July 13, 1943. J. MAYNARD 2,324,100

GAS CONTROL MEANS

Filed Aug. 26, 1940

Fig. 1.

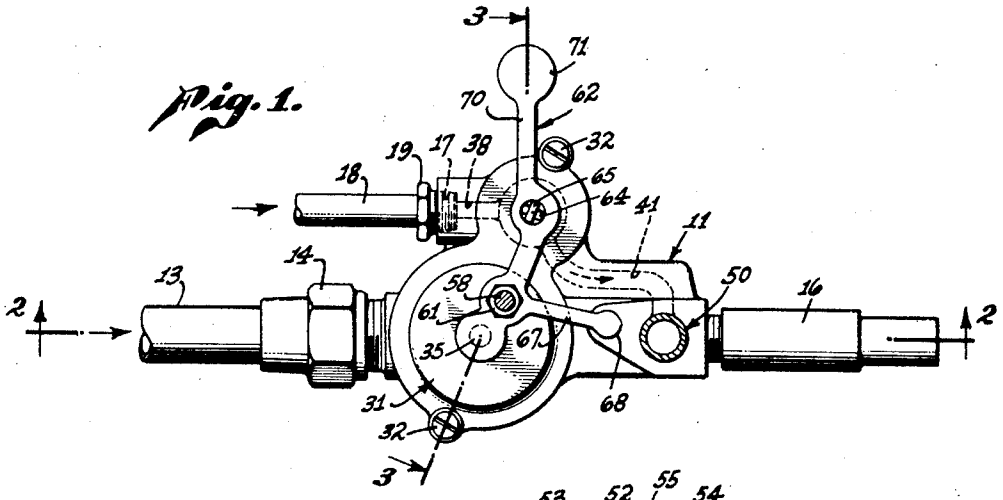


Fig. 2.

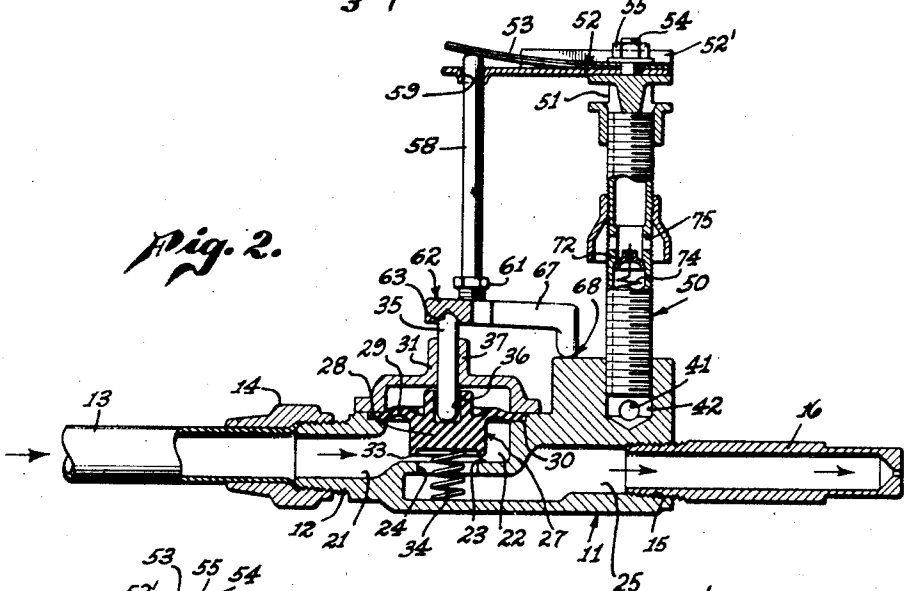


Fig. 3.

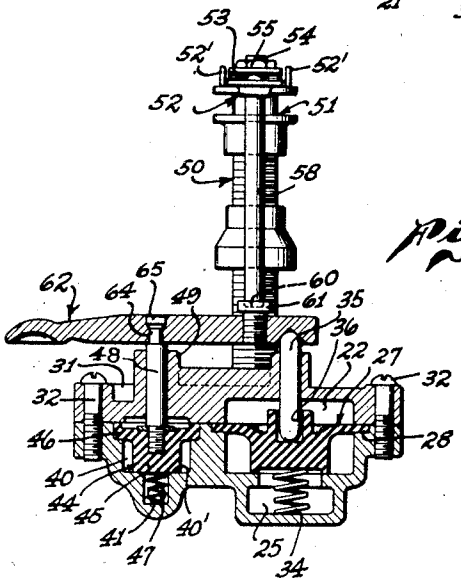
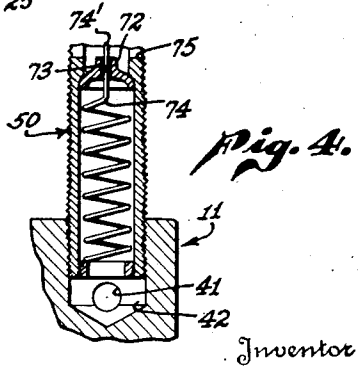


Fig. 4.



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GAS CONTROL MEANS

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4 Claims. (Cl. 158—117.1)

This invention relates generally to valves and more particularly to thermostatic control means for valves. The invention is particularly designed for use in connection with the ordinary gas water heaters, gas furnaces and the like for use in shutting off the gas supply to the burners when for any reason the pilot flame is extinguished.

It is a primary object of this invention to provide thermostatically controlled valve means for controlling the supply of gas to both a pilot burner and a main burner which is operable to shut off the supply of gas to both burners when the pilot flame is extinguished for any reason. In this connection it is an object to provide a single valve body having two valves therein and to provide a single thermostatic means for operating both valves.

It is also an object of this invention to provide a thermostatically controlled valve in which the valve opens and closes relatively quickly in response to changes of the thermostatic element. In this connection it is an object to provide as part of the means between the thermostatic element and the valves, a member which is relatively long when hot and relatively short when cold as compared to other parts of the device.

It is a particular object to provide a lever mechanism associated with two valves which is operable by thermostatic means in order to close one of the valves before the other and which is manually operable to open first the valve which was closed last by the thermostatic means.

It is a further object of the invention to provide a lever mechanism which may be so proportioned as to arrange for the closing simultaneously, or in any desired order, of two valves requiring unequal closing effort.

It is also an object to provide a combination valve means, pilot burner, and thermostatic means for controlling the valve means as an integral unit which may be readily installed in the ordinary type of gas water heater, furnace or the like. In this connection it is also an object to provide a unit of the type indicated which may be readily and inexpensively manufactured.

It is a still further object to provide an easily operable orifice cleaning element which also serves as a means of providing a desired effective orifice area and thereby eliminates the requirement of drilling the orifice to size to obtain the desired fluid passage area.

These and other objects will be apparent from the drawing and the following description thereof. Referring to the drawing which is for illustrative purposes only;

Fig. 1 is a plan view of the valve and pilot burner unit of this invention, the pilot burner tube and operating rod having been broken off and shown in section;

Fig. 2 is a sectional elevation of the device taken on line 2—2 of Fig. 1;

Fig. 3 is a cross-section on line 3—3 of Fig. 1; and

Fig. 4 is an enlarged fragmentary sectional elevation of the lower end of the burner tube showing the orifice cleaning and control spring.

More particularly describing the invention, reference numeral 11 generally indicates the valve body which is provided with a threaded extension 12 to which is attached a gas supply pipe 13 by means of the nut 14. In Figs. 1 and 2 the direction of flow of the gas has been indicated by arrows. At its opposite end the valve body 11 is provided with a threaded opening 15 to accommodate a tube 16 which may lead to the main burner as used in a gas water heater or the like but not shown on the drawing. The valve body 11 is provided with an internally threaded opening 17 adapted to accommodate a pilot gas supply pipe 18 secured to the valve body by means of the nut 19.

The valve body 11 is provided with a main inlet passage 21 which communicates with the gas supply pipe 13 and terminates at its inner end in a main valve chamber 22. The lower portion of the valve chamber is provided with an annular valve seat 23 surrounding an opening 24. The opening 24 leads to an outlet passage 25 which terminates in the aforementioned threaded opening 15.

Mounted in the valve chamber 22 is a resilient main valve 27 which may be made of rubber or other suitable resilient material. This valve is provided with a central body portion 28 having a corrugated flange 29. The corrugated flange is mounted in an annular ledge 30 and is secured in place by means of the cap 31 which is secured to the valve body by screws 32. At its lower end the body portion 28 of the valve is provided with an annular rim 33 which is adapted to engage and seat on the valve seat 23. The valve member is normally open as shown in Fig. 2, the corrugated flange serving to resiliently hold the main body of the valve in the position shown. If desirable a spring 34 may be utilized beneath the valve to assist the effort of the valve itself. In Fig. 3 the valve member has been shown closed. A valve stem 35 seats in a recess

36 in the upper end of the valve 27 and is slidably received through a boss 37 in the cap member 31.

The valve body is provided with another inlet passage shown in broken lines in Fig. 1 and indicated by reference numeral 38. This passage communicates with the gas inlet pipe 18 and with a pilot valve chamber 40. Leading from the valve chamber 40 is an outlet passageway 41 which terminates in a partially threaded bore 42 in the valve body. In the chamber 40 is a pilot valve 44 which comprises a central body portion 45 and a flange 46. The valve is adapted to seat on the annular seat 40'. This valve member 44 is also formed of a resilient material such as rubber or the like and is so mounted that it normally is open, although in Fig. 3 it has been shown closed. A spring 47 may be used to assist the opening effort of the valve if desired. The valve 44 is provided with a valve stem 48 which is slidably receivable in the boss 49 on the cap 31.

The construction of the valve body containing the two resilient valves and valve stems is such that should either of the valves break as for instance at some point in the region of their flanges, practically no gas will escape from the valves as the valve stems 35 and 48 have a close sliding fit in the cap member.

The threaded bore 42 accommodates a pedestal burner tube 50 which is provided at its upper end with a pilot burner 51 shown as threadably mounted thereon. The pilot burner supports a member 52 which is a combination operating rod guide and shield as will hereinafter become apparent. Above the member 52 is mounted a bimetallic thermostat 53. Both the members 52 and 53 are secured to the burner 51 by means of the threaded stud 54 and nut 55.

When the valve 44 is opened gas may be supplied through pipe 18 to passageway 38, chamber 40, passageway 41 and pilot burner tube 50 through the burner 51. When the pilot is lighted the flame goes up on each side and one end of the shield and guide 52 and serves to heat the thermostat 53, the metal of the thermostat being shielded from the direct combustion area of the flame by the upwardly extending sides 52' on the member 52. This member of course may be made of any suitable material to resist the corrosive effect of the flame.

The thermostatic element 53 is utilized for closing the two valves 27 and 44 when it is cold. In order to accomplish this, an operating rod 58 is provided which is slidably receivable in an aperture 59 in the member 52 and which abuts at its upper end against the under surface of the thermostat 53. At its lower end this rod is received in a recess 60 in the upper end of an adjustment nut 61 which is threadably mounted in a control lever 62. The lever 62 is provided with a recess 63 in its under surface which seats on the valve stem 35. The lever is also provided with a slotted opening 64 to accommodate the head 65 of the valve stem 48. In assembly, the head of the valve stem 48 is inserted in the opening 64 and when in the position shown in Fig. 3 is turned at right angles to the slot as indicated in Fig. 1 so that elevation of the control lever will raise the valve stem 48 with it.

Reference is made to Fig. 1 for the plan shape of the control lever and from this it is apparent that the operating rod 58 is located above the control lever at a point between the two valve stems and more closely adjacent the valve stem 35 than the other. The lever itself is provided with an offset fulcrum or bearing point consisting of the laterally extending arm 67 which is adapted to bear upon the valve body at 68. At its opposite end the control lever is provided with an extension 70 which terminates in a finger receiving portion or trigger 71 by means of which the lever may be manually operated.

In the operation of the device, assuming that the device is being put into operation for the first time and that all parts are cold, the parts will be in the position shown in Fig. 3, that is, both valves will be held in closed position by reason of the fact that the bimetallic element 53 is holding the rod 58 down which in turn maintains depressed the lever 62 to maintain the valves closed. To light the pilot, the end or trigger portion 71 of the lever is raised thereby opening the valve 44 and permitting flow of gas to the burner which may be lighted. It will be noticed that when the outer end 71 of the control lever is manually raised, both the valve stem 35 and the bearing point 68 acts as fulcrums. Thus the main valve 27 is held closed during the pilot lighting operation. It is necessary to manually hold the control lever 62 up until the thermostat element 53 is heated sufficiently to expand to the approximate position in which it is shown in Fig. 2. The lever may then be released and by reason of the fact that the rod 58 no longer is acting against the lever 62, the resiliency of the valve 27 is sufficient to raise the portion of the lever in the region of the seat 63 whereby the main valve is opened and gas may be supplied to the main burner.

Assuming that for any reason the flame is extinguished the thermostat 53 will then contract and press the operating rod 58 downwardly. The first effect of this action is to depress the valve stem 35 and close the main valve 27. This is due to the fact that the operating rod 58 engages the lever 62 at a point nearer the valve stem 35 than the valve stem 48. After the valve stem 35 has been depressed to close the valve 27 the upper end of the valve stem 35 becomes a fulcrum and the downward pressure of the thermostat exerted through the operating rod closes valve 44 through downward pressure on the valve stem 48.

Although the operating rod has been disclosed as engaging the lever at a point intermediate the two valve stems and nearer one valve stem than the other and the arm 67 and fulcrum point 68 are shown with definite relation thereto and to the two valve stems, it is within the scope of the invention to vary the relative positions of these elements or to so proportion the lever as to arrange for either the simultaneous or any given order of closing of the valves whether the valves require an equal or unequal closing effort.

It is desirable in thermostat operated valves which are designed for use in connection with gas water heaters and other installations of a similar character to have a valve which will open and close relatively quickly. In order to accomplish this in mechanisms of the type disclosed, it is necessary to have a relatively long operating rod when the parts are hot and a relatively short operating rod when the parts are cold. By utilizing a rod which has a greater coefficient of expansion than the burner tube 50 it is possible to achieve this with the result that the rod may be so proportioned that when it is cold it is just long enough to maintain the valves closed and as a result upon slight heating of the thermostat metal 53 it may move upward to permit opening of the valves, the thermostat 53 becoming heated

long before the rod **58** becomes warm. When the opposite conditions prevail, as will obtain within the influence of the main burner, namely both the member **58** and the bimetal **53** are hot, it is then desirable to have a relatively long rod in order that as soon as the bimetal **53** begins to cool upon extinguishment of the flame, it will immediately depress the rod **58** and result in the closing of the valves. The rod **58** may be made of any material which expands at a rate exceeding that of the metal used for the tube **50**. It is of course obvious that various combinations of metals may be used for making the two parts in order to achieve the desired ratio of rate of expansion between the two.

In Fig. 4 there is illustrated an enlarged sectional elevation of the lower end of the pilot tube and gas control orifice means therein. Referring to this figure there is provided an element **72** provided with gas control orifice **73**. Ordinarily the orifice **73** is drilled to exact size in order to control the flow of gas to the pilot flame. Where it is desired to utilize only a very small flow of gas it is necessary to provide a very accurately drilled hole through the element **72** in order to obtain the desired effective orifice area. This is a relatively expensive process and it has the further disadvantage that in usage the passage tends to become stopped up either by gumming or by small particles of matter lodging in or adjacent one end of the passage.

To obviate the above difficulty and the further difficulty of cleaning such a small passage, a spring **74** is provided which may be mounted in any suitable manner below the element **72** in the tube **50**. This spring has a straight vertically projecting portion **74'** at its upper end which extends through the orifice **73**. In operation this spring tends to maintain the passage free of obstructions and it provides an easily operable means of cleaning the passage, it only being necessary to insert a match stick or the like through one of the air openings **75** in the burner tube and depress the spring once or twice to clean the orifice. Furthermore, by providing a given size wire spring with relation to the known size of the aperture **73** it is possible to inexpensively provide a relatively small effective orifice area for the passage of gas.

It is contemplated that various changes and modifications may be made without departing from the scope of the invention and it is intended to cover such changes as come within the scope of the claims.

I claim as my invention:

1. In combination, a valve body having two valve chambers and having inlet and outlet passages communicating with the respective chambers; a valve in each chamber; a valve stem associated with each valve; a pilot burner tube mounted in said valve body; a thermostatic element mounted on said pilot burner tube; an actuating lever engaging said valve stems and having an independent fulcrum; an operating rod connecting the thermostatic element and said lever, said rod bearing against the upper side of said lever at a point between said valve stems and nearer one than the other whereby one of said valves is actuated before the other.

2. A device as defined in claim 1 in which the actuating lever is provided with an extension trigger at one end laterally beyond the valve stems.

3. A device as defined in claim 1 in which the actuating lever is provided with an extension trigger at one end laterally beyond the valve stem farthest removed from said operating rod.

4. In thermostat valve control means for actuating two valves having parallel laterally spaced and longitudinally movable valve stems, the combination of: a control lever bearing on said stems and having an independent fulcrum at a point laterally spaced from a line passing through the two valve stems; and an operating rod bearing on said lever at a point between said valve stems nearer one valve stem than the other; said lever having a manually operable trigger portion comprising a portion extending laterally beyond the valve stems.

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