means for turning on and off current to said heating element.

6. An electric water heater, including a boiler, adapted to contain water, an oil-filled container arranged in the lower part thereof, formed with a hollow upwardly-extending portion, said container having a part extending transversely of the boiler near the bottom thereof and positioned so that one end of said part will extend through the wall of the boiler, an electric heating unit positioned in said container formed with a cap for closing the end of the container extending through the wall of the boiler, and means for supplying said unit with current.

7. An electric water heater, including a boiler, a heating chamber arranged in the boiler and extending therefrom at one point, a heating unit arranged in said chamber, an end plate secured to said heating unit and acting as a cap for that part of the chamber extending through the boiler, said cap having an annular groove, a gasket arranged in said groove, means for clamping said cap and gasket against said chamber, and means for supplying said heating unit with current.

8. An electric water heater, including a boiler, a covering of heat insulating material positioned to cover the boiler, a box submerged in said covering material, a liquid-carrying tubular member arranged within the boiler, an electric heating member arranged in said tubular member, said tubular member having a branch extending to said box, a thermostat carried by said box and extending into said branch, a switch actuated by said thermostat, means for connecting said switch with said heating element, and means for connecting said switch with a source of current.

9. A water heater, including a boiler, a covering of insulating material for the boiler, a metal outer shell for holding the insulating material in place, a pipe extending from near the bottom of the boiler through the boiler, insulating material and outer shell, a valve arranged at the outer end of said pipe, a water inlet pipe positioned between the boiler and the outer shell connected with said first pipe between the ends thereof, the upper end of said water inlet pipe extending through said shell near the upper end thereof, a hot water pipe extending from the upper end of said boiler through said insulating material and outer shell, a heating element arranged in said boiler, and means for causing said heating element to function.

10. A hot water heater, including a boiler, a tubular member extending from the top to near the bottom, a tubular member arranged adjacent the bottom and merging into the first-mentioned tubular member and extending laterally through the boiler, said tubular members being adapted to carry an oil, an electric heater formed with a plate at one end, said heater being adapted to fit into said last-mentioned tubular member while the plate fits against the end thereof, means for rigidly clamping the plate against the end of the last-mentioned tubular member, and means for directing electricity to said electric element, said means including an automatically actuated switch for turning on and off the current and a manually actuated switch for turning on and off the current.

11. An electric liquid heater comprising a boiler adapted to contain liquid, a T-shaped container positioned with the head thereof adjacent the bottom of said boiler and extending transversely thereof, one end of said head extending through the walls of the boiler, said last mentioned end having a removable cover, a heating element fitted into said head, said heating element being removable through said end and means for supplying electricity to said heating element.

12. An electric liquid heater comprising a boiler, a container positioned interiorly of the boiler and formed with a primary chamber adjacent the bottom of the boiler and a secondary chamber extending upwardly from the primary chamber, an oil filling said container, an electric heating element positioned in said primary chamber and substantially filling the same, and means for supplying current to said electric heating element, said means including a manually actuated switch and a thermostatically actuated switch.

13. An electric liquid heater including a boiler, a substantially T-shaped oil carrying container arranged within the boiler, the post of the T-shaped container extending for almost the full length of the boiler while the head extends transversely of the boiler at a point adjacent the bottom thereof, an electric heater arranged in said head, means for supplying current to said heater, a thermostat extending from a point exterior of the boiler into communication with the container and a switch operated by said thermostat, said switch being interposed in the means for supplying current to said heater.

WALTER T. ROWE.