Feb. 14, 1933. E. LAPP ET AL 1,897,061

GAS VALVE MECHANISM

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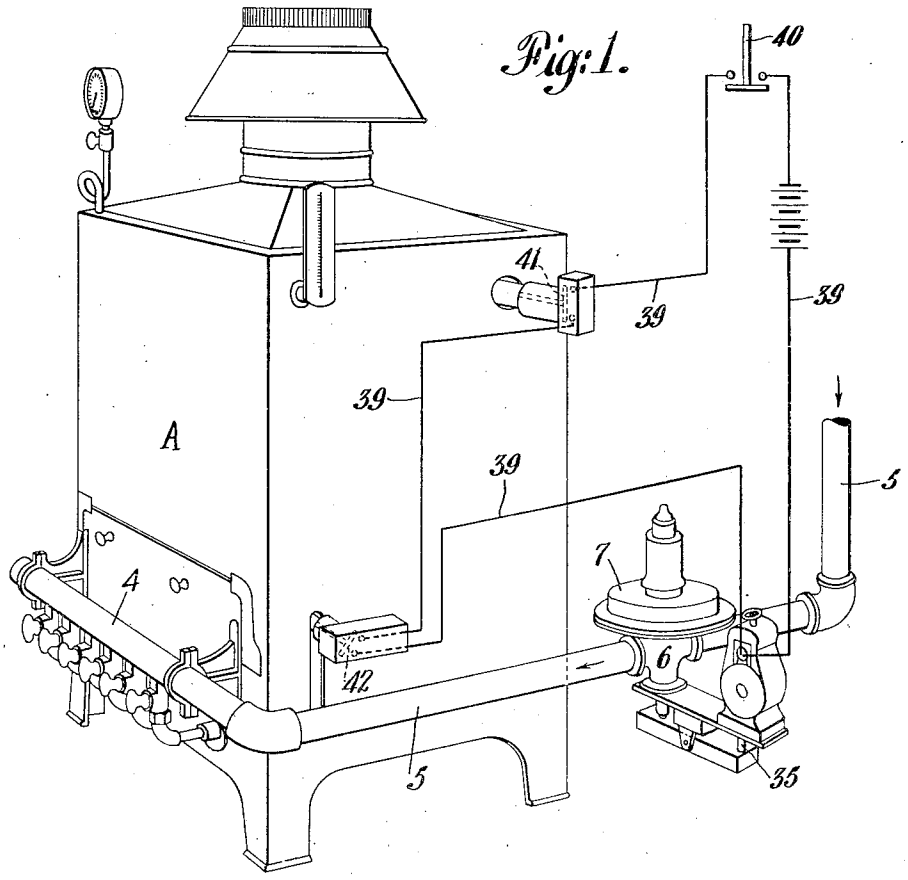
Fig. 1.



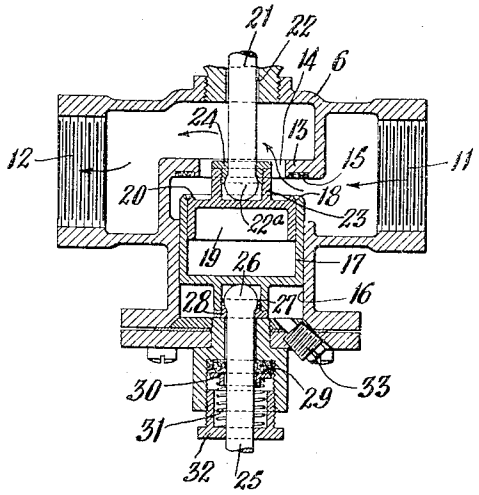


Fig. 3.

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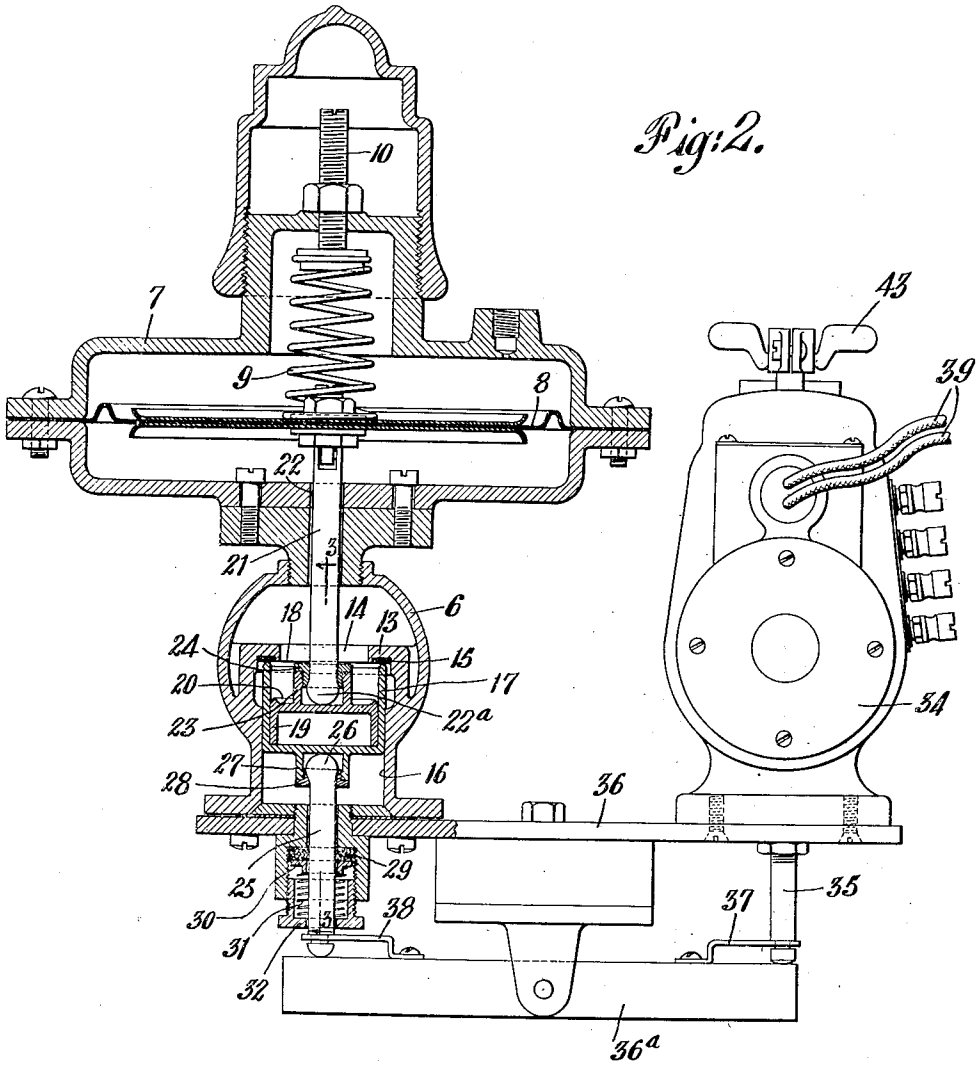
Fig. 2.



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UNITED STATES PATENT OFFICE

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GAS VALVE MECHANISM

Application filed January 8, 1930. Serial No. 419,272.

This invention relates to an improved valve mechanism for controlling the flow of gas through a gas supply line and is particularly adapted for use in connection with gas fired domestic heating installations.

In installations of this kind there is a plurality of factors which should be taken into consideration in controlling the flow of the gas. In the first place the room or house temperature is generally kept at a certain average (in the neighborhood of 72 degrees Fahrenheit); in the second place what we may refer to here as the furnace temperature should be kept within safe limits, and, in the third place, whether or not the pilot light is burning must be taken into consideration in controlling flow of the gas to the main burners.

In addition to the foregoing it is generally customary to provide what is known as a pressure regulating valve in the gas supply line for the purpose of maintaining a constant pressure at the burners, regardless of fluctuations in the line, such fluctuations in the line often amounting to considerable, especially where the mains of the gas company are inadequate for a constantly increasing demand.

The furnace temperature above mentioned in the case of a hot water furnace is, of course, the temperature of the water which should not be permitted to rise above a certain maximum, which may be said to be in the neighborhood of 15 or 20 degrees F. below boiling temperature. In the case of a hot air furnace this furnace temperature would, of course, be the temperature of the air within the furnace which should not be permitted to go above a certain maximum, depending upon the installation. In the case of a steam boiler the control of the gas is generally accomplished through the medium of either a steam pressure control or a low water cut-off, or both, and the expression "furnace temperature" which we will use in this application is to be construed as including such a control. In connection with the pilot light the supply of gas, of course, should be cut off in case the pilot light is for any reason extinguished.

The present invention is in the nature of an improvement over the construction disclosed and claimed in the copending application of Messrs. Lapp and Wolpert, Serial No. 363,929, filed May 17, 1929, now Patent No. 1,836,567, to which reference may be had if so desired.

The principal objects of the present invention involve the provision of an improved valve mechanism which is more positive and reliable in its control of the gas supply; the provision of a valve mechanism in which the valve seat is flexible and readily replaceable, yet very rugged and long lived; the provision of a valve mechanism in which the valve heads or members are not held rigidly to one axis, but which are arranged to spin or rock slightly so as to seek a firm seat and thereby prevent all possibility of leakage; the provision of valve mechanism which is very easily actuated so that it can be operated by a comparatively small motor or other actuating means without the absorption of much energy; the provision of a valve mechanism in which the annular area exposed to the full pressure of the gas is relatively small so that the force required to overcome such pressure is kept down to a minimum; the provision of a valve mechanism which is noiseless in operation and in which little or no wear takes place in the operating joints; the provision of a valve mechanism which employs independently movable telescopic members adapted to seat on a common seat; the provision of a valve mechanism employing the usual pressure regulator with its leather diaphragm in which no tar or ammonia deposits from the gas will come in contact with the leather; and the provision of an actuating motor for the valve mechanism which will permit hand operation in case of motor failure.

The foregoing, together with such other objects as may appear hereinafter, or are incident to our invention, are obtained by means of a construction which is illustrated in the preferred form in the accompanying drawings, wherein—

Fig. 1 is a somewhat diagrammatical perspective view of a domestic hot water heating furnace showing the gas supply line therefor and our improvements applied thereto;

Fig. 2 is a vertical cross section on an enlarged scale through our improved valve mechanism with certain of the motor actuating parts shown in elevation, and

Fig. 3 is a fragmentary section on the line 3—3 of Fig. 2.

For the sake of this disclosure it will be assumed that the furnace A is of the hot water type, the burners of which are fed in the usual manner through the manifold 4, the details of which, however, form no part of the present invention, so that they will not be illustrated or described. The gas is supplied through the line 5 in which is located the casing or housing 6, the details of which are shown in section in Figs. 2 and 3.

Secured to the top of the casing 6 is the customary pressure regulating device the operation of which is quite well known in the art and which consists essentially of a casing 7 in which is located the flexible or leather diaphragm 8 and the compression spring 9, the pressure of which latter can be varied or adjusted by means of the bolt 10.

In the housing 6 between the gas inlet 11 and the gas outlet 12 is disposed a dividing wall or web 13 having a suitable circular aperture 14. In the lower face of the dividing web surrounding the opening 14 is an annular valve seat member 15 made preferably of leather.

Below the leather valve seat and in alignment therewith the casing 6 is formed into a bore 16 in which is mounted a cylindrical cup-like valve member or body 17 having its upper edge formed into a ridge 18 adapted to seat on the leather valve seat 15 as shown in Figure 2.

Telescoped within the valve member 17 is a second concentrically disposed cup-shaped valve 19, the cup, however, of the valve 19 being in inverted position. Projecting upwardly from this second cup-shaped valve is a ridge 20 also adapted to seat on the valve seat 15.

It will, therefore, be seen that both of the valve members 17 and 19 can shut off the flow of gas through the housing 6 by virtue of their ability to seat on the common valve seat 15.

The inner valve 19 of the two telescopically arranged valves is connected to the pressure responsive diaphragm 8 by means of the operating stem 21 which projects out of the casing 6 and into the casing 7 through a bore or connecting opening 22 of a diameter somewhat larger than the diameter of the stem 21. The under face of the diaphragm 8 is subjected to the pressure of the incoming gas through the bore 22 around the stem 21.

A flexible joint which takes the form of a ball 22*a* on the end of the stem 21 and a socket 23 on the top of the valve 19 serves to connect the valve 19 with the operating stem 21, the ball 23 being held in place by means of the nut 24.

The other valve 17 is connected to its operating stem 25 by means of a similar flexible joint involving the ball 26, socket 27 and nut 28.

The stem 25 is tightly packed by means of any suitable packing 29 held in place by the ring 30, spring 31 and nut 32. The ball and socket joints above described, while providing a very positive operating means for the valves, still permit them to spin or rock slightly so that they can seek a firm seat against the leather seat 15, thereby ensuring a leak-proof valve mechanism.

It will be seen that the arrangement of the parts so far described is such that any tar or ammonia deposits from the gas will not come into contact either with the diaphragm leather 8 or the valve seat leather 15, so that these two members will not in any way be detrimentally affected by the chemical action resulting from contact with such deposits. Whatever foreign substances are deposited from the gas will collect in the bottom of the bore 16 from which they can be cleaned out by removing the plug 33 at the bottom (see Fig. 3).

The valve 17 is operated by means of the motor device 34 which, in the present instance, takes the form of a small solenoid having the armature or core 35 which projects downwardly through the supporting or base plate 36.

Pivoted between the core 35 and the operating stem 25 is a lever 36*a* one end of which is connected by means of the spring clip 37 to the end of the core 35 and the other end of which is connected by means of the spring clip 38 to the lower end of the operating stem 25.

The circuit 39 which controls the movements of the core 35 is subject to the control of the room thermostat 40, the furnace thermostat 41 and the pilot light thermostat 42. From an inspection of Fig. 1 it will be seen that all of the thermostats 40, 41 and 42 must be calling for heat so that the circuit 39 will be closed. In other words, the temperature in the room must be below, say, 72° F., or whatever standard temperature is desired, the furnace temperature must be below whatever standard temperature is desired, and the pilot light must be burning, as it is only under these conditions that the furnace should be operated.

Should the motor device 34 fail for any reason, the core 35 can be hand actuated by means of the hand control 43.

The operation of the device is as follows, assuming that the furnace is out and heat is desired. With the furnace out, the valve 17 will be in its closed position as shown in Fig. 2 and the valve 19 will be in its open position, since no gas will be flowing through

the casing 6 and therefore no pressure will be applied against the under surface of the diaphragm 8. The thermostats 40, 41 and 42, since they are all calling for heat, will close the circuit 39 and raise the core 35, which, of course, through the medium of the lever 36*a* will lower the stem 25 and the valve 17. Gas can then flow through the casing 6 in the direction indicated by the arrows in Fig. 3, and the pressure of this gas will be effective on the diaphragm 8 as already described, so that when the pressure which accumulates at the burners rises above a predetermined point, the inner valve 19 will close or almost close in order to maintain a given standard. The functioning of such a pressure regulating device is well understood in this art, and in and of itself forms no part of the present invention.

Gas will flow to the burners just so long as this condition exists, but when any one of the thermostats 40, 41 or 42 ceases to call for heat, the circuit of the solenoid will, of course, be broken and the parts will return to the position indicated in Fig. 2, thereby shutting off the flow of gas to the furnace.

It will be seen that the construction of the gas valve mechanism is such as to require very little force to operate the valve 17, inasmuch as it is unnecessary for the motor device 34 to operate against the pressure of any springs. The only loss is the slight friction loss which is very small because of the fact that the weight of the valve is very little. Furthermore, the gas pressure above the valve 17 is slight, since only a small area is exposed to this pressure.

The valve mechanism as a whole is very quiet in operation and there are no quick wearing pin joints as in previous constructions.

We claim:—

1. Gas valve mechanism including in combination telescoping members seating upon a common seat, an operating stem for each member, and a flexible joint between each member and its operating stem.

2. Gas valve mechanism comprising in combination, a housing, a valve seat, a pair of telescoping members adapted to seat on said seat, a pair of oppositely disposed operating stems projecting from said housing, and a flexible joint between each member and its operating stem.

3. Gas mechanism comprising in combination, a housing, a valve seat, a pair of telescoping members adapted to seat on said seat, an operating stem for each member projecting from said housing, and a flexible joint between each member and its operating stem.

In testimony whereof we have hereunto signed our names.

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