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TWO-COMPARTMENT HOT WATER TANK

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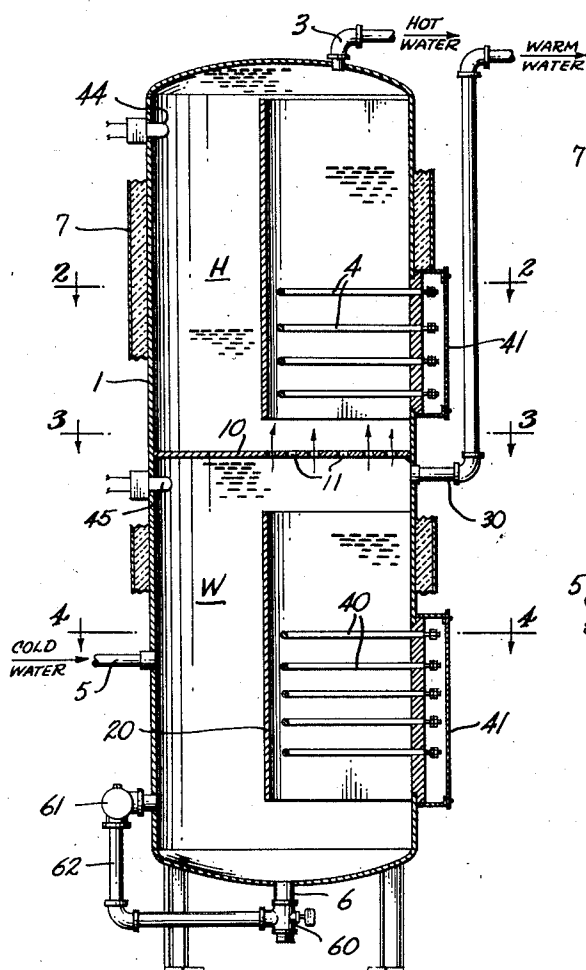


Fig. 1.

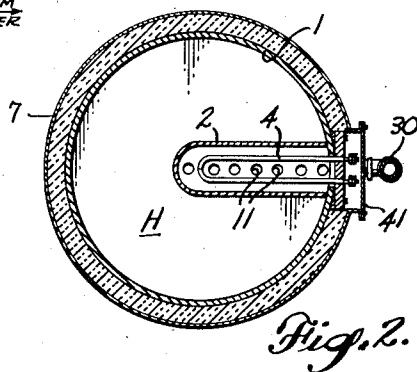


Fig. 2.

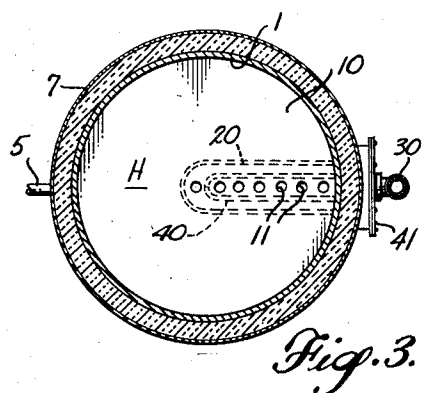


Fig. 3.

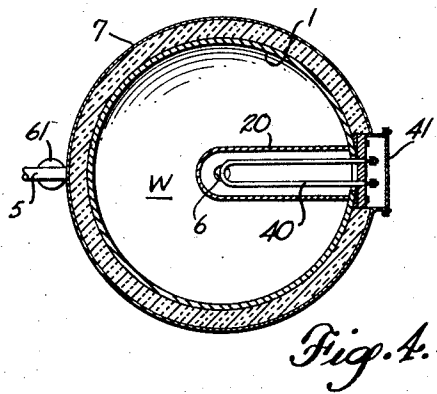


Fig. 4.

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TWO-COMPARTMENT HOT WATER TANK

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3 Claims. (Cl. 219—38)

This invention concerns a hot water tank capable of delivering hot water of two different temperatures consistently from a single tank. It is an improvement upon the hot water tank which constitutes the subject of my pending application, Serial No. 624,407, filed November 26, 1956, now Patent No. 2,804,534.

It is a primary object of this invention to provide a single upright tank divided by a transverse partition into an upper and a lower compartment, which from the lower compartment will deliver what may be termed warm water, especially as compared with the water delivered from the upper compartment which may be termed hot water. Thus the user is enabled to draw off warm water, of say 140° F., when he wishes; or if he needs hotter water there is instantly available to him an appreciable supply of hot water, at say 180° F.

It is an object to form a tank of this nature in a simple manner but in a manner in which the thermal losses are slight, and especially in that the warm water is the source for the supply of hot water, whereas the cold water inlet from the main is admitted only to the warm water compartment of the tank and is there warmed to the warm water temperature, before it can enter the hot water compartment.

It is a further object to accomplish the ends above in a construction which is entirely practical, which is well adapted to the employment of simple rod type immersion electric heaters, and which is readily adapted to the replacement of such heaters whenever that is necessary.

With such objects in mind, and others as will appear more fully hereinafter, the present invention comprises the two-compartment hot water tank illustrated in a typical form in the accompanying drawings, as will be described more fully hereinafter, and the novel features whereof will be set forth in the appended claims.

Figure 1 is an axial sectional view through the tank of this invention in somewhat diagrammatic form, and Figures 2, 3 and 4 are transverse sections through the same at the respective lines 2—2, 3—3 and 4—4 of Figure 1.

The upright tank 1 is interiorly divided by a transverse partition 10 into an upper hot water compartment H and a lower warm water compartment W. These two compartments are in restricted communication with one another through the medium of a series of holes 11, but these holes are in a particular location and of relatively small total area, as will appear hereinafter.

Within each compartment is a segregated heating chamber 2 or 20, the two being alike but differently numbered in order to distinguish readily between the chamber 2, which is in the hot water compartment H, and the chamber 20 in the lower warm water compartment W. These heating chambers are conveniently of U-shape in cross section and may be of uniform diameter from top to bottom. If preferred, or if it is found necessary to retain the rising water in these chambers longer in contact with the heating elements, they may be somewhat restricted at their upper end. The chambers 2 and 20

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are located in vertical alignment with each other and with the holes 11. Each heating chamber is open at its top and bottom to the space within its compartment, for free circulation therein.

5 The hot water delivery connection 3 leads from the top of the chamber H in alignment with the open upper end of the heating compartment 2, and the warm water delivery connection 30 likewise leads from the space within its compartment W that is directly above the open upper end of the heating chamber 20. Thus each delivery connection is from the portion of the compartment with which it is connected wherein the water is most highly heated, and which receives freshly heated water as it rises from the enclosed heating chamber.

15 The water is heated in each instance by suitable electric immersion type heaters. Thus the heating elements 4 for the hot water compartment are represented as straight rod type heaters in U-shape received within the heating chamber 2 and entering through an aperture in the side of the tank; and the heating elements 40 for the warm water compartment are of like nature, similarly received within the heating chamber 20, and they, too, enter through an opening provided in the side of the tank. Each of these heating elements, it will be observed, is straight and readily withdrawn or entered into the compartment by direct lateral movement, upon removal of the cover 41 from over its terminal ends. The heating elements 40 and 4 are aligned vertically so that in case of need water heated to the temperature of the warm water, 140° for instance, in the heating chamber 20 can rise directly through the holes 11 into the heating compartment 2, and may there be quickly raised by the heating element 4 to the further temperature necessary to produce the 180° hot water for delivery at 3.

35 The cold water inlet is represented at 5. Cold water is delivered only to the lower compartment W, at a point laterally far removed from the heating chamber 20, and at a level well below the upper end of that heating chamber but yet appreciably above the bottom of the same. It is therefore necessary for the cold water entering at 5 to sink to the level of the bottom of the compartment 20 before it may enter the same, and in doing so it must displace or mingle with the warmed water within the bottom of the chamber W. There thus can be no immediate and abrupt cooling down of the water within the compartment W; and since the only water that enters the upper compartment H is that which enters through the holes 11 directly from the hottest water in the lower compartment W, the water in the compartment H will always be at least of the temperature of the hottest water in the compartment W, and by proper setting of thermostatic controls the water in the compartment H will always be actually at an appreciably higher temperature than the water in the compartment W. A thermostat 44 in the compartment H is arranged in known manner to control the heating elements 4, and the second thermostat 45 in the chamber W is arranged in the same manner to control the heating elements 40.

60 To complete the description of the tank, a drain connection is shown at 6, with a drain valve 60; and in order to bypass any sediment that may have collected within the bottom of the tank and so provide an assured outlet for a safety valve 61, a bypass from the safety valve, connected above the bottom of the tank, is shown at 62, connecting for discharge past the drain valve 60.

65 Insulation as indicated at 7 may be provided about the tank 1, and has been illustrated but fragmentarily.

70 Considering first the lower compartment W, the cold water entering at 5 will gradually sink to the bottom of this compartment and then will rise within the heating chamber 20 as water previously within that chamber rises after being heated, to the upper part of the compartment.

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This water, warmed to the temperature permitted by the thermostat 45, can be drawn off at 30 for use. Some of it can rise through the holes 11, but only a limited part due to the small area of such holes, and during static conditions the water within the compartment W will circulate within that compartment only until such time as is required to attain the required temperature, or to supply heat lost by withdrawal of water from the tank and the entrance of more cold water which requires heating.

If hot water is desired to be withdrawn at 3, then this requires replacement of the withdrawn water, and the replacement comes through the holes 11 from the hottest water in the compartment W. If, indeed, withdrawal at 3 is long continued, the water which enters the compartment H through the holes 11 is that which has just risen from the heating elements 40 in the lower compartment, and this water at approximately 140° is delivered directly to the heating elements 4, and is by them heated to the higher temperature, and by the time it rises to the top of the heating chamber 2 it is at proper temperature ready for delivery at 3. During static conditions, however, any loss of heat from the hot water will merely cause circulation within the compartment H until substantially the entire contents of the compartment H have been heated to the maximum temperature. While conditions are static, there is no entry of cold water at 5 to the tank as a whole, and circulation continues within each of the compartments separately until the water in each has risen to the desired temperature for that compartment, and thereafter circulation within that compartment ceases, although not necessarily within the other compartment. The result is that there is constantly available a supply of warm water and a supply of hot water; and if there is a long-continued demand for hot water, the dual action just described will, with a high degree of reliability, supply the desired amounts of properly heated hot water.

I claim as my invention:

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1. A hot water heater comprising an upright tank, a transverse partition intermediate its ends dividing the tank into upper and lower compartments, said partition having a group of apertures for limited communication between the two compartments, a heating chamber in each compartment, freely open at top and at bottom to the space therein, and each aligned with said group of apertures, whereby heated water rising from the lower heating chamber will in part rise through the apertures to enter the upper heating chamber, and in part will circulate within the lower compartment, and heated water rising from the upper chamber will circulate within the upper compartment, a cold water inlet admitting to the lower compartment only, two hot water delivery connections, from the upper portion of the respective compartments, a heating element in each chamber acting upon the water rising therethrough, and thermostatic control means for the respective heating elements, to maintain the water in the upper compartment at a given temperature, and that in the lower compartment at a given lower temperature.

2. A hot water heater as in claim 1, wherein the hot water delivery connection from the upper compartment is located in vertical alignment with the upper end of the upper heating chamber.

3. A hot water heater as in claim 1, wherein the cold water inlet is located in the lower compartment laterally distant from the heating chamber therein, and at a level intermediate the top and bottom of said heating chamber.

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