Nov. 27, 1928.

1,693,182

R. ROCHESTER, JR

HEATING DEVICE

Filed June 24, 1926

2 Sheets-Sheet 1

Fig. 1.

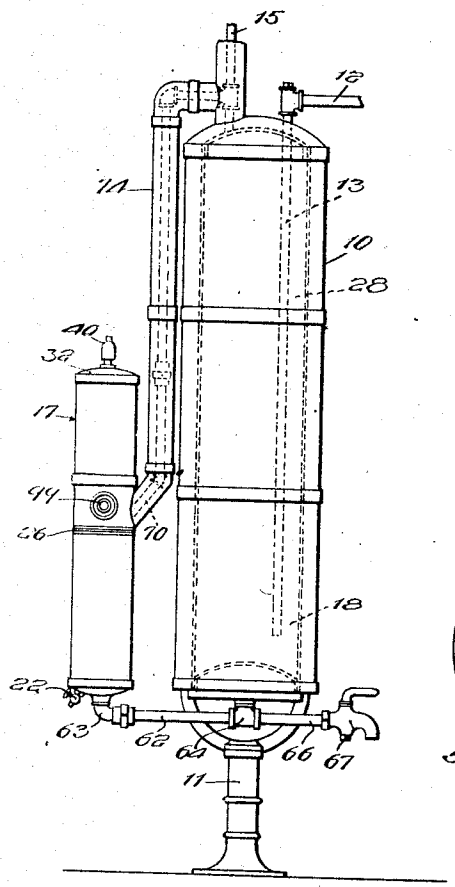


Fig. 6.

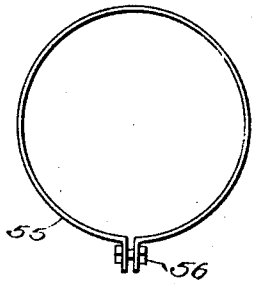
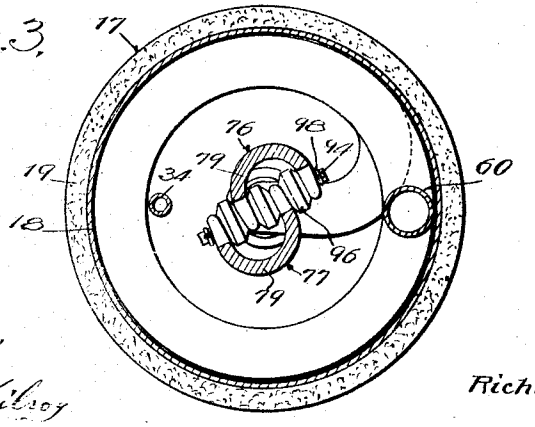


Fig. 3.



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HEATING DEVICE

Filed June 24, 1926 2 Sheets-Sheet 2

Fig. 2.

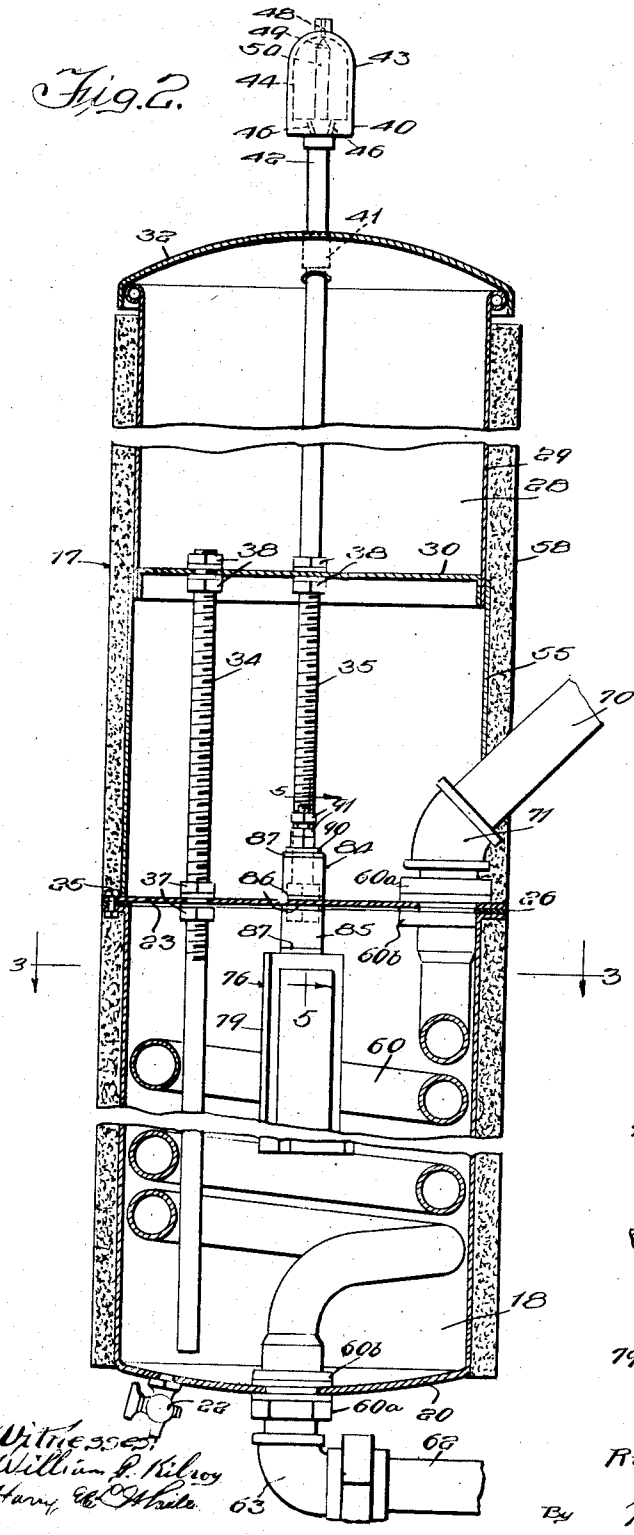


Fig. 4.

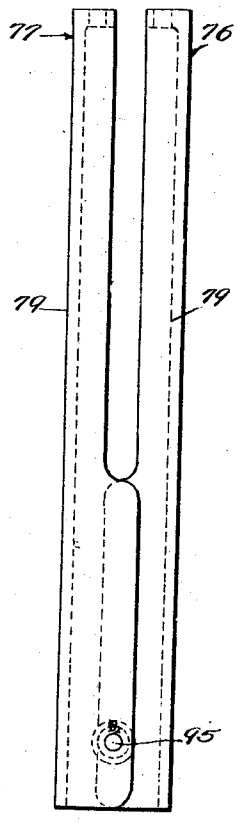
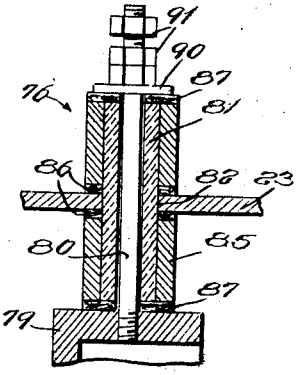


Fig. 5.



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Patented Nov. 27, 1928. 1,693,182

UNITED STATES PATENT OFFICE.

RICHMOND ROCHESTER, JR., OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC BOILER CO., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

HEATING DEVICE.

Application filed June 24, 1926. Serial No. 118,287.

My invention relates to heating devices and particularly to devices for providing a supply of hot water.

A particular object of the invention is to provide improved devices of the kind described for supplying hot water to the faucets in a dwelling, factory or the like.

Another particular object of the invention is to provide an improved device of the kind described, which is substantially automatic in its operation.

Still another particular object of the invention is to provide improved means whereby an electrical current may be efficiently employed to heat a liquid.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a side elevation of a device embodying the invention, my improved heating unit being shown in connection with a hot water tank of the kind commonly employed in dwellings or the like;

Fig. 2 is an enlarged vertical section taken through the improved heating unit;

Fig. 3 is a section taken on line 3—3 of Fig. 2;

Fig. 4 is a side elevation of a pair of electrodes forming part of the improved heating unit;

Fig. 5 is a section taken on line 5—5 of Fig. 2; and

Fig. 6 is an end view of a split band forming part of my improved heating device.

Referring to Fig. 1 for the present, the reference character 10 designates a hot water tank of the type commonly employed in dwellings, factories or the like for holding a supply of hot water. In line with the usual practice, the tank 10 is mounted upon a pedestal 11 and is connected to a city water main by means comprising a pipe 12, which communicates with a pipe 13 projecting into the tank. As well known to those skilled in the art, the water in the tank 10 is usually heated by apparatus making use of a thermo-siphon action, the heating apparatus being positioned at any convenient point. The arrangement is such that when hot water is withdrawn from the tank 10, it is immediately replaced by cold water flowing from the city water main. In Fig. 1, the reference character 15 designates a pipe communicating with the upper end of the tank 10 and adapted to deliver heated water from the tank 10 to faucets or the like spaced therefrom.

My improved heating unit is designated generally by the reference character 17 and is positioned adjacent the tank 10. As best shown in Fig. 2, the heating unit 17 comprises a receptacle 18 which is, in this instance, of substantially cylindrical form and is provided on its outer surface with a layer 19 of heat insulating material, such as asbestos. The lower end of the receptacle 18 is closed by a bottom wall 20 from which a valve fitting 22 projects, the valve fitting 22 providing means whereby the receptacle may be drained. The upper end of the receptacle is preferably closed by a plate 23 which is secured to the receptacle by bolts 25 or the equivalent. If desired, packing 26 may be provided between the receptacle and the cover plate 23. Disposed above the receptacle 18 and spaced therefrom is a tank 28 comprising a cylindrical side wall 29 and a bottom wall 30. The upper end of the tank 28 is preferably closed by a loosely fitting cover 32. The means for supporting the tank 28 above the receptacle 18 preferably comprises tubes or pipes 34 and 35 which are secured to the cover plate 23 by nuts 37 and are secured to the bottom plate 30 by nuts 38, the nuts 37 and 38 being screw-threaded upon the pipes 34 and 35. It will be noted that the upper end of the pipe 34 opens into the lower end of the tank 28 and that the lower end of the pipe 34 opens into the receptacle 18 in relatively close proximity to its bottom wall 20. The pipe 35 projects a relatively small distance into the receptacle 18 and communicates therewith. The upper end of the pipe 35 projects through the cover plate 32 and communicates with an air valve 40, the pipe 35 being connected to the air valve by means comprising a pipe coupling 41 and a nipple 42. The air valve 40 may be of any

suitable construction but in this instance comprises a casing 43 having a chamber 44 formed therein, which chamber communicates with the pipe 35 through ports 46 formed in the casing. The chamber 44 may communicate with the atmosphere through a port 48 provided in its upper end but the flow of air through this port 48 is controlled by a valve 49 formed upon a post 50 mounted in the chamber 44. The post 50 is formed of material which is readily affected by temperature changes within the chamber 44, the construction being such that when steam enters the chamber the post 50 expands and brings the valve 49 into a position wherein it closes the port 48. When the steam condenses and returns to the pipe 35 by way of the ports 46, the post 50 contracts and permits air to enter the chamber 44 through the port 48.

The space between the receptacle 18 and the tank 28 is preferably closed by a split band 55, which is clamped around the lower end of the cylindrical wall 29 by bolts 56 or the equivalent. It will be noted that the band 55 extends from the upper surface of the cover plate 23 to the bottom wall 30 of the tank 28. The tank 28 and the split band 55 are preferably covered with a layer 58 of any suitable heat insulating material, such as asbestos.

Disposed within the receptacle 18 is a helical coil 60, one end of which coil projects through the bottom wall 20 of the receptacle and is coupled to a pipe 62 by means comprising an elbow 63. The pipe 62 is connected to a T fitting 64 which communicates with the interior of the tank 10. Obviously, water may flow from the tank 10 into the T fitting 64 and thence through the pipe 62 to the coil 60. A pipe 66 screw-threaded into the T fitting 64 and a faucet 67 screw-threaded upon the pipe 66 provide means whereby the tank may be drained.

The upper end of the coil 60 projects through the cover plate 23 and is connected to a pipe 70 by an elbow fitting 71, which is adapted to deliver water obtained from the coil 60 to the aforementioned pipe 45. As shown, the pipe 70 is preferably provided with a jacket 74 of any suitable heat insulating material, such as asbestos. It will be noted that the upper and lower ends of the coil 60 are provided with flanges 60^b and are screw-threaded to accommodate nuts 60^a whereby the coil is rigidly secured to the cover plate 23 and the bottom plate 20. Obviously, this construction permits the heating unit to be suspended from the tank 10.

Mounted upon the cover plate 23 and projecting into the receptacle 18 are electrical terminals 76 and 77. Each electrical terminal comprises an electrode 79 screw-threaded upon the lower end of a vertically disposed post 80 which projects through the cover plate 23 and is positioned in a sleeve 81 formed of any suitable electrical insulation such as porcelain or the equivalent. The sleeve 81 projects through one of a plurality of apertures 82 provided in the cover plate 23 and is provided with collars 84 and 85 at its upper and lower ends, respectively, the collars 84 and 85 being preferably formed of porcelain or the equivalent. Interposed between the cover plate 23 and the collars 84 and 85 are washers or gaskets 86 of asbestos or the equivalent. At the upper and lower ends of the sleeve 81 I preferably provide similar gaskets 87 and 88, respectively. Positioned upon the upper end of the rod 80 is a metallic washer 90 and screw-threaded upon the upper end of the rod are a plurality of nuts 91 which are adapted to secure an electrical conductor to the rod.

The electrodes 79 may be formed of any suitable material but are preferably cast from metal and are preferably U-shaped in cross section at their lower ends. Means is provided for spacing the lower ends of the electrodes, this means preferably comprising a glass or porcelain rod 94 accommodated in aligned apertures 95 provided in the electrodes. Mounted upon the rod 94 are a plurality of spools 96 preferably formed of porcelain, the spools being mounted upon the rod 94 in such manner that they accurately space the lower ends of the electrodes. Longitudinal displacement of the rod 94 is prevented by means of wires 98 or the equivalent twisted around the ends of the rod.

The operation of the above described apparatus is substantially as follows: Assuming that the apparatus has not been in operation for some time and that it is operatively connected to a water main, or the equivalent, in such manner that the tank 10 is filled with water and that there is sufficient water in the receptacle 18 to completely fill it, it is obvious that if the electrical terminals 76 and 77 are operatively connected to a source (not shown) of electrical energy, a current will flow through the water between the electrodes and vaporize a portion thereof. For convenience, I preferably mount a switch 99 upon the split band 55, which switch may be employed to operatively connect the electrical terminals to the source of electrical energy. The vapor produced between the electrodes 79 causes a rise of pressure within the receptacle 18 and water passes from the receptacle up through the tube 34 into the tank 28, the head of water thus created being equal to the pressure produced within the receptacle. Of course, vapor tends to flow out of the system by way of the tube 35 and the air valve 40, but, as set forth above, the post 50 immediately expands and closes the port 48 in the valve. The heat which results from the passing of the electrical current through the water in the receptacle 18 is utilized to heat the water in the coil 60 whereupon a thermo-siphon action takes place and water circu-

lates through the coil and the tank 10. This water passes up through the pipe 70 into the distributing pipe 15 and thence down through the tank 10 into the pipe 62 which returns it to the lower end of the coil. In the event that water is withdrawn from the tank 10 by way of the pipe 15, it is obvious that the heated water flowing from the coil 60 will pass directly out of the system through the pipe 15 without first passing into the tank 10. This is advantageous as it obviates the necessity of heating a relatively large quantity of water before it can be obtained from the system through the pipe 15.

The apparatus is substantially automatic in its operation as the pressure produced within the receptacle 18 causes the level of water therein to fall until a point of equilibrium is reached wherein the current passing between the electrodes 79 generates an amount of heat which is substantially equal to the amount of heat dissipated by the system. In an installation embodying the invention, I have obtained satisfactory results and have found that the water in the tank 10 remains at substantially 190° F., but, of course, the design of the apparatus may be varied to obtain the results desired. If water is withdrawn from the tank 10 by way of the pipe 15, cold water will flow through the pipe 60 and there will be a more rapid exchange of heat between the water and vapor in the receptacle and the water in the coil. This will cause a lowering of the pressure in the receptacle and the water therein will rise so that a larger current of electricity will flow between the electrodes to produce a greater amount of heat. Then, after the water in the tank 10 has again reached the desired temperature, the water within the receptacle 18 will have been lowered to establish the point of equilibrium mentioned above.

The provision of the air valve 40 is advantageous as it facilitates filling the receptacle 18 with water, the receptacle 18 being filled through the tank 28. When the receptacle is to be filled with water, the cover 32 is lifted sufficiently to permit water to be poured into the tank 28. This water enters the receptacle by way of the tube 34, the air in the receptacle being driven upward through the pipe 35 and through the port 48 provided in the air valve. If, however, the system has been in use for some time and the electrodes are disconnected from the source of electrical energy, the water within the system will cool, and if a sufficient amount of water has been evaporated from the receptacle 18 to create a partial vacuum therein, this partial vacuum will be relieved by air which enters the receptacle by way of the port 48 in the valve.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a hot water tank, of a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle, and means connecting said tubular means with the tank to obtain a circulation of water therethrough by a thermo-siphon action.

2. The combination with a hot water tank, of a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle, means connecting said tubular means with the tank to obtain a circulation of water therethrough by a thermo-siphon action, an expansion tank, and means for operatively connecting the receptacle to the expansion tank.

3. The combination with a hot water tank, of a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle, means connecting said tubular means with the tank to obtain a circulation of water therethrough by a thermo-siphon action, an expansion tank, means for operatively connecting the receptacle to the expansion tank, and means for controlling the flow of air into and out of the receptacle.

4. The combination with a hot water tank, of a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle, means connecting said tubular means with the tank to obtain a circulation of water therethrough

by a thermo-siphon action, an expansion tank, and an air valve for controlling the flow of air into and out of the receptacle.

5. An electrically operated water heater comprising a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle and being provided with an intake opening and a discharge opening, means for receiving water driven from the receptacle by a rise of pressure therein, and means for controlling the flow of air into and out of said receptacle.

6. An electrically operated water heater comprising a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle and being provided with an intake opening and a discharge opening, means for receiving water driven from the receptacle by a rise of pressure therein, and an air valve for controlling the flow or air into and out of said receptacle.

7. An electrically operated water heater comprising a receptacle for holding water, spaced electrodes projecting downwardly into the receptacle and arranged so that an electrical current may flow therebetween through the water, a coiled tube disposed in the receptacle and having its ends projecting through the wall thereof, means for receiving water discharged from the receptacle by a rise of pressure therein, and means for controlling the flow of air into and out of the receptacle.

8. An electrically operated heating device comprising a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, means for receiving water discharged from the receptacle by a rise of pressure therein, and means for automatically controlling the flow of air into and out of said receptacle.

9. An electrically operated heating device, comprising a receptacle for holding water, electrodes projecting into the receptacle, an expansion tank disposed above the receptacle, a tube extending from the upper portion of the receptacle through the expansion tank whereby air may flow into and out of said receptacle, an air valve for controlling the flow of air through said tube, means carried by the tube for holding the receptacle and the expansion tank in spaced relation, and a second tube extending between the receptacle and the expansion tank and communicating with each of them.

10. An electrically operated heating device, comprising a receptacle for holding water, electrodes projecting into the receptacle, an expansion tank disposed above the receptacle, a tube extending from the upper portion of the receptacle through the expansion tank whereby air may flow into and out of said receptacle, an air valve for controlling the flow of air through said tube, means carried by the tube for holding the receptacle and the expansion tank in spaced relation, a second tube extending between the receptacle and the expansion tank and communicating with each of them, and tubular means disposed in said receptacle whereby water may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle and being provided with a discharge opening and an intake opening outside of the receptacle.

11. The combination with a tank for holding liquid, of a receptacle for holding water, spaced electrodes projecting into the receptacle and arranged so that an electrical current may flow therebetween through the water, tubular means disposed in the receptacle whereby liquid may be heated through an exchange of heat with the water in the receptacle, said tubular means being sealed from communication with the interior of the receptacle, means for receiving water discharged from the receptacle by a rise of pressure therein, and means connecting said tubular means with the tank to obtain a circulation of liquid therethrough by a thermo-siphon action.

12. In an electrically operated water heater comprising a heat insulating casing, the combination of a receptacle disposed within said casing for holding water, spaced electrodes projecting downwardly into the receptacle and arranged so that an electric current may flow therebetween through the water, means for suspending said electrodes into said receptacle, means associated with said last-named means for conducting air into and out of said receptacle and controlling the flow thereof, a coiled tube disposed in the receptacle and having its ends projecting through the wall thereof, and means within said casing for receiving water discharged from the receptacle by a rise of pressure therein.

13. An electrically operated water heater comprising a receptacle for holding water, spaced electrodes projecting downwardly into the receptacle and arranged so that an electric current may flow therebetween through the water, a coiled tube disposed in the receptacle and having its ends projecting

through the wall thereof, means for receiving water discharged from the receptacle by a rise of pressure therein, and heat actuated means for controlling the flow of air into and out of the receptacle.

14. In an electrically operated water heater comprising a heat insulating casing, the combination of a receptacle disposed within said casing for holding water, spaced electrodes projecting downwardly into the receptacle and arranged so that an electric current may flow therebetween through the water, means for suspending said electrodes into said receptacle, means associated with said last-named means for conducting air into and out of said receptacle, heat actuated means for controlling the flow of air into and out of said receptacle, a coiled tube disposed in the receptacle and having its ends projecting through the wall thereof, a second receptacle disposed within said casing above said first-mentioned receptacle for receiving water discharged from said first receptacle by a rise of pressure therein, and means for conducting water from said first receptacle to the second receptacle.

In testimony whereof, I have hereunto signed my name.

RICHMOND ROCHESTER, JR.