May 27, 1924. 1,495,658

R. L. WILKINSON

HEATER

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Fig. 1.

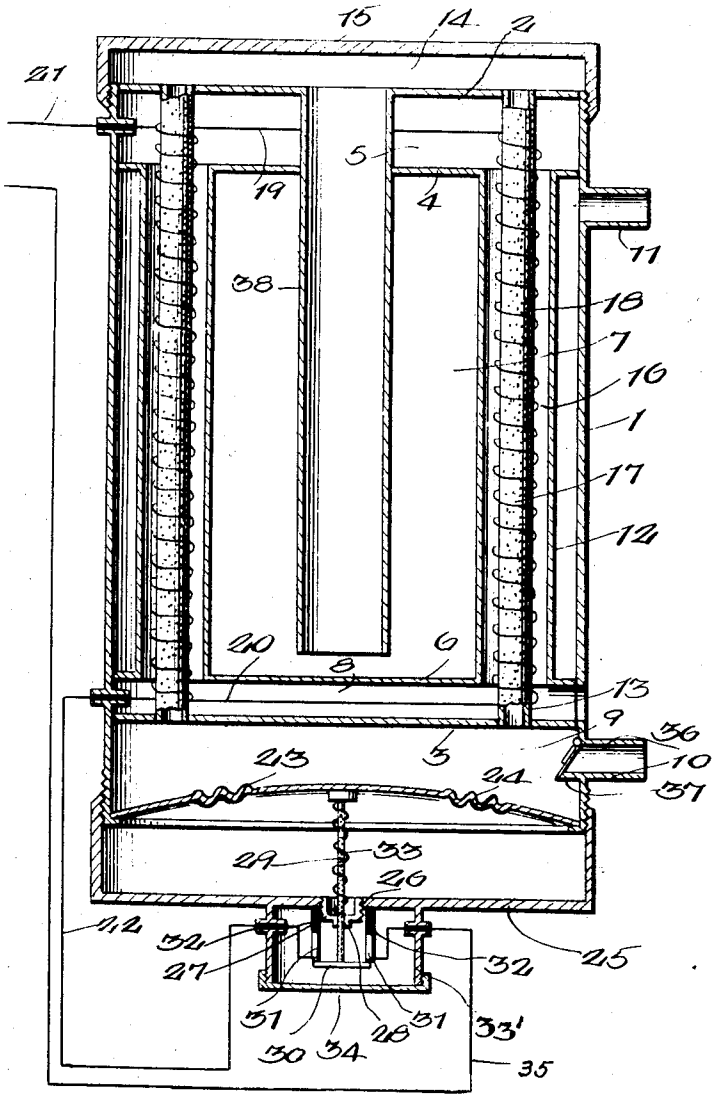
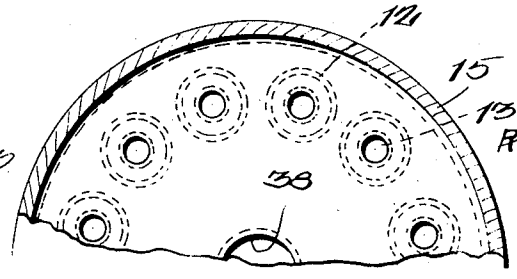


Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

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HEATER.

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To all whom it may concern:

Be it known that I, RUFUS LESTER WILKINSON, a citizen of the United States, and resident of Amarillo, in the county of Potter and State of Texas, have invented certain new and useful Improvements in Heaters, of which the following is a specification.

My invention relates to heaters of that class in which water or other fluid to be heated is brought into heat absorbing relation to an electric heating element, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a heater of the character described which is adapted to heat a fluid during its passage through the heater and which includes an electric heating element and means operating while the pressure within the heater is less than a predetermined pressure to maintain an electric circuit for causing the energization of the heating element closed and to open the circuit upon the building up of pressure within the heater to the predetermined pressure, whereby deenergization of the heating element results from the cutting off of water from the heater.

A further object of my invention is to provide a device of the character described comprising novel means for controlling the circuit for supplying electric current to the heating element.

A still further object of my invention is to provide a heater of the character described which is of simplified construction, includes no relatively moving parts disposed within the heating chamber thereof, and is free from complicated valves, pistons and like arrangements, and which is consequently not likely to get out of order easily.

Other objects and advantages will be apparent from the following description, and the novel features of the invention will be particularly outlined in the appended claims.

My invention is illustrated in the accompanying drawings, forming a part of this application, in which

Figure 1 is a vertical sectional view showing a practical embodiment of the invention, and

Figure 2 is a fragmentary horizontal sectional view, showing a portion of the structure exhibited in Fig. 1.

In carrying out my invention, in the form now preferred by me, I provide a casing comprising a body 1 which is shown as being cylindrical but which may have any other suitable configuration in cross section, as will be understood from the following. The body 1 is closed at its one end by a head plate 2. A second head plate 3 is mounted within the body 1 adjacent to its other end. A partition plate 4 mounted within the body in parallel spaced relatively adjacent relation to the head plate 2 provides a space 5 at the one end of the body between the head plate 2 and the partition plate 4. A second partition plate 6 is mounted in the body 1 between the plate 4 and the head plate 3 and in proximity to the latter, thereby dividing the space within the body 1 between the partition plate 4 and the head plate 3 into a relatively large compartment 7 and a space or compartment 8 of considerably less area and located between the partition plate 6 and the head plate 3.

With the organization described so far, a space is provided within the body between the head plate 3 and the proximate end of the body, with which space an inlet in the form of a nipple or pipe connection 10 opening through the walls of the body 1 communicates. An outlet 11 also in the form of a nipple or pipe connection opens through the walls of the body 1 into communication with the compartment 7 at the end of the latter defined by the partition plate 4.

Spaces 8 and 5 are in communication with each other through a plurality of tubes 12 which extend through the compartment 7 between the partition plates 4 and 6 and open at their opposite ends through the latter. The tubes 12 are preferably arranged in a circular series concentric with the body 1, as shown in Figure 2, although the arrangement of the tubes 12 may vary from that shown without departing from the spirit and scope of the invention, as will be understood.

Extending through each of the tubes 12 in spaced concentric relation thereto is a tube 13 having its opposite ends opening through the head plates 2 and 3, respectively, and thus establishing communication between the space 9 and a space 14 at the

opposite ends of the body 1, which last named space is defined by the head plate 2 in conjunction with the wall of a screw cap 15 mounted upon the body 1. As illustrated to advantage in Figure 1, the outside diameter of each tube 13 is considerably less than the inner diameter of the tube 12 through which it extends, whereby an annular space 16 is provided within each tube 12 between the inner wall of the latter and the circumference of one of the tubes 13. Each tube 13 is provided with a covering 17 of a suitable insulating material. Resistance coils 18 are wound upon the insulating covering 17 of the several tubes 13 and are shown as being connected together in parallel at their ends by conductors 19 and 20, respectively, which extend within the spaces 5 and 8 and through the walls of the body 1 into union with conductors 21 and 22, respectively. The conductors 19 and 20 are insulated from the walls of the body 1 in any suitable known manner.

The space 9 is closed at the outer end thereof by a diaphragm 23 which is supported at its peripheral edge upon the inner wall of the body 1 at the one end of the latter and is shown as having concentric corrugations 24 therein. A cap 25 threadedly engaged with the body 1 at the end of the latter provided with the diaphragm has a central opening 26 formed through the head thereof and in this central opening is a hollow plug 27 provided with a central opening 28 through its head. A stem 29 extends from the outer face of the diaphragm 23 through the central opening 28 and in axial alignment with the diaphragm. The stem 29 is made of insulating material and carries at its outer end a contact 30 which is adapted to engage adjacent to its opposite ends with a pair of contacts 31—31 insulatingly supported upon the outer face of the head of the cap 25, as at 32. An expansion spring 33 coiled about the stem 29 reacts at its one end against the diaphragm 23 and at its other end against the adjusting plug 27 and thus tends to maintain the diaphragm 23 in position to hold the contact 30 against the contacts 31—31.

A tubular extension 33′ to the head of the cap 25 encircles the contacts 31—31 in spaced relation thereto, and is closed at its outer end by a head or cap 34 in threaded engagement therewith. The conductor 22 extends through the walls of the extension 33′, being insulated therefrom in any suitable manner, and is connected with one of the contacts 31. A conductor 35 is connected with the other contact 31 and extends through the walls of the extension 33′ for connection with any suitable source of electric current supply, none being shown. The conductor 35 is insulated from the walls of the extension 33 in any suitable known manner.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The body 1 is preferably disposed vertically with the head plate 2 uppermost and the inlet 10 is then connected with any convenient and suitable source of fluid supply, as to a water conduit. The outlet 11 is likewise connected with any suitable means for conducting fluid from the body 1 to any desirable place. It is to be noted at this point that a check valve 36 is associated with the inlet 10 so that water or other fluid is admitted freely to the space 9 within the body, but is prevented from passing from the space 9 into the inlet. In the embodiment of the invention illustrated, the check valve 36 is in the form of a flap valve hingedly attached at its upper end to an extension 37 extending inwardly within the space 9 from the inner end of the inlet 10, the extension 37 having an inclined or beveled inner end so that the valve 36 is normally actuated by gravity to remain in closed position.

Water or other fluid entering the space 9 passes from the latter through the tubes 13 into the space 14 and from the latter through the depending central tube 38 into the space 7. The tubes 13 extend through the space 7, as hereinbefore stated, and are heated by the resistance coils 18. The water or other fluid entering the space 7 comes into contact with the heating tubes 12 and is heated while passing from the discharge end of the tube 38 to the outlet 11.

The tension on the spring 33 may be adjusted by manipulating the adjusting plug 27 and is adjusted so that the pressure upon the diaphragm 23 occasioned by any given amount of fluid passing through the heater in the manner described will not be sufficiently great to flex the diaphragm 23 downwardly against the action of the spring and therefore the contact 30 will be held against the contacts 31—31 so long as water or other fluid is passing continuously through the heater. The conductor 21 is adapted to lead to or connect with any suitable source of electric current supply, and as stated, the conductor 35 is adapted for connection with the same source of electric current supply. It will be understood therefore that the circuit for energizing the resistance coils 18 will be closed so long as the contact 30 is in engagement with the contacts 31—31 and that therefore the resistance coils 18 will be energized as water or other fluid is passing continuously through the heater in the manner described. When the flow from the heater is stopped, pressure builds up within the heater and the diaphragm 23 is flexed downwardly against the action of the spring 33, the stem 29 moving in the guide plug 27. The contact 30 is moved out of engagement with the contacts 31—31 and the

resistance coil operating circuit will be opened. As soon as the flow of water or other fluid from the heater is resumed, the spring 33 will act to move the diaphragm 23 upwardly and thus effect closing of the circuit.

The device is simple in construction and includes no complicated valve, piston or other mechanisms, such as are usually found in like devices. In fact, there are no relatively moving parts disposed within the heating compartment or space of the device, the compartments or spaces 9 and 14 being merely header spaces, and as a result, a device embodying my invention is not likely to get out of order easily in the service for which intended. The heating of water or other fluid passing through the device is practically instantaneous and the heating coils may be renewed when worn out without any extended interruption to the service for which the device is provided and at a slight cost. The device is automatic in its action so that the turning on of means for drawing the water or other fluid from the heating chamber 7 will result in the closing of the circuit whereby an electric current is supplied to the resistance coils.

Obviously, my invention is susceptible of embodiment in forms other than that illustrated in the accompanying drawings, and I therefore consider as my own all modifications and adaptations of the form of the device herein disclosed which fairly fall within the spirit and scope of the appended claims.

Having thus described the invention, what is claimed is:—

1. In a heater, a liquid receiving compartment having spaced apart inlet and outlet connections and having a flexible bottom wall, an electric heating element arranged within the compartment for heating the liquid passing therethrough from the inlet to the outlet, an electric circuit for operating said heating element, yieldable means pressing said flexible bottom inward, and means connected with said flexible bottom for breaking said circuit when said bottom is flexed outward by pressure within said compartment.

2. In a heater of the character described, a compartment having a flexible bottom and being provided with spaced apart inlet and outlet ports each adapted for connection with a liquid conduit, an inwardly opening check valve controlling the inlet, means controlled by the flexible bottom for heating liquid passing through said compartment, said means being active when said bottom is flexed inward and inactive when the bottom is flexed outward, and springs means tending to hold said bottom in inwardly flexed position.

3. In a heater of the character described, a compartment having a flexible bottom and being provided with spaced apart inlet and outlet ports each adapted for connection with a liquid conduit, an inwardly opening check valve controlling the inlet, means controlled by the flexible bottom for heating liquid passing through said compartment, said means being active when said bottom is flexed inward and inactive when the bottom is flexed outward, spring means tending to hold said bottom in inwardly flexed position, and means for adjusting the tension on said spring means to vary the pressure at which the latter will yield to pressure within the compartment.

4. A heater comprising a casing having header spaces at opposite ends thereof and a heating compartment between said header spaces, an inlet adapted for connection with a source of water supply and communicating with one of said header spaces, an outlet adapted for connection with a water supply and communicating with said heating compartment, means for conducting water from the header space provided with the inlet through said heating compartment to the other header space, means for conducting the water from the last named header space to the heater compartment, resistance coils supported upon said next to the last named conducting means, means including a switch for connecting said resistance coils electrically with a source of current supply, an inwardly opening valve controlling the inlet, a diaphragm supported within the casing between the level of the inlet and the proximate end of the casing, means between the diaphragm and the switch for operating the latter and spring means reacting against the diaphragm to tend to hold the switch closed, said diaphragm being adapted to be actuated by a predetermined pressure within the casing to cause opening of the switch.

5. A heater comprising a casing having header spaces at opposite ends thereof and a heating compartment between said header spaces, an inlet adapted for connection with a source of water supply and communicating with one of said header spaces, an outlet adapted for connection with a water supply and communicating with said heating compartment, means for conducting water from the header space provided with the inlet through said heating compartment to the other header space, means for conducting the water from the last named header space to the heater compartment, resistance coils supported upon said next to the last named conducting means, means including a switch for connecting said resistance coils electrically with a source of current supply, an inwardly opening valve controlling the inlet, a diaphragm supported within the casing between the level of the inlet and the proximate end of the casing, means between the

diaphragm and the switch for operating the latter and spring means reacting against the diaphragm to tend to hold the switch closed, said diaphragm being adapted to be actuated by a predetermined pressure within the casing to cause opening of the switch, and means for varying the tension on the spring to vary the pressure at which the switch will be opened.

6. In a heater, a casing having a compartment provided with an inlet, an electric switch associated with the casing, a diaphragm supported within and closing the compartment below the level of the inlet, a stem extending from the diaphragm for opening and closing the switch, resistance coils supported within the compartment whereby the resistance coils and the switch may be incorporated in an electric circuit, and spring means arranged between said diaphragm and switch and reacting against the former to maintain the latter closed until a determined pressure has been reached within the compartment.

7. In an electric heater of the character described, a casing provided with header spaces at the upper and lower ends thereof, a heating compartment located between the header spaces and compartments at opposite ends of the heating compartment spacing the latter from the header spaces, the lower header space being provided with an inlet and said heating compartment being provided with an outlet, vertical tubes leading through said heating compartment from the lower spacing compartment to the upper spacing compartment, other vertical tubes of less diameter than the first tubes and each extending through one of the first vertical tubes from the lower header space to the upper header space, means for conducting liquid from the upper header space to the heating compartment, and an electric heating coil encircling each of said second named tubes and having the ends thereof extending into said spacing compartments for connection with line wires.

RUFUS L. WILKINSON.