April 9, 1940. H. J. LONG 2,196,316

GAS CONTROL MECHANISM

Filed Aug. 14, 1937 2 Sheets-Sheet 1

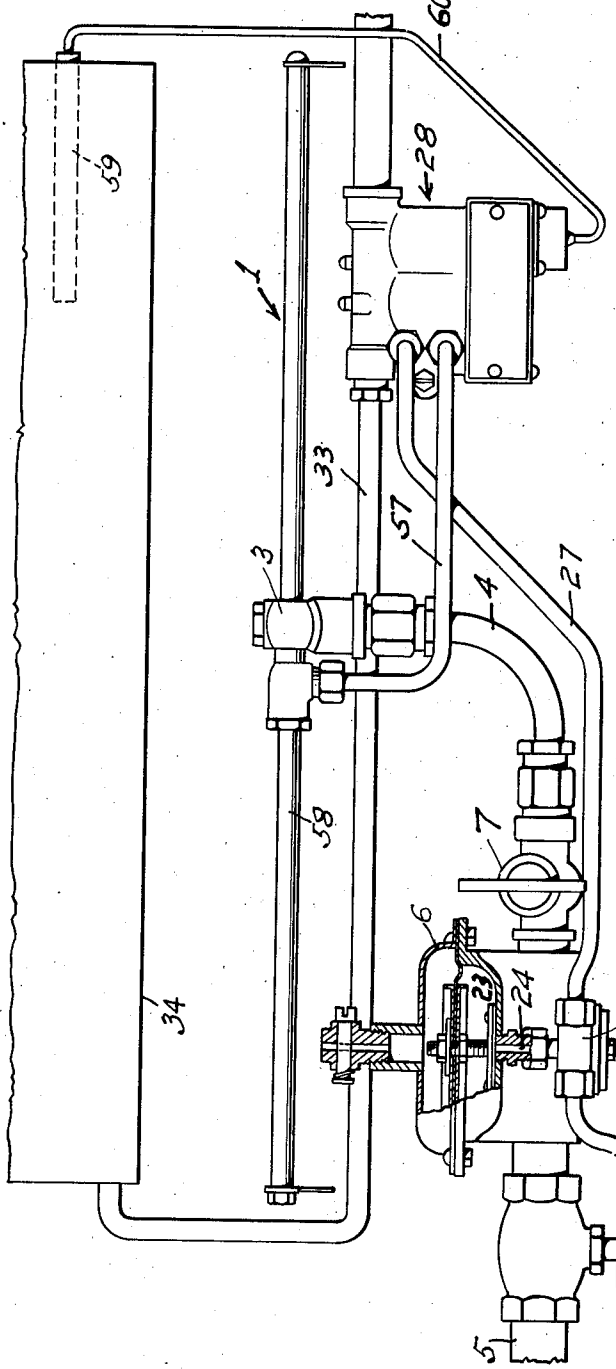


Fig. 1.

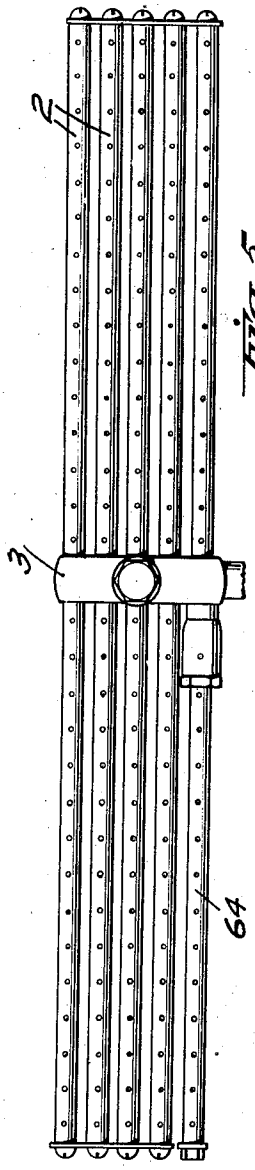


Fig. 5.

INVENTOR.
HERBERT J. LONG

BY

ATTORNEY.

April 9, 1940. H. J. LONG 2,196,316

GAS CONTROL MECHANISM

Filed Aug. 14, 1937 2 Sheets-Sheet 2

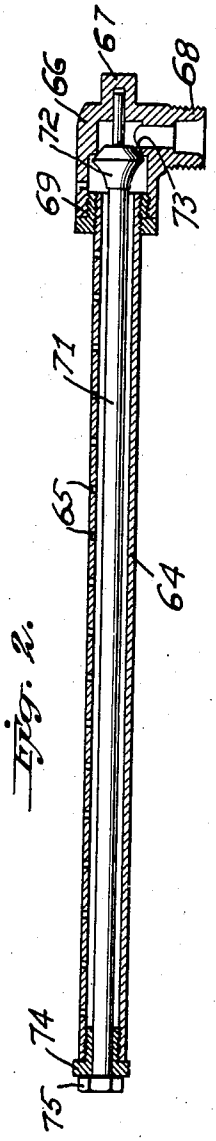


Fig. 2.

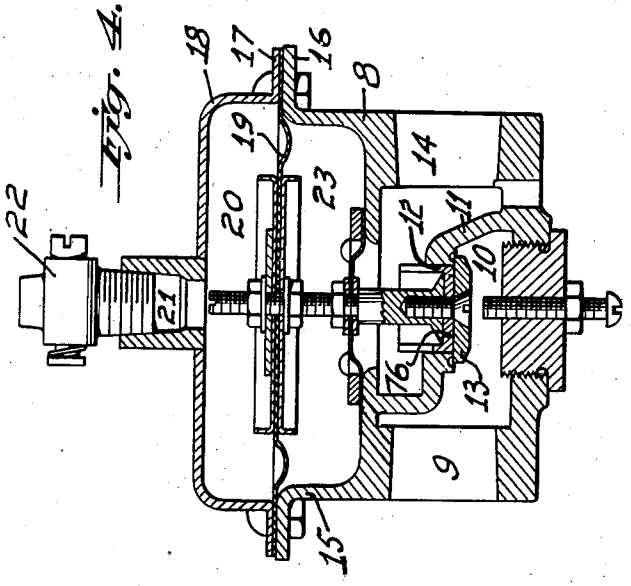


Fig. 4.

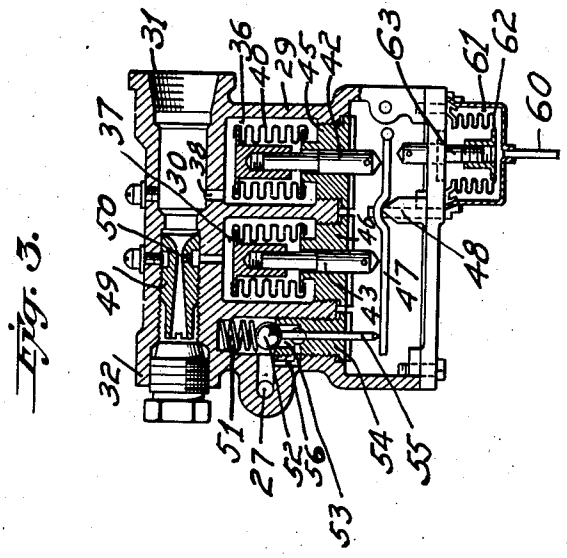


Fig. 3.

INVENTOR.
HERBERT J. LONG

BY

ATTORNEY.

Patented Apr. 9, 1940

2,196,316

UNITED STATES PATENT OFFICE

2,196,316

GAS CONTROL MECHANISM

Herbert J. Long, Springfield, Mass., assignor to American Bosch Corporation, a corporation of New York

Application August 14, 1937, Serial No. 159,046

3 Claims. (Cl. 236—23)

This invention relates to a system for controlling the supply of gas to the burner of water heaters and more particularly water heaters of the instantaneous type.

It is among the objects of the present invention to provide a pilot burner which burns with a low flame in the manner of conventional pilot burners when the main burner is out of operation but which burns with a high flame and functions as a portion of the main burner during periods when the main burner is in operation.

It is a further object of this invention to control the fuel supply to the pilot burner in such a manner that the flow of gas thereto is immediately increased upon the opening of a hot water faucet and the resulting flow of water through the heating element of the system.

It is a further object of the present invention to utilize the increased flow of gas to the pilot burner to control the flow of gas to the main burner in a manner that will cause a predetermined time lag between the initial supply of gas thereto and the full operation thereof.

The combined effect of the above mentioned objects and other features and objects of the invention hereinafter more fully set forth results in a gas burner in which during the periods when no water is being withdrawn, the pilot burner consumes but a small quantity of gas. Immediately upon withdrawal of water at a material rate the flame at the pilot burner increases to a flame as large as that at any portion of the main burner during full operation, thus providing a large pilot flame during the period when the jets of main burner are being ignited and also supplying a material portion of the heat of the main burner during its full operation. At the same time the flow of gas to the main burner is dependent upon the flow of gas to the pilot, so that there is necessarily a large flame at the pilot portion of the burner at the moment when gas is supplied to the main burner. The flow of gas to the main portion of the burner during the initial period is preferably at a low rate whereby the flame from the pilot may spread from jet to jet of the main burner before the full flow of gas thereto is permitted.

The above and other objects and features of this invention will be apparent to those skilled in the art from a consideration of the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a side elevation with parts removed to show internal structure of the control system constructed according to this invention; Fig. 2 is a detail of the pilot burner; Fig. 3 is a detail of the water control valve; Fig. 4 is a detail of the main gas valve; and Fig. 5 is a top plan view of the gas burner.

Referring to Fig. 1, the reference numeral 1 indicates a main gas burner which in the instance shown is of the type having a plurality of arms 2 extending from a central manifold 3. Gas is supplied to the manifold 3 by pipe 4 which leads from a supply main 5 by way of a gas control device 6 and a supply cock 7. The gas control device 6, the details of which may be seen in Fig. 4, comprises a housing 8, the lower portion of which is provided with a gas inlet 9, which opens into a chamber 10. A partition 11 having an opening 12 controlled by a valve 13 divides the chamber 10 into two parts and an outlet opening 14 provides a connection between that portion of the chamber 10 above the valve 13 and stop cock 7. The upper portion of the housing 8 is provided with an upwardly extending portion 15 provided with an outwardly extending flange 16. The flange 16 coacts with a similar flange 17 on a cup-shaped cover member 18 to secure a diaphragm 19 therebetween. A chamber 20 above the diaphragm 19 communicates with the atmosphere by way of passage 21 controlled by an adjusting cock 22. A chamber 23 below diaphragm 19 is in communication with the gas supply main 5 by way of a passage 24 which connects with a T fitting 25, one arm of which is connected by tube 26 to the supply main 5 and the other arm of which is connected by a tube 27 to a flow control device 28. The flow control device 28, the details of which may be seen in Fig. 3, comprises a housing 29 having a transverse passage 30 in the upper portion thereof, one end of which is provided with an outwardly projecting and internally threaded boss 31 for connection with a source of water supply and the opposite end of which is provided with a similar boss 32 for connection by way of pipe 33 with the heating element 34 of the heater. Two chambers 36 and 37 are provided within the housing 29 below the passage 30 and in communication with said passage by way of openings 38 and 39 respectively. A pair of bellows 40 and 41 within the chambers 36 and 37 actuate push rods 42 and 43 which extend through screw plugs 45 and 46 which close the lower open ends of the two chambers. The push rods 42 and 43 contact a lever 47 at points which are substantially equidistant from and on opposite sides of a fulcrum 48 of said lever. A plug 49 forming a venturi is inserted in the transverse passage 30 and a

lateral opening 50 adjacent the opening 39 provides communication between the most restricted portion of the throat and the chamber 37. A valve chamber 51 in the housing 29 adjacent the chamber 37 accommodates a spring-pressed ball valve 52 which controls a passage 53 formed in a screw plug 54 closing the lower open end of the valve chamber 51. A rod 55 extends through a central bore in the screw plug 54 and contacts at its lower end with the lever 47. A by-pass passage 56 permits a small continuous flow of gas between the intake tube 27 and a discharge tube 57 when the ball valve 52 is closed. The discharge passage 57 leads to a pilot burner 58, the details of which will hereinafter be more fully described. A thermostat 59 of the expansible fluid type, which is responsive to the temperature in the heating element 34, communicates by way of a capillary tube 60 with a bellows chamber 61 having a Sylphon bellows 62 therein. The bellows 62 is connected with a push rod 63 adapted to project into and out of contact with the lever 47.

The pilot burner 58, details of which may be seen in Fig. 2, comprises a tube 64 similar in length to the arms 2 of the burner and having an approximately equal number of jets 65. The tube 64 is detachably supported upon the body of the manifold 3 but not in communication therewith by a fitting 66 having an axially projecting boss 67 for connection with said manifold. A downwardly projecting and externally threaded annular boss 68 is adapted for connection with the tube 57 and a horizontally projecting portion 69 of the fitting 66 is internally threaded to receive the external threads upon an annular plug 70 which unites the burner tube 64 and fitting 66. A rod 71 extends through the tube 64 with sufficient clearance therebetween for the free flow of gas to the jets 65, and carries at one end a valve 72 adapted to coact with a seat 73 formed in the fitting 66 to control the flow of gas to the pilot burner. The opposite end of the rod 71 projects slightly through the free end of the tube 64 and is adapted to be adjusted by means of screw plug 74 and nut 75.

In the operation of the device as above described, the pilot burner is first ignited by holding a flame adjacent thereto until the tube 64 becomes heated and expands to move the rod 71 outwardly and open the valve 72 permitting flow of gas to the pilot. Assuming that no water is being drawn through the heater, the flame at the pilot burner is restricted to that permitted by the quantity of gas flowing through the by-pass 56. This quantity is so restricted that there is a suitable back pressure in the tube 27 which is communicated to the chamber 23 below the diaphragm 19 and maintains the diaphragm in its uppermost position. The attached valve 13 is held in closed position so that no gas flows to the main burner through the opening 12. Should a hot water tap be opened water will flow through the transverse passage 30 and thence through the heating element 34. In its flow through the venturi 49, it will effect a reduction in pressure at the lateral opening 50 which will be communicated to the chamber 37. The pressure within the passage 30 on the intake side of the venturi will be greater than that at the restricted portion of the venturi and this pressure will be communicated to the chamber 36 by way of passage 38. The pressure in the two chambers 36 and 37 will become unbalanced, and the rod 62 will act upon the lever 47 with greater force than the rod 62. The lever 47 will thus be unbalanced to lift the ball valve 52 and open free communication between the passage 27 and the passage 57. A full flow of gas will be supplied to the pilot burner and the flame at this burner will rise to its full height. This results in a reduction of back pressure within the passage 27 which is communicated by way of passage 24 to the chamber 23 beneath the diaphragm 19 and permits the diaphragm to fall moving the attached valve 13 downwardly. As the valve leaves its seat a small quantity of gas is permitted to flow through a restricted passage between a skirt 76 on the valve 13 and the surrounding wall of the opening. This small quantity of gas flows through the jets of the main burner and is ignited by the pilot flame. Continued downward movement of the diaphragm 19 which movement is relatively slow because the air pressure upon the upper side thereof is somewhat reduced and is equalized but slowly through the passage 21 restricted by the cock 22. After a period which can be predetermined by adjustment of the cock 22, the valve 13 has moved downwardly to such an extent that the skirt 76 no longer restricts the opening 12 and a free flow of gas to the main burners is permitted. Flame at the jet orifices therefore rises to its full extent which is comparable to the flame from the jet orifices of the pilot burner so that heat is evenly distributed throughout the combustion chamber between the burner and the heating element.

Should the flame at the pilot burner become extinguished, the tube 64 will contract in cooling and thereby force the valve 72 against the seat 73 to completely cut off the flow of gas to the pilot burner. In such a case if water is withdrawn from the heater so that the valve 52 is open, there will be no reduction in the pressure of the gas in the passage 27 and the main gas valve 13 will accordingly remain closed. Thus no gas can flow to the main burner unless there is a flame at the pilot burner.

Should the temperature of the water exceed the desired temperature the fluid in the thermostat 59 will expand and accordingly force the push rod 63 upwardly against the lever 47 to reduce the flow of gas through the ball valve 52 and accordingly increase the back pressure in the tube 27 and the diaphragm chamber 23 to lift the valve 13 and thereby reduce the flow of gas to the main burner.

From the above description it will be apparent that I have provided a control system for water heaters of the instantaneous type in which the flow of gas to the main burner is dependent on and follows after a predetermined time lag upon the increased flow of gas to the pilot burner, while the flow of gas to the pilot burner is dependent upon the rate of flow and the temperature of the liquid being drawn through the system, and is also dependent upon the presence of flame at the jets thereof. It will also be apparent that by forming the pilot burner as one of the arms of the main burner and supplying gas thereto, at a rate which during normal operation is approximately the same as the flow of gas to the other arms of the burner, the heat from the pilot and the main burners is evenly distributed in the combination chamber and therefore equally effective for heating the heating element.

While there is herein described but the preferred embodiment of the invention, other embodiments and adaptations thereof within the

scope of the appended claims will be obvious to those skilled in the art.

Having thus described the invention, what is claimed as new is:

1. A control system for water heaters of the instantaneous type including a heating element, a main burner for heating said element, a valve controlling the supply of fuel to said main burner, a pilot burner associated with said main burner, means for continuously supplying fuel to said pilot burner, means responsive to the flow of the water passing through said heating element for increasing the flow of fuel to said pilot burner, and means responsive to the reduction of fluid pressure due to an increased flow of fuel to said pilot burner for controlling the flow of fuel through said valve.

2. A control system for water heaters of the instantaneous type including a heating element, a main burner for heating said element, a valve controlling the supply of fuel to said burner, a pilot burner associated with said main burner, means for continuously supplying fuel to said pilot burner, means responsive to the flow of the water passing through said heating element for controlling the flow of fuel to said pilot burner, and means responsive to the reduction of fluid pressure due to an increased flow of fuel to said pilot burner for first initiating the flow of fuel at a low rate through said main gas valve to said main burner and after a predetermined time lag increasing the flow of gas to said main burner.

3. A control system for hot water heaters of the instantaneous type including a heating element, a main burner for heating said element, a valve controlling the supply of fuel to said burner, a skirt on said valve for obstructing the opening controlled thereby until after a predetermined movement thereof, a pilot burner associated with said burner, means for continuously supplying fuel to said pilot burner, means responsive to the rate of flow and the temperature of the water passing through said heating element for controlling the flow of fuel to said pilot burner, and a diaphragm for actuating said valve in response to the reduction of fluid pressure due to the flow of fuel to said pilot burner thereby first initiating the flow of fuel at a low rate through said main gas valve to said main gas burner and after a predetermined time lag increasing the flow of gas to said main burner.

HERBERT J. LONG.