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APPARATUS FOR HEATING LIQUIDS

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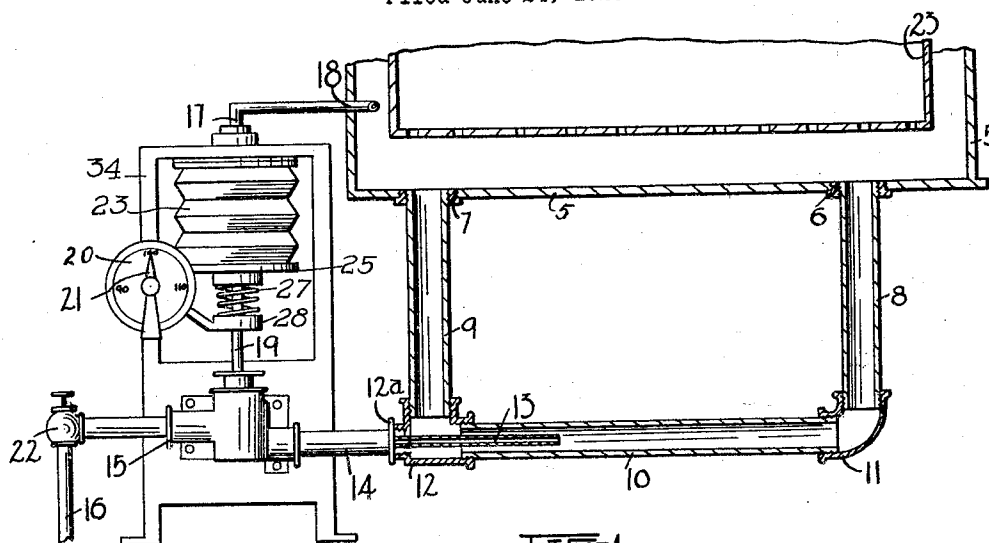


FIG-1

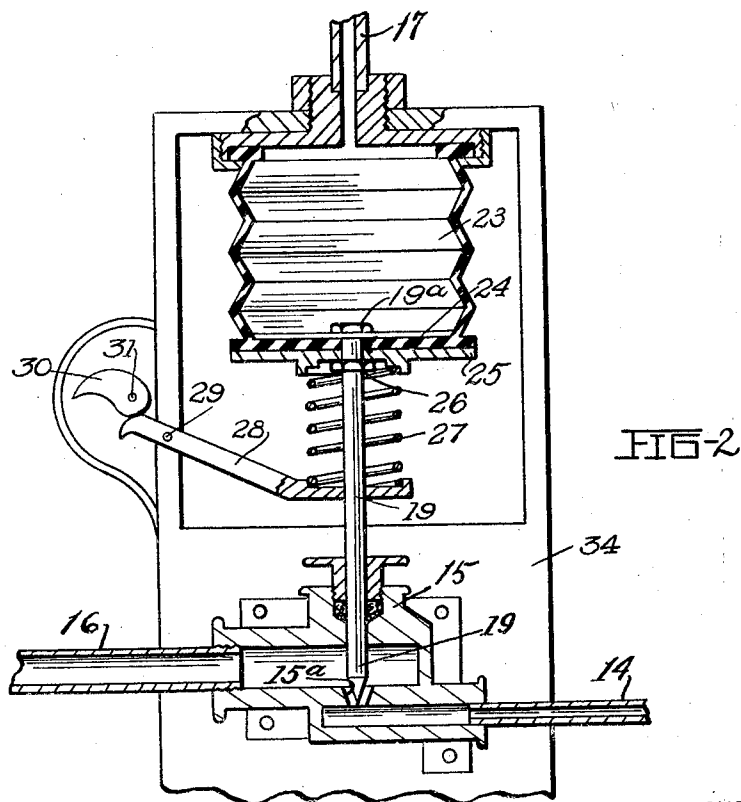


FIG-2

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## UNITED STATES PATENT OFFICE

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## APPARATUS FOR HEATING LIQUIDS

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This invention relates to new and novel improvements in apparatus for heating liquid and for controlling the temperature thereof; and while intended for use generally wherever it may be advantageously applied, it is especially adapted for use in laundry apparatus, particularly washing machines, in which connection it will be herein illustrated and described.

10 Objects of the invention are to provide a liquid heating device of simple, durable construction which may be manufactured at a low cost and which will be very convenient to operate and economical and efficient in operation.

Another object is to provide efficient means for employing steam to raise the temperature of a liquid and to maintain the same at a certain temperature without introducing the steam directly into the tube or container whereby fine fabrics or other articles in the container will not be subjected to extreme heat by being brought into direct contact with the steam.

25 A further object is to provide a thermostatically operated valve and valve regulating means for apparatus of the character described whereby the valve may be accurately regulated to quickly raise the liquid to a certain desired temperature and maintain the same at said temperature.

30 An additional object is to provide new and improved means for heating water or other liquid in a tub or other container by the use of steam which is discharged in a mixing pipe so as to cause the liquid within the tank to flow to and from the heating device whereby the same will be thoroughly mixed and maintained in a thoroughly mixed condition at an even temperature.

35 The above objects are accomplished and additional ends are attained by the novel construction, combination and arrangement of parts hereinafter described and illustrated in the accompanying drawing, wherein I have shown a preferred form of the invention, it being understood that the invention is capable of various adaptations and may be used in different ways for a variety of purposes and that changes and modifications

may be made which come within the scope of the claims hereunto appended.

In the drawing there is illustrated a washing machine equipped with a heating device, constructed in accordance with this invention, like characters of reference being employed to denote like parts as the same may appear in any of the several views and in which:—

Figure 1 is a vertical, longitudinal sectional view showing a portion of a washing machine fitted with a heating device constructed in accordance with this invention,

Figure 2 is a side elevational view partly in vertical section, showing one form of thermostatically operated valve employed in carrying out the invention.

Proceeding now to a detailed description of the invention with reference to the particular adaptation thereof disclosed in the drawing, the numeral 5 is used generally to denote a washing machine casing or other container. The casing 5 is provided in the lower wall thereof with the openings 6 and 7 which are formed therein in spaced relation to each other.

A pipe 8 is secured in the opening 6 and a pipe 9 is secured in the opening 7 so as to project downwardly in parallel, spaced relation to each other. The numeral 10 denotes a horizontal pipe which is provided at one end thereof with an elbow 11 in which the vertical pipe 8 is operatively secured. A coupling 12 is operatively secured to the other end of the horizontal section 10 and the vertical pipe 9. The coupling 12 is also provided with a horizontal nipple 12a which is coaxially arranged relative to the pipe 10 and a pipe 14 is operatively secured therein. A relatively smaller pipe 13 is secured in the pipe 14 so as to project through the coupling 12 into the pipe 10.

The numeral 15 denotes a valve which is operatively connected to the pipe 14 and to the pipe 16 which leads from a boiler or other source of steam under pressure. The valve 15 includes a stem 19 which is longitudinally movable to close the opening 15a. The valve 15 is preferably secured to a rigid frame 34. The numeral 23 denotes a bel-

lows or longitudinal expansible casing. One end of the bellows 23 is secured to the frame 34; the other end of the bellows being secured to the valve stem 19 whereby an expansion or contraction of the bellows 23 will cause the stem 19 to be moved in accordance therewith. In the drawing, I have shown a bellows 23 of cylindrical form having circumferentially corrugated side walls and having a lower end wall secured between the plates 24 and 25 by means of the nuts 19a and 26 which are threaded on the stem 19. A tube 17 communicates with the cavity of the bellows 23 and terminates in an end portion 18 which extends into the cavity of the container 5. The tube 18 contains a volatile liquid which possesses the property of vaporization at a relatively low temperature and which when heated by a liquid within the tank 5 expands and closes the valve head or needle 19 thus operating the valve and stopping the flow of steam, into the pipe 10. As soon as the liquid within the tank cools sufficiently to raise the valve head 19, steam will flow from the pipe 16 through the valve 15 and be discharged through the pipe 13 into the pipe 10. The steam thus discharged through the pipe 14 will force the liquid in the pipe 10 upwardly through the pipe 8 into the tank 5. This discharge also causes water in the tank to flow downwardly through the pipe 9 into the pipe 10, thus forming a continuous circulation of the liquid within the tank. The numeral 27 denotes a coil spring which is positioned around the stem 19 so as to bear against the plate 25. The other end of the spring 27 is positioned in a suitable seat on the member 28 which is provided with an opening through which the rod 19 is extended. The member 28 is fulcrumed on the frame 34 as at 29. The cam 30 is operatively mounted to bear against the outwardly projecting end of the member 28. The cam 30 is mounted on the shaft 31 and the other end of the shaft 31 is provided with a lever or handle 21 which is positioned on a dial 20. The dial 20 is provided with suitable characters indicating a degree of temperature required within the container 5. The lever 21 when moved in one direction will force the member 28 against the spring 27, thus restraining the expansion of the bellows 23. It will be seen that when the spring 27 is compressed to exert an increased force on the lower face of the bellows 23 that a greater temperature will be required within the container 5 to close the valve 15.

It will be seen that with the indicator 21 set at any temperature, the device will operate automatically to maintain a liquid in a tank 5 at said temperature. If it is desired to lower the temperature the regulator 21 may be set at the desired point or the valve 22 operated to close the pipe 16.

With the device installed in a washing ma-

chine as above described, the desired quantity of water is placed in the casing 5 and the articles to be washed are placed in the rotor 23. The machine is then operated to wash the articles in cold water which prevents a setting of stains from spots caused by deposits of albumin, blood or any substance which will coagulate in hot water. The water is then drawn off and the desired quantity of fresh water is placed in the casing and the indicator 21 on the dial 20 is then turned to a higher temperature, say 90° F., thus causing steam to be discharged into the pipe 10. The water is thus quickly circulated and heated so that the temperature of the water in the casing 5 is raised to 90°. The machine is operated at a temperature of 90° for about ten minutes when the water is drawn off.

Soapy water is then placed in the casing 5 and the indicator 21 on the dial 20 is turned to say 140° F. This opens the valve head 19 and causes a discharge of steam in the pipe 10 which quickly raises the temperature of the water in the casing 5 to 140° F. The machine is then operated for 10 or 15 minutes and the water is again drawn from the casing 5. A soapy water solution is then placed in the casing 5 and the indicator 21 on the dial 20 is turned to a higher temperature, say 180° F. This opens the valve 15 and causes the steam to be discharged by the pipe 13 thus rapidly raising the temperature of the liquid in the casing 5, to 180° F. and maintaining the same at said temperature. After the machine is thus operated for a sufficient period of time to thoroughly wash the articles in the rotor 23, the water is drawn off.

The indicator 21 on the dial 20 is then turned to a low temperature or the valve 22 is operated to close the pipe 16 and a quantity of rinse water is placed in the casing 5. The machine is operated for the proper length of time and the rinse water is drawn off, thus completing the washing operation.

While the heating element employed has been herein designated as steam, it is understood that the term is intended to include any suitable form of fluid suitable for heating purposes and while the preferred form of the invention includes the mixing pipe 10, the quickly changeable, thermostatically controlled valve herein illustrated and described may also be used to introduce steam directly into the container or to heat the same by means of coils or other suitable steam operated means.

It will thus be seen that the invention provides extremely simple, highly efficient means for heating water or other liquid to the desired temperature, for automatically maintaining the same at said temperature and for quickly changing said temperature.

Having thus illustrated my invention and

described the same in detail, what I claim as new and desire to secure by Letters Patent is;—

1. In a device of the character described,  
5 an expansible bellows, a tube communicating with the cavity of said bellows, an expansible element in said tube, a valve, means to hold one end of said bellows in fixed relation to said valve, said valve having a stem secured to the other end of said bellows,  
10 a spring for restraining the action of said bellows and means for regulating the tension of said spring, said means including a movable member bearing against said spring, a cam for moving said member and a lever for  
15 operating said cam.

2. In a device of the character described, an expansible bellows, a tube communicating with the cavity of said bellows, an expansible element in said tube, a valve, said  
20 valve having a stem secured to one end of said bellows, a spring for restraining the action of said bellows and means for regulating the tension of said spring, said means including  
25 a movable member bearing against said spring, a cam for moving said member, a lever for operating said cam and means associated with said lever for indicating the temperature conditions obtainable by movement  
30 thereof to certain points.

In testimony whereof I have hereunto set my hand.

ROY C. SUTTON.

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