Sept. 4, 1951 W. A. RAY 2,566,372

SAFETY SHUTOFF CONTROL SYSTEM FOR GAS BURNERS

Filed May 11, 1946 4 Sheets-Sheet 1

Fig. 1

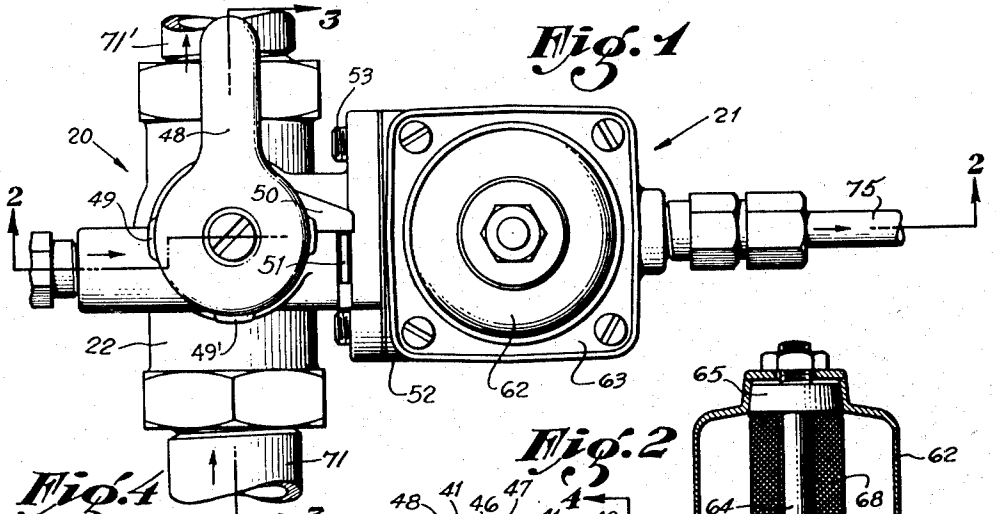


Fig. 2

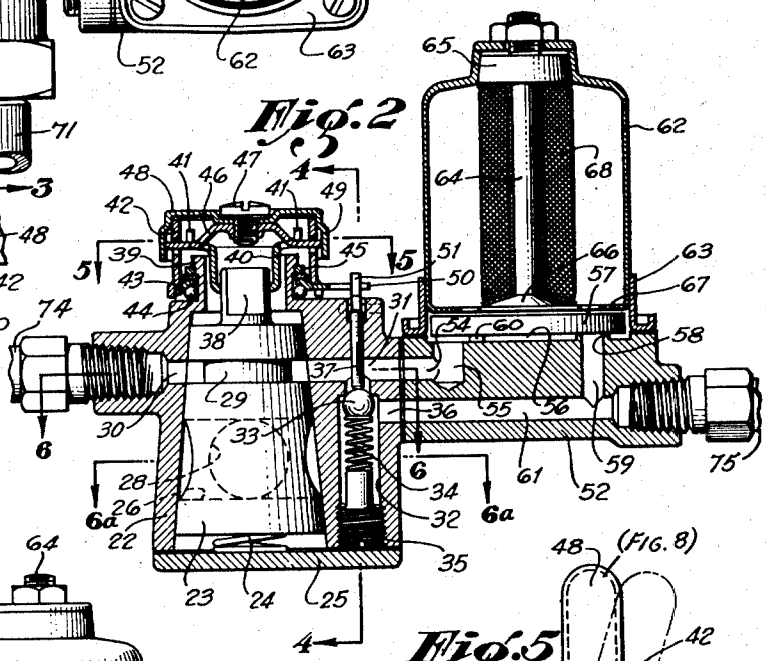


Fig. 4

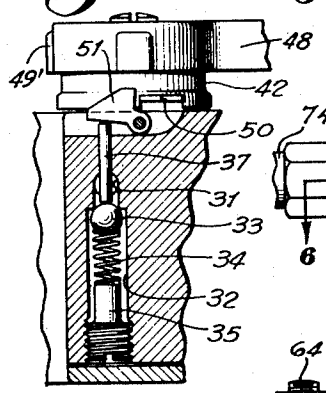


Fig. 3

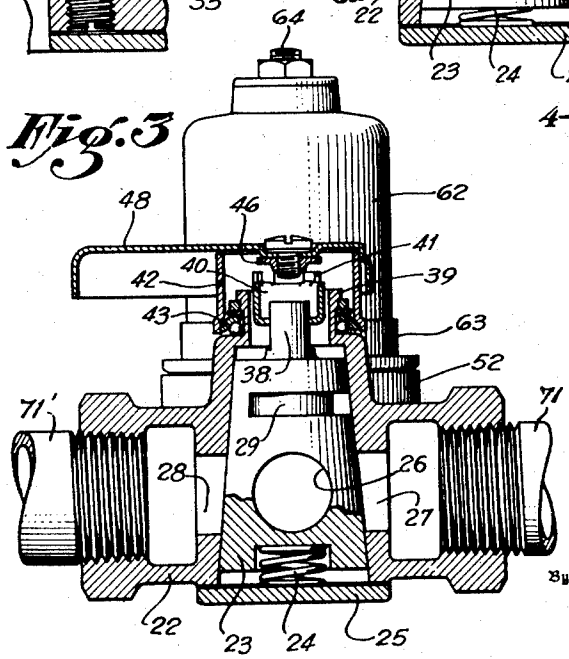
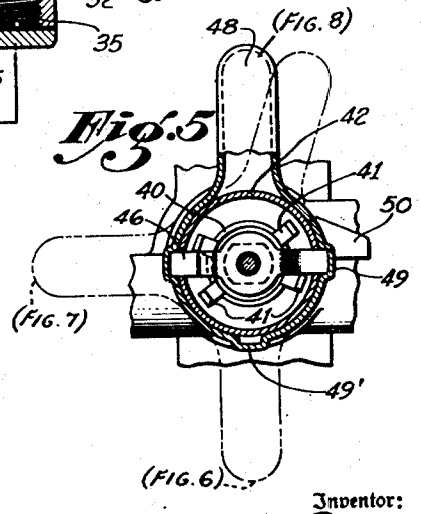


Fig. 5



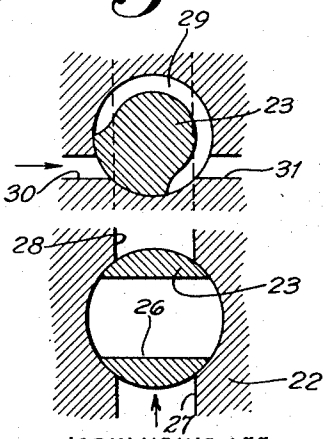
Inventor:
WILLIAM A. RAY,
John H. Rouse,
Attorney.

Sept. 4, 1951 W. A. RAY 2,566,372

SAFETY SHUTOFF CONTROL SYSTEM FOR GAS BURNERS

Filed May 11, 1946 4 Sheets-Sheet 2

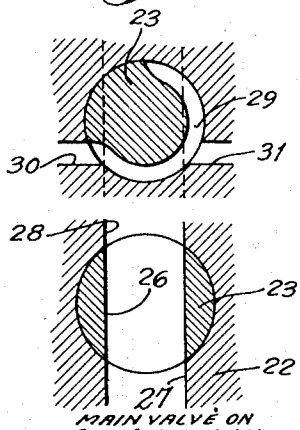
Fig. 6



MAIN VALVE OFF
PILOT VALVE OFF

Fig. 6a

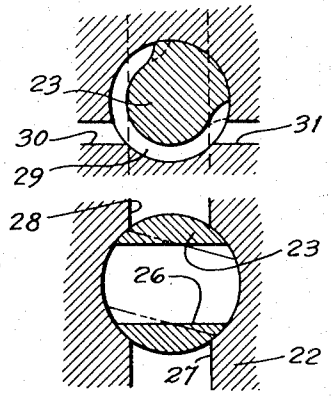
Fig. 7



MAIN VALVE ON
PILOT VALVE ON
(SEE LINES 6, 7, 8 IN FIG. 9)

Fig. 7a

Fig. 8



MAIN VALVE OFF (FIGS. 2-3)
PILOT VALVE ON

Fig. 8a

Fig. 9

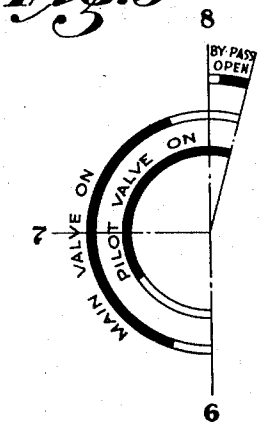
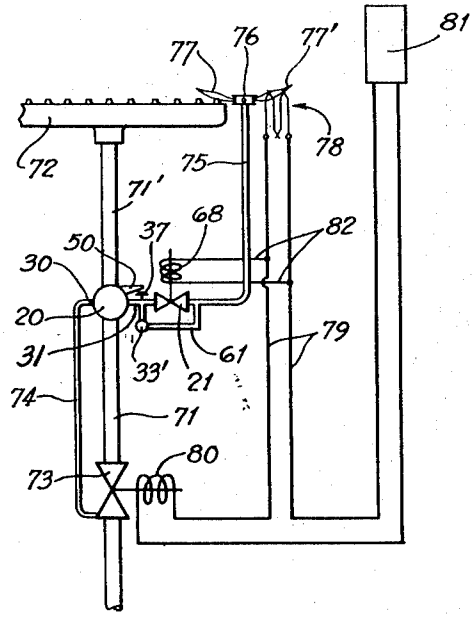


Fig. 10



Inventor:
WILLIAM A. RAY,
By
John H. Rouse,
Attorney.

Sept. 4, 1951 W. A. RAY 2,566,372

SAFETY SHUTOFF CONTROL SYSTEM FOR GAS BURNERS

Filed May 11, 1946 4 Sheets-Sheet 3

Fig. 11

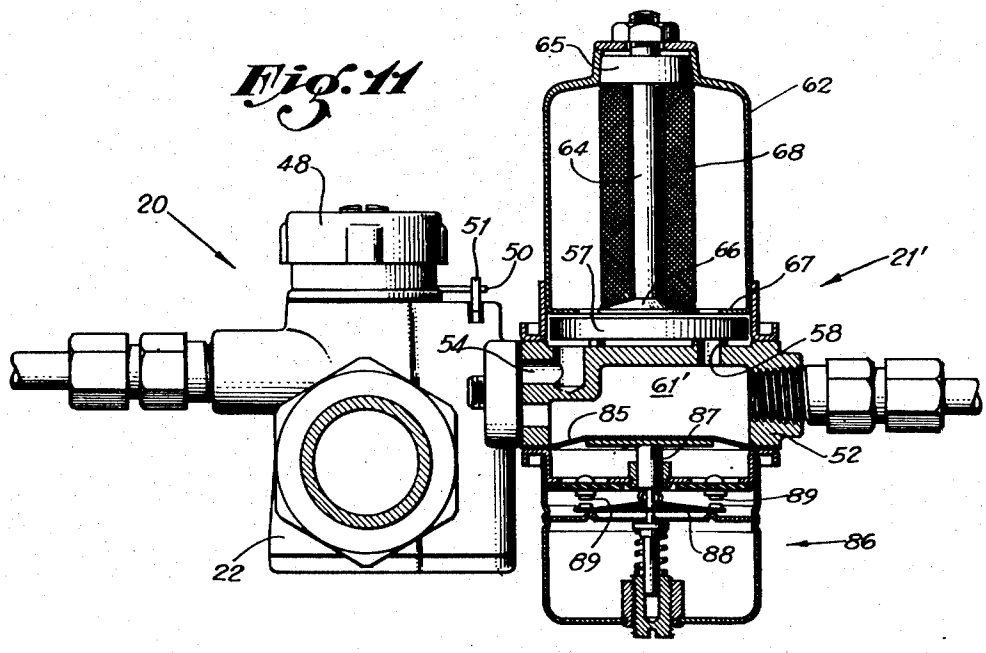
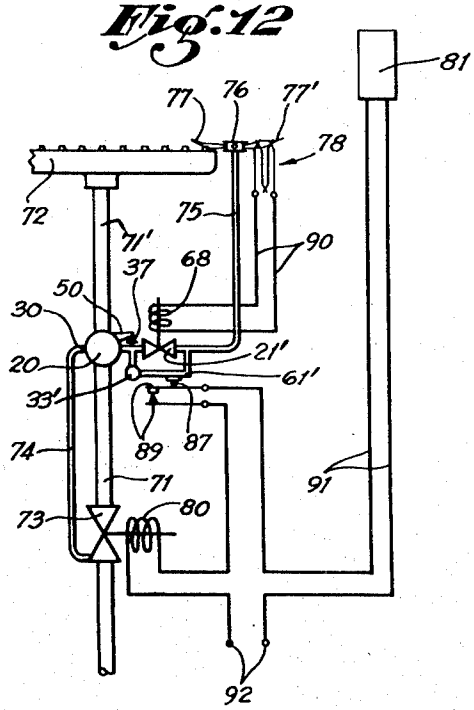


Fig. 12



Inventor:
WILLIAM A. RAY,
By
John H. Rouse,
Attorney.

Sept. 4, 1951 W. A. RAY 2,566,372

SAFETY SHUTOFF CONTROL SYSTEM FOR GAS BURNERS

Filed May 11, 1946 4 Sheets-Sheet 4

Fig. 13

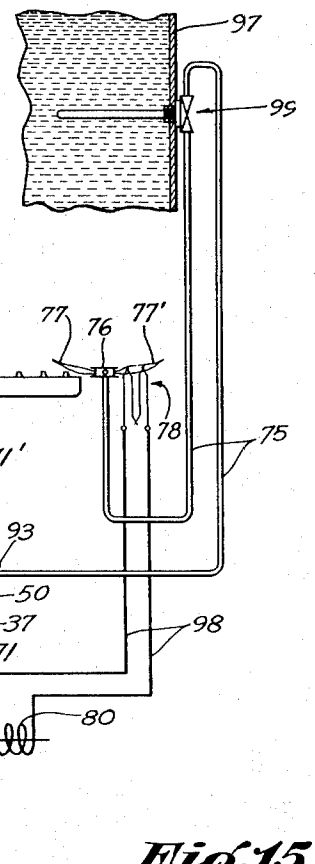


Fig. 14

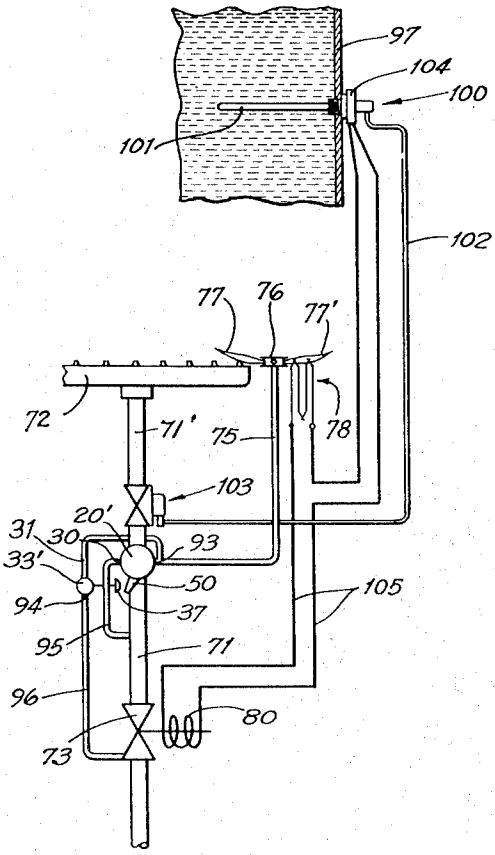
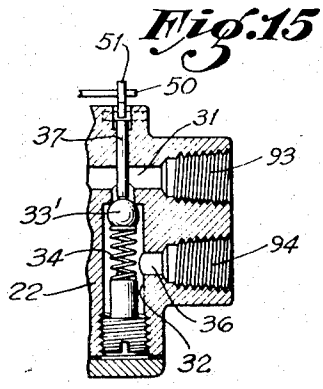


Fig. 15



Inventor
WILLIAM A RAY,

By
John H. Rouse,
Attorney

Patented Sept. 4, 1951

2,566,372

UNITED STATES PATENT OFFICE

2,566,372

SAFETY SHUTOFF CONTROL SYSTEM FOR GAS BURNERS

William A. Ray, North Hollywood, Calif., assignor to General Controls Co., Glendale, Calif., a corporation of California

Application May 11, 1946, Serial No. 669,037

12 Claims. (Cl. 158—117.1)

1

My present invention relates to gas-burner control systems of the safety-shutoff type; and more particularly to such systems as include a main burner and a pilot burner, and means for shutting-off supply of fuel to the main burner while lighting the pilot burner. To accomplish this result it has been proposed to employ a valve of the manually-rotatable plug type, in conjunction with a supplementary or safety valve, manually openable only while the plug is in position to obstruct flow to the main burner, for supplying fuel to the pilot burner; means responsive to the flame of the pilot burner being provided for maintaining the supplementary valve in its manually-opened condition while the flame exists.

A main object of this invention is to provide an improved burner control system wherein the safety valve or valves are of the automatically-operable type, as distinguished from the "manual-reset" valve employed in the above-mentioned prior-art system.

Another object is to provide a system of the character described wherein the various conditions of the system, including one in which supply of fuel to both burners is mechanically shut off, are controlled through the medium of a single manual-actuating means or handle.

For full understanding of the invention, and further appreciation of its objects and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

In the drawing:

Figure 1 is a plan view of a combination valve structure of the present invention;

Figures 2 and 3 are sectional views taken respectively along the lines 2—2 and 3—3 of Fig. 1;

Figures 4 and 5 are fragmentary sections taken respectively along the lines 4—4 and 5—5 of Fig. 2;

Figures 6 and 6*a* are fragmentary sections taken, respectively, along the lines 6—6 and 6*a*—6*a* of Fig. 2, showing the flow-controlling passages in the upper and lower sections of the plug valve 20;

Figures 7, 7*a* and 8, 8*a* are views similar to those of Figs. 6, 6*a* with the plug 23 in moved positions;

Figure 9 is a graph illustrating the various flow-controlling functions of the plug 23;

Figure 10 is a diagrammatic view of a burner control system embodying this invention, and including the valve structure illustrated in Figs. 1 to 8;

2

Figure 11 is a view, corresponding generally to that of Fig. 2, of a modified form of combination valve structure;

Figure 12 is a diagrammatic view of a modified form of burner control system according to this invention, and including the valve structure illustrated in Fig. 11;

Figures 13 and 14 are diagrammatic views of still further modified forms of burner control systems according to this invention; and

Figure 15 is a fragmentary section of the plug valve 20 as modified for use in the systems of Figs. 13 and 14.

Referring first to Figs. 1–8 of the drawing, the combination valve structure shown in Figs. 1, 2 and 3 comprises a manually-operable valve structure and an electromagnetic valve, generally indicated in Fig. 1 by the numerals 20 and 21, respectively. In Fig. 1, the vertical arrows indicate the direction of main flow through the valve 20, and the horizontal arrows the direction of flow through valve 21.

The valve structure 20 comprises a casing 22 having a tapered bore or seat for a rotatable tapered plug 23 which is maintained in seated condition by the force of a spring 24 compressed between the bottom of the plug and a plate 25 covering the open bottom end of the casing. Through the lower portion or section of the plug 23 is a main opening 26 (Fig. 3) which, when the plug is turned through 90° from its position shown in Figs. 2 and 3, registers with an inlet and an outlet opening 27 and 28 (Fig. 3) in the casing. In the side surface of the upper portion of the plug is a groove 29 which cooperates with an inlet and an outlet passage 30 and 31, respectively, (Fig. 2) in the casing.

In a thickened portion of the side wall of casing 22 is a vertical bore 32 which joins the passage 31; the bore being restricted toward its upper end to form a seat for a ball 33 (urged toward seating position by the force of a spring 34 backed by an adjusting screw 35) which controls communication between the passage 31 and another passage 36 branched from bore 32. Resting on the ball 33 is an actuating pin 37 which is closely guided in a relatively long opening through the top wall of the casing.

The flat-sided stem 38 of the plug 23 is within an elongated opening, through the top wall of the casing, encompassed by a tubular extension 39. Within this extension is a cupped member 40 having in its bottom wall an opening fitting the plug-stem 38; four spaced fingers 41 extending outwardly and upwardly from the mouth of the

cup, as is better seen in Fig. 5 (for the sake of clarity, the extension 39 is not shown in this figure). Around the extension 39 is a sleeve 42, to the flared bottom end of which a ball-race 43 is secured as by welding. This race, together with balls 44, forms a ball-bearing support for the sleeve 42 and is held in place by a snap-ring 45 cooperating with a shoulder formed on the extension 39. Providing a lost-motion connection between the sleeve 42 and the plug-operating member 40 is an arm 46 the extremities of which are received in conforming slots in the sleeve; the inner or middle portion of the arm lying between the fingers 41 of member 40. Secured to the arm 46, by a screw 47, is a handle 48 comprising a cupped portion fitting over the sleeve 42 and having projections 49 formed to provide inner recesses for receiving the extremities of arm 46; an extra projection 49' being provided so that, if desired, the handle may be attached at another position 90° to that shown. Extending integrally from the ball-race 43 is a lug 50 which is cooperable with a lever 51 pivoted in a recess in the casing (Fig. 4) and in engagement with the head of the ball-valve pin 37. From the foregoing it is apparent that the plug 23 can be rotated by manipulation of handle 48, and when the handle is turned from its shown position through a small angle in a clockwise direction (as viewed in Fig. 5) the valve-ball 33 is unseated; the force of spring 34 sufficing to return the handle to its original position, when released, due to the lost-motion connection between the arm 46 and fingers 41, and also due to the anti-friction mounting of the handle assembly.

As can be seen in Figs. 6, 7 and 8, the groove 29 in the upper section of plug 23 extends only partway around, so that when the plug is in the position of Fig. 6 communication between the passages 30 and 31 is obstructed; the main opening 26 through the lower section of the plug (shown in Figs. 6*a*, 7*a* and 8*a*) then also being in flow-averting position. When the plug is rotated in a clockwise direction through 90° from the position of Figs. 6, 6*a* to that of Figs. 7, 7*a*, fluid can pass through both sections of the plug; and when the plug is rotated through an additional 90° to the position of Figs. 8, 8*a* (which corresponds to that shown in Figs. 2 and 3), fluid can still pass through the upper section, but the main flow is obstructed. The positions of the plug-openings, when the plug is rotated through an additional small angle to unseat the valve-ball 33 as described above, are indicated by the broken lines in Figs. 8, 8*a*. These conditions of the plug valve are graphically illustrated in Fig. 9 wherein the heavy lines bearing the legends "Main Valve On" and "Pilot Valve On" indicate flow through the main openings 27—28, and through passages 30—31, respectively; the legend "By-Pass Open" referring to the unseated condition of the valve-ball 33. The straight lines in Fig. 9 numbered generally 6, 7 and 8 relate to the like-numbered figures of the drawing, as well as to the lower sections 6*a*, 7*a* and 8*a*; also, the solid and broken-line positions of the handle 48, as shown in Fig. 5, correspond in angular relation to the numbered lines of Fig. 9.

The electromagnetic valve 21 comprises a casing 52 which is secured to the casing 22 of plug valve 20 by screws 53 (Fig. 1) in flanged portions of the two casings. In the casing 52 is an inlet passage 54 (in register with the passage 31 of the plug valve) from which a branch passage 55 leads to a valve chamber 56 above the casing. In this chamber is a disk-shaped closure 57, of magnetizable material, which normally has three-point support on a valve seat 58 (raised around an outlet port 59) and a pair of pins 60. By this arrangement, generally disclosed in my Patent No. 2,294,421 of September 1, 1942, only a small amount of power is required to effect initial tilting action of the closure on its seat; the resultant relief of fluid pressure in the chamber 56 facilitating movement of the closure to its fully-open position. The port 59 leads to an outlet passage 61 which is also in communication with the passage 36 of plug valve 20.

On top of the casing 52 is an electromagnet comprising an inverted cup-shaped magnetic shell 62 to which is welded a flanged supporting-ring 63, also of magnetic material. A central core 64 is bolted to the top wall of shell 62, the tapered enlargement 65 of the core affording intimate engagement between the parts. The bottom end of core 64 is formed to provide a polar enlargement 66, the pole-face of which is in the plane of the pole-face of shell 62 defined by the underside of its inwardly-turned flange 67. When the electromagnet is energized by passage of current (preferably D. C.) through its coil 68, the closure-armature 57 is attracted to open position as described above (against gravity, and against fluid pressure acting on its top when fluid is supplied to the valve chamber 56 by way of the inlet passages 54—55).

The system of Fig. 10 includes apparatus corresponding to the combination valve structure shown in Figs. 1–8*a* and described hereinabove; the parts therefore being designated in Fig. 10 by the same reference numerals; the part indicated at 33', however, being intended to represent the complete valve constituted by ball 33. The other of these parts in Fig. 10 are: plug valve 20, electromagnetic valve 21, coil 68 of valve 21, pin 37 for actuating valve 33', handle-lug 50 cooperable with pin 37, and passage 61 by-passing valve 21. The system of Fig. 10 further includes a conduit 71—71' for supplying fluid fuel, such as ordinary gas, to a main burner 72. Connected in series in this conduit is a pair of valves, one of them (indicated at 20) being the main or lower section (controlled by the plug opening 26) of the plug valve, the other an electromagnetic valve 73 which may be of the same type as valve 21 (but of greater flow-capacity), or of the electrically-controlled fluid-pressure-operated type, such as the diaphragm valve disclosed in my Patent No. 2,294,693 of September 1, 1942.

The inlet passage 30 of the upper section of the plug valve is connected by a pipe 74 to the conduit 71 ahead of the valve 73, the outlet passage 31 being connected directly to the inlet 54 of the electromagnetic valve 21, as shown in Fig. 2. From the outlet of valve 21 a pipe 75 leads to a pilot burner 76, the flame 77 of which serves as means for igniting the main burner. Arranged to be heated by another flame 77' of the pilot burner is a thermoelectric generating device 78 comprising a plurality of thermocouples connected in series to form a thermopile. The generating device 78 is connected by wires 79 to the energizing coil 80 of valve 73 in series with an automatic control device 81 which, for example, may be a thermostat responsive to the temperature of a space heated by the main burner 72. Branching from wires 79 are other wires 82 which connect the coil 68 of valve 21 directly to the generator. It is to be understood that in place of the thermoelectric generating device other

well-known generating means, influenced by the pilot-burner flame, may be employed; as, for example, a conventional source of electricity controlled by a thermal cut-out, or a photoelectric system responsive to the flame.

In Fig. 10, the plug valve **20** is in the condition shown in Figs. 1–5 and Figs. 8, 8*a*; the handle-lug **50** being adjacent pin **37**. Since flame is shown at the pilot burner, the valve **21** is energized and in open condition; the valve **73** being either open or closed depending upon the condition of thermostat **81**, however, no fuel can now pass to the main burner since the main plug-opening **26** is in flow-averting position. To establish normal operation of the burner system, the valve plug is rotated in a counterclockwise direction through 90° to the position of Figs. 7, 7*a*; the valve **73** then automatically controlling fuel flow to the main burner in accordance with the requirements of the thermostat. If it is desired to completely discontinue operation of the system (as during a season when heating is not required), the plug is turned to the position of Figs. 6, 6*a* so that flow through both sections of the plug valve is obstructed; the valves **73** and **21** also closing due to the resultant cessation of generation of electricity by the device **78** when the pilot flame **77'** is extinguished, so that positive "100%" shut-off of the fuel is ensured.

In the event that during normal operation of the system (with plug in Figs. 7, 7*a* position) the pilot-burner flame is extinguished, both of the valves **73** and **21** close as described above. To light the pilot burner and thereby reinitiate operation of the system, the plug is rotated to the position of Figs. 8, 8*a* and then slightly beyond that position (in clockwise direction) to effect opening of the by-pass valve **33'** by the handle-lug **50**; fuel flow to the main burner then being obstructed not only due to the fact that valve **73** is deenergized, but also due to the flow-averting position of the main plug-opening as shown in broken lines in Fig. 8*a*. The by-pass valve **33'** is maintained in open position for an interval, following relighting of the pilot burner by any convenient means, long enough to permit generation of electricity by the device **78** in an amount sufficient to effect automatic opening of the valve **21** (which opening is evidenced by an audible "click"); whereupon the plug-valve handle is released and returns (under the force of the bias spring of valve **33'**) to the position shown in solid lines in Fig. 5. If normal or automatic operation of the system is then desired, the plug is rotated back to the position of Figs. 7, 7*a* as described in the preceding paragraph. By the series arrangement of the valves **20** and **73** in conduit **71** fuel flow to the main burner is obstructed if either of these valves is closed, and it is to be understood that their order of arrangement in the conduit can be reversed (as by removing valve **73** from conduit **71** and connecting it in conduit **71'** between the main burner and valve **20**) without in any way affecting operation of the system.

In the combination valve structure of Fig. 11, the plug valve **20** is identical in construction with that shown in the preceding figures; the electromagnetic valve, indicated here by the numeral **21'**, being the same as valve **21** except in regard to the outlet passage which in valve **21'** is enlarged to provide a chamber **61'** the bottom wall of which is formed by a flexible diaphragm **85** clamped at its margin to the casing by a switching device generally indicated by the numeral **86**. Inasmuch as this switching device is of conventional construction and forms, per se, no part of the present invention, it suffices to state that when the actuating button **87** is moved downwardly by gas pressure in chamber **61'** acting through the medium of the diaphragm **85**, a bridging element **88** is snapped into engagement with contacts **89**, and when the pressure is reduced a reverse action occurs.

The burner control system shown in Fig. 12 includes the modified combination-valve-structure of Fig. 11 and differs in other respects from the system of Fig. 10 only by the provision of a separate source of electricity for energizing the coil **80** of valve **73**. In Fig. 12, the thermoelectric generating device **78** is shown connected to the coil **63** of valve **21'**, only, by wires **90**; separate wires **91**, having terminals **92** for the ordinary electric-service source, connecting the thermostat **81** to the coil **80** of valve **73** in series with the contacts **89** of switching device **86**.

The operation of the system of Fig. 12 is, in effect, the same as that of the system of Fig. 10, since upon extinguishment of the pilot-burner flame, and resultant closing of valve **21'**, the valve **73** is deenergized due to the opening of contacts **89**. It is to be observed that in Fig. 11 the switching device **86** is in normal or open condition, while in Fig. 12 it is shown as being closed due to the existence of gas pressure in chamber **61'**.

The systems of Figs. 13 and 14 are similar to each other and each includes a plug valve, indicated at **20'** in these figures, which differs from the plug valve **20** only in the fragmentary portion of its casing **22'**, shown in Fig. 15, wherein the outlet passage **31** and passage **36** are each provided with a threaded connection **93** and **94**, respectively. The systems of Figs. 13 and 14 differ essentially from those of Figs. 10 and 12 mainly by the omission of the pilot-burner control valves **21** and **21'** of those figures; the valve **73** being arranged to control supply of gas to both the main burner and the pilot burner, and serving as a "100%" safety shut-off. For that purpose, the inlet passage **30** of the upper section of the plug valve is connected by a pipe **95** to the conduit **71** at the downstream side of valve **73**; the connection **94** (here, the inlet connection) of ball-valve **33'** being joined to the conduit **71** ahead of valve **73** by another pipe **96**. Hence, when valve **73** is closed, gas can be supplied to the pilot burner only by manual opening of valve **33'**. The systems of Figs. 13 and 14 are associated with a boiler (assumed to be heated by the main burner **72**) of which a fragmentary wall-section is indicated at **97**.

In Fig. 13, the thermoelectric generating device **78** is connected by wires **98** directly to the coil **80** of valve **73**, so that only in the event of extinguishment of the pilot-burner flame does the valve **73** close to effect the 100% shut-off. Connected in the pilot-burner supply pipe **75** is a thermostatic valve **99**, of conventional construction, which is mounted in an opening through the boiler-wall **97**; this valve serving to shut-off the pilot-burner gas supply in the event that the boiler temperature reaches a dangerously-high limit, so that the system is then rendered inoperative due to the extinguishment of the pilot-burner flame.

In Fig. 14, there is shown, mounted in an opening through the boiler-wall **97**, a compound thermostatic device **100** which may be the same as that disclosed in my Patent No. 2,312,479 of March 2, 1943. This device comprises a thermal

bulb 101 operatively connected by a capillary tube 102 to a pressure-operated valve 103 inserted in conduit 71' between the main burner and the valves 28' and 73; the device also comprising a bimetallic thermostat 104 responsive to the temperature of the thermal bulb and hence also to that of the boiler. The thermoelectric generating device 78 of Fig. 14 is connected by wires 105 to the coil 80 of valve 73 in series with the contacts of thermostat 104. The units of the thermostatic device 100 are so adjusted that the valve 103 is operated between open and closed positions to normally effect maintenance of desired temperature in the boiler; the contacts of thermostat 104 opening only in the event that the boiler temperature rises above a safe limit, whereupon the system is rendered inoperative due to the resultant closing of valve 73 and extinguishment of the pilot-burner flame.

In the systems of Figs. 13 and 14 the relighting of the pilot burner (while flow to the main burner is positively prevented) is accomplished in the same manner as described in connection with the systems of Figs. 10 and 12; gas being temporarily supplied to the pilot burner, when ball-valve 33' is opened, through by-pass pipe 96 and the outlet passage 31 (represented in Figs. 13 and 14 by a pipe 31) of the plug valve; the supply then being by way of pipe 95 and the recess 29 of the plug valve when valve 73 opens in response to the heating of the thermoelectric generating device.

The feature of providing a lost-motion connection between handle 48 and plug 23 to avoid the possibility of valve-ball 33 being retained in open position due to friction between the plug and its seat, is claimed in application Serial No. 220,033 which on April 9, 1951 was filed as a division of the present application.

The embodiments of my invention herein shown and described are obviously susceptible of modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a manually operable valve in said conduit for controlling flow therethrough; means for operating said manually operable valve; a pilot burner for igniting said main burner; a supplementary valve for temporarily supplying gas to said pilot burner and operable to open position by said operating means only while the manually operable valve is in position to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while the operating means is manually held; and valve means opening in response to the flame of the pilot burner and capable only while said flame exists of supplying gas to the pilot burner.

2. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a manually operable valve in said conduit for controlling flow therethrough; means for operating said manually operable valve; a pilot burner for igniting said main burner; a supplementary valve for temporarily supplying gas to said pilot burner and operable to open position by said operating means only while the manually operable valve is in position to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while the operating means is manually held; normally-closed electrically-operated valve means for supplying gas to the pilot burner; and means influenced by the flame of the pilot burner for generating electrical energy for operating said electrically-operated valve means to open position and for maintaining it in that position only while said flame exists.

3. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves being manually operable, the other being automatically operable to normally control the flow; means for operating said manually operable valve; a pilot burner for igniting said main burner; a supplementary valve for temporarily supplying gas to said pilot burner and operable to open position by said manual operating means only while the manually operable valve is in condition to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while said operating means is manually held; means for supplying gas to the pilot burner while said supplementary valve is closed; electrical means for rendering said last-named means effective; and means influenced by the flame of the pilot burner for generating energy for said electrical means.

4. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves being manually operable, the other being automatically operable to normally control the flow; means for operating said manually operable valve; a pilot burner for igniting said main burner; valve means responsive to the flame of said pilot burner and adapted to supply gas to the pilot burner only while said flame exists; and a supplementary valve for by-passing said valve means so as to supply gas to the pilot burner when said flame is extinguished, said supplementary valve being operable to open position by said operating means only while the manually operable valve is in condition to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while the operating means is manually held.

5. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves being manually operable, the other being electrical and automatically operable to normally effect on-and-off control of the flow; means for operating said manually operable valve; a pilot burner for igniting said main burner; normally-closed electrically-operated valve means for supplying gas to said pilot burner; means influenced by the flame of the pilot burner for generating electrical energy for operating said valve means to open position and for maintaining it in that position only while said flame exists; a supplementary valve for by-passing said valve means so as to supply gas to the pilot burner when said flame is extinguished, said supplementary valve being operable to open position by said operating means only while the manually operable valve is in condition to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while the operating means is manually held; and means for effecting closure of said other of said main-

burner-control valves upon extinguishment of the pilot-burner flame.

6. A burner control system, as defined in claim 5, wherein said means for effecting closure of the other of the main-burner-control valves upon extinguishment of the pilot-burner flame comprises electrical switching means responsive to the pressure of the gas supplied to the pilot burner.

7. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves comprising a manually-rotatable plug, the other being electrically and automatically operable to normally effect on-and-off control of the flow; means for operating said plug valve; a pilot burner for igniting said main burner; a pipe for supplying gas to said pilot burner and connected to said conduit ahead of said main-burner-control valves; normally-closed electrically-operated valve means for controlling flow through said pipe; means influenced by the flame of the pilot burner for generating electrical energy for operating said valve means to open position and for maintaining it in that position only while said flame exists; and a supplementary valve for by-passing said electrical valve means so as to effect supply of gas to the pilot burner when said flame is extinguished, said supplementary valve being operable to open position by said operating means only while said plug is in position to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of maintaining the supply of gas only while the operating means is manually held.

8. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves comprising a manually-rotatable plug, the other being electrical and automatically operable to normally effect on-and-off control of the flow; a pilot burner for igniting said main burner; a pipe for supplying gas to said pilot burner, said pipe being connected to said conduit ahead of said main-burner control valves and to the pilot burner through flow-controlling passages in said plug valve; means for manually operating said plug valve to control flow to both the main burner and the pilot burner; normally-closed electrically-operated valve means for controlling flow through said pipe; means influenced by the flame of the pilot burner for generating electrical energy for operating said valve means to open position and for maintaining it in that position only while said flame exists; and a supplementary valve for by-passing said electrical valve means so as to effect supply of gas to the pilot burner when said flame is extinguished, said supplementary valve being operable to open position by said operating means while said plug is in position to obstruct flow to the main burner only, said supplementary valve being biased to closed position and capable of maintaining the supply of gas only while the operating means is manually held.

9. A burner control system, as defined in claim 8, including electrical means for effecting closure of said other of the main-burner-control valves upon extinguishment of the pilot-burner flame.

10. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves being manually operable, the other being automatically operable to open and closed position when respectively energized and deenergized; a pilot burner for igniting said main burner and connected to said conduit at the outlet side of said automatically-operable valve so that normally only when the same is open can gas pass to the pilot burner; means influenced by the flame of said pilot burner for generating energy for opening said automatically-operable valve and for maintaining it in open position only while said flame exists; means for operating said manually-operable valve; and a supplementary valve for supplying gas to said pilot burner when said automatically-operable valve is closed, said supplementary valve being operable to open position by said operating means only while the manually-operable valve is in condition to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while the operating means is manually held.

11. A burner control system, as defined in claim 10, including means, responsive to a heat condition resulting from the operation of said main burner, for independently effecting obstruction of gas-flow to both the main and the pilot burner in the event that said condition becomes abnormal.

12. In a burner control system: a main burner; a conduit for supplying gas to said main burner; a pair of valves arranged in series in said conduit for controlling flow therethrough, one of the valves comprising a manually-rotatable plug, the other being electrical and automatically operable to open and closed positions; means for operating said plug valve; a pilot burner for igniting said main burner; a pipe for supplying gas to said pilot burner, said pipe being connected to said conduit at the outlet side of said automatically-operable valve and to the pilot burner through flow-controlling passages in said plug valve; means influenced by the flame of said pilot burner for generating electrical energy for opening said automatically-operable valve and for maintaining it in open position only while said flame exists; and a supplementary valve for supplying gas to the pilot burner when the automatically-operable valve is closed, said supplementary valve being operable to open position by said operating means only while said plug is in position to obstruct flow to the main burner, said supplementary valve being biased to closed position and capable of supplying gas only while the operating means is manually held.

WILLIAM A. RAY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,201,398	Grayson	May 21, 1940
2,217,785	Betz et al.	Oct. 15, 1940
2,253,670	Wetzel et al.	Aug. 26, 1941
2,361,944	Jackson et al.	Nov. 7, 1944
2,371,351	Paille	Mar. 13, 1945
2,403,611	Ray	July 9, 1946