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INDUCTION WATER HEATER

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2 Sheets-Sheet 2

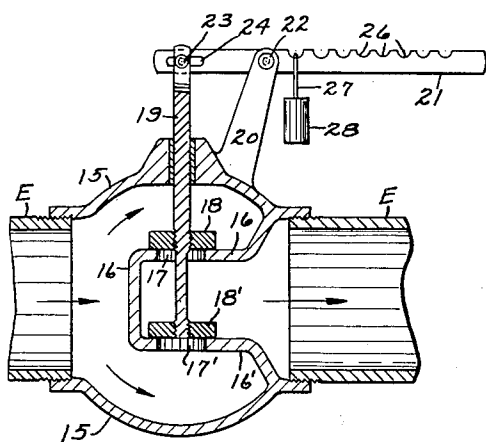


Fig. 2.

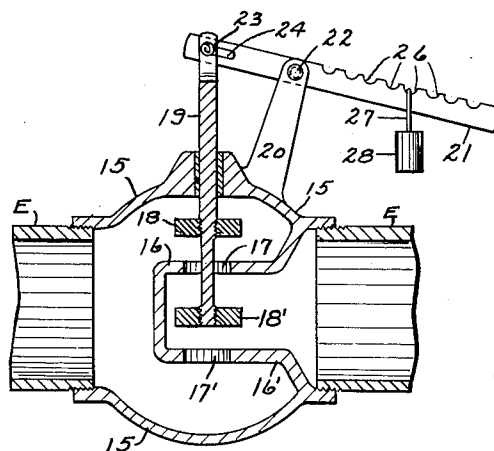


Fig. 3.

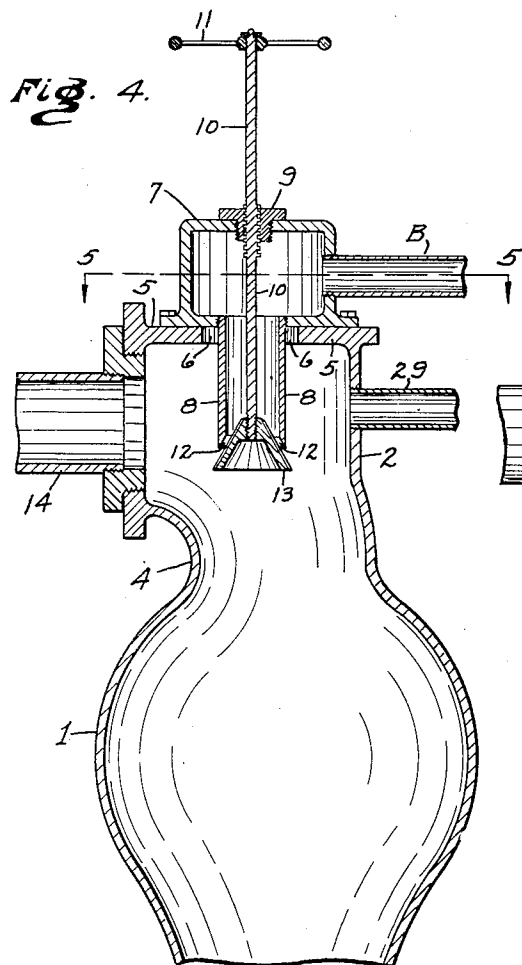


Fig. 4.

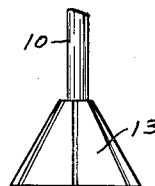


Fig. 6.

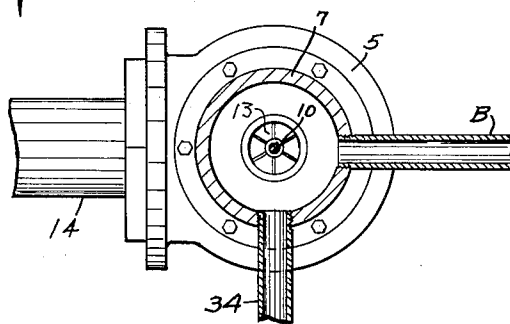


Fig. 5.

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UNITED STATES PATENT OFFICE

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INDUCTION WATER HEATER

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Serial No. 582,965

3 Claims. (Cl. 261-116)

The object of my present invention, broadly speaking, is the provision of an induction water heater of comparatively simple and inexpensive construction, which is easily and expeditiously installed, which is adapted to conserve the interests of the owner, the same being efficient and fully automatic in its operations, in which the cost of operation will be practically nil, and which can be manufactured, sold, and installed at a comparatively low price.

More specifically stated, my object is the provision of an induction water heater which employs as the heating element the otherwise waste exhaust steam which has been expelled from a steam engine, or the like, the arrangement being such that only the proper amount of steam will pass into the heating chamber, and that solely by induction, the same being automatically controlled by a relief valve which functions by reason of the temperature of the water which is being heated, and wherein no manual operation or attention is required.

Other objects and particular advantages of my invention will be brought out in the course of the following specification, and that which is new will be pointed out in the appended claims.

The preferred means for carrying out the principles of my invention in an efficient, practical, mechanical, and scientific manner, is shown in the accompanying two-sheets of drawings, in which—

Figure 1 shows in elevation a completely assembled water heating system, which is constructed in accordance with my invention.

Figure 2 is a central vertical section as taken through the balanced relief valve, showing the same in closed position.

Figure 3 is the same as Figure 2, except that the valve is shown in open position.

Figure 4 is a vertical central section taken through the heater assembly, showing the several essential members thereof.

Figure 5 is a horizontal section, as taken on the line 5—5 of Fig. 4.

And Figure 6 is a side elevation of the water distributing valve head, and a portion of the stem thereof.

Similar indices designate like parts throughout the several views.

In order that the construction, the operation, and the several advantages of my invention may be more fully understood and appreciated, I will now take up a detailed description thereof, in which I will set forth the same as comprehensively as I may.

In the drawings letter A denotes a portion of a hot water tank, which is of comparatively large capacity, into which hot water is discharged from my heating system, and from which hot water may be drawn as required.

Letter B designates the cold water supply pipe, through which water is forced, usually by power, after the water has been softened. Connected into the pipe B is an automatic shut-off valve C, which is operated by the height of the water in the tank A, by means of a float C', which is located in the upper portion of the tank A, the same being carried by an arm F, which arm is attached to the fixed shaft D, whereby the raising of said float by the water in the tank A will cause the valve C to close and shut off the flow of water through the pipe B. It is deemed that further explanation of operation of said valve and float will not be required, as this construction is old, and I make no claim thereto per se, as further description would add more to prolixity than to clearness of comprehension.

Letter E designates the steam conveying pipe, through which the exhaust steam escapes, from an engine, to the atmosphere, through the retarding nozzle G. The source and production of the steam, in itself, forms no part of this invention, although it, or its equivalent, is necessary to the practical operation thereof.

The central and basic element of my system is the heater, shown in Fig. 1, and it comprises the centrally expanded or body portion 1, whose interior forms the mixing chamber; the head 2, forming the heating chamber; the spout 3 forming the discharge chamber; and the throat 4, which is a contraction between the head 2 and the body 1, for slightly retarding the flow from the heating chamber into the mixing chamber. The upper open end of the head 2 is closed by a flat horizontal face 5, through the center of which is formed a round aperture 6.

Detachably mounted on the face-plate 5 is the cold water intake head 7, through the bottom of which is formed a threaded aperture in which is threaded the nozzle 8, the lower end of the nozzle 8 is formed interiorly flaring, forming a valve seat 12.

Formed through the top of the member 7 is an aperture in which is threaded the interiorly threaded bushing 9 in which is threaded the vertical stem 10, which projects upwardly therebeyond, with a handle 11 secured on its upper end. To the lower end of the stem 10 is secured the upwardly tapering conical deflector 13, whose

periphery is of the same angle as is the angle of the flange 12.

However it is not desirable that the deflector be entirely closed therefore the periphery of the deflector is formed fluted, in order that moisture may drain from the nozzle 8, when the heater is not in use. It is apparent that by turning the stem 10 the amount of water passing downwardly through the nozzle 8 may be varied or controlled as desired. Also it is to be noticed that removing the means by which the head 7 is secured in place that it may be lifted off, together with the nozzle 8 and the deflector 13, the two latter being adapted to pass through the aperture 6.

Extending laterally from the exhaust pipe E into the side of the head 2 is an auxiliary steam pipe 14 through which steam may pass from the pipe E into the head 2, for the purpose of heating water.

The discharge end of the pipe B is secured in the side of the water intake head 7, as will hereinafter be set forth.

The pipe H leads from the bottom of the spout 3 to the interior of the tank, for conveying hot water into the tank A.

The relief valve, shown in central section in Figs. 2 and 3, comprises a body 15, which is coupled into a horizontal section of the pipe E. Formed in the body 15 is a laterally extending U-shaped partition, the same having the horizontal portions 16 and 16', through which the respective valve seats 17 and 17' are formed in vertical alignment with each other. Each of said seats has a valve disc, 18 and 18' respectively, adapted to rest therein by gravity. The valve discs, 18 and 18', are secured on the stem 19, which stem projects outwardly through the top of the body 15, in which it is slidably mounted. Numeral 20 denotes an arm extending from the body 15 to the upper end of which is pivoted by the pivot 22, the scale-arm 21. The upper end portion of the stem 19 is connected with the shorter end portion of the arm 21 by means of a pivot 23, which is slidable in the slot 24 of the arm 21. Notches 26 are formed in the upper edge of the scale-arm 21, in which may engage the hook 27 which extends upwardly from the weight 28. When the weight is suspended from the last notch to the left the valve discs are supposed to be in neutral, that is to say they are evenly balanced and will stay where they are moved to, when the heater is not in use.

Numeral 29 denotes a pipe leading from the interior of the head 2 outwardly and downwardly into the tank A, forming an auxiliary drain and pressure relief. Extending upwardly from the pipe 29 is the relief pipe 30, which has a check-valve 31 incorporated therein, to permit the escape of non-condensable gases from the head 2.

Numeral 32 denotes a pipe for draining condensation from the exhaust nozzle G into the tank A.

Numeral 34 denotes an auxiliary water pipe leading from inside the tank A, by which water may be injected into the head 2 other than through the pipe B.

The same being accomplished automatically by the temperature of the water in the lower portion of the tank A, whereby the temperature throughout all parts of the tank A may be maintained at 180° F.

Stated broadly, the operation of my invention is as follows:

When water, which is cooler than the temperature of the exhaust steam, enters the heater the relief, or balanced induction, valve will automatically close, for the reason that the hot steam will more easily travel into the heater into which cold water is flowing, whereby the temperature is reduced, rather than upwardly through the relief valve and out through the nozzle G against a greater atmospheric pressure. Now should the valve C be closed, thereby cutting off the flow of water into the heater, then there will be no pull through the pipe 14, but there will be an easier channel established, which will be out through the nozzle G into the free atmosphere. Therefore if the flow of water through the heater be discontinued or if the water in the heater becomes heated to a certain temperature then the exhaust steam will cease to flow into the heater, but will return thereto as soon as said conditions are reversed.

It is to be understood that, when there is a temperature difference, steam will be condensed in the heater, causing a considerable vacuum therein, which will naturally draw in more steam until the temperatures are balanced at a point where steam no longer condenses.

I am aware that heretofore water has been heated by means of exhaust steam, under what is commonly termed the "Thoroughfare" system, its objection being, among other things, that when the water supply to the heater diminishes, or is cut off, the steam continues to flow through the heater, and consequently carries with it to the atmosphere a large quantity of soft water and condensed steam, which under my system would become usable water. Even when the water is cut off and the exhaust steam is escaping into the nozzle G, a great amount of the escaping steam will become condensed in the nozzle G and flow through the pipe 32 into the tank A.

I am also aware that water has heretofore been heated by induction with apparatuses infinitely more complicated, expensive, and even inferior, than by my system, and without attaining the high degree of efficiency I am able to obtain with the construction herein shown and described.

My invention overcomes all of said objection, and others which might be advanced, whereby no usable water is lost, or at least the loss is reduced to the minimum, but it has been determined that there is more water delivered into the tank than is passed through the supply pipe B, for the reason that all condensation of the exhaust steam will be drained into the reserve tank.

While the mechanism and the normal fluid capacity of my construction is comparatively small, yet its capacity for obtaining the desired results is almost illimitable.

It is evident that the deflector 13 will cause the water passing downwardly through the nozzle 8 to be fractionated and distributed in the throat of the heater, whereby it will be more quickly and thoroughly impregnated with the incoming steam through the pipe 14. It is to be observed that by turning the handle 11 the deflector 13 may be raised or lowered, in order to allow greater or less quantity of water to pass through the nozzle 8, but when once set for a particular installation it does not, ordinarily, have to be changed.

It is a well known principle in physics that if steam be given the opportunity of taking either

of two routes of escape it will take that which offers the least resistance, both from a mechanical standpoint and from the point of atmospheric conditions. By the former is meant freedom from friction and acceleration by suction or otherwise; and by the latter is meant, the temperature of the channels through which it may pass, and the final point of delivery. Therefore, while the heating chamber and the water passing therethrough is below a certain degree of temperature the exhaust steam moving upwardly through the pipe E, will naturally turn into the pipe 14 and thence into the heater. Said cause of diversion will be plus the suction of the water from the pipe B passing through the heater into the tank A. The elimination of either one or both of said reasons for causing the steam to flow into the heater may cause the steam to automatically shift to the other alternative, that is upwardly through the nozzle G into the free atmosphere.

It is to be observed that by adjusting the weight 28 along the arm 21 that the flow of steam through the nozzle G may be retarded until the water in the heater is at the desired degree of temperature, after which it will automatically open the relief valve, by reason of the higher degree of temperature in the heater, thereby providing means for manually predetermining the degree of heat to which the water in the supply tank will be brought. The employment of the above described scientific formula constitutes the basic principle of this invention.

It is to be understood that my invention is not to be limited to the tank A, as the final depository of product, or to the particular mechanism herein shown, but only to the final results which I am able to obtain thereby.

Having now fully shown and described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An induction water heater comprising in combination, a hot-water container, a pipe for conveying exhaust steam to the atmosphere, a heating chamber, a conduit affording means for conveying steam from the exhaust pipe into the heating chamber, an outlet pipe leading from the upper portion of the heating chamber for the elimination of non-condensable gases, a hot water pipe leading outwardly from the bottom of the heating chamber into the hot water container, means for admitting water into the upper portion of the heating chamber, means for distributing the water as it is being admitted into the heating chamber, a valve located in the exhaust steam pipe and positioned outwardly beyond said conduit, said valve comprising a horizontal U-shaped partition therein with two aligned and spaced apart valve seats therein, a disc for closing

ing the respective valve seats, a stem to which both of said discs are connected and extending outwardly through the body of the valve, a scale arm having one of its ends pivoted to said stem, an arm rigidly connected with said body of the valve and pivotally connected to said scale arm, a weight adjustable along and suspended by said scale arm and normally at all times tending to raise said stem and discs to afford free passage of steam through said valve.

2. An induction water heater comprising in combination, a hot-water container, a pipe for conveying exhaust steam to the atmosphere, a heating chamber, a conduit providing means for conveying steam from the exhaust pipe into the heating chamber, an outlet pipe leading from the upper portion of the heating chamber for the elimination of non-condensable gases, a valve located in the exhaust steam pipe and located outwardly beyond said conduit, a hot water pipe leading outwardly from the bottom of the heating chamber into the hot-water container, manually controlled means for admitting water to be heated into the upper end of the heating chamber, said means comprising an intake head secured on the upper end of the heating chamber, a nozzle leading downwardly from the intake head through an aperture in the top of the water heater, a stem adjustably mounted through the top of the intake head and projecting thereabove and extending downwardly through the nozzle and concentric therewith, means for manually raising and lowering said stem, a cone-shaped deflector carried by the lower end of said stem and adapted to contact with the lower end of said nozzle, and a water pipe leading into said intake head.

3. In combination with a water container, and a pipe for conveying exhaust steam from its source into the atmosphere, a heating chamber, a secondary pipe through which steam may be diverted from the exhaust steam pipe into the heating chamber, an outlet pipe leading from the upper part of the heating chamber, a valve located in the exhaust steam pipe and outwardly from said secondary pipe, means whereby said valve will be automatically operated, means for changing the degree of pressure required to operate said valve, a pipe leading from the bottom of the water container, an induction water heater, means for admitting water into the heating chamber, said last mentioned means comprising an intake head secured to the heating chamber, a nozzle leading downwardly from the intake head into the water heater, a deflector carried by the lower end of said stem and adapted to be detachably secured thereto, and a water pipe leading into said intake head, all substantially as set forth.

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