Dec. 1, 1931. J. J. PARKINSON 1,834,070

HEATING DEVICE

Filed May 14, 1928

Fig. 1.

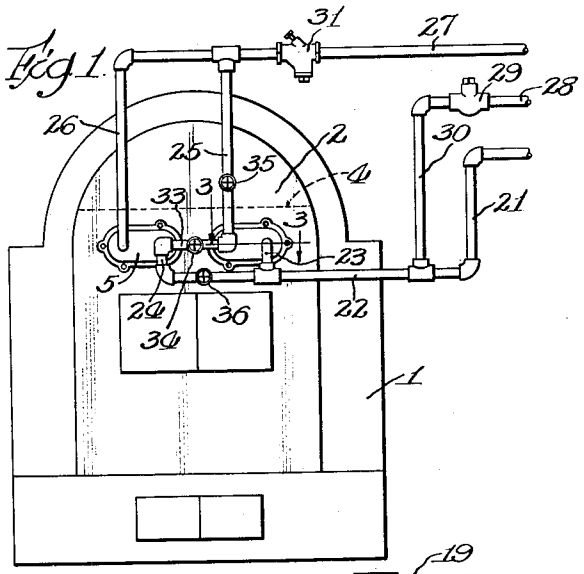
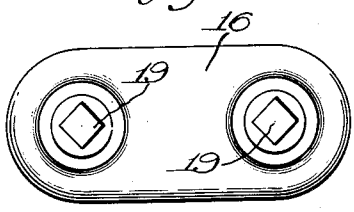


Fig. 2.



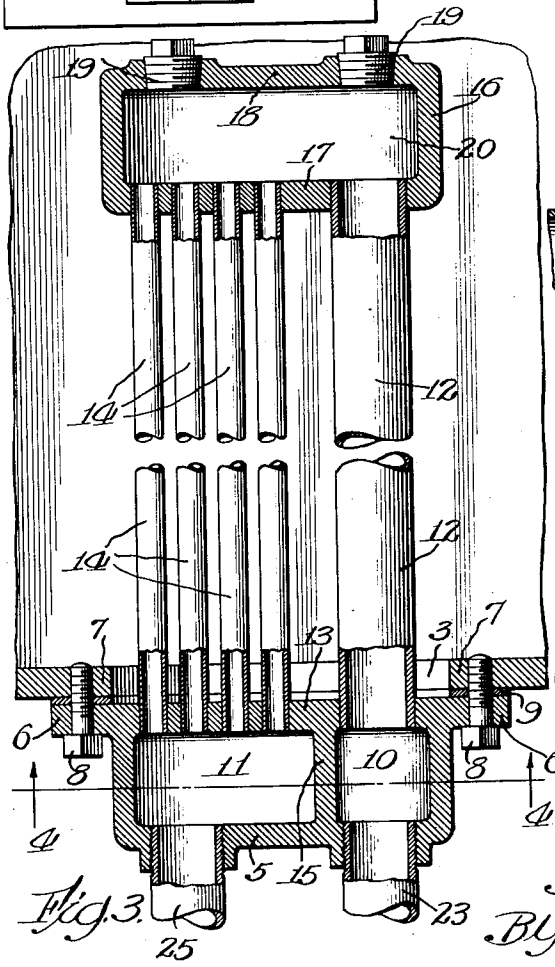


Fig. 3.

Fig. 5.

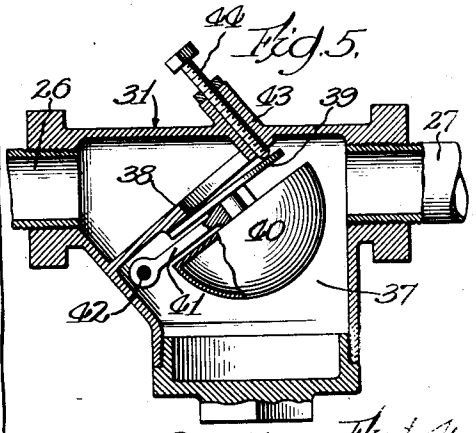
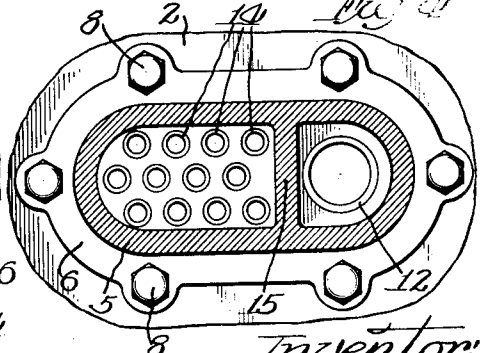


Fig. 4



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UNITED STATES PATENT OFFICE

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HEATING DEVICE

Application filed May 14, 1928. Serial No. 277,403.

The present invention relates to heating devices, such as those for heating water of a hot water system for buildings and other like and similar structures.

Among the objects of the invention, is to provide a novel water heater or heating coil adapted to extend into a boiler to be submerged in the heated water therein.

Another object of the invention is to provide a heating device or coil with increased heat transfer or exchange surface area, such that the coil will be entirely submerged in a relatively shallow stratum of the heated water in a boiler, without any part protruding above the level of the water whereby it might receive excessive heat, such as from the steam thereover. Hence, in a specific illustrative embodiment of the invention, the coil, in general transverse form, is horizontally elongated, or relatively wide and shallow. To secure the increased heating surface, the device has different sized to and fro passages, such that the to or inlet passage is of large diameter, or cross sectional area, and the fro or return or outlet passages, there being a plurality of them, are small, but their combined or total surface area being greater than that of the large passage.

Hence, as the water is returning through the smaller tubes, the larger surface thereof will give a greater heat exchange or transfer area. Also, if the combined cross-sectional area be greater than that of the larger tube, the linear flow in the smaller tubes will decrease with the incident greater absorption of heat, and decrease of friction of the water against the inner surfaces of the tubes. An advantage of using a horizontally elongated and vertically narrow arrangement of heat absorbing tubes, is that the whole coil will, at all times, be submerged within a rather shallow stratum of the heated water of the boiler, and thus avoid any chance of any part of the coil extending above the water level and becoming too hot as compared to tubes in the lower part of the water strata, where a condenser effect might happen to the higher heated fluid in the upper tubes. If the coil were of round form, and to obtain the heat capacity effects and flow effects possessed by the present invention, a much deeper stratum of water would be required to completely submerge the device. Therefore, it will be apparent that the advantage of the horizontally elongated device of this invention will avoid the above disadvantages and at the same time a large capacity coil is capable of use in the hot water system.

A further object of the invention is to provide a heating coil of unit construction, which is capable of being simply inserted through a suitable opening in a wall of a boiler, at a submergible locus, and secured at such opening, a part of the coil acting as a closure for such opening. In a specific embodiment illustrative of the invention, the coil comprises a header having inlet and outlet chambers, and being securable to the margin of the opening in the boiler, such that the header acts as a closure for such opening. With the inlet chamber is rigidly connected a large tube and with the outlet chamber are rigidly connected a plurality of small tubes. These smaller tubes are grouped horizontally laterally of the larger tubes so that all the tubes are disposed in a rather shallow but horizontally elongated space, thus requiring a rather shallow strata of heated water in which the coil is submerged. At the other ends of the tubes, is rigidly connected another header having a chamber acting as a passage for the water from the outlet of the larger tube to the inlets of the smaller tubes.

Another feature of the invention is the provision of a float check valve in the circuit of the coils, such that when no water is being drawn off at the faucets, the float acts to close or substantially close the valve, to prevent rapid circulation of the water in the circuit and hence to prevent overheating of the water in the circuit, but when the water is drawn off at the faucets, then the movement of the water in the circuit will automatically cause the valve to open and permit un-impeded flow of water. This valve may have means for preventing the valve completely seating or closing, so as to permit a small amount of circulation. An adjustable stop means may be engaged by the valve when moved toward its seating position, and act to hold the valve

slightly open to the desired amount. The float valve is used to prevent a rapid circulation when the faucets are closed, and hence, a too high temperature of water of the circuit. It also prevents unnecessary circulation. By using a float, the disadvantage of a weighted check valve is avoided. A weighted check valve would offer resistance to the free flow of the water when the faucets are open. A minimum circulation is permitted by the adjustable stop acting to prevent the valve from entirely closing.

The invention also comprehends as another object thereof, the connecting up of the coils in series and in parallel, with such control means as to effect either operation. When the coils operate in series, a greater amount of heat may be transferred to the water in the coils, and hence the water will be hotter than if merely one coil were used, and in the case of their operating in parallel, a greater amount of water may pass through although not at as high a temperature as in the case of the series operation.

Other objects, capabilities, and features are comprehended by the invention as will later appear and as inherently possessed thereby.

Referring to the drawings:

Fig. 1 is a conventional front view in elevation of a boiler using the invention;

Fig. 2 is a rear end view of a coil constructed in accordance with the invention;

Fig. 3 is a fragmentary horizontal sectional view, with parts shown in plan, taken in a plane represented by line 3—3 in Fig. 1 of the drawings;

Fig. 4 is a transverse sectional view taken in a plane represented by line 4—4 in Fig. 3 of the drawings; and

Fig. 5 is a sectional view of the float valve.

Referring now more in detail to the drawings, the invention is shown in connection with a boiler 1 having a front wall 2 in which is provided one or more openings 3 through which the heating device or coil may be introduced and extended into the interior of the boiler and submerged in the upper strata of the water therein and below the level 4 of such water.

The coil selected to illustrate the invention, is shown as comprising a header 5 having a flange 6 adapted to overlap the margin 7 of the opening 3 and be bolted thereto by a number of bolts 8, a suitable gasket 9 being interposed between the flange 6 and the margin 7, as clearly shown in Fig. 3 of the drawings. The header 5 has an inlet chamber 10 and an outlet chamber 11. With the inlet chamber 10 is rigidly connected a large diameter tube or passage 12, the end of the tube being suitably secured in an opening provided in the inner wall 13 of the header 5 as by welding, or by other suitable means known in this art. In the back wall portion 13 opposite the chamber 11, are also provided a number of openings in which are similarly secured a plurality of small tubes 14. These tubes are grouped, preferably laterally of the large tube 12 and in a shallow or horizontally elongated base whereby the height of the coil will be much smaller than the width of the coil. A dividing partition 15 is provided between the chambers 10 and 11 as clearly shown. At the other ends of the tubes or passages 12 and 14 is secured a second header 16 having a wall 17 provided with a large opening in which is suitably secured the other end of the tube 12, and a plurality of small openings in which are secured the other ends of the smaller tubes or passages 14. The header 16 has a rear wall 18 having two or more threaded openings in which are located plugs 19. These plugs may be removed when desired to obtain access to the interior of the chamber 20 of the header 16 for any purpose, such as for cleaning out the same. It is therefore apparent that the heating device or coil is a single unitary rigid structure, capable of being introduced through the opening 3, and extends therethrough and into the interior of the boiler, the whole coil being supported wholly by means of the flange 6 bolted to the margin 7 of the hole or opening 3. At the same time, the header 5, constitutes a closure for the opening 3.

The heating device or coil may be duplicated or used in any number desired. Although two are shown in the drawings, it is to be understood that the invention comprehends the use of but one coil in the boiler or any greater number than two, as desired, the illustration of two being merely illustrative of the utility of the invention.

The coils are designed for use in a hot water system for buildings and other like structures, for the supplying of hot water at faucets and the like. Such system usually includes a cold water inlet pipe or duct 21 connected to a duct 22 leading to one or more inlet connections 23 and 24, the inlet connections leading into and being connected to the inlet chamber 10 of each header 5. With the chamber 11, acting as an outlet chamber, may be connected outlet connections 25 and 26. These outlet connections are then connected to an outflow duct or conduit 27 leading to the faucets. A return pipe from the faucets leads back to the pipe 28 connected to a check valve 29 and pipe 30 connected to the inflow duct or conduit 22. In the outflow pipe 27 may also be connected a float check valve 31. In the form shown in Fig. 1, the coils are arranged for series and parallel operations. The outlet chamber of one coil is connected by a duct or cross connection 33 leading to and connected to the inlet chamber of the second coil of the series. The connection 33 has a valve 34 for controlling the flow of fluid there-

through. Likewise the connections 25 and 22 are provided with valves 35 and 36, the operation and use of which will be later explained.

The float check valve 31 shown in section in Fig. 5, is shown as having a chamber 37 in which is located a seat 38 against which or toward which may seat or move a valve gate 39 connected to a float 40 supported in an arm 41 pivotally mounted on a pivot 42 fixed to the casing as shown. The valve casing carries a boss 43 in which is threaded a screw 44 having its inner end extending into the chamber 37 and at a locus for engagement therewith of the valve gate 39, as clearly shown in Fig. 5 of the drawings.

In operation, the coils are submerged in the upper strata of the hot water in the boiler. Cold water is supplied from any suitable source through the pipes 21 and 22 to the connections 23 and 24. The water is introduced in the inlet chamber 10 of each coil and passes through the large pipe or passage 12, and thence into the chamber 20 of the header 16, and then into the return tubes or passages 14, and thence into the chamber 11 of each coil. A plurality of tubes 14 are used for giving an increased heat exchange surface to the passages, whereby the total heat exchange surface area of these tubes will be greater than the surface of the tube 12, and the total cross sectional areas of these passages will be at least as great as and preferably greater than the cross sectional area of the passage 12. In this way, the water passing through the tubes 14 will travel at decreased speed, and will also receive a greater amount of heat than would be possible if the same passed through a larger tube, such as tube 12.

After the water passes into the chamber 11, it passes out through the connections 25 and 26 to the pipe or conduit 27, the water passing in the meanwhile through the float check valve 31.

In operation and assuming the valves 35 and 36 to be open and the valve 34 to be closed, the water passing from the pipe 22 passes into the connections 23 and 24 and into the chambers 10 of the different coils, and the outlet flow of the water is by way of the chamber 11 in each coil, and through the connections 25 and 26 to the float check valve 31 and conduit 27 to the faucets. In this way, the flow of the water is in parallel and a greater capacity of water will be supplied to the outlet line part although it might not be as high in temperature as when the water passes through the coils serially. On the other hand, when the valves 35 and 36 are closed and the valve 34 is open, the passage of the water is from the pipe 22 through the connection 23, through the coil, and out through the cross connection 33, into the inlet chamber of the second coil and out through the outlet chamber of the second coil through the connection 26 and then through the float check valve 31 and the conduit 27 to the faucets. In other words, Fig. 1 shows the means for both serial and parallel operation of the device. If desired, all valves 34, 35 and 36 may be left open whereby both serial and parallel operations may be utilized.

If the float check valve were not used, and the circuit open so as to permit free circulation, the heating of the water in the coils would cause a rapid circulation of the water and hence it would attain a very high temperature; a temperature too high, perhaps, for ordinary use. Therefore, the float valve is provided so that when the faucets are closed, the float will rise in the liquid in the chamber 37 and move the valve gate toward its seat. Assuming the screw 47 to be adjusted so that the end thereof projects a slight distance beyond the seat, the valve gate will contact this screw and be held slightly open so as to permit a slight or small flow or circulation. This is for the purpose of preventing overheating of the water in the coils. In this way, a small circulation is permitted, but not one such as would overheat the water in the whole system. On the other hand, when one or more faucets are open, there is a movement of the whole column of the water in the circuit, and the valve will immediately open to permit free flow of the water to the pipe 27.

While I have herein described and upon the drawings shown exemplifications of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, details, arrangements of parts, and features without departing from the spirit thereof.

Having thus disclosed the invention, I claim:

1. A water heater adapted to be submerged in heated water of a boiler, and comprising an inlet passage, and a plurality of return passages of smaller sizes than said inlet passage and having a greater total heat exchange surface than that of the inlet passage.

2. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising a header having inlet and outlet chambers, an inlet passage connected to the inlet chamber, return passages of smaller size than the inlet passage connected to the outlet chamber and having a total heat exchange surface greater than the heat exchange surface of the inlet passage, and means for connecting the outlet of the inlet passage to the inlets of the smaller passages.

3. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and

comprising a header having inlet and outlet chambers, an inner header having a single chamber, an inlet passage between said inlet chamber and said inner header, and outlet passages of smaller size than the inlet passage between said outlet chamber and said inner header, said smaller outlet passages having a total heat exchange surface area greater than that of the inlet passage.

4. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising inlet and outlet passages grouped to form a relatively flat and wide unit adapted to be mounted in an opening of the boiler and to occupy a shallow space in heated water of the boiler.

5. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising inlet and outlet passages grouped to form a relatively flat and wide arrangement to occupy a shallow space in heated water in a boiler, said inlet passage being larger than said outlet passages and the latter having a total heat exchange surface area greater than that of the inlet passage.

6. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising a horizontally elongated header having an inlet chamber at one end and an outlet chamber at the other end thereof, a large passage leading from said inlet chamber, and small passages leading from said large passage to said outlet chamber, the total heat exchange surface area of said small passages being greater than that of the large passage.

7. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising a pair of spaced horizontally elongated headers, one of said headers acting as a closure for the opening in the boiler, and to and fro passages between said headers, the fro passages having a greater total heat exchange surface area than that of the to passage.

8. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising a pair of spaced horizontally elongated headers, one of said headers acting as a closure for the opening in the boiler, a large passage connected between said headers, and small passages located horizontally laterally of said large passage and connected between said headers, said small passages having a total heat exchange surface area greater than that of said large passage.

9. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising a pair of spaced horizontally elongated headers, one of said headers acting as a closure for the opening in the boiler, and having inlet and outlet chambers, a large passage connected to the inlet chamber and the other header, a plurality of small passages connected to said other header and said outlet chamber, said small passages having a total heat exchange surface area greater than that of the large passage.

10. A water heating device adapted to extend through an opening in a boiler and be submerged in the heated water therein, and comprising a pair of spaced horizontally elongated headers, one of said headers acting as a closure for the opening in the boiler, and having inlet and outlet chambers, a large passage connected to the inlet chamber and the other header and said outlet chamber, a plurality of small passages connected to said other header and said outlet chamber, said small passages being grouped horizontally laterally of said large passage to occupy a shallow space in the heated water of the boiler and having a total heat exchange surface area greater than that of the large passage.

11. A water heating device comprising a heating coil submerged in the heated water of a boiler, an inflow duct, an outflow duct, the latter having a float valve provided with a movable part adapted to substantially close the duct upon non-flow of water and to open the duct upon flow of water.

12. A water heating device comprising a heating coil submerged in the heated water of a boiler, an inflow duct, an outflow duct, the latter having a float valve provided with a movable part adapted to substantially close the duct upon non-flow of water and to open the duct upon flow of water, and means for holding the movable part from completely closing to permit a small circulation of water.

13. A water heating device comprising a heating coil submerged in the heated water of a boiler, an inflow duct, an outflow duct, the latter having a float valve provided with a movable part adapted to substantially close the duct upon non-flow of water and to open the duct upon flow of water, and an adjustable stop for holding the movable part from entirely closing to permit a small amount of circulation of water.

14. A water heating device comprising a hot water duct, a cold water duct, a return duct connected to the cold water duct, and groups of heating coils between the cold and hot water ducts and submerged in the heated water of a boiler to receive heat therefrom, said groups of coils being arranged in series for increased heating of the water passing therethrough.

15. A water heating device comprising a hot water duct, a cold water duct, a return duct connected to the cold water duct, and heating coils between the cold and hot water ducts and submerged in the heated water of

a boiler to receive heat therefrom, said coils being arranged in parallel for increased capacity flow of water therethrough.

16. A water heating device comprising a series of coils adapted to be submerged in heated water of a boiler, said coils having inlet and outlet chambers, a supply duct for inflowing water to the coils, inlet connections from said duct to said inlet chambers, a conduit for outflowing water from said coils, outlet connections from said outlet chambers to said conduit, a cross connection between the outlet chamber of one coil (to) the inlet chamber of a succeeding coil of the series, and control means in certain of said connections for effecting series or parallel flow of water through said coils.

17. A water heater comprising an inlet passage, and a return passage having a heat exchange surface greater than that of the inlet passage, said passages being submerged in the heated fluid of a boiler for exchange of heat units from said fluid to a fluid in said passages.

In witness whereof, I hereunto subscribe my name to this specification.

JOHN J. PARKINSON.