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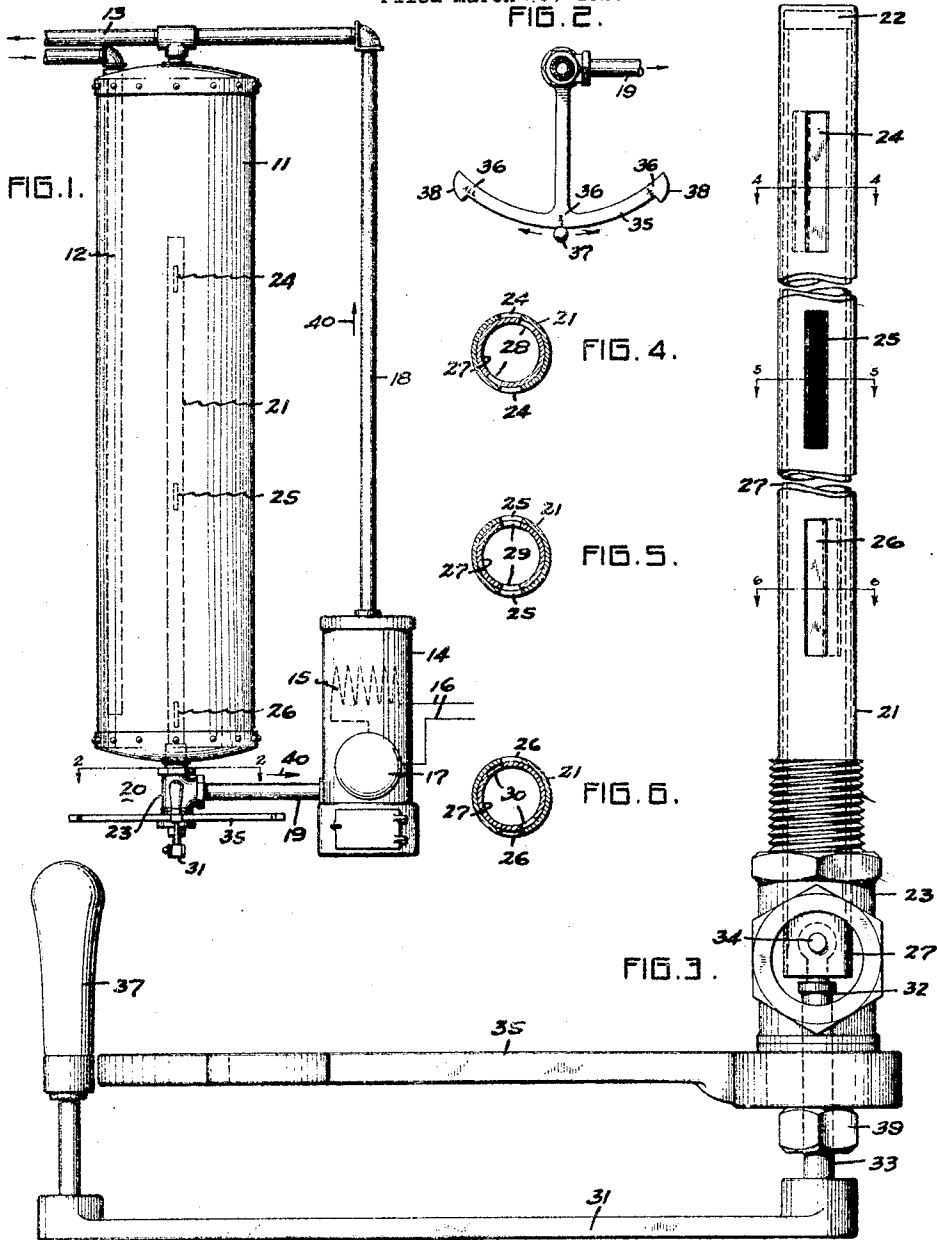
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WATER HEATER

Filed March 26, 1923

FIG. 2.



WITNESS:

H. Sherburne.

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UNITED STATES PATENT OFFICE.

ARTHUR J. KERCHER, OF BERKELEY, CALIFORNIA.

WATER HEATER.

Application filed March 26, 1923. Serial No. 627,662.

To all whom it may concern:

Be it known that I, ARTHUR J. KERCHER, a citizen of the United States, and a resident of the city of Berkeley, in the county of Alameda and State of California, have invented a new and useful Water Heater, of which the following is a specification.

This invention relates to a system for heating water, and more especially to a system adapted for domestic use, and incorporating a tank in connection with a gas burner or an electrical heating element or the like.

In such systems it is common to provide for an automatic temperature control, so that when the water reaches a certain temperature, the heating element is rendered inactive. As ordinarily installed, systems of this character act to bring all the water to the desired temperature before the temperature control operates. It very often happens however, that only a relatively small amount of stored heated water is necessary. For example it may be that substantially during the entire day, hot water is needed merely for washing dishes or for washing the face and hands occasionally. On the other hand, in the morning it may be advisable to have a large quantity of hot water on hand so that a bath may be taken. On occasional days, a large quantity may be needed for the laundry throughout a large portion of the day. With prior systems however, it has been impossible to vary the quantity of water which is maintained hot by the heater. Thus a great waste in heat energy results, since the thermal control does not function until all of the water in the tank is at the desired temperature, irrespective of the amount which is actually needed.

It is one of the objects of my invention to make it possible to maintain only a fraction of the water in the tank at the desired temperature, whenever the demand is low.

It is a matter of common observance, in connection with water heaters, that the water in a tank does not heat uniformly, but instead, hot water collects first at the top, and gradually extends clear to the bottom of the tank if the heating is sufficiently prolonged. With my invention it is possible to set a limit on the amount of hot water which collects at the top of the tank. Stated in another way, therefore, an object of my invention is to provide a variable

limit to the amount of hot water that collects at the top of the tank.

In order to secure this result, I employ a valve device that may be operated at will to permit circulation of any desired amount of water at the top of the tank, through the heater. It is thus another object of my invention to provide a valve that controls the portion of the volume of the tank which is placed in circulating relationship with the heater.

My invention possesses other advantageous features, some of which with the foregoing will be set forth at length in the following description, where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. Although I have shown but one embodiment of my invention in the drawings, I do not desire to be limited thereto, since the invention as expressed in the claim may be embodied in other forms also.

Referring to the drawings:

Figure 1 is a diagrammatic elevation of a water heating system embodying my invention;

Figure 2 is a view taken from the section plane 2—2 of Fig. 1, and illustrating the manner of adjustment of the tank volume that is placed in circulating relation with the heater;

Figure 3 is an elevation of the valve structure on an enlarged scale, and

Figures 4, 5, and 6 are sectional views along the planes 4—4, 5—5, and 6—6 of Fig. 3, and illustrate the operation of the valve.

In Figure 1 I have for the sake of convenience shown a conventional water tank 11 having the usual inlet pipe 12 and the outlet pipe 13. Of course other types of tanks may be used. The inlet pipe 12 is adapted to be connected to any appropriate source of water supply, while the outlet pipe 13 may lead to any desired points of distribution for the hot water. The inlet pipe 12 as is customary may extend from the top of tank 11 down to nearly the bottom so that cold water will be introduced at this latter point.

A heater 14, shown as electrically operated, is connected to the tank 11 so as to heat the water from the tank. An electrical heating element 15 is diagrammatically

shown in connection with heater 14, and is adapted to be supplied from any appropriate source of electrical energy, as by the leads 16. A thermostat 17 is arranged to control the heating so that the heating circuit is interrupted at a predetermined high temperature attained by the water circulating through heater 14, and is closed again at a predetermined low temperature. The heater 14 is connected by pipe 18 to the top of tank 11, and the other side of the heater is connected, as by pipe 19, to an adjustable limit valve 20.

This valve is so arranged that it may connect the heater 14 to the interior of the tank at a point relatively near the top of tank 11, or optionally at other points at varying distances from the top. Thus for example if the valve 20 is so adjusted that the heater pipe 19 is in communication with the tank 11 at a point say one third of the total length of the tank from the top, then substantially only the water in the top third of the tank will circulate through the heater 14, and only that amount of water will be heated to the desired temperature. On the other hand, by adjusting the valve 20 so that the heater pipe 19 is in communication with a lower point of the tank 11, a proportionately greater portion of the water in tank 11 will be maintained at the desired temperature by the thermostat control. The valve 20 may finally be so adjusted that the pipe 19 is placed in communication with the bottom of tank 11, and substantially all of the water will be maintained at the desired temperature. In this way it is possible to maintain only that amount of water heated which is needed, and there is no substantial waste of energy due to unnecessary heating of a larger amount of water.

Although the valve 20 may take many optional forms while still performing its desired function, I prefer to employ the form shown, because it is simple and inexpensive to manufacture. It comprises a tube 21 that may be fastened into the bottom of tank 11 and that extends upward toward the top of the tank. This tube is closed at the top by a plug 22 as shown in Fig. 3, and at the bottom it communicates with pipe 19, as by the aid of the T fitting 23. A plurality of apertures 24, 25, and 26 are cut in the tube 21 at varying levels or heights. It is evident that by closing all apertures except one, an amount of water will circulate through the heater 14 which corresponds to the volume of the portion of the tank between the open aperture and the top of the tank. Thus if aperture 24 is open and the others closed, about one third of the water in tank 11 will circulate through the heater 14, and if one of the lower apertures 25 or 26 is open, then proportionately more water will circulate. The

direction of circulation is indicated by the arrows 40, and the circulation may be traced from the tank 11, through pipe 21, to heater 14, back to tank 11 via pipe 18.

To control the opening and closing of apertures 24, 25, and 26 in a simple and convenient manner, I provide a rotatable sleeve valve 27, in this instance located within the tube 21 and having a rotatable fit therein. This sleeve valve 27 has a series of openings 28, 29 and 30 which are adapted to be brought into registry respectively with apertures 24, 25 and 26. It may be noted also, that these apertures may be multiplied so that at any given level more than one opening may be located. This is clearly shown in the sectional views, Figures 4, 5 and 6, in which a pair of openings are indicated for each level, arranged diametrically opposite to each other in the tube 21.

The apertures 24, 25, and 26 are so located angularly with respect to the valve openings 28, 29, and 30 that by rotating the sleeve member 27 any one set of them may be opened while the others are kept closed. For rotating the sleeve valve 27 in relation to the tube 21, a handle 31 may be provided, which is mechanically connected to the bottom of the sleeve 27, as by the aid of the rod or shaft 32. This shaft is journaled in one of the branches of the T fitting 23, and extends downwardly exteriorly of tank, so as to offer a projection 33 to which the handle 31 may connect. A pin 34 is used to secure the shaft 32 to the sleeve 27.

In order to guide the manipulator to perform the proper setting of the sleeve 27, I preferably provide a segment 35, shown most clearly in Fig. 2, along which indicia 36 are marked for cooperating with the projecting grip 37 of the handle 31, and for indicating which of the apertures 24, 25 and 26 is open. Thus in the position illustrated, the aperture 25 is open, and apertures 24 and 26 are closed. Therefore the water in the top two thirds only of the tank 11 will be heated. By moving the handle 31 to the right, aperture 25 will be closed and aperture 24 opened, and the water in the top one third only will be heated. By moving the handle 31 to the left, aperture 26 will be open and the others closed, and substantially all of the water in the tank will be heated. Stops 38 formed on the segment 35 may be provided to limit the throw of sleeve 27. This segment may be supported in any appropriate manner; in the present instance it is shown as fastened to the bottom of the T connection 23 as by the aid of nut 39.

Although in the present instance only three sets of openings 24, 25, and 26 are shown, it is evident that any desired number may be provided, whereby the amount of water heated may be regulated by as small steps as desired.

I claim:

In combination, a tank for holding a liquid, an inlet pipe extending through the top of the tank and nearly to the bottom thereof, an outlet pipe connected to the top of the tank, a heater, a pipe from the top of the tank to the top of the heater, a tubular member extending through the bottom of the tank, up toward the top thereof, said member having a plurality of apertures at different levels communicating with the interior of the tank, a T connection at the bottom of the member, a pipe between the connection and the bottom of the heater, a thermostat associated with the heater to maintain the temperature of the liquid circulating therethrough between predeter-

mined limits, a rotatable sleeve within the tubular member and having apertures capable of alinement with those in the member, said apertures being so arranged that any one set may be alined rotatably by adjusting the sleeve, a shaft connected to the sleeve and extending through the T connection, a handle attached to the shaft, a segment cooperating with the handle to indicate which of the apertures are alined as regards their location below the top of the tank, and means for fastening the segment to the T connection.

In testimony whereof, I have hereunto set my hand.

ARTHUR J. KERCHER.