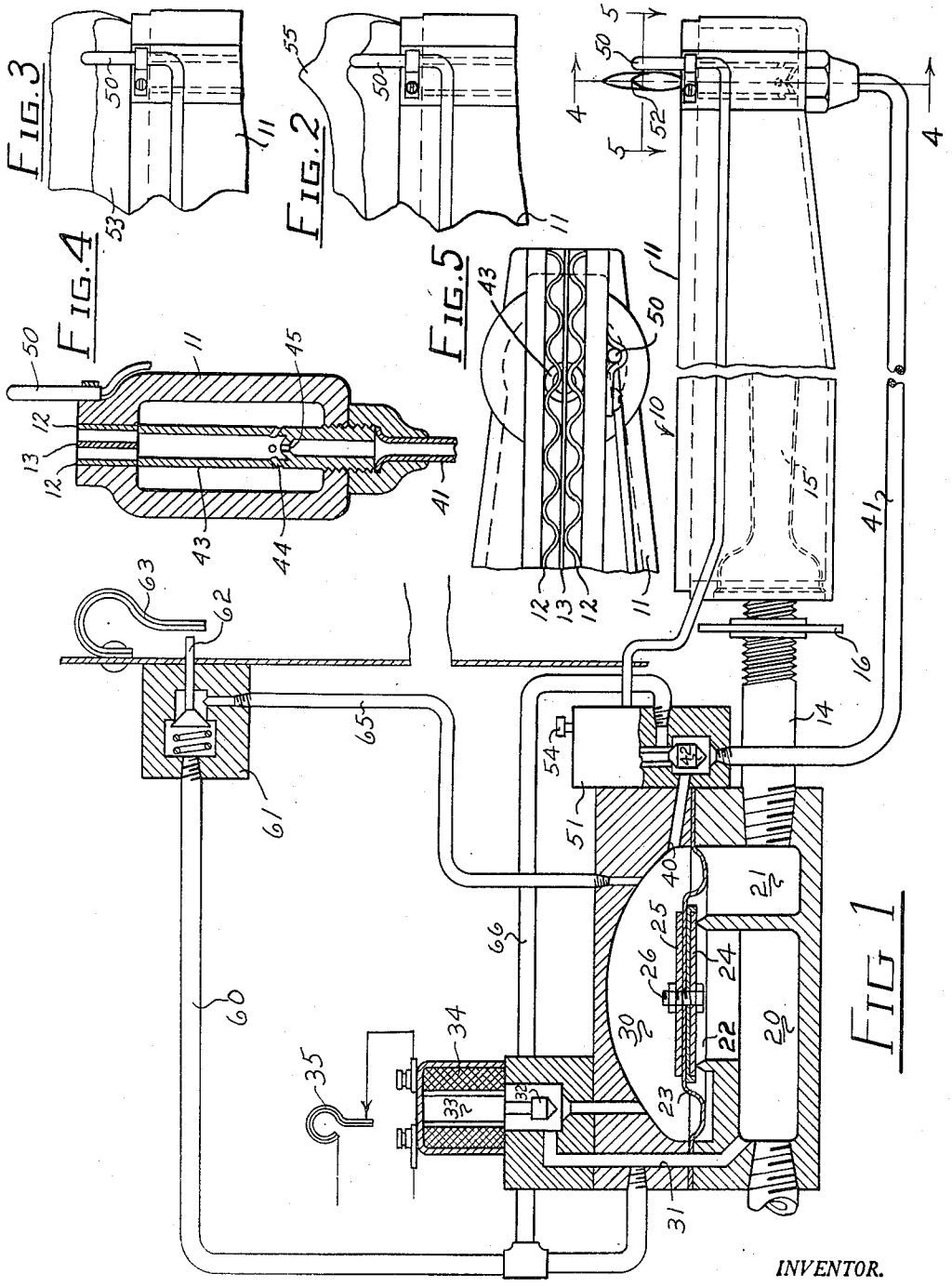
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PILOT AND MAIN BURNER UNIT

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PILOT AND MAIN BURNER UNIT

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My present invention relates to the construction of a gas burner and pilot device therefor.

It is a principal object of my invention to provide a pilot flame construction such that the pilot flame orifices act as an extension of the main flame when the main flame is ignited, the construction being such that the pilot flame orifices draw gas from the main supply when the main supply is open, and draw gas from a main valve bleed line when the main supply is shut off.

In the drawings Fig. 1 discloses in schematic fashion a preferred embodiment of my invention, the parts being illustrated in the positions assumed for pilot flame operation; Fig. 2 is a partial view showing a portion of the burner with the flame illustrated as it appears for a short time after the main flame is ignited; Fig. 3 is a view similar to Fig. 2 showing the main flame as it appears after the pilot flame supply ceases; Fig. 4 is a vertical section through the pilot device taken substantially along line 4—4 of Fig. 1; and Fig. 5 is a partial plan view of the burner taken substantially along line 5—5 of Fig. 1.

Referring to Figs. 1 to 5 inclusive there is illustrated a gas burner 10 which is preferably of the type claimed in my co-pending application No. 655,853, filed March 20, 1946, and now abandoned. The burner comprises a hollow body 11 defining a chamber and having a longitudinal slot in its upper surface within which is positioned a corrugated ribbon pack comprising two corrugated ribbons 12 separated by a spacer 13, thus providing a plurality of closely spaced ports of substantial length with respect to their greatest lateral dimension. The gas is admitted to the interior of the body 11 through an inlet pipe 14 carrying a spud (not shown) through which there is a centrally drilled orifice for creating a jet of gas. The gas jet enters a Venturi tube 15 extending within the body 11 and providing means for inspirating primary air under control of an adjustable shutter 16. One form of the device, as shown in Fig. 1, utilizes a tube 15 that terminates in about the mid portion of body 11. Other types of burners may be substituted for the type shown without departing from my invention, but I prefer the embodiment shown for reasons of simplicity and compactness.

The gas flow into the inlet pipe 14 may be controlled in any desired manner and has been illustrated as controlled by a valve comprising an inlet chamber 20 and an adjacent outlet chamber 21 separated by a substantially horizontal valve seat 22. Positioned above the valve seat there is provided a diaphragm 23, the central portion of which is clamped between disks 24 and 25 by bolt 26. The disks provide weighting means in addition to a valve surface adapted to engage the valve seat 22, so that if the pressure above the diaphragm substantially equals the pressure below the diaphragm the valve will be closed. In order to control the pressure above the diaphragm I provide an upper chamber 30 of the same cross-sectional area as the combined areas of chambers 20 and 21 so that gas at the same pressure as the main supply gas will close the valve. After the valve closes it is apparent that the upper surface of the diaphragm is subjected to greater total pressure than the lower surface since the lower surface is exposed to gas pressure only within the area of the valve seat 22, thus providing means for firmly clamping the valve closed after it has become seated.

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In order to apply pressure to the chamber 30 I provide a bypass 31 communicating with the inlet chamber 22 and the chamber 30, the bypass being controlled by a valve 32 operated by an armature 33 which is raised when a solenoid 34 is energized, and which drops to close the bypass when the solenoid is deenergized. The solenoid is operated by a control device such as a room thermostat 35. When the valve 32 is open the pressure in chamber 30 equals the pressure in the inlet and outlet chambers and the weight of the diaphragm causes the supply valve to close.

In order that the diaphragm may be reopened I provide means for bleeding off the gas from chamber 30 when the valve 32 closes. This means comprises a bleed opening 40 which communicates with a pilot flame supply tube 41 when valve 42 is in raised position as illustrated. The tube 41 is connected to the lower exposed end of a pilot tube 43 which preferably extends through the interior of the body 11 as illustrated and claimed in my aforesaid co-pending application. In said application the pilot tube is disclosed as drawing primary air from outside of the burner body, but in the present embodiment of my present invention I prefer to have the burner tube 43 draw primary air from within the burner body 11 as by means of inspirator openings 44 having air drawn therethrough by the effect of a jet 45 in the tube. The end of tube 43 abuts the lower surfaces of the ribbon members 12 and 13 so that at least one, usually two or three, of the ports are in position to receive a mixture of gas and primary air from the tube 43 when gas is supplied through the tube 41. The bypass 31 will be open to supply gas to the tube 41 when the main gas supply is shut off. Under these condi-

tions air may enter the burner body through the remainder of the burner ports and through the Venturi tube 15 and primary air will thus be supplied to the openings 44.

In Fig. 1 I have illustrated a pilot flame safety device comprising a thermo-electric element 50 in position to be heated by the pilot flame, the operative element thereof being connected to a solenoid device 51 which maintains the valve 42 in raised position as long as current is induced by the application of heat to the thermo-electric element 50. As long as either the pilot flame, indicated at 52, or the main flame, indicated at 53 (Fig. 3), is lighted the valve 42 will remain open. I have indicated at 54 a manual reset button for holding the valve 42 in raised position so that an initial supply of gas may be passed through the pilot device when the button is held down until heat has been applied to the device 50 long enough to generate current to maintain the valve in open position. There are many such control devices available and I have illustrated only sufficient thereof to indicate the preferred arrangement.

In the operation of the device when the device is shut down the diaphragm 23 is seated on valve seat 22 by its own weight. If the pilot is out, as it would be after the initial installation the operator pushes on manual reset button 54 to open valve 42 so that an initial supply of gas may be supplied to the pilot. The operator then ignites the pilot and heat therefrom acts on thermo-electric element 50 to maintain valve 42 open. If the room thermostat 35 is satisfied and is not demanding heat then the solenoid 34 is energized and valve 32 and by-pass 31 are open. A supply of gas for the pilot may thus be obtained indefinitely from chamber 20, by-pass 31, chamber 30, bleed opening 40 and tube 41. When the room thermostat 35 calls for heat solenoid 34 is de-energized and valve 32 closed and pressure builds up in chamber 20 while the pilot continues to withdraw gas from chamber 30. When the pressure differential between chambers 20 and 30 becomes sufficient to lift diaphragm 23 the main valve is thus opened and gas is supplied through pipe 14 to burner 10 to accommodate full burner operation.

As seen in Fig. 1 when the pilot flame is ignited and the thermostat 35 indicates that the room temperature is satisfied the diaphragm is seated on seat 22 and the main valve is closed. Gas may then escape from the chamber 30 through opening 40 and tube 41 to the jet orifice 45 to supply gas to the pilot flame 52. As soon as this escape of gas from chamber 30 effects a sufficient reduction in pressure in chamber 30 the diaphragm rises from its seat and the burner 10 commences operation. The pilot flame continues for an appreciable time after the main flame becomes ignited which produces a flame similar to that shown in Fig. 2. With one form of gas valve, specifically Minneapolis-Honeywell valve V–148A, which has the smallest upper chamber within my knowledge, this continued flow of pilot flame gas continues for approximately 15 seconds after the main valve is fully opened, thus creating a slight peak in the ribbon of flame as indicated at 55. After the pressure in chamber 30 becomes sufficiently reduced the pressure existing within the burner body 11 will cause mixed gas and primary air to enter the openings 44 and thus the ports above the tube 43 act identically the same as all other ports so that the main flame 53 is the only flame existing.

However, the chamber 30 and the tube 41 remain filled with gas under pressure so that upon opening valve 32 a jet of pure gas will commence immediately to move through jet orifice 45. A flame will thus continuously burn from the ports above tube 43 even after the main flame goes out. Thus the pilot flame ignites the main flame, remains in evidence for an appreciable time interval after the main flame becomes established and then disappears so as not to disrupt the main flame, and is reignited from the main flame just before the main flame goes out. I have observed artificially created conditions simulating the action of the diaphragm valve in cocked position such that gas escapes over the valve seat 22 in insufficient quantities to maintain a continuous main flame. Under these conditions a continuous pilot flame exists and part or all of the main flame area may flash on and off. I have thus provided a burner and pilot device which "fails safe."

In Fig. 1 I have indicated that the single main valve may be controlled by a plurality of simple control devices placed in parallel. Thus I have provided a tube 60 drawing gas from the bypass 31 when valve 61 is open. The valve 61 may comprise a simple, spring-loaded valve having a rod 62 to open the valve against the compression of the spring. The rod may be moved by a bimetallic element 63 placed on the heat exchange chamber or flue therefrom and adapted to overcome the valve spring when an excessive temperature is created, thus providing a limit switch for the heating appliance. When the valve is open gas flows through tube 60 and a tube 65 leading to the upper chamber 30. Thus if either valve 32 or valve 61, or both, are open the main valve will be closed and the pilot flame ignited. Other controls may be so positioned in parallel with each other so that as many control devices as are desired may be supplied. The valves will operate independently of each other and do not need complicated interconnecting tubing as required by all previous devices within my knowledge.

A further safety feature is illustrated in Fig. 1 in that a tube 66 connects tube 60 and the upper portion of the valve body against which valve 42 normally seats. If the pilot flame should become extinguished when the main flame is off the valve 42 will drop, thus opening communication between tube 66 and bleed opening 40 and assuring the establishment of pressure in chamber 30 regardless of the positions of valves 32 and 61. As long as this condition exists the diaphragm cannot be raised from its seat and the burner cannot be supplied with gas. Usually this will result in the closing of valves 32 and 61 since the room and the device heated by the burner will become cooled. Immediately upon depression of the manual button 54 the pilot device will be supplied with gas from the chamber 30 only, and should this prove insufficient to reignite the pilot flame the same match or other lighting means being applied to the area of the pilot flame will ignite the main burner which is supplied with gas as soon as the diaphragm rises.

I claim:

1. A main and pilot gas burner assembly comprising a hollow body defining a chamber and having a plurality of burner ports communicating with said chamber and extending through said body, said body having an orifice for the admission of primary air to said chamber, means for admitting a main gas supply to said cham-

ber for mixture with said primary air supply, a tubular pilot member extending through said body and into said chamber and having an outlet end located adjacent some of said ports, said tubular member having openings therethrough communicating with said chamber and having means including a jet orifice located within said member upstream of said openings adapted to deliver a high velocity flow of gas past said openings to induce a mixture of air and gas from within said chamber to enter said pilot member through said openings to sustain a pilot flame at said end of said pilot member.

2. A main and pilot gas burner assembly comprising a hollow body defining a chamber and having a plurality of burner ports communicating with said chamber and extending through said body, said body having an orifice for the admission of primary air to said chamber, means for admitting a main gas supply to said chamber for mixture with said primary air supply, a tubular pilot member extending through said body and into said chamber and terminating in an outlet end in fluid flow registration with at least one of said ports, said tubular member having openings therethrough communicating with said chamber and having means including a jet orifice located within said member upstream of said openings adapted to deliver a high velocity flow of gas past said openings to induce a mixture of air and gas from within said chamber to enter said pilot member through said openings to sustain a pilot flame at at least one of said ports.

3. A main and pilot gas burner assembly comprising a hollow body defining a chamber and having a plurality of burner ports communicating with said chamber and extending through said body, said body having an orifice for the admission of primary air to said chamber, means for admitting a main gas supply to said chamber for mixture with said primary air supply, a tubular pilot member extending through said

body and into said chamber and terminating in an outlet end in fluid flow registration with at least one of said ports, said tubular member having openings therethrough communicating with said chamber and having means including a jet orifice located within said member upstream of said openings adapted to deliver a high velocity flow of gas past said openings to induce a mixture of air and gas from within said chamber to enter said pilot member through said openings to sustain a pilot flame at at least one of said ports, said tubular pilot member and the openings therein being operable to deliver mixed air and gas from said chamber to at least one of said ports when said main burner is operating and gas is not being discharged by said jet orifice.

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