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GAS SUPPLY CONTROL SYSTEM

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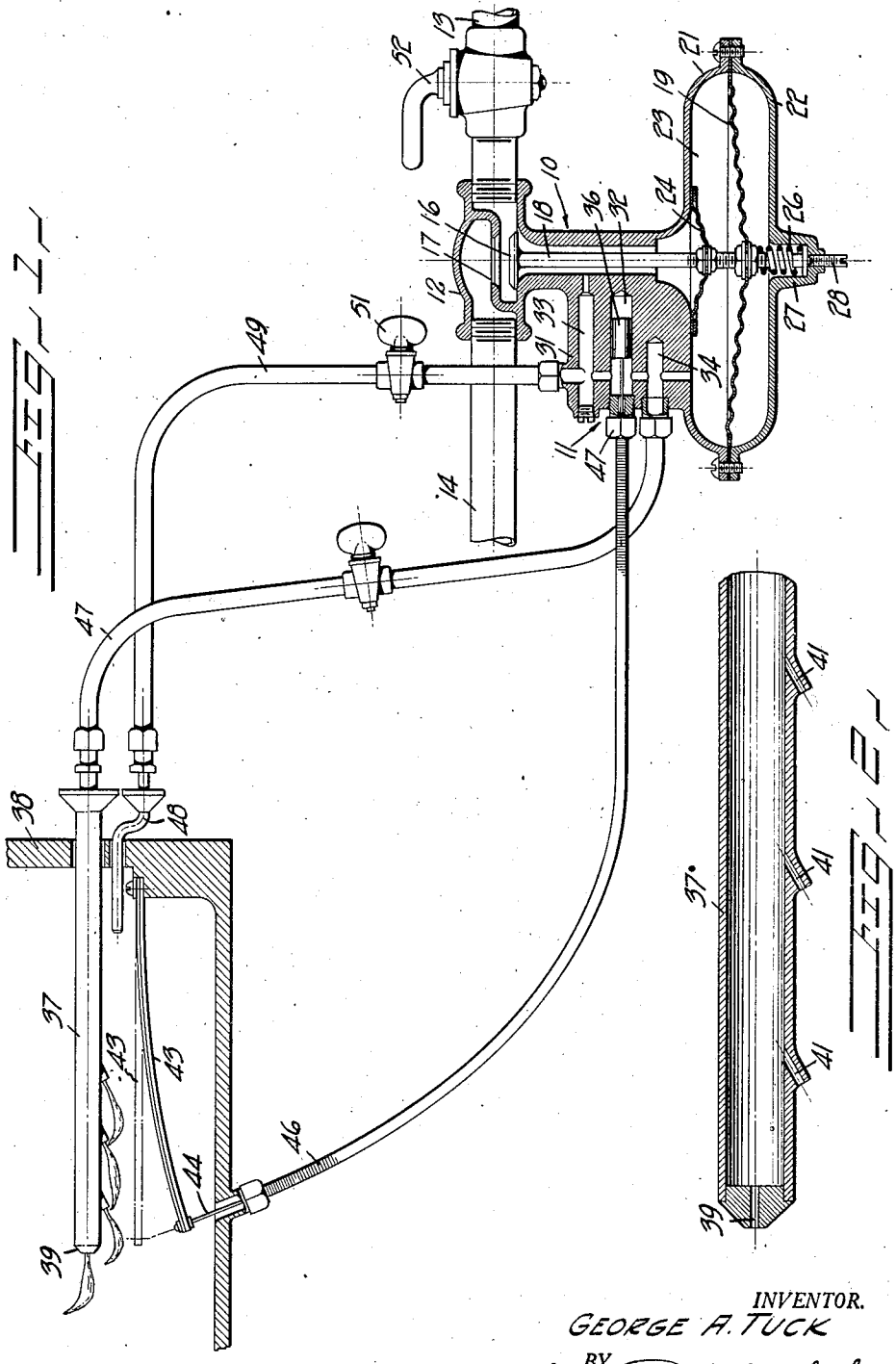


Fig. 1

Fig. 2

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GAS SUPPLY CONTROL SYSTEM

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2 Claims. (Cl. 158—117.1)

This invention relates generally to systems for effecting control of the supply of gaseous fuel to gas heaters, as for example to domestic heating furnaces.

In connection with gas heaters it has previously been proposed to provide a valve connected in the gas supply line, which is automatically closed in the event the pilot flame becomes extinguished. The advantages to be gained by such an arrangement are obvious, in that where the heater is controlled from a remote point, the possibility of introducing large amounts of gas into the furnace thru the main burner when the pilot is extinguished, is precluded. Prior systems of this character have had the disadvantage that they are difficult to install upon existing heaters. It frequently happens that in variously proposed installations, various parts, as for example the main or primary control valve, must be so located as to meet peculiar requirements and conditions, and these requirements and conditions will vary with different installations. Thus unless the arrangement of parts can be readily shifted for different installations, the cost of making installations upon prevailing systems will be relatively high.

It is an object of the present invention to devise an automatic system of the above character which can be readily installed with slight expense on prevailing gas heaters, and which will enable various arrangements of parts to suit varying conditions.

It is a further object of the invention to devise such a system which will be characterized by simplicity of operation, and by reliability under actual working conditions.

Further objects of the invention will appear from the following description in which the preferred embodiment of the invention is set forth in detail in conjunction with the accompanying drawing. It is to be understood that the appended claims are to be accorded a range of equivalents consistent with the state of the prior art.

Referring to the drawing:

Figure 1 is a side elevational view, partly in cross section, illustrating a system incorporating the present invention.

Fig. 2 is a cross sectional detail, in side elevation, illustrating a pilot burner such as is preferably utilized in my system.

The system and apparatus illustrated in the drawing consists of a main or primary gas valve 10, in conjunction with a secondary valve 11. The particular type of primary valve 10 illustrated consists of a valve casing 12 having its inflow side adapted for connection with a gas supply pipe line 13, and its outflow side adapted to be connected with a pipe 14 which leads to a burner of a gas heater. A valve member 16 of the poppet type is disposed within valve casing 12, and cooperates with the valve seat 17. A stem 18 extends downwardly from valve member 16, and at its lower end stem 18 is connected to the center of a flexible diaphragm 19.

The lower portion 21 of valve casing 12 is enlarged to embrace the upper side of diaphragm 19. The peripheral edge portion of diaphragm 19 is shown clamped between casing portion 21, and a lower cover 22. Thus a fluid chamber 23 is formed above the diaphragm. In order to seal chamber 23 against flow of gas about stem 18, I have shown a smaller diaphragm 24 having its outer peripheral portion secured to and sealed with respect to the casing portion 21, and having its inner portion secured to and sealed to stem 18. In order to normally bias stem 18 and valve member 16 upwardly toward closed position, I provide a compression spring 26. The upper end of this spring is shown seated upon the lower end of stem 18 below diaphragm 19, while the lower end of the spring is positioned within a socket or recess 27 formed in the center of cover 22. By means of a set screw 28, the tension upon spring 26 can be adjusted.

With respect to the secondary valve means 11, the body portion 31 thereof is formed as an integral portion of the primary valve casing 12 as illustrated, and is provided with a cylindrical bore 32 and also with gas ducts 33 and 34. Duct 33 communicates with the inflow side of valve 10 about stem 18, and with bore 32, while duct 34 communicates between bore 32 and the fluid chamber 23. Slidably positioned within bore 32 there is a movable valve member 36, which can be in the form of a cylindrical plug.

Associated with the apparatus described above, there is a pilot burner 37, a preferred form of which is illustrated in Fig. 2. This burner is of course located in the combustion chamber of the gas heater, and can be conveniently carried by a bracket 38. In the form illustrated in Fig. 2 it consists of an enlongated tube or pipe having a gas vent 39 formed in its inner end, and having additional apertures 41 formed along its lower side for escape of gas. Holes 41 are preferably arranged at an angle to the axis of the burner, so that the flame from one hole will tend to overlap and ignite gas issuing from an adjacent hole.

To provide a thermostatic element cooperating with pilot burner 37, I provide a bimetallic strip

43 which extends in spaced relationship below burner 37, and which has its one end fixed to bracket 38. The upper surface of strip 43 is exposed to radiation from the flame of burner 37, so that when the burner is lighted, the strip 43 is heated to cause it to flex to a position shown in solid lines in Fig. 1. When the flame of the pilot burner is extinguished or is abnormally low, strip 43 cools and assumes a position such as shown in dotted lines. To provide a mechanical connection between strip 43 and the movable secondary valve member 36, I utilize a flexible wire 44, made of suitable material such as steel, one end of this wire being connected to the free end of strip 43, the other end being connected to valve member 36. This wire is preferably protected by a flexible casing or tube 46. Where the wire enters the bore 32 leakage can be prevented by suitable means such as a packing gland 47.

To supply gas to the pilot burner 37 a tube 47 is shown having its one end connected to the pilot burner and its other end communicating with the gas duct 34. To enable lighting pilot burner 37 I have shown a small burner 48 located near the forward end of pilot burner 37, and which is connected by tube 49 to the gas duct 33. By means of a gas cock or valve 51 the flow of gas to burner 48 may be manually controlled.

In installing my control system primary valve 10 is suitably located outside the heater, while bracket 38 together with pilot burner 37 and thermostat strip 43 is located within the combustion chamber in such position that the pilot burner will readily ignite gas flowing from the main burner of the heater. Generally a solenoid or electrical motor operated valve, controlled as by means of an electrical thermostat from a remote point, is interposed in the gas supply pipe 13. A manual gas cock 52 can also be interposed in this line, in order to permanently shut off supply of gas to the primary valve 10 and to the pilot and main burners. Flexible wire 44 is connected between the thermostat strip 43 and movable valve member 36, and the length of this wire is such that when strip 43 is heated and in a position such as shown in solid lines in Fig. 1, valve member 36 will be in a corresponding position such as shown in solid lines in this figure. However when strip 43 is not heated and assumes a position such as shown in dotted lines, valve member 36 is moved to a position in which it interrupts communication between gas ducts 33 and 34.

Operation of the system can be briefly outlined as follows:—When the heater is operating normally and gas from pilot burner 37 is ignited, primary valve member 16 is in open position as shown in Fig. 1. Thermostatic strip 43 is at an elevated temperature by virtue of heat transferred to it by radiation from the flame of pilot burner 37, so that it is flexed as illustrated in solid lines. Secondary valve member 36 is likewise in the position illustrated, so that gas from the inflow side of primary valve 10 is free to exert a pressure thru gas ducts 33 and 34, in chamber 23. This pressure in chamber 23 acting upon diaphragm 19, serves to retain primary valve member 16 open. Assuming now that the flame of pilot burner 37 becomes extinguished, or becomes abnormally low because of greatly reduced subnormal gas pressure, thermostatic strip 43 immediately cools and flexes to a position such as shown in dotted lines. Such movement of thermostat strip 43 causes a corresponding movement of secondary valve member 36 to interrupt communication between gas ducts 33 and 34. Thus further flow of gas from the inflow side of valve 10 to pilot burner 37 is interrupted, and gas pressure in chamber 23 is immediately reduced to atmospheric because at this time it is vented thru the pilot burner. The force of spring 26 simultaneously forces valve member 16 to closed position, to interrupt further supply of gas from pipe 13. Under such conditions it is of course impossible to supply gas to the main burner of the heater, or to the pilot burner 37. To return the system to normal operating condition, the operator supplies gas to burner 48 by turning cock 51, and ignites this burner. The flame from burner 48 heats thermostatic strip 43, thus causing this strip to again flex downwardly to move secondary valve member 36 to a position to again establish communication between gas ducts 33 and 34. When this communication is again established, gas is again supplied to pilot burner 37, which is then ignited by the flame from burner 48, and the primary valve member 16 is also moved to open position by virtue of the pressure of gas introduced into chamber 23, so that gas can be again supplied to the main burner of the heater.

It is characteristic of my system that the primary valve is shut off by an abnormal reduction of gas pressure, such as would reduce the pilot flame to a point at which the main burner might not be properly ignited. This feature is made possible because the bimetallic strip is heated largely by radiation and because the pilot flame on the lower side of the pilot burner recedes upwardly when the gas pressure is reduced.

I claim:

1. In a gas supply control system for gas heaters, a primary gas valve including a valve member movable between open and closed positions, the inflow side of said primary valve being adapted for connection with a source of gas under pressure and the outflow side being adapted for connection with a gas burner, spring means for normally biasing said valve member toward closed position, a diaphragm connected with said primary valve member, means forming a closed fluid chamber upon one side of said diaphragm whereby when gas under pressure is introduced into said chamber flexing of said diaphragm effects opening movement of said primary valve member, secondary valve means including a movable valve member, a gas duct serving to connect said secondary valve means with the inflow side of said primary valve, a second gas duct serving to connect said secondary valve means with said closed fluid chamber, said secondary movable valve member being operable to cut off communication between said gas ducts in one position of the same and to permit communication between said ducts for another position of the same, a pilot gas burner having uninterrupted communication with said second mentioned gas duct, a bimetallic strip associated with said pilot burner, and an elongated wire serving as a mechanical motion transmitting connection between said strip and said secondary valve member, one end of said wire being connected to said strip and the other end being connected with said secondary valve member.

2. In a gas supply control system for gas heaters, a primary gas valve including a valve member movable between open and closed positions, the inflow side of said primary valve being adapted for connection with a source of gas under pressure and the outflow side being adapted for connection with a gas burner, spring means for nor-

mally biasing said valve member toward closed position, a diaphragm connected with said primary valve member, means forming a closed fluid chamber upon one side of said diaphragm whereby when gas under pressure is introduced into said chamber flexing of said diaphragm effects opening movement of said primary valve member, secondary valve means including a movable valve member, a gas duct serving to connect said secondary valve means with the inflow side of said primary valve, a second gas duct serving to connect said secondary valve means with said closed fluid chamber, said secondary movable valve member being operable to cut off communication between said gas ducts in one position of the same and to permit communication between said ducts for another position of the same, a pilot gas burner having uninterrupted communication with said second mentioned gas duct, a temperature responsive means associated with said pilot burner, and means forming a mechanical motion transmitting connection between said temperature responsive means and said secondary movable valve member.

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