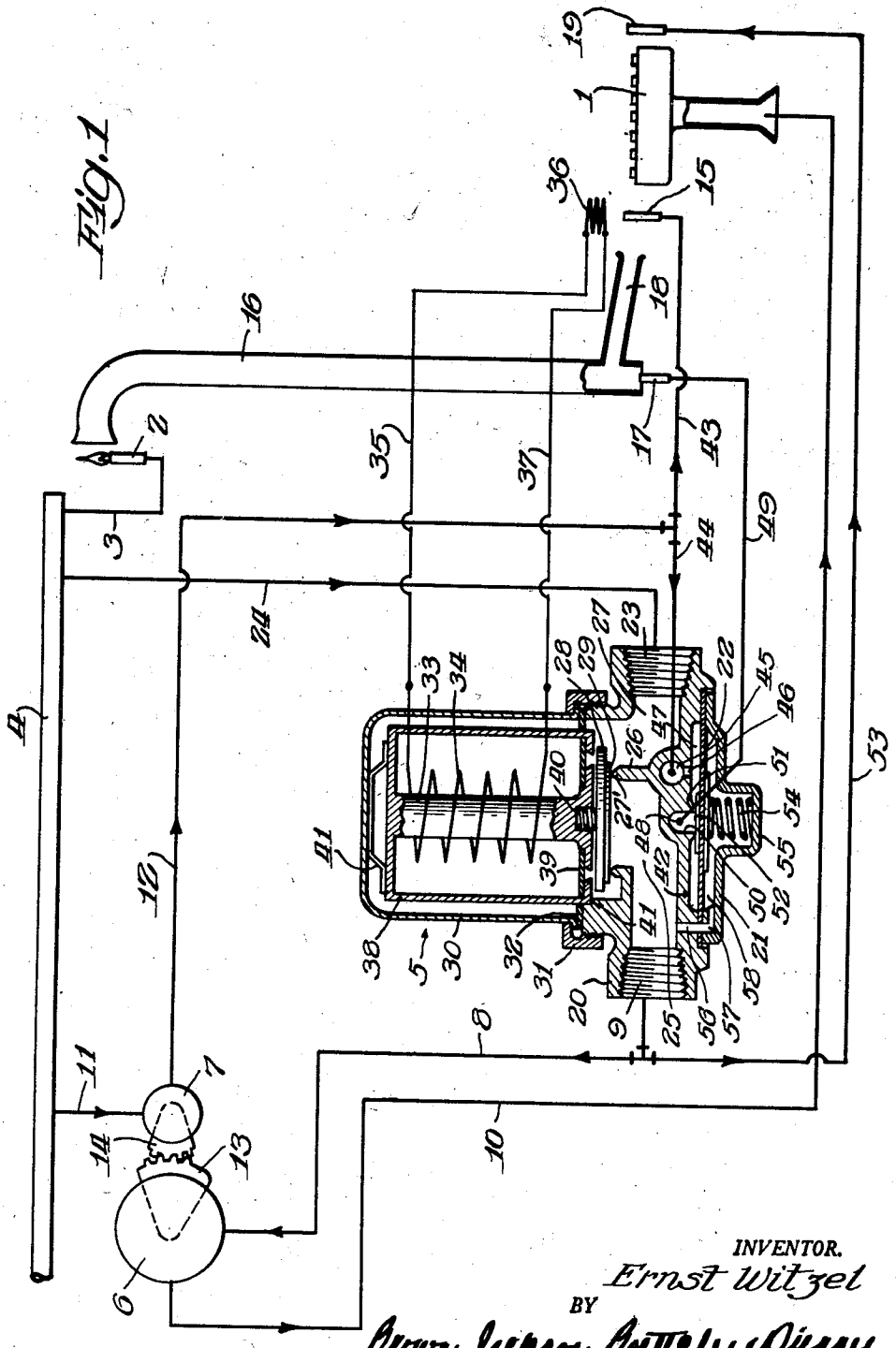
May 2, 1950 E. WITZEL 2,506,403

BURNER CONTROL SYSTEM AND CONTROL MEANS THEREFOR

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Fig. 1



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Filed Feb. 9, 1948 2 Sheets-Sheet 2

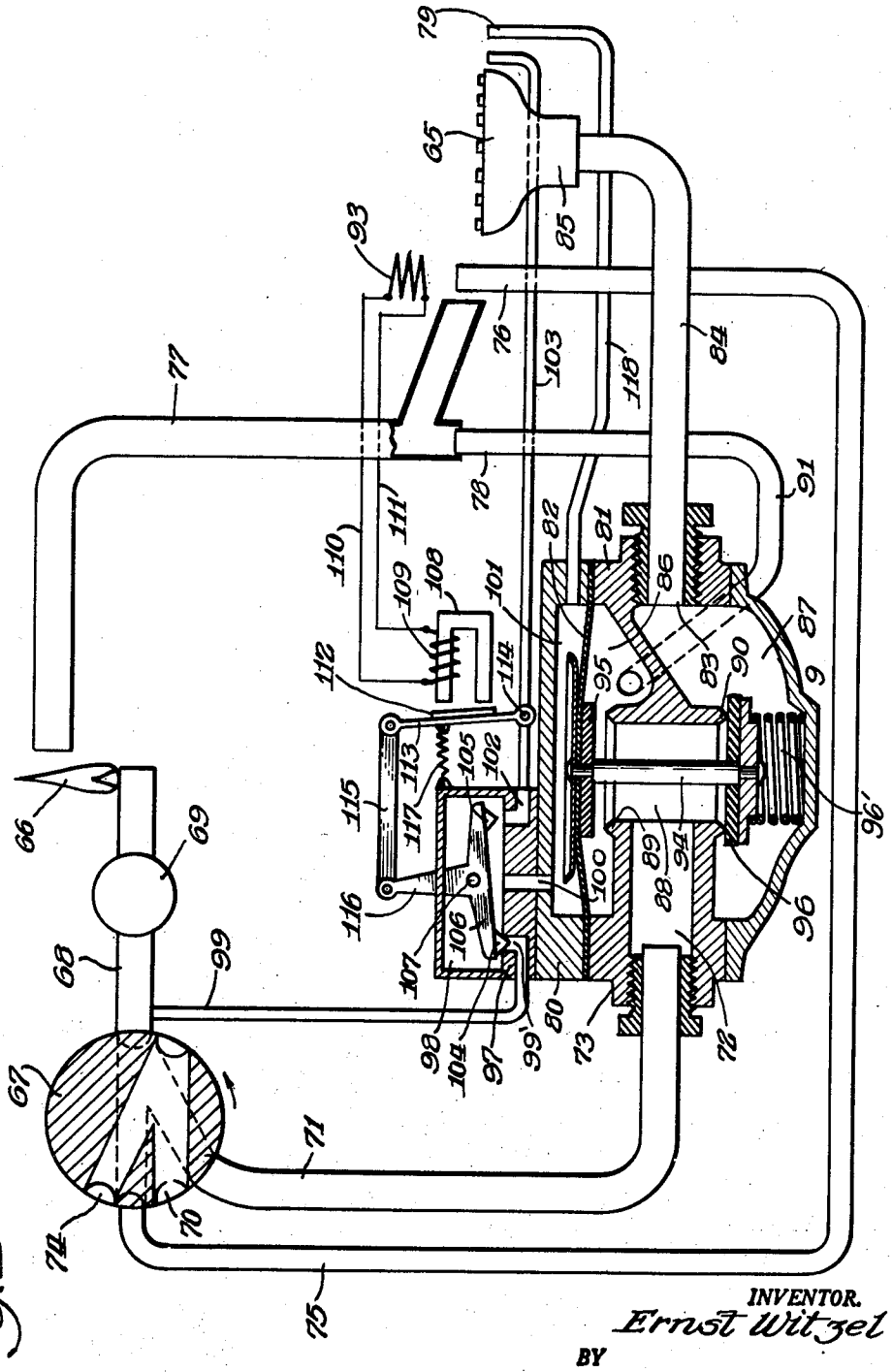


Fig. 2

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BURNER CONTROL SYSTEM AND CONTROL MEANS THEREFOR

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Application February 9, 1948, Serial No. 7,142

19 Claims. (Cl. 158—117.1)

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This invention relates to a burner control system and control means for such system.

While the particular embodiments of the invention which I shall describe hereinafter in connection with the drawings are systems adapted for use with domestic gas ranges, it is to be understood that the invention is not limited to such use, but may be employed for all similar purposes; for example, in connection with various commercial forms of apparatus having a baking oven burner, broiler oven burner or other burner remotely located relative to the pilot burner.

In the usual domestic gas range, the pilot burner is in the form of a single, constantly burning pilot burner located in juxtaposition to the top burners at the upper part of the range, and the baking oven, broiler, or like burners are located in the lower part of the range. Although the top burners are usually provided with a constantly burning pilot burner for lighting the same, a match has usually been employed for lighting the baking oven, broiler, or like burners. The stooping and hazards of lighting an oven burner or the like with a match are well known in the art.

In my copending applications, Serial No. 738,412, filed March 31, 1947, and Serial No. 744,905, filed April 30, 1947, I provide an improved system of flash tubes and intermediate pilot burner means for assuring ignition of a pilot burner in juxtaposition to the oven or like burner from a constantly burning top pilot burner; also an improved system wherein means is provided for extinguishing the intermediate pilot burner means and establishing a flow of fuel to the oven or like burner after a time delay following ignition of the pilot burner for the main burner, and an improved thermoelectric control device and other instrumentalities are provided for accomplishing the new and advantageous results therein set forth.

One of the main objects of the present invention is to provide a simple, improved and effective system and means which will provide all of the advantageous results obtained with the systems disclosed and claimed in my above identified copending applications but without the time delay mechanism for establishing a time delay between ignition of the pilot burner for the main burner and establishment of a flow of fuel to the main burner.

Another object of the invention is to provide an improved system of the character described in which the diaphragm or equivalent means at the thermoelectric control valve, instead of being exposed to the deleterious action of the gas and

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chemicals therein at all times, is exposed to the gas only when the gas cock or other gas shut-off means is open.

Another object of the invention is to provide an improved system of the character described which may be used with only one pilot burner instead of a plurality of pilot burners at the thermoelectric generator heating position, although not limited to such use.

Another object of the invention is to provide an improved system of the character described in which trouble free mechanism is provided for accomplishing the desired results.

Another object of the invention is to provide an improved form of automatic or thermoelectric control valve having various features of novelty and advantages, and which is characterized by its simplicity in construction, its economy in manufacture and installation, and its effectiveness in use; also a valve of this sort having a diaphragm or equivalent means with provision for exposing such diaphragm or equivalent means to the gas only when the gas cock or other shut-off means is open.

Another object of the invention is to provide an improved system embodying a bleed port control, and, more particularly, a system of this sort wherein the automatic or thermoelectric control valve does not require special seals or the like.

Further objects and advantages of the invention will appear from the following detailed description, taken in connection with the accompanying drawings which illustrate the manner of constructing aand operating illustrative embodiments of the invention.

In the drawings:

Figure 1 is a diagrammatic view showing a system embodying the present invention, with the thermoelectric control valve in section; and

Figure 2 is a similar view showing another system embodying the present invention; also with the thermoelectric control valve in section.

Referring first to the embodiment of the invention shown in Figure 1, the burner 1 is the baking oven, broiler, or other remote burner. It is usually located in the lower part of the range or other appliance.

The pilot burner 2 is the constantly burning pilot burner. It may be, for example, the top pilot burner for the top burners of a gas range or other constantly burning pilot burner. The pilot burner 2 is usually located in the upper part of the appliance.

A fuel supply pipe 3 leads, for example, from gas manifold 4 to pilot burner 2 for the delivery

of gaseous fuel thereto. The flow of fuel to the burner 1 is controlled by an automatic or thermoelectric control valve 5 and by a thermostat controlled valve 6 and a gas cock 7 or other gas shut-off means. The thermostat controlled valve 6 may be of any type well known in the art, and therefore will not be described in detail except to state that it operates under the action of a thermostat to place the fuel supply pipe 8, leading from the outlet 9 of the thermoelectric control valve 5, in communication with fuel supply pipe 10 leading to the burner 1 and to shut off communication between these pipes. The pipe 10 is shown as adapted to supply the gaseous fuel to burner 1 through a mixing chamber to which air is admitted through adjustable air inlets (not shown), as well understood in the art.

The gas cock 7 may also be any type well known in the art, and therefore, likewise, will not be described in detail, except to state that it is operable, for example, manually to place fuel supply pipe 11, leading from manifold 4 to cock 7, in communication with a fuel supply pipe 12 which leads from the cock 7 and to shut off communication between these pipes. In the illustrated embodiment of the invention, the valve 6 and cock 7 are connected by suitable linkage shown comprising meshed toothed sectors 13 and 14. The form of linkage connection may vary, and combining of the valve 6 and cock 7 into a single device is contemplated within the scope of the present invention.

The oven or like burner 1 is provided with an oven or like pilot burner 15 for igniting it. A flash tube 16 has a laterally turned upper end opening directly to the constantly burning pilot burner 2. This tube 16 extends downwardly and opens at its lower end to an intermediate pilot burner 17. The intermediate pilot burner 17 is spaced laterally from the oven pilot burner 15, and the tube 16 has, at its lower end, a generally horizontally extending branch 18 which opens at its outer end to the oven pilot burner 15. An auxiliary or standby pilot burner 19 is also provided in lighting proximity to the burner 1 for a purpose which will hereinafter appear.

The thermoelectric control valve 5 comprises a valve body formed of top and bottom valve body parts 20 and 21 clamped together by screws or other suitable means (not shown) with a diaphragm 22 therebetween. The valve body part 20 has an inlet 23 and the outlet 9. A fuel supply pipe 24 leads from manifold 4 to the inlet 23 for the delivery of gaseous or other fuel thereto. Internally the valve body part 20 has a generally L-shaped outlet chamber 25 having a longitudinally extending part in open communication with the outlet 9 and a transversely extending portion defined by a cylindrical wall 26. An inlet chamber 27, in open communication with the inlet 23, terminates at its inner end in a generally annular-shaped portion which embraces the cylindrical wall 26.

The wall 26 terminates in an annular valve seat 27'. An armature 28, of disc-like form, has a yielding or other suitable valve or valve facing 29 adapted to seat against the seat 27' to shut off the flow of gas from inlet 23 to outlet 9 through the chamber 25. A hood 30 is clamped to the valve body part 20 by a union nut 31, and preferably with a hood gasket 32 therebetween.

In the illustrated embodiment of the invention, the means for operating the valve 29, and, more particularly, the means for opening this valve, is in the form of an electromagnet comprising a magnet frame or coil spool 33 and a coil 34. One side of the coil 34 is connected by a lead 35 to one side of a thermoelectric generator shown in the form of a thermopile 36, although it may be in the form of a thermocouple or other suitable thermoelectric generator. The other side of the coil 34 is connected by a lead 37 to the other side of the thermoelectric generator 36, although I contemplate grounding one side of the coil 34 and one side of the thermoelectric generator 36 where suitable and appropriate.

In the illustrated embodiment of the invention, the electromagnet has a flux shell 38 and a spacer ring 39. The lower end of the coil spool 33 has an axial recess, and disposed in this recess and interposed between spool 33 and armature 28 is a coiled spring 40 which operates to move the armature 28 to retracted position and to seat the valve 29 on valve seat 27' when the electromagnet is deenergized. Energization of the electromagnet by heating of the hot junctions of the thermopile 36 is sufficient to lift the valve 29 to open position against the action of the spring 40. A hood spring 41, interposed between the top of the spool 33 and hood 30, seats the shell 38 in the valve body part 20 at 41'.

The bottom of the valve body part 20 has a recess 42 spaced inwardly from its periphery. The pipe 12 connects with a branch pipe 43 which leads to pilot burner 15 for supplying gaseous fuel thereto, and with another branch pipe 44 which leads to a chamber 45 which may, for example, be cored in the valve body part 20. A port 46 opens from the chamber 45 into chamber 47 above the diaphragm 22.

The valve body part 20 has a pilot outlet passage 48 for supplying fuel to the intermediate pilot burner 17 through a pipe 49. Fuel is adapted to be delivered from the diaphragm chamber 47 to the passage 48 through a passage 50, the lower end of which is surrounded by an annular valve seat 51. A valve or valve facing member 52 is adapted to seat against seat 51 to shut off the supply of fuel to the intermediate pilot burner 17. The auxiliary or standby pilot burner 19 is supplied with fuel by a pipe 53 leading from the pipe 8, or otherwise from the outlet of the thermoelectric control valve 5.

Valve or valve facing 52, which is of disc-like form, is secured to the diaphragm 22 at the axis thereof. The diaphragm 22 may have diaphragm plates, and interposed between the bottom of this diaphragm and valve body part or cover plate 21 is a coiled spring 54. The part 21 has an axially disposed cup-shaped part 55 for accommodating the spring 54. A port 56 opens from the outlet chamber 25 and through a port 57 into the chamber 58 beneath the diaphragm 22.

The operation of the system shown in Figure 1 is as follows:

When the thermostat valve and gas cock combination is opened, gas will flow through the pipes 11 and 12 and branch off through pipe 43 to supply fuel to the burner pilot burner 15. At the same time the other branch pipe 44 supplies gas through chamber 45 and port 46 to the top of the diaphragm 22, and thereby opens the valve 52 and supplies fuel through the passage 50, outlet passage 48, and pipe 49 to the intermediate pilot burner 17.

The gas from the intermediate and pilot burners 17 and 15 rises in the tube 16 which is always relatively cool to permit this action. As it reaches the flame of the constantly burning pilot burner 2, the gas is ignited and then recedes or

flashes back to light the intermediate and pilot burners 17 and 15. The turning of the upper end of the flash tube 16 laterally toward the pilot burner 2 reduces the possibility of extinguishing this pilot by flash back action in the tube 16.

The thermopile or other thermoelectric generator 36 is now heated by the pilot burner 15, and energizes the electromagnet 33, 34, which, after a given time, will lift the armature 28 and, with it, valve 29, thereby opening the valve 29. Gas will now flow through the pipes 24 and 8, thermostat valve 6, and pipe 10 to the burner 1; also through the pipe 53 to the auxiliary or standby pilot burner 19. As soon as the automatic valve 5 opens, gas passes to the under side of the diaphragm 22 through ports 56 and 57, and balances the pressure on opposite sides of the diaphragm. The spring 54 will now close valve 52, thereby shutting off the supply of gas to the intermediate pilot burner 17, which permits flash tube 16 to cool for the succeeding starting operation.

When the thermostat-gas cock 6, 7 is closed, the gas supply to the burner 1 is definitely shut off; also the gas supply to the pilot burners 17 and 15. However, gas can still pass through the pipe 24, valve 5, and pipe 53 to the auxiliary or standby pilot burner 19 which will remain lighted as long as the valve 5 is open, which depends on the cooling rate of the thermoelectric generator 36. When finally the armature 28 is released from the electromagnet 33, 34, the valve member 29 moves to closed position against valve seat 27' and shuts off the supply of fuel to the auxiliary or standby pilot burner 19.

It is an important feature that the pilot burner 19 is standing by and maintains a pilot flame for lighting the burner 1 as long as the automatic valve 5 is open. In case the thermostat-gas cock 6, 7 is turned on before the thermoelectric generator 36 has cooled sufficiently to close the valve 5, gas passing to the burner 1 will ignite from the standby pilot burner 19; the intermediate pilot 17 being shut off or inoperative to produce lighting of the burner 1 as long as the valve 5 is open.

The present invention provides for accomplishing the results set forth without exposing the diaphragm 22 to gas at all times, which is objectionable because of the deleterious effect of the gas and chemicals therein on the diaphragm material. Instead of being exposed to the gas at all times, the diaphragm 22 is exposed to the gas only when the gas cock 7 or other shut-off means is open. The possibility of developing leaks and failure of the system are thereby reduced.

The structure and operation of the automatic or thermoelectric control valve 5 are also important aspects of the present invention.

As usual, the safety shut-off feature is present. If the pilot burner 15 should fail, the thermoelectric generator 36 will cool and the valve member 29 will operate to closed position.

In the system shown in Figure 2, the burner 65 and constantly burning pilot burner shown diagrammatically at 66 correspond with the burner 1 and constantly burning pilot burner 2 of the preceding embodiment of the invention.

The fuel shut-off means at 67, although shown in the form of a gas cock, may be a combined thermostat controlled valve and gas cock or other fuel shut-off means. It receives gaseous fuel from a pipe 68 leading thereto from the manifold 69 and has a port 70 for delivering gaseous fuel to a pipe 71 leading to the inlet 72 of the automatic or thermoelectric control valve 73; and a second port 74 for delivering fuel to a pipe 75 leading to a pilot burner 76 for supplying gaseous fuel hereto. The gas cock 67 is shown in closed position and is turned counterclockwise in the direction of the arrow to open position. Suitable passages (not shown) are provided in the gas cock 67 for delivering fuel from the inlet of the cock through the ports 70 and 74, and thereby to the pipes 71 and 75 when the gas cock is open.

The flash tube 77 has a laterally turned upper end opening to the constantly burning pilot burner 66. This tube extends downwardly and opens directly over a flash tube pilot burner 76 in lighting proximity to the burner 65. The auxiliary or standby pilot burner 79 is also in lighting proximity to the burner 65.

The automatic or thermoelectric control valve 73 comprises a valve body formed of top and bottom valve body parts 80 and 81, clamped together as suitable or desired, with a diaphragm 82 therebetween. The valve body part 81 has the inlet 72 and an outlet 83. The outlet 83 is adapted to supply gaseous fuel to the burner 65 through a pipe 84, for example, through a mixing chamber 85 to which air is admitted through adjustable air inlets (not shown).

Within the valve body part 81 there are chambers 86 and 87 between which there is a passage 88 having valve seats 89 and 90 at the opposite ends thereof. The inlet 72 of the valve 73 opens into the passage 88 intermediate the valve seats 89 and 90 at opposite ends thereof. A pipe or tube 91 leads from the chamber 86 to the pilot burner 76.

Secured to the diaphragm 82 at the axis thereof is a valve stem 94 having a valve or yielding facing 95 adapted to seat against the seat 89 to shut off the supply of fuel to the pilot burner 76. The valve stem 94 also carries a second valve or yielding valve facing 96 adapted to seat against the seat 90 to shut off the supply of fuel to the burner 65.

The bleed port control comprises a body part 97 mounted, for example, on the valve body part 80 and provided with a chamber 98. A pipe 99, leading from the pipe 68 or, if desired, from the gas cock 67, is adapted to deliver gaseous fuel into the chamber 98 through a port 99'. A port 100 opens from the chamber 98 into the chamber 101 above the diaphragm 82, and a vent port 102 opens from the chamber 98. The gaseous fuel vented through the port 102 is preferably delivered through a pipe 103 to position adjacent to the burner 65 where it is burned. The ports 99' and 102 are controlled by valve members 104 and 105 carried by a generally T-shaped arm 106 pivoted at 107.

In the illustrated embodiment of the invention the means for operating the arm 106, and thereby the valves 104 and 105, is in the form of an electromagnet comprising a magnet frame 108 and a coil 109. One side of the coil 109 is connected by a lead 110 to one side of the thermoelectric generator 93. The other side of the coil 109 is connected by a lead 111 to the other side of the thermoelectric generator 93. As before, I contemplate grounding one side of the coil 109 and one side of the thermoelectric generator 93 and omitting one of the leads 110 or 111 where suitable and appropriate.

The armature 112 is carried by an arm 113 pivotally mounted at one end at 114. The opposite end of the arm 113 is connected by a link 115 with the outwardly extending arm 116 of the arm or lever 106. A spring 117, connected, for example, between the arm 113 and the body

part 87, is adapted to actuate the arm 113 in a counterclockwise direction and thereby the armature to retracted position to close valve 104 and open valve 105. The connections of the arms 113 and 116 with the opposite ends of the link 115 are, of course, such as to permit the desired action.

With the mechanism in the position shown in Figure 2, the operation of this form of system is as follows:

When the gas cock 67 is opened, gas will flow through the port 70 and pipe 71 to inlet 72 of valve 73 and into the passage 88. Valve 96 being closed, there is no flow of gas to the burner 65, but valve 95 being held open by spring 96', gas flows into the chamber 86 and out through the pipe 91 to the pilot burner 78. Pilot burner 78 ignites from the top pilot burner 66 by means of the flash tube 77. At the same time, gas flows through the port 74 and pipe 75 to the pilot burner 76 which ignites from pilot burner 78.

The thermoelectric generator 93 is now heated by the pilot burner 76 and energizes electromagnet 108, 109 which, after a given time, will move the armature 112 to attracted position, swinging arm 113 in a clockwise direction and also swinging arm 106 in a clockwise direction to open valve 104 and close vent valve 105. Gas will now flow through pipe 99 and port 99' into chamber 98, and from chamber 98 through port 100 into chamber 101. The action of the gas pressure in chamber 101 on the large area of the diaphragm 82 flexes the diaphragm downwardly, thereby closing valve 95 and opening valve 96. As soon as valve 96 opens, gas passes to the burner 65 which is ignited by the adjacent pilot. As gas enters the chamber 101 it is delivered through a tube or pipe 118 to the auxiliary or standby pilot burner 79 which ignites. When the valve 95 closes, it shuts off the gas supply to the pilot burner 78.

When the gas cock 67 is closed the gas supply to the burner 65 is definitely shut off; also the gas supply to the pilot burner 76 is shut off. However, gas can still pass through pipe 99, port 99', chamber 98, port 100, chamber 101 and pipe 118 to the auxiliary or standby pilot burner 79 which will remain lighted as long as the valve 104 is open and vent valve 105 is closed, which depends on the cooling rate of the thermoelectric generator 93. When finally the armature 112 is released from the electromagnet 108, 109, the valve member 104 closes and vent valve 105 opens under the action of the spring 117. This shuts off the supply of fuel to the auxiliary or standby pilot burner. The gas in chamber 98 escapes through the pipe 103 and may be burned by the flame, for example, at pilot burner 79 which will remain lighted until the gas in chamber 101 is exhausted.

The embodiment of the invention shown in Figure 2 provides the advantageous results set forth in more detail in connection with the preceding embodiment of the invention.

Many other variations and adaptations of the systems and devices selected for illustration are contemplated within the scope of the present invention. Therefore the embodiments of the invention shown in the drawings are for illustrative purposes only, and it is to be expressly understood that the drawings and the accompanying specifications are not to be constructed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. In apparatus of the class described, in combination, a thermoelectric control device having a fuel inlet and a fuel outlet, a first valve member for shutting off communication between said inlet and said outlet, said control device having a valve body provided with a pair of chambers separated by a diaphragm, a pilot fuel outlet means on one side of said diaphragm, a first intermediate pilot burner connected to said pilot fuel outlet, a second constantly burning pilot burner, a main burner remote from said first constantly burning pilot burner, a third pilot burner for igniting said main burner, a flash tube for igniting said first intermediate pilot burner and said third pilot burner from said second constantly burning pilot burner, a second valve member for controlling said pilot fuel outlet and actuated to open position by said diaphragm, port means for delivering fuel into the chamber on one side of said diaphragm independently of the fuel inlet of the valve body for actuating said diaphragm in a direction to open the valve member for the pilot outlet when said first valve member is closed, port means for delivering fuel into the chamber on the opposite side of the diaphragm to equalize the fuel pressure in the chambers on opposite sides of the diaphragm when said first valve member is open, means for actuating said diaphragm in a direction to close said second valve member upon equalization of pressure upon opposite sides of the diaphragm, and a standby pilot burner in juxtaposition to the burner and connected to the fuel outlet of the valve body of said thermoelectric valve.

2. Apparatus according to claim 1 wherein there is a fuel supply line leading to the port means for delivering fuel into the chamber on one side of the diaphragm independently of the fuel inlet of the thermoelectric control device, and fuel shut-off means in said fuel supply line anterior of said port means.

3. Apparatus according to claim 1 wherein there is a fuel supply line leading to the port means for delivering fuel into the chamber on one side of the diaphragm independently of the fuel inlet of the thermoelectric control device; also fuel shut-off means in said fuel supply line anterior of said port means, and a branch fuel line leading from said last mentioned fuel line to said third pilot burner.

4. Apparatus according to claim 1 wherein there is a fuel supply line leading from the outlet of said thermoelectric control device to the burner with a thermostat controlled valve in said last supply line.

5. Apparatus according to claim 1 wherein there is a fuel supply line leading to the port means for delivering fuel into the chamber on one side of the diaphragm independently of the fuel inlet of the thermoelectric control device, with fuel shut-off means in said fuel supply line anterior of said port means and wherein there is a fuel supply line leading from the outlet of said thermoelectric control device to the burner, with a thermostat controlled valve in said last fuel supply line.

6. In a thermoelectric control device, in combination, a valve body having a fuel inlet and a fuel outlet, said valve body having a passage open to said fuel inlet and having valve seats at its opposite ends, a diaphragm carrying a pair of valve members, one adapted to seat against one valve seat and the other adapted to seat against the other valve seat, said valve

body having a first chamber posterior of one valve seat and adjacent to one side of said diaphragm, said valve body having a second chamber on the other side of said diaphragm, said valve body having a third chamber posterior of the other valve seat, said valve body having an outlet leading from said first chamber for supplying fuel to a burner pilot, said valve body also having an outlet leading from said second chamber for supplying fuel to a standby pilot, and said valve body having an outlet leading from said third chamber for supplying fuel to a burner.

7. A thermoelectric control device according to claim 6 wherein there is a bleed chamber opening into said second chamber, with a port opening into said bleed chamber for delivering fuel into said chamber, a bleed port opening from said bleed chamber to atmosphere, and thermoelectrically controlled valve means controlling said ports.

8. A thermoelectric control device according to claim 6 wherein there is a bleed chamber opening into said second chamber, with a port opening into said bleed chamber for delivering fuel into said chamber, a bleed port opening from said bleed chamber to atmosphere, thermoelectrically controlled valve means controlling said ports, said thermoelectrically controlled valve means comprising a pivoted lever having a pair of valve members one for each of said ports, and an electromagnet for actuating said lever to and holding it in position with the valve member for the bleed port closed and the valve member for the other port open.

9. In a burner control system of the class wherein there is a main burner, pilot burner means for lighting said main burner, said pilot burner means comprising a first pilot burner, a fuel supply line for supplying fuel to said main burner, a fuel supply line for supplying fuel to said first pilot burner, a safety shutoff valve in the fuel supply line for the main burner and operable to closed position to shut off the supply of fuel to said main burner, valve means in the fuel supply line for said first pilot burner and operable to closed position when said safety shutoff valve in the fuel supply line for the main burner is open, whereby to shut off the supply of fuel to said first pilot burner, the combination with said system of stand-by pilot burner means in juxtaposition to the main burner for relighting said main burner when the safety shutoff valve in the fuel supply line to the main burner is in open position and the valve means in the fuel supply line for said first pilot burner is closed.

10. A burner control system according to claim 9 wherein the safety shutoff valve has port means through which fuel pressure is delivered, and means actuated by the fuel pressure delivered through said port means for actuating the valve means in the fuel supply line for said first pilot burner to open position upon closing of the safety shutoff valve in the fuel supply line for the main burner.

11. A burner control system according to claim 9 wherein the safety shutoff valve in the fuel supply line for the main burner is under the control of an electromagnet connected in circuit with a thermoelectric generator subject to the heat of said pilot burner means.

12. A burner control system according to claim 9 wherein the pilot burner means comprises a second pilot burner in addition to said first pilot burner, and wherein there is a fuel supply line

for said second pilot burner and additional valve means partially in the fuel supply line for the main burner and partially in the fuel supply line for one of the pilot burners, said additional valve means being operable to closed position simultaneously to shut off the supply of fuel to both the main burner and one of said pilot burners and to open position simultaneously to establish a supply of fuel to said main burner and to one of said pilot burners.

13. A burner control system according to claim 9 wherein the pilot burner means comprises a second pilot burner and fuel supply means therefor in addition to said first pilot burner, wherein the safety shutoff valve in the fuel supply line for the main burner is under the control of an electromagnet connected in circuit with a thermoelectric generator subject to the heat of said second pilot burner, and wherein there is a thermostat controlled valve and a connected gas cock for controlling the supply of fuel to the main burner and to said first and second pilot burners.

14. A burner control system according to claim 9 wherein the safety shutoff valve in the fuel supply line for the main burner comprises a valve body having an outlet port for supplying fuel to said first pilot burner, and wherein there is a fuel supply means for said outlet port and a valve member under the control of the safety shutoff valve for controlling the supply of fuel through said fuel supply means to said port.

15. In a control device of the class described, in combination, a pilot burner, a valve body having a first fuel inlet and a first fuel outlet, a first valve member for shutting off communication between said inlet and said outlet, said valve body having a first chamber and a second chamber separated by a diaphragm, with said chambers disposed on opposite sides of the diaphragm, said valve body having a second fuel outlet for supplying fuel to said pilot burner, a second valve member for controlling said second fuel outlet and operable to open position by fluid pressure in said first chamber for supply of fuel to said second fuel outlet when said first valve member is closed, said valve body having port means for delivering fuel into said first chamber independently of said first fuel inlet for actuating said diaphragm in a direction to open said second valve member, said valve body having additional port means for delivering fuel into said second chamber from said first fuel outlet when said first valve member is open to equalize the fuel pressure in the chambers on opposite sides of the diaphragm, and means for actuating said diaphragm in a direction to close said second valve member upon equalization of pressure upon opposite sides of the diaphragm.

16. In apparatus of the class described, in combination, a control device comprising a valve body having a first fuel inlet and a first fuel outlet, a first safety valve member for shutting off communication between said first fuel inlet and said first fuel outlet, said valve body having a first chamber and a second chamber separated by a diaphragm, with said chambers disposed on opposite sides of said diaphragm, said valve body having a second fuel outlet, a first pilot burner connected to receive fuel from said second fuel outlet, a second valve member for controlling said second fuel outlet and operable to open position by fuel pressure in said first chamber for supply of fuel to said second fuel outlet when said first valve member is closed, said valve body having first port means for de-

livering fuel into said first chamber independently of said first fuel inlet for actuating said diaphragm in a direction to open said second valve member, said valve body having second port means for delivering fuel into said second chamber from said first fuel outlet when said first valve member is open to equalize the fuel pressure on opposite sides of the diaphragm, means for actuating said diaphragm in a direction to close said second valve member upon equalization of pressure on opposite sides of the diaphragm, a second pilot burner, a first fuel supply line leading to said first port means and to said second pilot burner for supplying fuel thereto, a third stand-by pilot burner, a main burner, a second fuel supply line leading through the valve body of said control device to said main burner and to said third stand-by pilot burner for supplying fuel thereto, a first shutoff valve in said first fuel supply line anterior of said first port means and said second pilot burner, and a second shutoff valve interconnected with said first shutoff valve for operation therewith and disposed in said second fuel supply line posterior to the first safety valve member of said control device.

17. Apparatus according to claim 16, wherein the first safety valve of said control device is under the control of an electromagnet connected in circuit with a thermoelectric generator subject to the heat of the first pilot burner.

18. In apparatus of the class described, in combination, a main burner, a fuel supply line for supplying fuel to said main burner, a first pilot burner, a safety shutoff valve in the fuel supply line for said main burner, said safety shutoff valve having a fuel inlet and a fuel outlet, an electromagnet connected in circuit with a thermoelectric generator subject to the heat of said first pilot burner and operable to maintain said safety shutoff valve open when said first pilot burner is ignited and to release said safety shutoff valve for operation to closed position when said first pilot burner is extinguished, a second stand-by pilot burner in juxtaposition to said main burner, and a fuel supply line for maintaining a supply of fuel to said second stand-by pilot burner from the fuel outlet of the safety shutoff valve in the fuel supply line for the main burner, whereby to maintain said second stand-by pilot burner ignited if said safety shutoff valve remains open after said first pilot burner is extinguished, said safety shutoff valve in the fuel supply line for the main burner being arranged so that when in closed position it shuts off the supply of fuel to both said main burner and to said stand-by pilot burner.

19. Apparatus according to claim 18 wherein there is additional shutoff means in the fuel supply line leading to the main burner and in the fuel supply line leading to said first pilot burner, which additional shutoff means is adapted to shut off the supply of fuel to both the main burner and the first pilot burner and is capable of being opened to reestablish a supply of fuel to the main burner and to the first pilot burner without ignition of said first pilot burner, the additional shutoff means in the fuel supply line leading to the main burner being disposed between the fuel outlet of the safety shutoff valve and the main burner.

ERNST WITZEL.

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Disclaimer

2,506,403.—*Ernst Witzel*, Milwaukee, Wis. BURNER CONTROL SYSTEM AND CONTROL MEANS THEREFOR. Patent dated May 2, 1950. Disclaimer filed Apr. 6, 1951, by the assignee, *Milwaukee Gas Specialty Company*.

Hereby enters this disclaimer to claims 9, 11, and 14 of said patent.

[*Official Gazette May 8, 1951.*]