Aug. 10, 1926. 1,595,400

R. C. HOYT

AUTOMATIC WATER HEATER VALVE

Filed Nov. 23, 1925 2 Sheets-Sheet 1

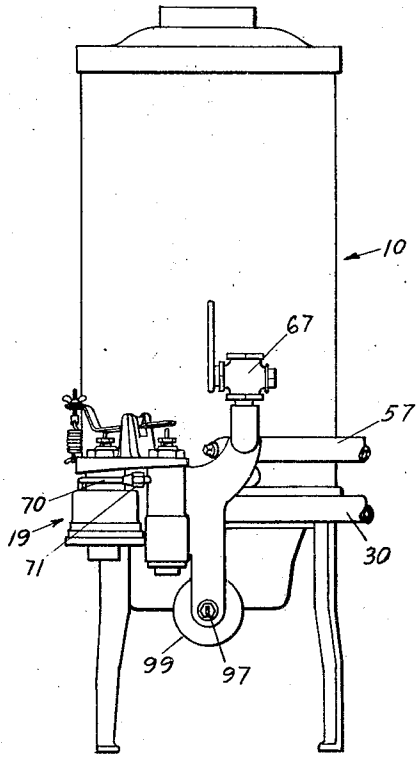

Fig. 1

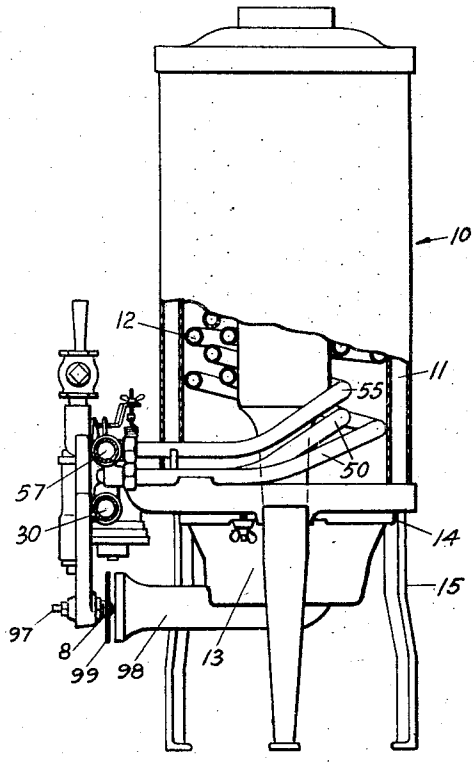

Fig. 2

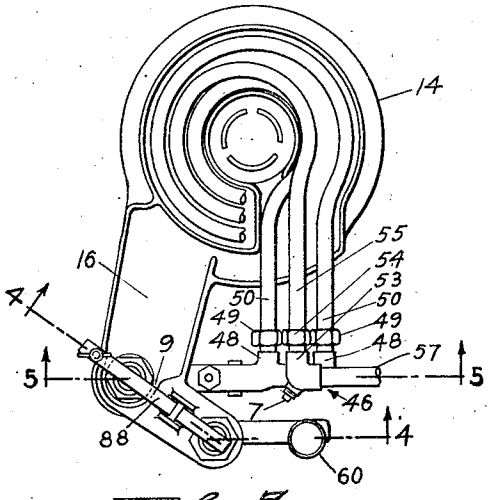

Fig. 3

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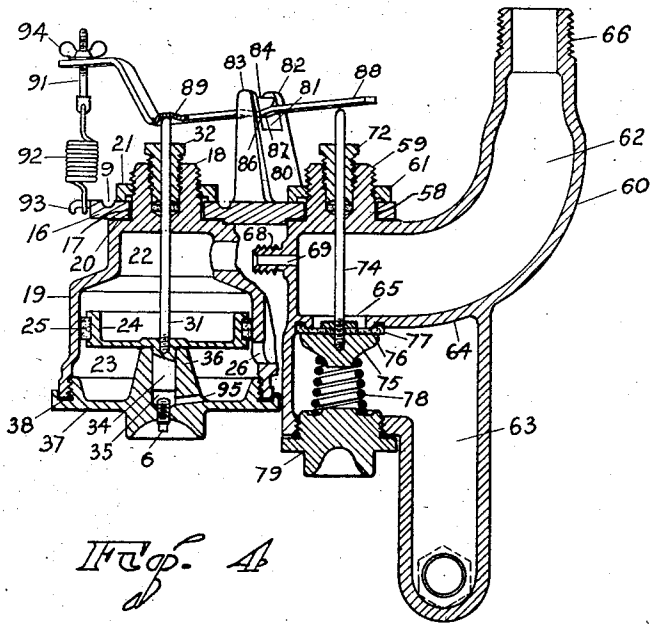

Fig. 4

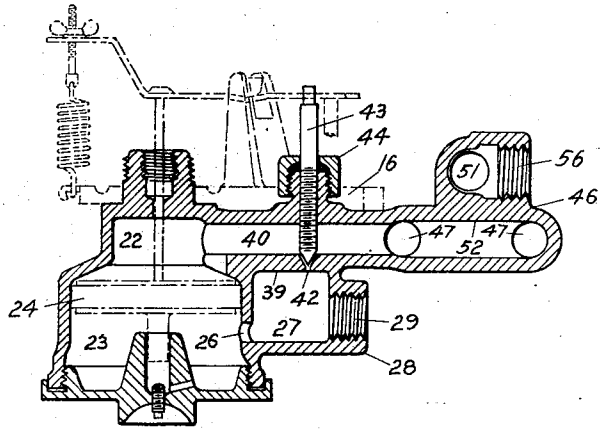

Fig. 5

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UNITED STATES PATENT OFFICE.

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AUTOMATIC WATER-HEATER VALVE.

Application filed November 23, 1925. Serial No. 70,830.

My invention relates to automatic water-heaters, and it has special reference to such heaters in which a valve mechanism, controlled by the differential of water pressure caused by the turning on and off of service faucets, is provided for actuating the gas-valve mechanism of the heater.

In some heaters of this type an adjustable valve stem is provided for an opening, and through which opening the water is led from the water inlet to the heater, and this valve stem is set so that the maximum amount of water flowing through the opening does not exceed the amount of water which can be successfully heated by the heater when the gas valve is fully opened. However, in such heaters the water is generally led downwardly from the inlet and through this opening into a passage from which it runs upwardly into the heating coils, and, since this passage is located below the water inlet, sediment collects therein and, if allowed to remain, soon closes the opening so that the heater becomes inoperative and it will be necessary to take the heater apart in order to restore it to full efficiency again, a constant annoyance, expense and service requirement.

In heaters of this kind where the water control-valve rod extends downwardly through a stuffing box, the constant reciprocating motion of the rod soon wears the packing around the rod and thus causes a leak, with consequent dripping of water onto the floor below the heater. At least 25% of service calls result from this cause alone, I have found as a manufacturer of automatic water heaters.

When the control-valve rod extends not only through the stuffing box in the water control-valve casing but also through the stuffing box of the gas-valve casing, located directly below the control-valve casing, as is shown in the patent to Ezra S. Hoyt, No. 1,310,160, dated July 15, 1919, the length of the rod causes additional strain thereon and consequent liability to bend so that the two valves may operate out of alignment with each other, or so that the valves may cease to function, thus in either case causing a leaking gas valve which allows the burner to continue heating the water even after it has reached the desired temperature in the heating coils.

It is the principal object of this invention to secure the valve, which determines the amount of hot-water flow from the heater, in such a position that sediment can not interfere with its operation and thus eliminate the objections above mentioned.

A further object of the invention is to provide, in combination with the valve mechanism for controlling the water and the gas flow in an automatic-water heater, a valve casing having an upper and a lower pressure chamber in communication with the water inlet of the heater; and removable closing means secured at the bottom of the lower pressure chamber for collecting sediment carried with the water from the water inlet and into the casing.

Another object is to make the control-valve mechanism of the heater positive in operation so as to assure a continuous flow of hot water from the heater when the hot-water faucet is open.

A still further object of the invention is to secure the control-valve casing of the heater to an extension of the heater base so that, if any water leak occurs in the stuffing box for the control-valve rod, the leakage will be carried to the extension and led therefrom to a central bowl of the base surrounded by the burner, and by the flame of the latter the drippings carried to the bowl will be heated and escape as vapor with the unburned products of combustion through the vent for the heater. The base is the subject matter of another patent application bearing the Serial No. 70827 and filing date of November 23, 1925.

Additional objects and advantages will appear as the invention is unfolded in the following detailed description having reference to a preferred embodiment of my invention as illustrated in the accompanying drawings, in which:

Figure 1 is an elevation of an automatic water-heater provided with a control valve of my construction, the view being taken directly in front of the air-mixing chamber for the burner of the heater;

Fig. 2 is an elevation of the heater taken at 90 degrees to Fig. 1, portion of the jacket and of the heating coils being in section, and also the cold-water inlet and the hot-water outlet;

Fig. 3 is a plan of the bottom layer of the

heating-coil unit and shows primarily its connection with the control valve mechanism, the latter being supported on the base of the heater;

Fig. 4 is an enlarged vertical section of the gas valve and a part of the water-control valve, and shows how they are supported by the base of the heater. The section is taken along the line 4—4 of Fig. 3; and

Fig. 5 is a similar sectional view of the water control valve as a whole, and is taken along, the line 5—5 of Fig. 3. The piston is shown at its upper limit and the rocker arm in a position to press down the gas valve to open the same.

Combined with the preferred embodiment of my invention an automatic water-heater 10 is provided with a jacket 11, a heating-coil unit 12 and a burner 13, all supported on a base 14, which stands on legs 15. The base 14 has thereon a lateral extension 16, Fig. 3, in which is an opening 17, Fig. 4, for receiving therein an externally threaded boss 18, which is integral with a water-control valve casing 19 and forms therewith a shoulder 20, and the valve casing is securely fastened to the extension 16 by means of a nut 21. Surrounding the nut, Figs. 3 and 4, is an annular groove 9 for carrying the valve water leakage down the base extension 16.

The valve casing 19 comprises an upper pressure chamber 22 and a lower pressure chamber 23, the upper chamber being simply a reduced portion of the lower chamber. The lower pressure chamber holds reciprocatingly therein a piston 24 which is provided with a packing 25 in order to fit watertight in the chamber, and below the piston's path of reciprocation in the chamber 23 is an opening 26 in communication with a water-inlet chamber 27, formed in a lateral extension 28 of the casing and being at its outer end threaded, as shown at 29 in Fig. 5, for connection with a water-inlet pipe 30.

From the piston 24 extends upwardly through the boss 18 a piston rod 31, for which the usual gland 32 and the packing are provided, and downwardly from the piston extends a projection 34, which is adapted to slide in a bore 35 in a boss 36, formed on the inside of a cap 37, and the cap is in threaded engagement with the lower end of the casing 19 and screwed down upon a gasket 38 so as to make the end of the casing water-tight. The cap 37 is on its inside recessed and of a bowl-like shape, in order to collect sediment from the water that passes into the lower pressure chamber 23.

Above, and divided from the water-inlet chamber 27 by a wall 39, Fig. 5, is formed in the extension 28, a passage chamber 40, which communicates with the upper pressure chamber 22, and also with the water-inlet chamber through an opening 42, while a valve stem 43 is in threaded engagement with, and extends through, the upper wall of the passage chamber 40, and which wall has the usual stuffing box 44 for the stem. The stem is adjusted so as to allow the proper amount of water to flow through the opening 42, as will be explained hereinafter. The end of the passage chamber 40 terminates in a header 46 provided with two similar openings 47, through threaded bosses 48 having glands 49 for tight connections with the initial convolutions of the two cold-water coils 50 in the heating-coil unit 12 of the heater, and in the same header 46, a third opening 51, above the openings 47 and divided from the passage chamber 40 by a partition wall 52, is provided through a threaded boss 53, which also has a gland 54 for tight connection with the terminal convolution of a hot-water coil 55 of the said heating-coil unit. This opening 51 communicates with a threaded outlet chamber 56 adapted to be connected with the outlet pipe 57 for the hot water from the heater and leading to the hot water service pipes throughout the dwelling or other place.

Beside the opening 17 in the base extension 16, there is another opening 58, Fig 4, adapted to receive therein an externally threaded boss 59 on the upper side of a gas-valve housing 60, and the housing is firmly secured to the extension 16 by a nut 61 screwed upon the boss 59. The housing 60 comprises two chambers, an upper or gas-inlet chamber 62, and a lower or gas- delivery chamber 63, divided by a wall 64, but being in communication with each other through an opening 65 in the said wall. The gas-inlet chamber 62 is extended upwardly and provided with a threaded end portion 66 adapted to be connected with a main gas-inlet valve 67. At the other end of the chamber 62 the housing 60 has thereon a threaded boss 68, through which is an opening 69, and to the boss 68 is secured a pipe 70, Fig. 1, leading to the pilot light, not shown, by a nut 71, the joint being made gas tight by the usual means. It is thus seen that the pilot light has a continuous and uninterrupted communication with the main gas service.

Through the boss 59 of the housing 60, Fig. 4, is an opening, which is enlarged and threaded in the boss for a stuffing box so as to receive therein a nut 72 adapted to compress a packing around a valve stem 74, which latter extends upwardly through the boss 59 and is at its lower end connected with a valve 75. At the opening 65 an annular valve seat 76 is formed on the underside of the wall 64, and the valve 75 is provided with a suitable washer 77 adapted to engage the seat and to seal the opening when the valve is seated. A compression spring 78 between the valve 75 and a plug 79, screwed into the bottom of the gas-de-

livery chamber 63, normally holds the valve in engagement with the seat 76.

Approximately midway between the two openings 17 and 58 in the base extension 16, the latter has integral therewith and on its upper side a structure 80, through which is an opening 81 formed by two side members 82 and 83 and a wedge-shaped top or fulcrum member 84. The latter has its edge or fulcrum 86 directed downwardly so that it is adapted to be in engagement with a grooved portion 87 of a rocker arm or lever 88 that extends through the opening 81, and which lever has a concave portion 89 on its underside adapted to rest upon the top of the afore-mentioned piston rod 31. Beyond this portion 89 the rocker arm is shaped somewhat like the letter Z and at its end is provided with an opening which allows free movement therein of the stem of a screw 91, connected at its lower end with a tension spring 92, and the tension spring in its turn is at its lower end slipped over a hook 93 cast on the base extension 16. A thumb nut 94 on the screw 91 serves to hold the rocker arm at the proper tension on the top of the piston rod 31. The other end of the rocker arm extends directly over the gas-valve stem 74 but is normally not in contact therewith.

For the purpose of draining the water out of the valve casing 19 when necessary, and particularly in countries having a freezing temperature, the boss 36 of the cap 37 has therein an opening 95 communicating with the bore 35 in the cap, and at the end of the bore is a small pipe plug 6 for draining the casing. To drain the water out of the coil unit 12, a similar plug 7, is provided in the chamber 56 of the water header 46, Fig. 3.

The gas-delivery chamber 63 is as usual provided with a valve stem 97, Fig 2, in alignment with an air mixing chamber 98 integral with the burner 13. Air is admitted in correct proportion into the mixing chamber by the adjustment of a disk 99, which is in threaded engagement with a boss 8 secured to the gas valve housing 60 and provided internally with a valve seat for the valve 97.

In practice, the operation of the control valve mechanism is as follows: The valve stem 43 is first adjusted so that it nearly closes the opening 42 to allow such an amount of water to pass therethrough, usually two and one-half gallons per minute, as can be heated to the desired temperature, usually 140 degrees Fahrenheit, when the gas valve 75 is opened. When set as above and in service, water will flow from the inlet chamber 27 into the lower pressure chamber 23 of the valve casing 19 and through the valve opening 42 into the passage chamber 40, from which it will also flow into the upper pressure chamber 22. Since the opening 26 leading to the pressure chamber 23 is considerably larger than the opening 42, and the flow through the latter opening can be further reduced by the adjustment of the tapered valve stem 43 to allow only a certain amount of water to pass therethrough in a certain time, the pressure in the lower pressure chamber will be considerably greater than the pressure in the upper pressure chamber, so that the tendency is to move the piston 24 upwardly. This tendency, however, is balanced by the spring 92, which is adjusted by means of the nut 94 on the screw 91, in proportion to the flow of water from the heating-coil unit, so that, when the flow is active, as by the turning on of a service faucet, and the necessity exists for the proper intensity of flame from the burner 13, the pressure in the lower pressure chamber will be greater than the resistance of the spring 92 and the pressure in the upper pressure chamber. This difference in pressure will thus cause the piston 24 to move upwardly so that the rocker arm 88, on its fulcrum 86, will push the valve stem 74 downwardly and therewith also the valve 75 and thereby admit the necessary proportional amount of gas from the gas-inlet chamber 62 to the gas-delivery chamber 63, from which it is conveyed to the burner through the air mixing chamber 98.

Again, when the faucet is shut off and no water is drawn from the heater, the pressure in the upper pressure chamber aided by the resistance of the spring 92 will overcome the pressure in the lower pressure chamber, so that the valve 75 closes.

While the drawing illustrates an embodiment of the invention, it is to be understood that in adapting the same to meet different conditions and requirements, various changes in form, proportion and minor details of construction may be resorted to without departing from the nature of the invention and spirit of the claims.

What I claim as new and desire to secure by Letters Patent of the United States is the following:

1. In combination with the valve mechanism for controlling the water and gas flow in an automatic water-heater, a valve casing having an upper and a lower pressure chamber in communication with the water inlet of the heater, the casing being threaded at its lower end; and an internally recessed cap removably engaging said threaded end for collecting sediment carried with the water from the water inlet and into said casing, the cap being provided with means communicating with the recess therein for draining the water from the casing.

2. In an automatic water-heater, the combination of a valve comprising a valve casing secured to a support and being provided

with an upper and a lower chamber in communication with each other; a piston adapted to reciprocate in the lower chamber and having secured thereto a rod extending upwardly through and above said casing; a water-inlet chamber communicating with the lower chamber below said piston; a passage chamber above the inlet chamber, said passage chamber being at one end in communication with the heating-coil unit of the heater, and at its other end in communication with the upper chamber and provided in its bottom with a valve opening in communication with said water-inlet chamber; a valve adjustably secured in said passage chamber and adapted to be adjusted above said opening so as to allow a predetermined amount of water to flow therethrough from the inlet chamber to said passage chamber; a rocker arm adapted to bear on the upper end of said piston rod; the said support provided with a fulcrum engaging the upper side of said rocker arm; means at one end of the rocker arm for holding the rocker arm in engagement with said rod and said fulcrum; a gas-valve housing secured to said support, said housing being divided into two chambers, an upper gas-inlet chamber having uninterrupted communication with the pilot light of the heater; and a lower gas-delivery chamber communicating with the burner of the heater; and a spring-closed valve in the lower gas-chamber, said latter valve having a rod extending upwardly under said rocker arm and which valve being adapted to be actuated by said rocker arm contacting with said valve rod.

3. A structure as specified in claim 2 and in which the rocker arm has formed thereon a concave portion on its underside for engagement with the upper end of the piston rod to prevent the said arm from slipping off the said rod.

4. A structure as specified in claim 2 and in which the rocker arm has formed thereon a grooved portion on its upper side for engagement with the fulcrum to prevent the said arm from slipping longitudinally on said fulcrum.

5. A structure as specified in claim 2 and in which the rocker arm has formed thereon a concave portion on its underside for engagement with the upper end of the piston rod to prevent the said arm from slipping off the said rod, and in which the rocker arm has formed thereon a grooved portion on its upper side for engagement with the fulcrum to prevent the said arm from slipping longitudinally on said fulcrum.

6. A structure as specified in claim 2 and in which the bottom of the lower chamber is provided with removable closing means for collecting sediment carried with the water.

In testimony whereof I affix my signature.

ROBERT C. HOYT.