

Oct. 27, 1942.

F. R. HIGLEY

2,300,156

LIGHTER FOR GAS BURNERS

Filed Aug. 24, 1940

3 Sheets-Sheet 1

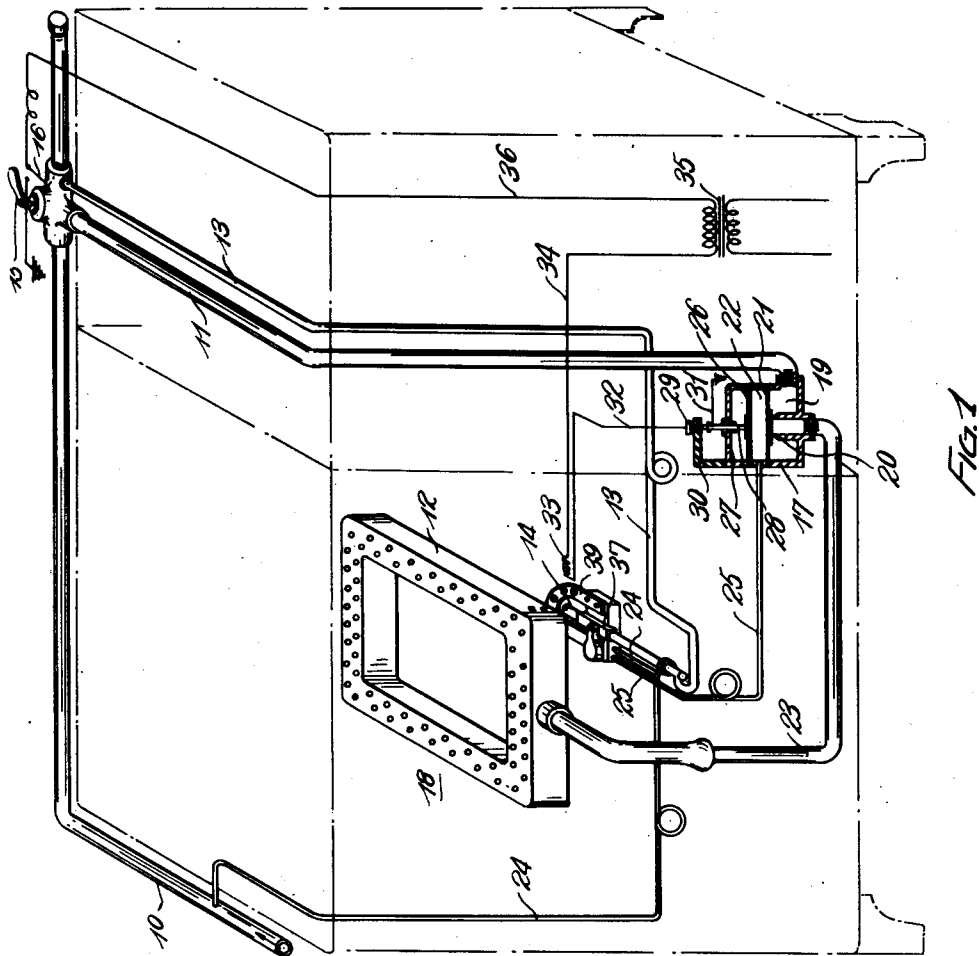


FIG. 1

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3 Sheets-Sheet 2

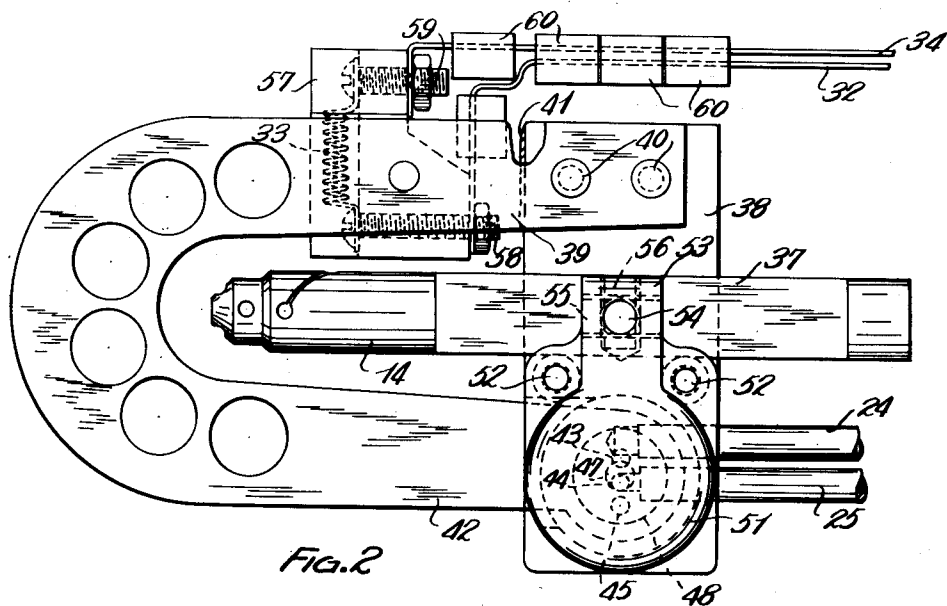


Fig. 2

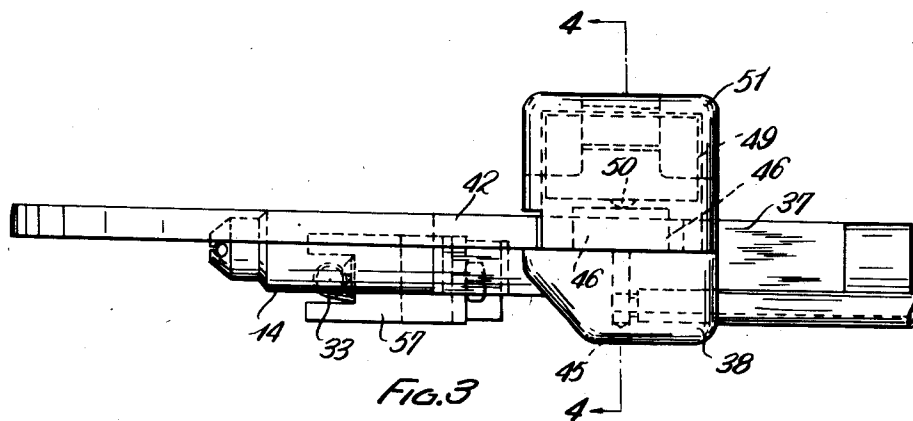


Fig. 3

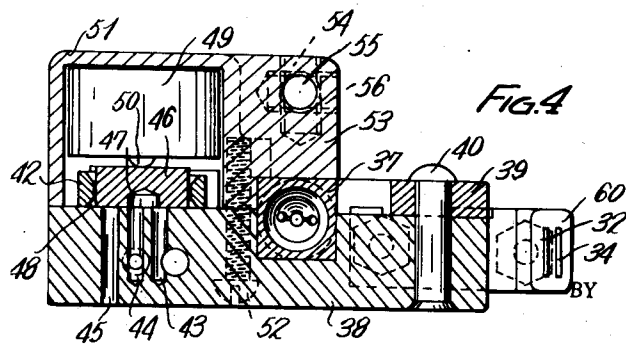


Fig. 4

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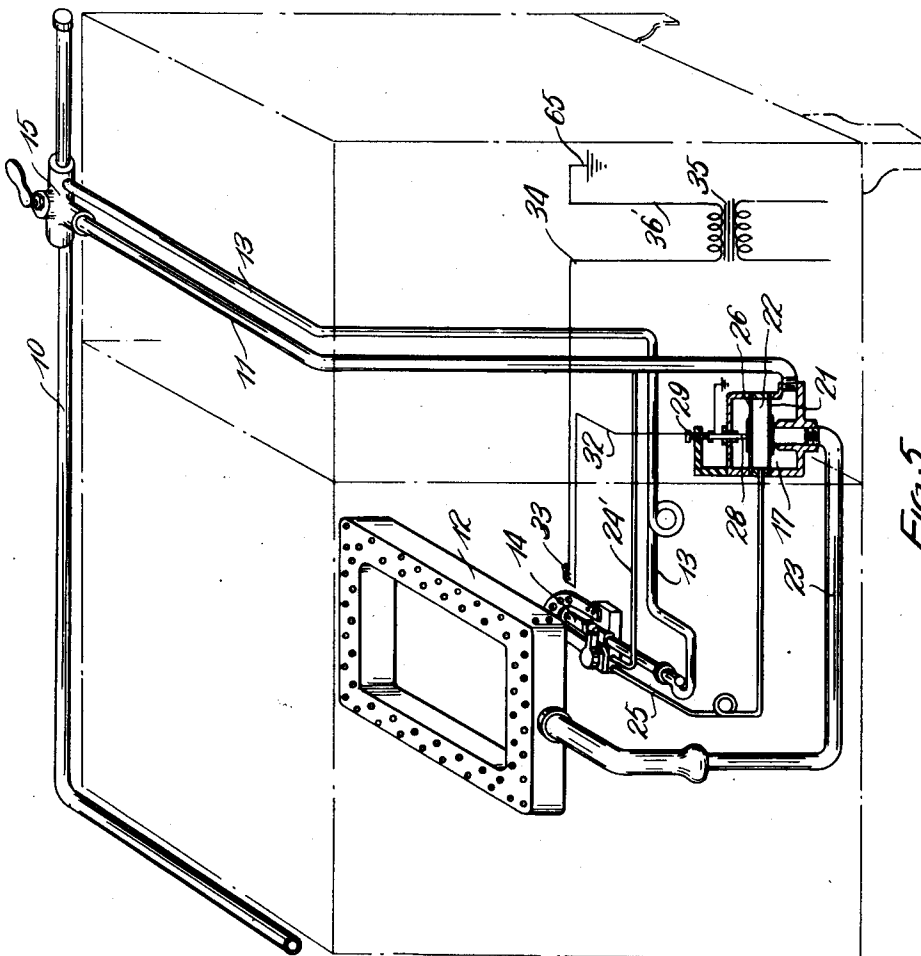


FIG. 5

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2,300,156

LIGHTER FOR GAS BURNERS

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Application August 24, 1940, Serial No. 354,061

2 Claims. (Cl. 158—117.1)

This invention relates to improvements in lighters for gas burners, and has reference particularly to lighters that are adapted to ignite the gas burner of an oven, broiler, or the like automatically when the gas is turned on, and that insure safety against explosions in the event that the gas supply fails for any reason and later is resumed.

Substantially all apparatus of this character comprises three elements, a thermal or other device associated with and responsive to the pilot burner, a valve controlling the main burner, and means for transmitting motion from the thermally responsive device or the like to the latter valve. Thus the operation of the automatic valve controlling the main burner is made dependent upon the proper functioning of the pilot. If the pilot is out the automatic valve must remain closed.

In some burner applications, notably in oven and broiler burners in cooking ranges, the main burner operates at high temperatures. The pilot flame must be in igniting relation with the main burner and the thermally responsive element must be in close proximity to the pilot burner and hence also to the main burner, so that the thermally responsive element is necessarily subjected to great heat.

In order that it may function to the best advantage the automatic valve for the main burner should be in as cool a spot as possible. Hence it should be located remotely from the thermal motor or element and preferably it should be entirely outside of the oven or other highly heated compartment. Heretofore it has been impractical in many cases to position the automatic valve in a relatively cold spot for the reason that the motion transmitting means between the thermal motor and the valve has been made up of rigid mechanical connections, that is levers and links, and the longer or more numerous these elements the more difficult was their operation and the greater the load imposed upon the thermal motor. Complicated mechanisms of this sort are also difficult to install and readily get out of order. Furthermore their design and location must be varied to meet the requirements of different installations. Therefore, as a practical result, the automatic valve has often been located in positions where the temperatures were relatively high, and this has interfered with the proper operation of the valve and reduced its life.

Recognizing the limitations of transmission mechanisms comprised of rigid elements, applicant has evolved the present invention to utilize

flexible connections which may be of any length suitable to locate the valve in an accessible and cool position, which connections require little or no skill in installation. According to the preferred embodiment, which is herein illustrated, the connection by which the automatic valve is operated from the thermal element consists of a length of flexible tubing through which the pressure in the pressure chamber of a diaphragm valve may be relieved so that the valve will open automatically. This tubing may be of very small bore, may be of strong heat resistant metal and may be bent readily into any shape that may be necessary or desirable in a given installation.

In the event that electric ignition is employed, it becomes desirable to install a switch for the igniter circuit which shall be opened after ignition of the pilot has taken place. Such switches heretofore have generally been operated by the thermal motor and have been positioned somewhere within the oven in order to minimize the operating connections with the thermal motor. A position outside the oven is to be preferred. In accordance with the present invention this switch is located upon or adjacent to the automatic gas valve, and is operated by the same means as the automatic valve.

One of the objects of the invention therefore is the provision of flexible connections by means of which the automatic valve may be operated by the thermal motor, thereby eliminating the difficulties attendant upon rigid connections.

Another object is the provision of escapement and cut-off valve means which may be attached to and directly operated by the thermal motor, the arrangement being such that the flow of gas through such auxiliary valve means will be infrequent and of small extent.

A further object of the invention is the provision of auxiliary valve means of a character such that it may be subjected to the high temperatures prevalent near oven burners, and yet render satisfactory service through a long life.

Other objects and features of novelty will appear as I proceed with the description of those embodiments of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings in which,

Fig. 1 is a perspective view showing in diagrammatic form an application of my invention to an oven burner of a cooking range, the view being taken from the rear of the range.

Fig. 2 is a plan view on an enlarged scale of the pilot unit illustrated in Fig. 1, this unit comprising in addition to the pilot burner a thermal

motor, an auxiliary valve means associated with the thermal motor and an electric heater coil for igniting the pilot.

Fig. 3 is a side elevation of the structure shown in Fig. 2.

Fig. 4 is a transverse sectional view taken substantially on the line 4—4 of Fig. 3, and

Fig. 5 is a perspective view showing diagrammatically a modified form of the invention.

Referring first to Fig. 1, I have shown at 10 a gas supply pipe, from which extends a branch pipe 11 for supplying gas to an oven burner 12. A flexible tubular conductor 13 also extends from pipe 10 to a pilot burner 14. While in the drawing several pilot burner ports are shown, for the purposes of the present application these ports may be considered together as constituting a single pilot burner. Gas may be turned into the branch pipe 11 and the conductor 13 simultaneously by the operation of a hand valve or other operator-controlled valve 15 located in a convenient and cool position outside the range, preferably at the front thereof. An electric switch 16 associated with the valve 15 is arranged to be operated simultaneously with the valve so as to close when the valve opens, and vice versa.

Branch pipe 11 leads to an automatic valve 17 positioned in a relatively cool spot preferably at the rear and near the bottom of the range, but in any event outside the compartment 18 in which the burner 12 is located. Pipe 11 communicates with a bottom chamber 19 of the valve surrounding a valve seat 20. Diaphragm 21 closes chamber 19 and is adapted to engage seat 20, thereby closing the valve. Above diaphragm 21 there is a pressure chamber 22 which is adapted to be filled with gas from the supply pipe 10, and when so filled the line pressure effective upon the entire upper surface of diaphragm 21 overcomes that effective upon the lower surface of the diaphragm outside the valve seat and closes the valve. On the other hand when the pressure in chamber 22 is dissipated the pressure underneath the diaphragm opens the valve. A pipe 23 leads from valve 17 to burner 12. Hence there is a flow of gas to the burner whenever both of the valves 15 and 17 are open.

When the gas to the main and pilot burners is turned off after a period of operation valve 17 is closed by the filling of chamber 22 with gas taken from the supply pipe 10 through flexible tubular conductors 24 and 25 which meet at the pilot unit where they are connected or disconnected by auxiliary valve means associated with the thermal member. These conductors are made of heat-resistant metal such as steel and are of small bore, their outer diameters being of the order of one-eighth of an inch. These conductors, as well as conductor 13, are flexible, as conventionally indicated by loops therein. Upon assembly of the parts in a range these conductors are readily bent to take the positions desired.

In the event that it is desired to employ electric ignition for the pilot burner I build an electric switch onto the valve 17, to be opened and closed by the dissipation or accumulation of pressure respectively in the chamber 22 of the valve. The switch is therefore in a cool spot and its certainty of operation and length of life are greatly enhanced. For the purpose indicated the valve 17 is provided with a second diaphragm 26 over which extends a cover 27 that is perforated to provide a guide for a pin 28 that moves up and down with the diaphragm 26. The head of this pin is adapted to engage the lower end of an ad-

justable screw 29 that is mounted in an arm 30 of insulation material. Pin 28 is grounded as indicated at 31. From screw 29 a conductor 32 extends to the igniter 33, shown as a heating coil, and from the igniter another conductor 34 extends to the secondary of a transformer 35, the other side of the secondary being connected with manual switch 16 by conductor 36. It will therefore be apparent that when switch 16 is closed current will flow through igniter 33 provided that gas line pressure is maintained in the pressure chamber 22 of the automatic valve.

The pilot unit is illustrated more or less in detail in Figs. 2, 3 and 4, where the pilot is shown as comprising a portion 37 which is square in external section and fits smoothly within a recess formed in a transverse bar 38 that is attached at one end to one leg 39 of a U-shaped thermal member. These two parts are first secured together by a rivet 40 and then by an electric weld 41, Fig. 2. The other leg 42 of the thermal member has its extremity resting upon but free to move over the surface of bar 38. The pilot 14 is disposed in heating relation to the intermediate bent portion of the U-shaped thermal member, which is of a type well known in the art and described in detail in Hahn Patent 2,064,909. When the temperature of the inner rim of the curved portion of this thermal member is raised relative to that of the outer rim the member expands and the legs spread apart and when the inner rim cools relative to the outer rim the reverse action takes place.

The free end of bar 38 carries a valve body. In the illustrated case it is integral with the bar itself and comprises two drilled passages 43 and 44 extending from the upper surface of the bar downwardly part way through the bar and a drilled passage 45 which extends entirely through the bar. The passages 43 and 44 communicate with horizontal passages in the bar in which are received the corresponding ends of each of the two tubular conductors 24 and 25. A valve piece 46 in the form of a round disk of hard heat-resistant metal, hereinafter termed a D-valve, overlies the passages 43, 44 and 45 and is provided with a circular pocket 47 by means of which it is adapted to connect together alternately the passages 43 and 44 or the passages 44 and 45. The meeting surfaces of the parts 38 and 46 are ground and polished to a mirror finish in order to provide a fit that will prevent leakage of gas.

The valve piece 46 is received within a circular opening 48 in the free leg 42 of the thermal member. The opening 48 is of a size to provide sufficient clearance so that any distortion of the thermal member or of the transverse bar 38, due to temperature changes, will not affect the sliding engagement of the valve piece with the valve body. For a similar reason the top and bottom edges of the opening 48 are beveled off so that engagement between the thermal member and the valve piece takes place along a relatively narrow ring.

In order that close engagement of the valve parts may be insured the valve piece 46 is pressed against the bar 38 by weight 49 which is formed on its lower side with a central knob 50 of rounded contour, whereby the pressure from the weight is applied to the valve piece at or near the center of the latter, permitting free tilting movement of these two parts with respect to each other. The movements of the weight are restrained by a cover or cap 51 which is attached to the bar 38 by screws 52 and is provided with an extension

53 which overlies and engages the square portion 37 of the pilot, and thereby holds the latter in place. The extension 53 is employed further as a means for receiving a fastening by means of which the unit is held in place in the range. To this end I may drill and tap three holes 54, 55 and 56 at right angles to each other in order to accommodate the unit to various different installations.

The igniter coil 33 is preferably mounted in a cavity provided in a block 57 of insulating material resistant to heat, which block is attached by suitable means to the leg 39 of the thermal member. Binding posts 58 and 59 are provided and to them the conductors 32 and 34 are attached, these conductors being preferably ribbon conductors extending through a series of heat-resistant insulating beads 60.

Operation.—During off periods of the burner, when the legs of the thermal member are contracted, the valve piece 46 stands in the position illustrated in Fig. 4, whereby the valve passages 43 and 44 are connected together and gas is free to flow from the supply through conductors 24 and 25 to the pressure chamber 22 of the automatic valve. The latter valve is thereby maintained closed and the electric circuit is closed in so far as the contacts 28 and 29 are concerned. Now, when the operator desires to turn on the burner he opens manual valve 15, at the same time closing switch 16. Gas then flows down to the valve 17 but not through that valve. It also flows through conductor 13 to pilot 14. The closing of switch 16 causes current to flow through igniter coil 33 which becomes incandescent and ignites the gas flowing from the pilot. The thermal member expands in response to the heat from the pilot and the valve piece 46 is shifted over from the position illustrated to a position in which communication between the valve passages 43 and 44 is cut off and passage 44 is brought into communication with passage 45. This exhausts the gas from chamber 22 through conductor 25 into discharge passage 45, whereby the gas pressure which had held valve 17 closed is relieved and that valve opens enabling gas to flow to the burner 12 and be ignited by the burning pilot. The relieving of pressure in chamber 22 also lowers pin 28 out of engagement with screw 29, so that the circuit through the igniter coil is broken and that coil is deenergized.

When the operator wishes to extinguish the burner he turns valve 15 to closed position and the pilot and main burner go out. The thermal member then cools and the valve piece 46 is shifted back to the position of Fig. 4, whereupon conductors 24 and 25 are again put into communication and the chamber 22 fills with gas, causing diaphragm 21 to close valve 17 and diaphragm 26 to raise pin 28 into electrical contact with screw 29, when the apparatus is ready for the next lighting cycle.

Obviously there can be no opening of automatic valve 17 unless the pilot 14 is burning, and if the pilot 14 goes out accidentally the auxiliary valve associated with the pilot shifts to the right, as viewed in Fig. 2, and gas pressure builds up in chamber 22, closing the automatic valve. That valve cannot then open again until the pilot is relighted in the regular manner as previously described.

In Fig. 5 of the drawings, I have illustrated a modified system employing the same parts essentially as in the first described form of the inven-

tion. In this instance however the operator-controlled valve 15 turns on and off the supply of gas to the pilot valve as well as to the pilot itself and to the automatic valve. Also, there is no switch associated with the operator-controlled valve 15.

In this figure a flexible tubular conductor 24' corresponding to the tubular conductor 24 of the first form is shown connected with the pipe 11 at some convenient point, so that gas may flow through the conductor 24' whenever valve 15 is open. Also the electric conductor 36' instead of running to a switch associated with the valve 15, as does conductor 36, runs directly to ground at 65. In all other respects the two systems are the same.

When after a period of idleness the operator turns valve 15 to the on position gas flows to pilot 14 and to valve 17. It also flows through conductor 24' which is then in communication with conductor 25 through the pilot valve, which puts pressure in chamber 22 and causes diaphragm 21 to tightly close the automatic valve and diaphragm 26 to close the contacts 28 and 29. Gas is then flowing from the pilot and is ignited by coil 33. The thermal member thereupon becomes heated and quickly shifts the pilot valve to its other position, cutting off communication between tubular conductors 24' and 25 and establishing communication between 25 and valve passage 45. The pressure in chamber 22 is thereby dissipated, permitting diaphragm 21 to rise in response to gas pressure therebeneath and open valve 17 and permitting diaphragm 26 to descend and cause pin 28 to break contact with screw 29, thereby opening the igniter circuit. The burner is then ignited by the pilot and continues to burn until the operator closes valve 15. When he does so the pilot goes out, the thermal member cools, and the pilot valve shifts back to connect conductors 24' and 25. In the meantime however the pressure below diaphragm 21 quickly falls to atmosphere and the valve 17 closes by its own weight. Communication between conductors 24' and 25 is open but there is no pressure in pipe 11 to cause flow of gas into the chamber 22 and consequently the contacts 28 and 29 remain open and the coil 33 remains deenergized. The parts are then in condition for the next lighting cycle.

A different form of thermal unit is illustrated in my copending application, Serial No. 354,062, filed of even date herewith, wherein the thermal unit and its combination with the auxiliary valve are claimed.

Having thus described my invention, I claim:

1. In combination, a gas supply, a main burner, a pilot burner, a main valve for cutting on and off the flow of gas from said gas supply to the main and pilot burners, means for igniting the pilot, a valve adapted to intercept the supply of gas from the said operator-controlled valve to the main burner, said intercepting valve comprising a pressure chamber and a diaphragm operable by gas pressure in said chamber to hold the valve closed, a valve associated with the pilot, a tubular connection under control of said main valve arranged to supply gas to the pilot valve coincident with the supply of gas to the pilot itself and to the intercepting valve, a tubular connection from the pilot valve to said chamber, said pilot valve functioning when the pilot is out to establish communication from the gas supply to said chamber and functioning in response to flame from the pilot to cut off said

communication entirely and relieve the pressure in said chamber, and means for effecting energization of said ignition means responsive to pressure in the chamber.

2. In combination, a main burner located in an enclosed compartment, a pilot unit located in said compartment comprising a pilot burner, a thermal member responsive to pilot flame and valve means responsive to said thermal member, operator-controlled valve means arranged to be operated from a conveniently accessible position outside the compartment for controlling the flow of gas from the supply to the main burner, an automatically operable valve arranged to in-

tercept the supply of gas from said operator-controlled valve means to the main burner, said intercepting valve being located in a cool spot outside of said compartment and comprising a pressure chamber and a diaphragm operable by gas pressure in said chamber to hold the valve closed, said pilot valve means having an inlet gas connection, an outlet connection to atmosphere and a connection to said pressure chamber, and being arranged when in one position to supply pressure to said chamber and when in another position to vent said chamber and close said inlet connection.

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