

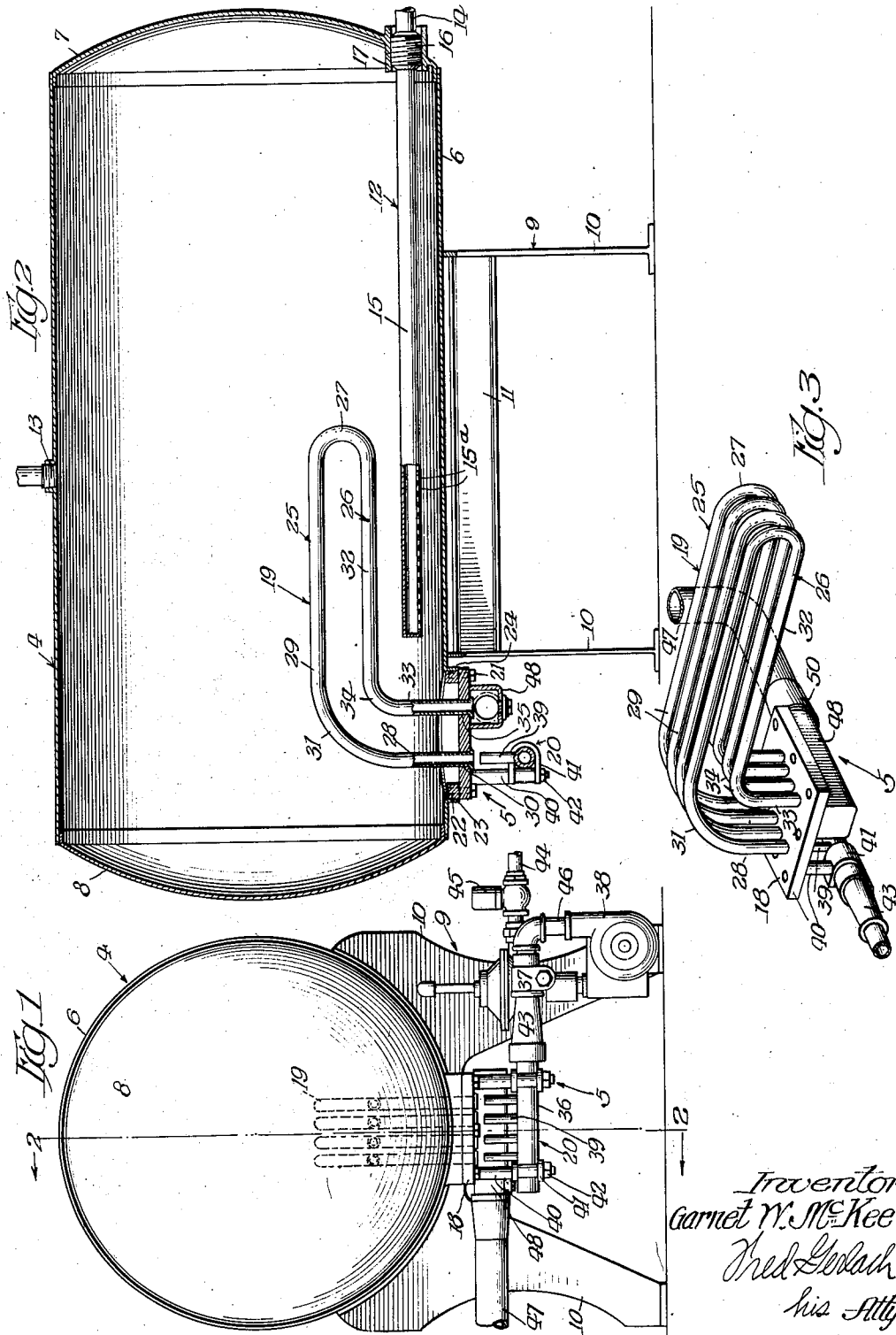
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HOT WATER HEATER

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HOT WATER HEATER

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The present invention relates generally to hot water heaters for commercial establishments, industrial plants, apartments, and homes. More particularly the invention relates to that type of heater which is used for hot water supply purposes and comprises a tank with an inlet for the water to be heated and an outlet for the heated water, and a heating unit which is associated with the tank and includes a plurality of tubes in the water in the tank and burner means for heating the tubes for water heating purposes.

One object of the invention is to provide a hot water heater of this type which is an improvement upon previously designed heaters, and in addition, is more efficient and may be manufactured at a lower cost.

Another object of the invention is to provide a hot water heater of this type in which the heating unit comprises a mounting plate on or near the bottom of the tank, the tubes are of the return bend variety and have the inlet and outlet ends thereof connected to and extending through the plate and the burner means of the unit is exteriorly disposed with respect to the tank and includes nozzles which serve to direct jets of flame into the inlet ends of the tubes.

Another object of the invention is to provide a hot water heater of the last mentioned character in which the inlet and outlet ends of the tubes of the heating unit are disposed in substantially the same horizontal plane with the result that when the burner means is inoperative there is no draft through the tubes and consequently heat loss is reduced to a minimum.

A further object of the invention is to provide a heater of the type and character under consideration in which the mounting plate of the heating unit embodies an exhaust manifold for delivering to a flue the products of combustion emanating from the outlet ends of the tubes, and is removably secured in place so that it, together with the manifold and tubes, may be removed from the tank for cleaning and inspection purposes.

A still further object of the invention is to provide a hot water heater of the removable immersion heating unit type which is generally of new and improved construction and effectively and efficiently fulfills its intended purpose.

Other objects of the invention and the various advantages and characteristics of the present heater will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are

more particularly defined by claims at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a front view of a hot water heater embodying the invention;

Figure 2 is a vertical longitudinal sectional view taken on the line 2-2 of Figure 1 and illustrating in detail the arrangement and design of the tubes of the heating unit; and

Figure 3 is a perspective view showing the heating unit in disconnected relation with the tank.

The heater which is shown in the drawing constitutes the preferred embodiment of the invention. It is adapted for use in a commercial establishment, an industrial plant, an apartment or a home in connection with the heating of water, and as the main parts thereof comprises a tank 4 and a heating unit 5.

The tank 4 is cylindrical and extends horizontally, as shown in Figures 1 and 2. It comprises a cylindrical side wall 6 and a pair of circular end walls 7 and 8, and is supported by a cradle 9 in spaced relation with respect to the floor of the room or space in which the heater is located. The cradle 9 is formed of structural steel and embodies a pair of end pieces 10 and a cross-piece 11. The end pieces embody in the upper ends thereof arcuate recesses for the side wall of the tank and are held in laterally spaced relation by means of the cross piece 11. The tank 4 is adapted to be filled with water and embodies a horizontal inlet pipe 12 and an outlet 13. The inlet pipe 12 embodies an inlet end 14, a discharge end 15, and an enlarged externally threaded connecting part 16 between the two ends and extends longitudinally of the tank, as shown in Figure 2. The connecting part 16 fits and is secured within an internally threaded nipple 17 in the lower portion of the end wall 7 of the tank. The inlet end 14 of the pipe 12 is exteriorly disposed with respect to the tank and is adapted to receive water under pressure from a water supply pipe or main (not shown). The discharge end 15 of the pipe 12 terminates inwardly of the end wall 8 of the tank and embodies a longitudinal series of discharge holes 15^a. These holes are disposed in the bottom portion of the discharge end of the pipe 12 and direct the water under pressure entering the tank via the pipe downwardly toward the bottom portion of the side wall 6. The nipple 17 is so positioned that the pipe 12 is positioned but a slight distance

above the bottom of said side wall 6. The outlet 13 is in the form of an internally threaded nipple and extends through and is connected to the upper central portion of the side wall 6.

5 The inlet pipe 12 operates to keep the tank filled with water and when water is drawn from the tank by way of the outlet 13 water under pressure flows into the tank through the discharge holes 16 in the lower portion of the discharge end of the inlet pipe 12. If desired a coating (not shown) of asbestos or like insulating material may be applied to the outer faces of the side and end walls of the tank.

15 The heating unit 5 serves to heat the water in the tank 4 and comprises as the main parts thereof a mounting plate 18, a plurality or group of tubes 19, and burner means 20 for heating the tubes. The plate 18 is removably secured by a series of bolts 21 to a rectangular frame 22 which fits within a rectangular opening 23 in the bottom portion of the side wall 6 of the tank 4. The opening, as shown in Figure 2, is positioned slightly inwards of the end wall 8 of the tank and is defined by a depending flange 24.

25 The frame 22 is flat, as shown in Figure 2, and is welded or otherwise secured to and maintained in sealed relation with the flange 24. The bolts 21 extend through holes in the marginal portion of the plate 18 and fit within internally threaded sockets in the frame 22. When it is desired to remove the plate in order to provide access via the frame 22 to the interior of the tank 4 for cleaning or inspection purposes, it is only necessary to remove the bolts 21. Upon removal of

35 the bolts from the sockets within the frame 22, the plate 18 is free so that it may be lowered out of engagement with the frame. When the bolts are in their operative position, the margin of the plate is so clamped against the bottom face of the frame that a leak-proof joint is provided between the plate and frame. As shown in Figure 2, the outer extremity of the discharge end 15 of the inlet pipe 12 terminates inwardly of the inner part of the frame 22. As the result of this, such extremity of the pipe does not interfere with

45 cleaning or inspection of the interior of the tank via the frame 22.

The tubes 19 are of the return bend variety and comprise inlet ends 25 and outlet ends 26.

50 They are arranged in side by side relation and operate when heated, as hereinafter described, by the burner means 20 to heat the water within the tank. The inlet ends 25 of the tubes are joined to the outlet ends 26 by vertically extending U-shaped bends 27 and comprise vertically

55 extending parts 28 and horizontally extending parts 29. The lower ends of the vertically extending parts of the inlet ends of the tubes extend through vertically extending holes 30 in the mounting plate 18 of the heating unit. Such lower ends are expanded or rolled into fixed or connected relation with the mounting plate and are open to the atmosphere surrounding the tank. The horizontal parts 29 of the inlet ends

65 of the tubes are connected to the upper ends of the vertical parts 28 by right angle bends 31 and project toward the end wall 7 of the tank. They are disposed over the inner extremity of the discharge end 15 of the water inlet pipe 12 and are of such length that the U-shaped bends 27 are positioned substantially equidistantly between the tank end walls 7 and 8. The outlet ends 26 of the tubes 19 underlie the horizontal parts 29 of the inlet ends 25 and comprise horizontal parts 32 and vertically extending parts 33.

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The horizontal parts 32 are vertically aligned with the horizontal parts 29 of said inlet ends 25 of the tubes and are joined at one end thereof to the lower portions of the U-shaped bends 27. They are positioned a comparatively small distance above the inner end of the discharge end 15 of the inlet pipe 12 and at their other ends are joined to the outer ends of the vertically extending parts 33 by right angle bends 34. The lower vertically extending parts 33 of the outlet 10 ends of the tubes extend through holes 35 in the mounting plate 18. Such ends of the parts 33 are open as shown in Figure 2, and are rolled or expanded into sealed relation with the portions of the plates which define the holes 35. By reason of the fact that the lower ends of the parts 28 and 33 of the inlet and outlet ends of the tubes are fixedly connected to the mounting plate 18, the tubes are removable with the plate when the latter is disconnected from the frame 22 by

20 removal of the bolts 21. Due to the fact that the lower extremities of said parts 28 and 33 terminate in the same horizontal plane there is no draft through the tubes when the hereinafter described burner means is inoperative and hence

25 there is no cooling of the water and resultant heat loss. Inasmuch as the horizontal parts 29 and 32 of the inlet and outlet ends of the tubes overhang and are in close proximity to the discharge end 15 of the inlet pipe, the water entering the tank by way of the holes 16 in the bottom of the end 15 flows substantially immediately into contact with the tubes and is hence quickly heated.

The burner means 20 is associated with the 35 mounting plate 18. It is of the gas burning type and comprises a horizontally extending manifold 36, a proportional mixer 37, and a motor driven blower 38. The manifold 36 is disposed beneath the lower ends of the vertical parts 28 of the inlet ends of the tubes 19 and is provided with a plurality of vertically extending nozzles 39. The latter correspond in number to, and are associated respectively with, the lower ends of the parts 28. They are aligned with and face

45 in the direction of the lower ends of the parts 28 and are adapted during operation of the burner means 20 to direct jets of flame into the inlet ends 25 of the tubes. These jets of flame flow through the tubes and serve to heat the latter so that they in turn heat the water in the tank. The manifold 36 is fixedly secured to the mounting plate 18 by way of a pair of posts 40 and a pair of U-shaped straps 41. The posts 40 are fixed to and depend from the plate 18 and carry

55 the U-shaped straps 41 at their lower ends. The straps, as shown in Figure 2, surround the ends of the manifold 36 and are secured in clamped relation with the manifold by way of nuts 42 on the lower ends of the posts. One end of the manifold 36 is closed and the other end is connected by a tube 43 to the proportional mixer 37. Gas under pressure is supplied to this mixer by way of a pipe 44 having a solenoid type valve

65 therein. The discharge end of the blower 38 is connected to the mixer by way of a pipe 46. When the burner means is in operation, gas and air in predetermined proportions flow into the manifold 36 via the tube 43 and thence through the nozzles 39. The gas and air constitute a fuel

70 mixture and this is adapted to be ignited at the nozzles. The motor for the blower is controlled by a switch which is in circuit with the solenoid portion of the valve 44 and in this circuit is included a thermostat whereby the motor for the

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blower and the solenoid for the valve are so controlled when the water in the tank reaches a predetermined temperature that the motor is cut off and the valve 44 closed. The burner means is of the on and off variety and embodies standard or conventional controlling means in addition to the thermostat type control heretofore described.

The products of combustion emanating from the outlet ends 26 of the tubes 19 during operation of the burner means 20 are conducted to a vertically extending flue 47 at one side of the tank by way of a cast metal exhaust manifold 48. The latter is secured to the bottom face of the mounting plate 18 by bolts which extend upwardly through the manifold and project into internally threaded sockets in the plate 18. One end of the manifold 48 is closed, as shown in Figure 3, and the other end is provided with a cylindrical sleeve-like member 50 for connection or attachment to the inlet end of the flue 47.

The operation of the heater is as follows: When the water in the tank drops in temperature so that the hereinbefore described control means serves to render operative the burner means 20, the jets of flame emanating from the nozzles 39 pass into the inlet ends 25 of the tubes 19 and flow through the tubes. During passage of the flame through the tubes, the resultant heat is absorbed by the tubes and is in turn absorbed by the water in the tank. The products of combustion emanating from the discharge ends 26 of the tubes flow into the manifold 48 and then pass to the flue 47. When the water in the tank is heated to the proper extent, the burner means is rendered inoperative by the control means with the result that the jets of flame emanating from the nozzles are cut off. While the burner is inoperative, there is no draft through the tubes tending to cool the water in the tank for, as hereinafter pointed out, the lower ends of the parts 28 and 33 of the inlet and outlet ends of the tubes terminate in the same horizontal plane. When it is desired to remove the heating unit 5 either for repair or inspection purposes or to provide access to the interior of the tank for tank cleaning purposes, it is only necessary to disconnect the inlet end of the flue from the sleeve-like member 50 and then remove the bolts 21. Upon removal of the bolts the mounting plate 18 is free and it, together with the tubes, nozzle supporting manifold 36, may be lowered out of associated relation with the tank.

The herein described heater because of the simplicity of the heating unit may be manufactured at a low cost and is exceptionally efficient in operation. Because of the design and construction of the heating unit there is substantially no heat loss while the burner means is inoperative, and the unit as a whole may be readily removed for cleaning and inspection purposes without disturbing the usual piping leading to and from the tank for the proportional mixer and blower constituting parts of the burner means.

Whereas the heater has been described as comprising a horizontally extending tank with a mounting plate in a horizontal position under the bottom portion of the side wall of the tank, it is to be understood that the invention is capable of embodiment in a heater having a vertically extending tank with a mounting plate in the lower portion of the side wall. In such a heater, the extremities of the inlet and outlet ends of the tubes, although not terminating in the same

horizontal plane would be so closely positioned to one another that there would be substantially no draft in the tubes while the burner means is operative. It is also to be understood that the heater may be used for heating fluids other than water and that the invention is not restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. A heater comprising a tank having an inlet and an outlet for fluid and embodying in the bottom portion thereof an opening and a removable plate arranged to close said opening and having two straight parallel laterally spaced closely positioned series of holes therein, and a plurality of fire tubes of the return bend variety disposed in side by side relation in said bottom portion of the tank and having U-shaped central portions and in addition inlet and outlet end portions extending in one direction and at right angles to said U-shaped central portions, positioned in close proximity to one another, projecting respectively through the two series of holes in the plate, and fixed to said plate so that the tubes are removable therewith.

2. A heater comprising a tank having an inlet and an outlet for fluid and embodying in the bottom thereof a downwardly facing opening and a removable horizontally extending plate arranged to close said opening and having two straight parallel laterally spaced closely positioned series of holes therein, and a plurality of fire tubes of the return bend variety and the same size and shape disposed in side by side relation in the bottom portion of the tank and having horizontally extending U-shaped portions and in addition vertical inlet and outlet end portions extending downwards at right angles to said U-shaped central portions, positioned in close proximity to one another, projecting respectively through the two series of holes in the plate, and fixed to said plate so that the tubes are removable therewith.

3. A heater comprising a cylindrical horizontally extending tank having an inlet and an outlet for fluid and embodying at one end thereof and in the bottom portion a downwardly facing opening and also embodying a removable horizontally extending plate arranged to close said opening and having formed therein two straight parallel laterally spaced closely positioned series of holes extending transversely of the tank, and a plurality of fire tubes of the return bend variety and the same size and shape disposed in side by side relation in the bottom portion of the tank and adjacent said one end of the latter and having U-shaped horizontally disposed central portions extending toward the other end of the tank and in addition vertical inlet and outlet end portions extending downwards at right angles to said U-shaped central portions, positioned in close proximity to one another, projecting respectively through the two series of holes in the plate, and fixed to said plate so that the tubes are removable therewith.

4. A heater comprising a tank adapted to hold a body of liquid and embodying in the bottom portion thereof a horizontally extending inlet pipe with laterally extending discharge holes, and having in its bottom a downwardly facing opening and a removable plate arranged to close

said opening and having two straight parallel laterally spaced closely positioned series of holes therein, and a plurality of fire tubes of the return bend variety and of substantially the same size and shape disposed in side by side relation in the bottom portion of the tank and having horizontally extending U-shaped portions in close proximity to, and overhanging relation

with, the pipe and in addition downwardly extending inlet and outlet end portions terminating in a common horizontal plane, projecting respectively through the two series of holes in the plate and fixed to the plate so that the tubes are removable therewith.

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