Nov. 24, 1942. E. R. KOPPEL 2,303,128

GAS BURNER CONTROL FOR DOMESTIC WATER HEATERS

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FIG. 1.

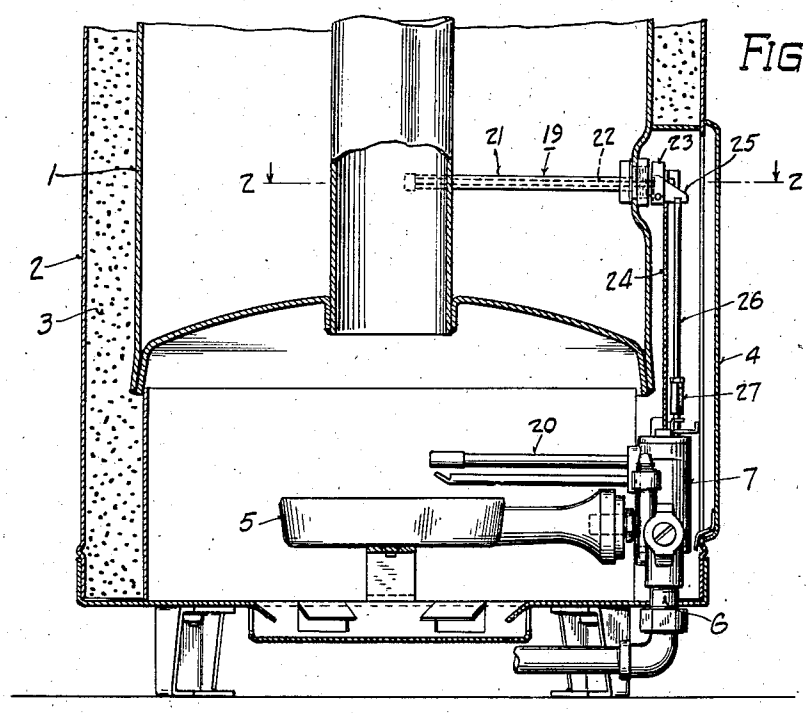
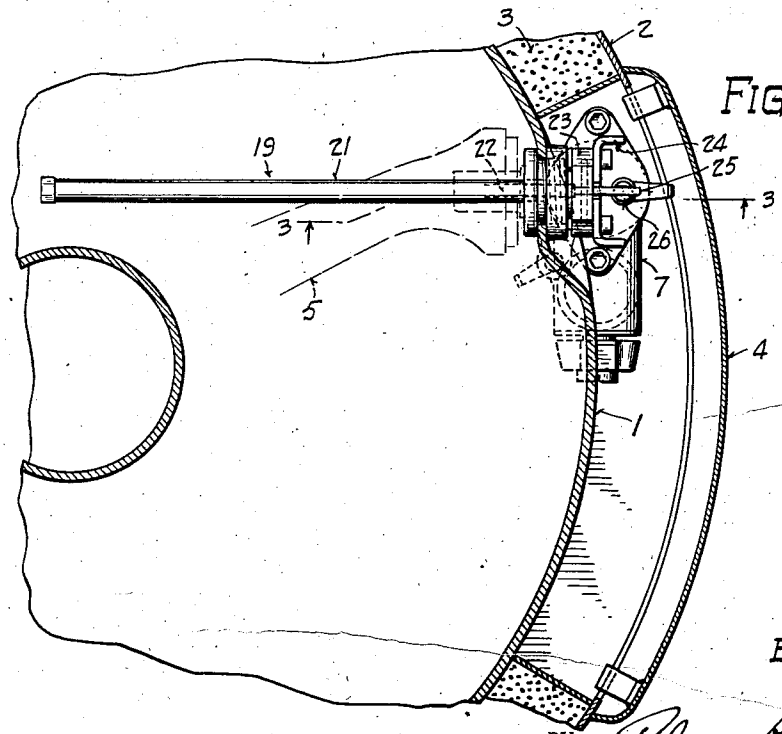


FIG. 2.



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FIG. 3.

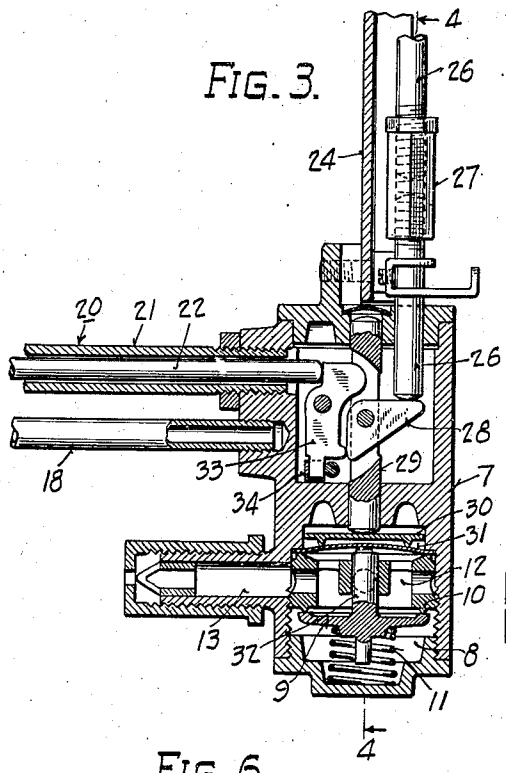


FIG. 4.

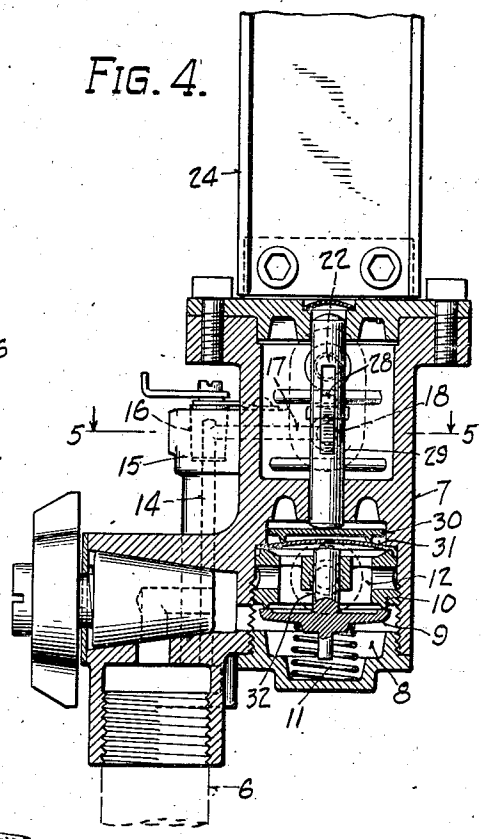


FIG. 6.

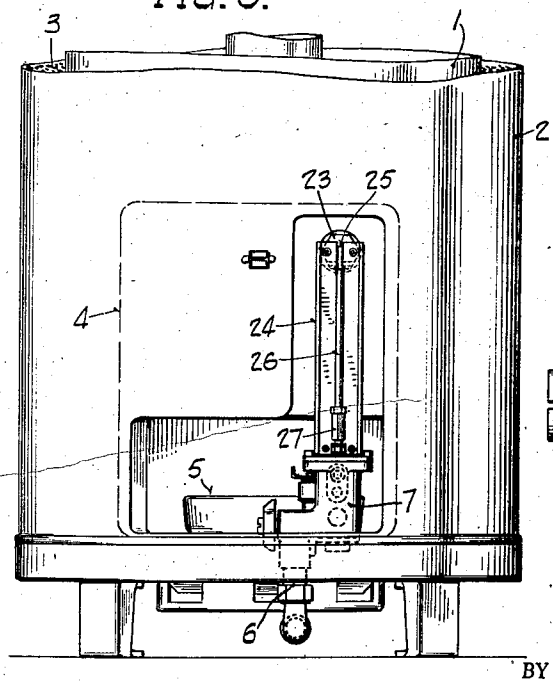
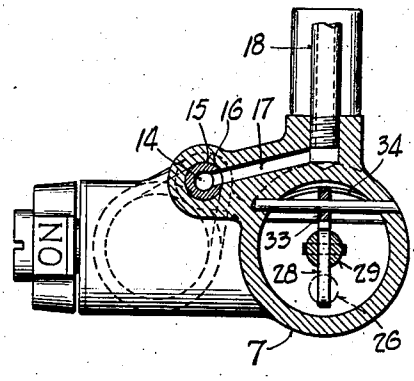


FIG. 5.



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UNITED STATES PATENT OFFICE

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GAS BURNER CONTROL FOR DOMESTIC WATER HEATERS

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3 Claims. (Cl. 236—21)

This invention relates to gas burner control for domestic water heaters.

In the construction of domestic water heating units, it is customary to employ a cylindrical tank disposed with its axis vertical and having a substantial thickness of insulation around its sides and over the top, with a thin sheet metal casing on the outside. A gas burner is normally placed beneath the tank, inside of the casing, and a chimney flue is provided upwardly through the center of the tank.

The gas burner has a pilot flame and a main burner flame, the former operating continuously and the latter operating intermittently in accordance with the demand for hot water. Heretofore, the control of the main burner flame by means of a thermostat has entailed equipment of a size requiring its location outside of the casing. This meant that the supply pipe for the gas was applied to the main thermostat located part way up the side of the casing and that two pipes went down on the outside of the casing to the bottom where they entered the pilot control and the burner. The unsightly appearance of this equipment and the danger of its being tampered with by small children has been recognized for some time and attempts have been made to design a control that can be placed entirely inside the casing, out of sight. This, with the existing controls could only be achieved by the addition of another merely ornamental housing around the heater proper.

The object of the present invention is to provide a control for the gas burner which is small and compact and which is positive and safe in action.

Another object is to provide a single valve which is operated by both a pilot thermostat and a main control thermostat.

Another object is to provide a control to which the gas supply pipe is connected through the bottom of the casing and in which no part extends outside of the casing.

Another object is to provide a less costly control mechanism which is readily adjusted and which has a very short path for the gas from the valve to the burner so that air cannot seep back into the pipe and cause damage upon opening of the valve.

Other objects will be made clear in connection with the description of one embodiment of the invention illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a sectional view of the lower end of a tank showing the control and thermostats applied thereto;

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 2;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 3;

Fig. 5 is a detail section showing the by-pass for the pilot burner, on line 5—5 of Fig. 4; and

Fig. 6 is a front view of the casing showing the control in place.

Referring to the drawings, the water tank 1 has an outer casing 2 spaced therefrom to provide for the heat insulation 3. A door or cover plate 4 is located near the bottom of the casing 2 to provide access to the burner 5 and to the control mechanism. The gas supply pipe 6 enters the control mechanism at the bottom of the casing.

The control mechanism has a lower casting 7 providing a gas chamber 8 receiving gas directly from the supply pipe 6. A circular disk valve 9 is normally pressed closed on its seat 10 by a spring 11 in the gas chamber 8, and closes off the gas from the burner. When the disk valve 9 is pressed downwardly against spring 11 it opens and allows gas to escape from chamber 8 past seat 10 into the upper chamber 12 and through the passage 13 directly to the burner 5.

The casting 7 has a small passage 14 leading from the gas supply pipe 6 upwardly to the pilot supply chamber 15 which has a small manually operated valve 16 controlling the passage of gas through port 17 to the pilot burner 18.

The main valve 9 is controlled by two thermostats 19 and 20. The thermostat 19 extends into the water space in the tank and responds to the temperature of the water in the tank to open or close the valve 9. The thermostat 20 extends above the pilot flame and is responsive to its temperature to provide the safety feature of preventing opening of valve 9 should the pilot flame become extinguished. Each thermostat preferably comprises a horizontally disposed copper tube 21 and an inner control rod 22 of different coefficient of expansion and inserted in the tube and secured to the end subjected to heat changes. The other end of the tube is fixed while the control rod extends outwardly through the base support for the thermostat.

The upper thermostat 19 has its base 23 secured in the wall of the tank and a channel 24 extends downwardly from base 23 on the outside of

the tank to hold the casting 7 at a substantially fixed distance from the thermostat. A bell crank lever 25 is horizontally pivoted at the upper end of channel 24 and has its vertical face engaged by the end of the rod 22 of the thermostat 19 while its horizontal face rests upon the upper end of a vertical push rod 26 extending downwardly inside the channel.

The push rod 26 is made in two sections joined by a coupling 27 threaded to the two ends in opposite directions to provide for adjusting the over-all length of the rod. The lower end of the rod 26 passes through the top of casting 7 and engages a triangularly shaped ledge 28 which is pivoted to a short stub vertical push rod 29.

Normally the ledge 28 is held against pivoting on the rod 29 so that when rod 26 presses downwardly upon the ledge it moves the rod 29 downwardly. The rod 29 rests upon the center of a disk 30 which in turn contacts the rim of a concave disk spring 31 in the lower part of casting 7 and disposed directly above the disk valve 9. The valve 9 has a vertical stem 32 which contacts the center of spring disk 31 so that pressing of the disk 30 downwardly snaps spring 31 below center and effects opening of the valve. When added pressure of rod 29 is removed from spring disk 31, the latter snaps back over center and valve disk 9 again seats. Spring 11 tends to support the weight of disk 9 and hold it against the seat.

In operation, when the water in tank 1 cools, the tube 21 of thermostat 19 contracts and causes its rod 22 to move outwardly against the bell crank lever 25. This forces push rod 26 downwardly against ledge 28, thereby pressing rod 29 downwardly against disk 30 which in turn snaps spring 31 past center, opening valve 9 and releasing the gas to the burner. Likewise, when the water in tank 1 becomes heated, tube 21 of thermostat 19 expands and withdraws rod 22 inwardly allowing the bell crank lever 25 to pivot away from rod 26. Spring 31 then snaps over center and lifts rod 29, ledge 28 and rod 26, and effects seating of the valve disk 9.

In order to provide the safety feature of preventing the valve 9 from being actuated to open position by thermostat 19 in case the pilot flame becomes extinguished, the ledge 28 has its vertical face engage one end of a lever 33 which is pressed against it by a spring 34 to hold the ledge in normal position. The other end of lever 33 is engaged by the control rod 22 of thermostat 28. When the thermostat is cold, as when the pilot is extinguished its tube 21 contracts and the consequent outward movement of rod 22 operates lever 33 against spring 34 and away from the ledge 28 so as to give the latter no support. Thereafter, when thermostat 19 calls for heat and rod 26 lowers, the ledge 28 merely drops away from the rod and does not effect a push on rod 29.

Upon lighting of the pilot burner again thermostat 28 will become heated and allow spring 34 to press lever 33 back to normal position holding ledge 28 in a non-pivotal relation.

The entire control mechanism takes up little space and can be placed wholly inside the casing of the tank. It is readily adjusted by means of the coupling 27 on rod 26 and is simple to maintain. If desired the manually controlled pilot valve 16 may be additionally shut off by thermostat 28, although in the average construction this will not be necessary.

Various embodiments of the invention may be made within the scope of the invention as set forth in the accompanying claims.

The invention is claimed as follows:

1. In combination in a domestic water heater having a cylindrical tank disposed with its axis vertical, a heating burner beneath said tank, a layer of heat insulation around the tank, a cylindrical casing enclosing the insulation and tank and substantially concentric with the tank to provide for a uniform thickness of insulation with a minimum of space between the casing and tank, gas control devices disposed entirely inside said casing and comprising a casting providing a main valve chamber having a connection for the gas supply pipe and a connection for the burner with a snap action valve disposed therebetween, a pilot burner secured to said casting and extending to a point relative to the main burner to effect lighting of the latter, and a thermostat responsive to the temperature of the water inside the tank to operate said valve, said thermostat being disposed above said valve and extending horizontally through the wall of the tank and being connected with said valve by a vertically reciprocating push rod disposed within the space provided for insulation between the tank and outer cylindrical casing.

2. In combination in a domestic water heater having a cylindrical tank disposed with its axis vertical, a heating burner beneath said tank, a layer of heat insulation around the tank, a cylindrical casing enclosing the insulation and tank and substantially concentric with the tank to provide for a uniform thickness of insulation with a minimum of space between the casing and tank, gas control devices disposed entirely inside said casing and comprising a casting providing a main valve chamber having a connection for the gas supply pipe and a connection for the burner with a snap action valve disposed therebetween, a pilot burner secured to said casting and extending to a point relative to the main burner to effect lighting of the latter, a thermostat responsive to the temperature of the water inside the tank to operate said valve, said thermostat being disposed above said valve and extending horizontally through the wall of the tank and being connected with said valve by a vertically reciprocating push rod disposed within the space provided for insulation between the tank and outer cylindrical casing, and a thermostat responsive to a temperature produced by the pilot flame, and means to disconnect said push rod to prevent the opening of the valve by it when said second thermostat moves to a position responsive to failure of the pilot.

3. In a gas burner control, a thermostat, a rod disposed to be moved longitudinally by the thermostat against a bell crank lever pivoted to a valve operating stem, means to hold said lever against pivoting relative to said stem during normal operation of said rod by said thermostat, and a safety thermostat for releasing said means to prevent movement of the stem by said rod, whereby the valve is retained closed under abnormal conditions.

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