Dec. 1, 1942. C. WANTZ 2,303,672

BURNER CONTROL APPARATUS

Filed May 31, 1940 3 Sheets-Sheet 1

Fig. 1.

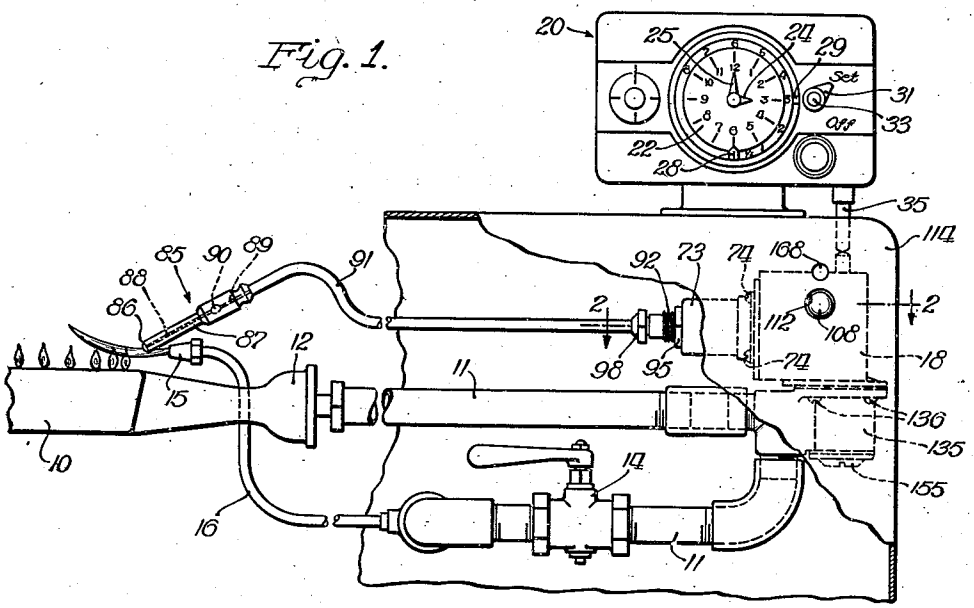
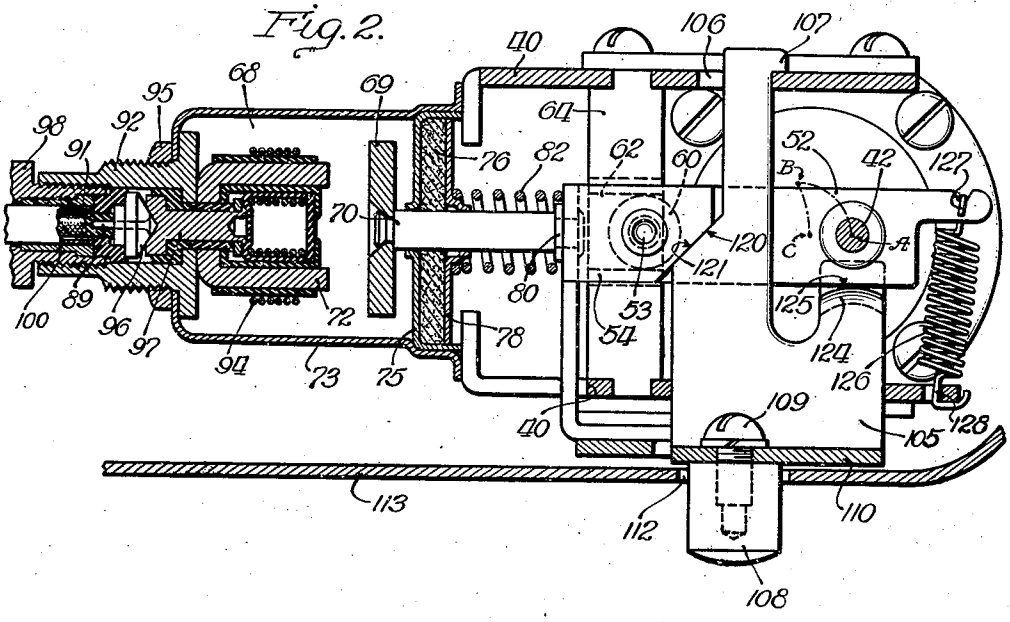



Fig. 2.




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Fig. 3.

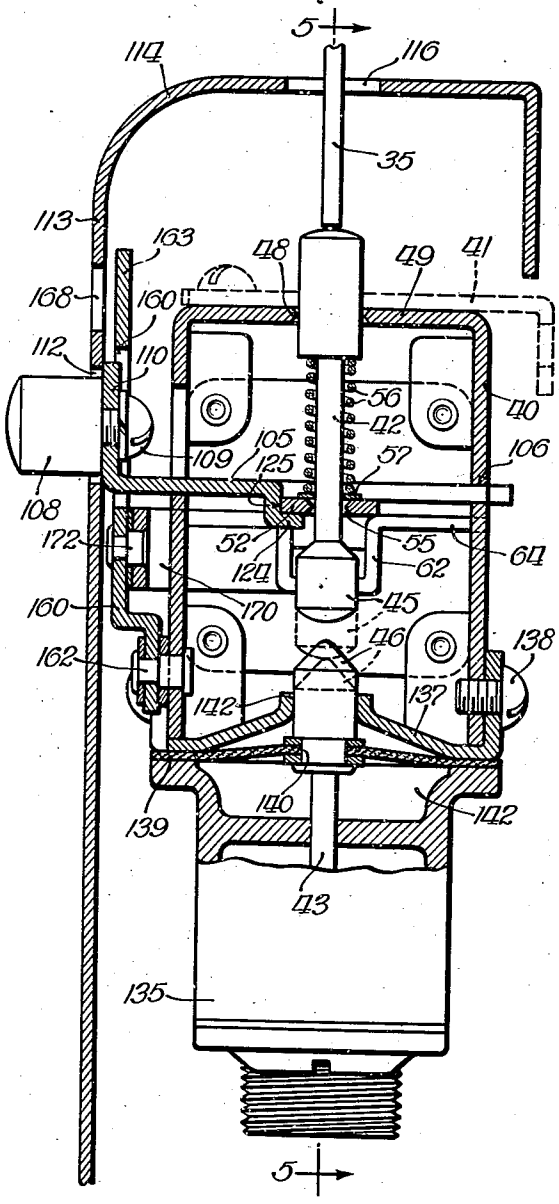
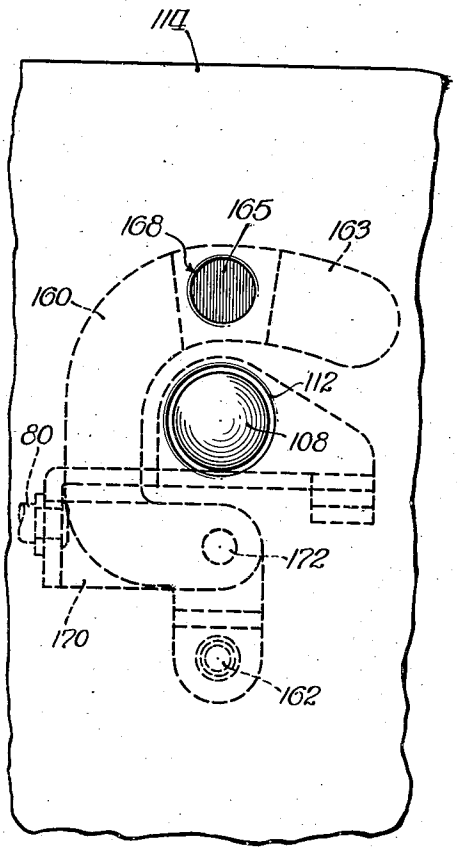



Fig. 4.



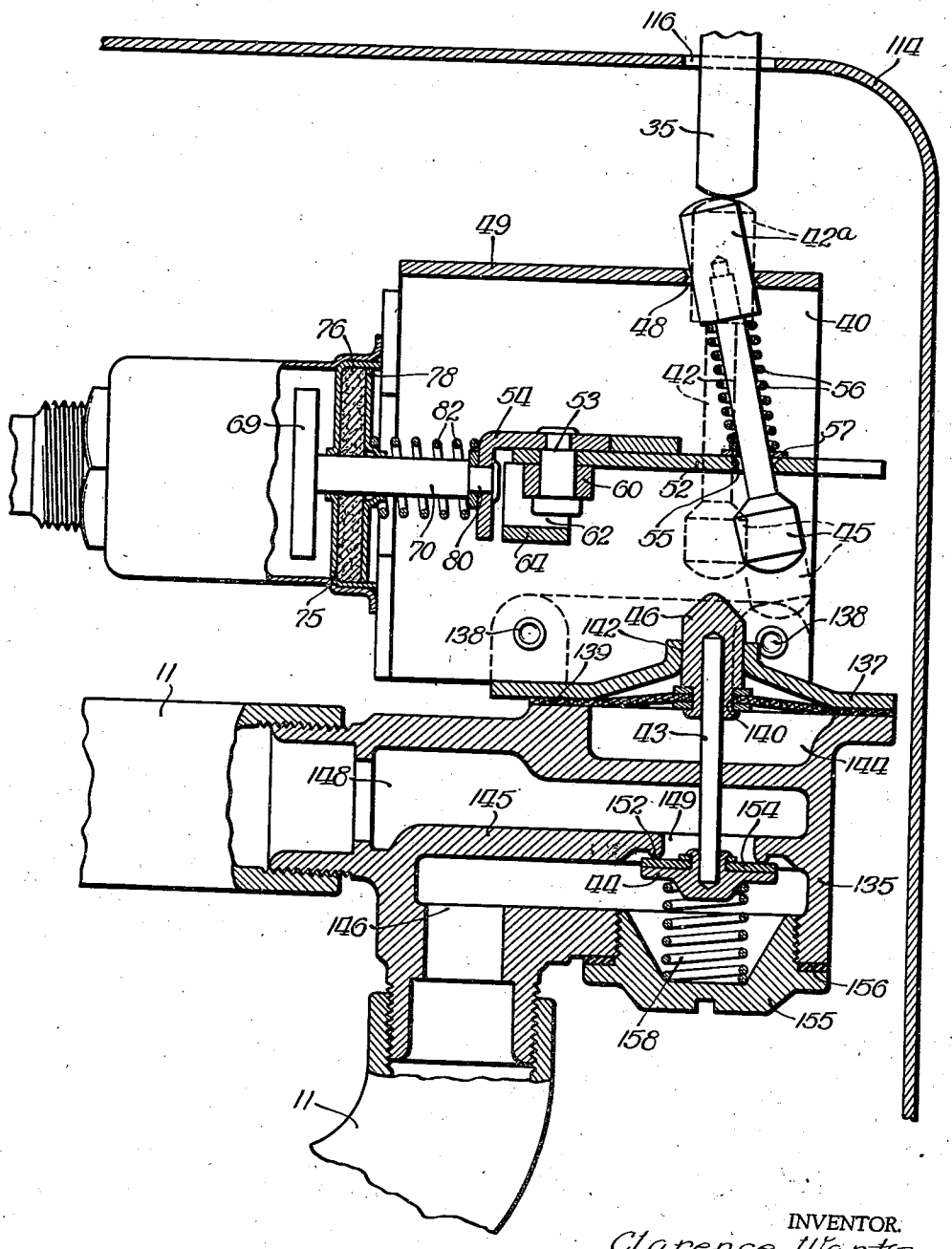

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Filed May 31, 1940 3 Sheets-Sheet 3

Fig. 5.




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2,303,672

# UNITED STATES PATENT OFFICE

2,303,672

## BURNER CONTROL APPARATUS

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Application May 31, 1940, Serial No. 338,081

25 Claims. (Cl. 161—9)

This invention relates to burner control apparatus.

While the invention is not necessarily limited thereto, its principal field of utility is in connection with gas burning cooking ranges of the type in which one of the burners, such as the oven burner, is adapted to be placed under automatic time control, but wherein a safety shutoff feature is associated with this burner so that it cannot possibly receive gas if the pilot light associated with the burner is extinguished.

The invention enables a single control valve to be employed for the automatic time control and also for the safety shutoff control. The automatic timing mechanism can be of the same general type as now commonly employed in time switches for ranges comprising the usual synchronous motor-driven clock and the adjustable controls associated therewith which are adapted to be set by the housewife automatically to effect the starting and stopping of the cooking operation at preselected times. The automatic timing mechanism is preferably arranged to actuate the control valve through a direct acting mechanical connection, and the automatic safety shutoff control is operative to prevent this same control valve being opened by the automatic timing mechanism in the event that the pilot light is extinguished.

One of the main objects of the preesnt invention is the provision in a device of the general character above set forth of improved means for disabling the operative connection between the automatic timer and the control valve when the pilot light or other ignition means is extinguished or inoperative to ignite the fuel at the burner.

Another object of the invention is the provision with this improved disabling means of improved means for resetting or cocking the device so that the motion transmitting member between the automatic timer and the valve will be disposed normally or as long as the pilot light is burning in a position effective to transmit valve opening motion from the automatic timer to the control valve.

Another object of the invention is to provide in a device of the character described improved means for indicating when the device is cocked and held cocked with the motion transmitting member in its normal position for transmitting valve opening motion from the automatic timer to the control device.

Another object of the invention is to provide an improved thermoelectric safety shutoff and automatic timer of relatively simple and inexpensive construction and which may be installed and operated conveniently and effectively; also a device of the character described composed of relatively few parts and adapted for convenient and expeditious manufacture and assembly, and which will operate quickly, positively, and effectively, and will fail "safe."

A further feature of the invention is in the provision, in a device of the character described, of cocking or resetting means which may be disposed sidewise of the axis of the electromagnet or other holding means for holding the disabling means in position to permit the motion transmitting member to remain in its normal operative position, and which cocking means is adapted to be actuated at an angle to the axis of the holding means.

While the particular structural features by which I obtain a device of the character set forth are important features within the more specific aspects of the invention, it is to be understood that the precise features shown and described may be varied within the broader aspects of the invention.

In order to acquaint those skilled in the art with the manner of constructing and operating a device in accordance with the present invention, I will now describe, in connection with the accompanying drawings, one preferred embodiment of the invention.

In the drawings:

Figure 1 is a fragmentary elevational view schematically illustrating one general relation of the main parts of the apparatus;

Figure 2 is a section through the safety shutoff and automatic timer device, taken substantially on the line 2—2 of Figure 1;

Figure 3 is a vertical section showing the operative connection between the automatic timer and the control valve, the disabling means for the operative connection, and the resetting or cocking means;

Figure 4 is a fragmentary elevational view showing the means for indicating when the device is cocked and held cocked with the motion transmitting member in its normal position; and

Figure 5 is a vertical section taken substantially on the line 5—5 of Figure 3.

The invention can be embodied in a wide variety of forms for use with a wide variety of devices, but for purposes of illustration the invention has been shown more or less schematically as embodied in connection with a cooking range burner. It is to be understood that the burner may be any other burner with which the

automatic timer and safety shutoff device of the present invention is adapted for use.

In the cooking range adaptation of the invention, the burner 10 represents, for example, a typical oven burner or broiler burner. A fuel supply pipe 11 leads to the burner 10 for the delivery of gaseous or other fuel thereto—for example, through a mixing chamber 12 to which air is admitted in the usual way, as well understood in the art. The various burners of the cooking range usually receive their gas from the main manifold or supply pipe through individual branch pipes which branch off the main supply pipe, these branch pipes having separate manually controlled valves. The fuel supply pipe 11 may constitute such a branch pipe for the burner 10, and the conventional manually controlled valve interposed in this pipe is indicated at 14.

The pilot burner 15, which is located in juxtaposition to the main burner 10 to maintain a pilot flame for igniting the main burner, is supplied with gaseous fuel by a pilot supply pipe 16 which shunts the manual valve 14—for example, by having its connection with the main supply pipe anterior of the valve 14.

Also interposed in the fuel supply pipe 11 is the automatic timer actuated and safety shutoff control valve unit of the present invention, this unit being indicated in its entirety at 18 in Figure 1. The valve unit 18 is jointly responsive to the automatic timer, indicated in its entirety at 20, and to the pilot burner 15.

The automatic timer 20 may be any desired type of mechanism capable of causing the control valve unit 18 to open and close at different times preselected by the housewife. This unit comprises a synchronous motor-driven clock, including a clock dial 22 and hour and minute hands 24 and 25. The clock may be a spring motor driven clock within the scope of the present invention. Rotatable concentrically around the outside of the clock dial is a "stop cooking" ring 28 which has an index pointer adapted to be placed in registration with the different hour numerals around the clock dial, the adjustable setting given this ring determining the time when the apparatus will interrupt the cooking operation. Rotatable concentrically around the outside of the adjusting ring 28 is an arm or other adjusting ring member 29 which is adjustable to different positions to predetermine the number of hours that the cooking operation is to continue. An index pointer on this outer adjusting ring member 29 is adapted to be placed in registration with different hour and fractional hour markings on the adjusting ring 28 in predetermining the length of the cooking interval.

The automatic timer device 20 is adapted to be placed in its normal position and in its set position through the manipulation of the control knob 31 which is secured to the front end of a control shaft 33. The control shaft 33 advances clockwise with a spring-impelled step-by-step motion as the timer 20 goes through the cyclical steps of starting the cooking operation, stopping the cooking operation, etc. The actuating member 35 is operated by the automatic timer, and when actuated downwardly as viewed in Figure 1, is adapted to open the control valve as will presently appear.

The control valve unit 18 comprises a supporting frame 40 which is supported in juxtaposition to the timing mechanism 20—for example, by means of a bracket 41 shown in Figure 3. Mounted for reciprocation in the frame 40 is the motion transmitting member 42 which is normally operative to transmit motion from the actuating member 35 to the stem 43 of the control valve member 44. The motion transmitting member 42 is in the form of a stem or rod having, at its inner end, a head 45, the end of which is rounded for endwise thrusting engagement against the tapered end of the head member 46 fixed on the adjacent end of the valve stem 43.

The outer end of the motion transmitting member 42, which has a head 42a, is loosely guided within a guide opening 48 formed in the wall 49 of the frame 40, this opening being sufficiently large to enable the motion transmitting member 42 to assume the disabled position shown in full lines in Figure 5. The actuating member 35 is adapted to exert downward thrust against the head at the outer end of the motion transmitting member, the headed end of this member which cooperates with the actuating member 35 and the cooperating end of the actuating member being preferably rounded as shown. The rounded formation of the end of the actuating member 35 and the cooperating end of the member 42 and the rounded formation of the end of the head 45 at the opposite end of the motion transmitting member avoid any interference or hindrance with the lateral displacement of the motion transmitting member 42 in the event that the actuating member 35 is transmitting pressure against the actuating member at the time a safety shutoff function occurs.

The lateral displacement of the transmitting member 42 for effecting an automatic shutoff is performed through the medium of shifter means comprising a shifter arm 52 pivoted by means of a pin 53 to an angular shaped shifter member 54. The shifter arm 52 has an opening 55 through which the motion transmitting rod 42 passes with a relatively loose fit. A compression spring 56 is confined between the upper side of the shifter arm 52 and the head 42a at the outer end of the rod 42, a spring washer being preferably provided at 57. The spring 56 normally thrusts the transmitter member outwardly or in an upward direction as the device is viewed in the drawings, and the actuating member 35 outwardly or upwardly and into proper cooperation with the time operated means for operating the actuator member. The lower end of the pivot pin 53 carries a roller 60, which roller operates in a channel-shaped guide 62, the guide 62 being formed in a member 64 extending transversely between the sides of the frame 40 and secured at its opposite ends thereto.

The electromagnet 68 has an armature 69 attached to the outer end of the stem 70, if desired, in a manner to permit self-accommodation of the armature when in attracted position to the pole ends of the magnet frame 72. The electromagnet and armature are enclosed within a generally cup-shaped housing 73, the inner flanged end of which is secured, for example, by screws 74 (Figure 1) to the adjacent end of the frame 40. The inner end of the cup-shaped housing 73 is closed by guide and closure means shown as comprising a cup-shaped member 75 having pressed fit or other suitable engagement in the inner end of the cup-shaped housing 73. Suitable sealing material 76 is provided between the member 75 and a spring disk 78 and around the stem 70 to prevent the passage of dust or other foreign matter into the electromagnet and armature housing along the stem 70.

The stem 70 extends into position between the sides of the frame 40, and is secured at 80, as the device is viewed in Figure 5, to the downturned leg of the shifter member 54. A compression spring 82 is confined between the spring disk 78 and the downturned leg of the shifter member 54. When the electromagnet is deenergized and the armature 69 released, the spring 82 actuates the shifter members 52 and 54 in a horizontal direction to the right as the device is viewed in Figure 5. This movement of the member 52 swings the motion transmitting member 42 from the position shown in dotted lines in Figure 5 to its position as shown in full lines, thereby disabling the operative connection between the automatic timer and the control valve.

A thermocouple, indicated at 85, is placed in position so that the hot junction 86 thereof will be heated by the pilot flame as long as the pilot flame is burning. The construction of the thermocouple may be similar to that more fully disclosed in Oscar J. Leins Patent No. 2,126,564, granted August 9, 1938, or the construction of the thermocouple and the leads therefor may be of any other suitable or preferred form.

For the purpose of the present description, suffice it to state that the particular thermocouple 85 selected for illustration comprises an outer tubular metallic thermocouple element 87 and an inner metallic thermocouple element 88 of different thermoelectric characteristics. The inner thermocouple element 88 is joined at one end to the outer end of the outer thermocouple element 87 to form the thermojunction which is placed in position to be heated by the pilot light. An inner lead conductor 89 is joined to the inner thermocouple element 88 to form an internal thermojunction 90, and an outer tubular lead conductor 91 is connected to the outer thermocouple element 87, for instance, through a sleeve to form a third thermojunction. The inner lead conductor 89 is insulated from the outer lead conductor 91, for instance, by wrapping of insulation on the inner lead conductor.

The magnet frame 72 is secured, for example, to a terminal bushing 92 in the manner more fully disclosed in the copending aplication of Richard K. Engholdt, Serial No. 328,923, filed April 10, 1940. The coil 94 of the electromagnet is wound around the legs of the magnet frame 72. The bushing 92 is shown as externally threaded for threaded engagement with a nut 95 by means of which the bushing is clamped to the outer end of the electromagnet and armature enclosing and mounting cup 73.

A quick detachable or removable connection is preferably provided between the ends of the leads 89 and 91 opposite the ends which are connected to the thermocouple elements. This removable lead connection may be of the form disclosed in the copending application of Richard K. Engholdt above identified, and is illustrated in that form, it being understood that this connection may be of any other suitable or preferred form. Suffice it for purposes of this description to state that the inner lead 89 has a connector cone 96 which seats in the correspondingly recessed outer end of the terminal tip 97 and is clamped in contact therewith by a connector sleeve 98. The adjacent end of the outer tubular lead conductor 91 is connected in circuit with one side of the coil 94 through the connector sleeve 100 and the bushing 92, and the other side of the coil is connected to the terminal tip 97, the parts being suitably insulated as shown.

The heat of the pilot light on the thermocouple 85 energizes the electromagnet 68 sufficient to hold the armature 69 in attracted position against the pole ends of the magnet frame 72, and the shifter members 52 and 54 in their non-disabling positions when the armature is engaged with the pole ends of the magnet frame, but this thermoelectric current is not capable of moving the armature to attracted position and the shifter members 52, 54 to their non-disabling positions. Cocking or resetting means is therefore provided for cocking the armature 69 to attracted position and the shifter members to their non-disabling positions.

The cocking means comprises a cocking arm 105 slidable in the frame 40 in a transverse direction relative to the direction of movement of the stem 70 and its connected shifter member 54. The inner end of the arm 105 is slidable through an opening 106 in the adjacent side of the frame 40 and has a catch at 107 for limiting the outward movement of the arm 105. The arm 105 is adapted to be actuated manually by a cocking button 108 secured at 109 to the upturned flange 110 at the outer end of the arm. The button 108 extends outwardly through a guide opening 112 in the wall 113 of the outer housing or enclosure 114, the cocking button being disposed in such location as to be conveniently accessible for the purpose of resetting or cocking the shifter members 52, 54 to their non-disabling positions, and thereby the motion transmitting rod 42 to its normal motion transmitting position as shown in dotted lines in Figure 5. The actuator member 35 extends into the housing or enclosure 114 through an opening 116 in the top wall thereof, as shown in Figure 3.

Within its length, the arm 105 has an inclined edge or shoulder 120 which engages a correspondingly inclined edge or shoulder 121 on the shifter member 54. Pressing of the cocking button 108 inwardly with the parts positioned as shown in Figure 2, slides or moves the arm 105 inwardly, and this inward movement of the arm 105, by engagement of its inclined edge 120 with the inclined edge 121 of the shifter member 54, wedges or actuates the member 54 and the connected stem 70 and armature 69 to the left, as the device is viewed in Figure 2, until the armature is disposed in attracted position against the pole ends of the magnet frame.

For the purpose of returning the cocking arm 105 and its button 108 to their outwardly projected positions upon completion of the cocking operation, the arm 105 is provided with an integral lug 124 which engages at 125 the adjacent edge of the pivoted arm 52, and a coiled tension spring 126 is connected at one end at 127 to the free end of the arm 52 and, at its opposite end at 128, to a fixed part of the frame 40. When the arm 105 is pressed inwardly in the cocking operation, the pivoted arm 52 is swung about its pivot 53 in a counterclockwise direction (Figure 2) by the thrust of the lug 124 on the arm 52 at 125. The roller 60 slides in the guide 62 in the accompanying movement of the shifter member 54, with its connected stem 70 and armature 69, to the left. When the cocking button 108 is released upon completion of the cocking operation, the spring 126 swings the arm 52 in a clockwise direction about its pivot 53 and, by cooperation with the lug 124, moves the arm 105 and its

button 108 to their normal outwardly projected positions as shown in Figure 2.

The valve member 44, which is under the control of the automatic timer and safety shutoff means, is enclosed within a valve housing 135 which is secured by screws 136 or other suitable means to the base member 137 of the frame 40. This base member 137 is secured to the frame 40 by screws 138 or other suitable means. An impervious flexible member 139 has its outer periphery clamped between the valve housing 135 and the base member 137, and at the center of the flexible member 139 is an opening for receiving the head 46 of the valve stem 43, the flexible member being secured tightly and in sealed relation to the head 46 as indicated at 140. The head 46 operates slidingly in the base member 137 at 142, and the member 137 is inclined up toward the bearing portion 142 to provide clearance above the flexible member 139 to allow for the flexing of this member with the movement of the valve stem 43. The valve housing 135 is recessed at 144 to provide clearance below the flexible member 139.

The valve housing 135 has a wall or partition 145 separating the inlet chamber 146 from the outlet chamber 148. The wall 145 has a valve opening 149 for placing the inlet chamber 146 in communication with the outlet chamber 148 when the valve member 44 is in open position. An annular valve seat 152 is provided about the valve opening 149, upon which valve seat the valve member 44 is adapted to seat to shut off communication between the inlet and outlet chambers and thereby the supply of fuel for the main burner. The valve member 44 preferably has a valve gasket or yielding facing 154 for cooperation with the valve seat 152. A cap nut 155 has detachable threaded engagement with the valve body, preferably with a gasket 156 therebetween. A compression spring 158, confined between the valve member 44 and the cap nut 155, normally urges the valve member into closed position engaging the valve seat 152.

Contiguous sections of the fuel supply pipe 11 are connected in communication with the inlet and outlet chambers 146 and 148 of the valve housing 135. If desired, the apparatus may be concealed behind any suitable trim plate, of which the outer housing 114 is illustrative, the reset or cocking button 108 projecting through the opening 112 in this trim plate or housing so as to be accessible at all times.

For the purpose of indicating when the device is set or cocked in operating position, an arm 160 is pivoted at 162 to the front side of the frame 40 inwardly of the outer housing or trim plate 114. This arm 160 has an arcuate portion 163 which constitutes in effect a flag or indicator arm having a red or other colored or appropriately marked portion 165 which, when the device is set or cocked in operating position, is displayed through an opening 168 in the front wall of the housing 114 to indicate that the device is in operating position. An angular arm 170, carried by the shifter member 54 for movement therewith, is pivoted at 172 to the arm 160 to swing this arm 160 about its pivot 162 with the movement of the shifter member 54. When the pilot light goes out, the armature 69 is released and the spring 82 actuates the shifter means in a direction to disable the motion transmitting connection between the automatic timer and the valve, with an accompanying closing of the valve, and, at the same time, the indicating marking 165 is moved out of register with the opening 168 so that it may be ascertained at a glance that the device is not cocked or set in operating position.

To start the operation of the apparatus, the following sequence is followed:

The cocking arm 105 is pressed inwardly from the position shown in Figure 2 by engaging the button 108 with the hand or finger and imparting pressure thereto. The inward movement of the arm 105, by engagement of the inclined shoulder 120 with the inclined shoulder 121 of the shifter member 54, wedges or shifts the member 54 to the left as the device is viewed in Figure 2, moving the stem 70 and the armature 69 with it until the armature is brought to attracted position in engagement with the pole ends of the magnet frame. At the same time, the engagement of the lug 124 with the shifter member 52 swings this member in a counterclockwise direction about its pivot 53 against the tension of the spring 126, and the roller 60 on the pivot pin 53 moves to the left (Figure 2) in the guide channel 62.

The pilot burner is lighted, or, having been lighted, heats the thermocouple 85, and the cocking button 108 is held pressed inwardly until the heat of the pilot flame on the thermocouple energizes the electromagnet sufficiently so that it will hold the armature 69 in attracted position and the shifter members 52 and 54 in cocked position.

When the electromagnet is energized sufficiently to hold the armature 69 in attracted position and the shifter members 52 and 54 in cocked position, the cocking button 108 is released and the parts are held cocked by the electromagnet 68. The motion transmitting member 42 is now disposed axially or, as shown in dotted lines in Figure 5, vertically between the actuator member 35 and the valve stem head 46 and the indicator coloring or marking 165 is in register with the opening 168. Release of the cocking button 108 allows the spring 126 to swing the member 52 in a clockwise direction about its pivot 53, and the engagement of the member 52 with the cocking arm 105 at 125 returns this cocking arm and the cocking button 108 to their outwardly projected position.

If the pilot burner is not lighted to produce the thermoelectric current for holding the armature 69 in attracted position upon setting the same to that position, the spring 82 will act upon release of the cocking button to move the shifter members 52 and 54 to the positions shown in Figures 2 and 5. This swings the motion transmitting member 42 to the position shown in full lines in Figure 5, thereby disabling the motion transmitting connection between the actuator member 35 and the valve stem head 46. Likewise, if after the parts are set in their cocked position and the pilot burner is lighted to hold the parts in their cocked or operating positions the pilot burner is extinguished, the armature is released and the shifter members operate to disable the motion transmitting connection between the actuator member 35 and the valve stem head 46.

If, however, with the device set in cocked or operating position and the pilot flame burning to energize the electromagnet sufficiently to hold the device in operating position, the motion transmitting rod 42 will be positioned axially or, as shown in dotted lines in Figure 5, vertically between the actuating member 35 and the valve stem head 46 as already described. With the device cocked when the control knob 31 is in the "set" position illustrated in Figure 1, the actu-

ator member 35 and the motion transmitting rod 42 are held in their raised positions in proper cooperation with the automatic timer driving mechanism. When the time arrives for the cooking operation to start, as predetermined by the setting of the adjustable member 29, the automatic timer operates to impart a downward thrust to the actuator member 35. This member is moved down to the dotted line position illustrated in Figure 3, this downward movement depressing the valve stem 43 and opening the valve 44. The manually actuated valve 14, having been moved to open position as a preparatory step in the setting of the timing mechanism 20, it will be obvious that the opening of the control valve 44 will allow gas to flow to the burner 10 for ignition by the flame issuing from the pilot burner 15.

At the hour predetemined for stopping the cooking operation (shown by the position of the adjustable member 28 as being six o'clock), the automatic timer operates to permit the valve 44 to move upwardly to closed position. At this time the control knob 33 is in the "off" position, signifying that the control valve has been turned off or closed for shutting off the supply of fuel to the burner 10. In each of the positions described, the indicator marking 165 indicates to the housewife that the pilot light is burning and the safety shutoff parts are held in cocked position.

As already pointed out, if for any reason the pilot light is extinguished with the burner 10 in operation or out of operation, the motion transmitting member 42 is shifted to the disabled position, shown in full lines in Figure 5, under the action of the spring 82. Once the motion transmitting member has been tripped into this disabled position, it will remain in that position until the manual cocking or resetting operation is performed by pressing the cocking button 108 inwardly, as described. As long as the motion transmitting member 42 remains in this disabled position, any and all downward thrusting movements of the actuating member 35 are utterly unable to depress the valve stem 43 for opening the valve 44. The formation of the contacting surfaces at the ends of the motion transmitting member 42 and the cooperating contacting surfaces on the actuator member 35 and on the valve stem head 46 offer very low friction against lateral displacement of the motion transmitting member, so that this member will be shifted to disabled position even though the head 45 is being held down against the valve stem head 46 in the operation of holding the valve 44 in open position.

The apparatus is so constructed and arranged that in the event of breakage of parts, interruption of the thermoelectric circuit, or other malfunctioning of the apparatus, there will be an inherent tendency for the apparatus to fail "safe," i. e., for the failure of the apparatus to result in closing of the valve 44 to shut off the supply of fuel to the burner.

When reset button 108 is pushed in to cock the armature 69 to attracted position, the line of motion of the axis of the motion transmitting member 42 is from A to B as shown in dot and dash lines in Figure 2, and although the member 42 has moved, it is still in a disabling position. When reset button 108 is released, and if the electromagnet is energized to hold the armature 69 in attracted position to the magnet frame 72, the line of motion of the axis of the member 42 will be from B to C. If the clock stem or actuating member 35 is up, this will swing the member 42 into its operating position so that downward movement of the member 35 will open the valve. If the member 35 is already down, the member 42 will also swing to its operating position, but due to the round end 45 and the conical end 46, camming action takes place and the valve will open immediately. If, however, the armature 69 is not held attracted to the magnet 72, the line of motion of the axis of the member 42 when the button 108 is released will be from B to A and the member 42 will remain in a disabling position at all times. In other words, the member 42 cannot possibly go to an operating position unless the armature 69 is held to the magnet 72. If the armature 69 is held to the magnet 72, the stem or member 42 will move to operating position whether the clock stem 35 is in the upward or downward position.

The embodiment of the invention shown in the drawings is for illustrative purposes only, and it is to be expressly understood that said drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. A gas burner control apparatus comprising a main gas supply pipe for connection with the burner, a valve in said pipe tending to remain closed, a time controlled mechanism, motion imparting means between said time controlled mechanism and said valve and having a first position for opening the valve by means of said time controlled mechanism and a second position in which it will not open said valve by said time controlled means, a pilot burner, disabling means associated with the pilot burner and movable upon extinguishment of the pilot burner to move said motion transmitting means to said second position, cocking means for cocking said disabling means to non-disabling position, and means operative to return said cocking means to its original position upon completion of the cocking operation and with said disabling means remaining in cocked position.

2. A gas burner control apparatus comprising a main gas supply pipe for connection with the burner, a valve in said pipe tending to remain closed, a time controlled mechanism, motion imparting means between said time controlled mechanism and said valve and having a first position for opening the valve by means of said time controlled mechanism and a second position in which it will not open said valve by said time controlled means, a pilot burner, disabling means associated with the pilot burner and movable upon extinguishment of the pilot burner to move said motion transmitting means to said second position, and cocking means movable in a generally lateral direction with respect to the direction of movement of said disabling means for cocking said disabling means to non-disabling position.

3. A gas burner control apparatus comprising a main gas supply pipe for connection with the burner, a valve in said pipe tending to remain closed, a time controlled mechanism, motion imparting means between said time controlled mechanism and said valve and having a first position for opening the valve by means of said time controlled mechanism and a second position in which it will not open said valve by said time controlled means, a pilot burner, disabling

means associated with the pilot burner and movable upon extinguishment of the pilot burner to move said motion transmitting means to said second position to disable same, cocking means for cocking said disabling means to non-disabling position, an enclosure having an opening in the wall thereof, a movable indicator arm having indicator means movable into and out of position for display through said opening to indicate whether the device is cocked, and means carried by said disabling means for actuating said movable indicator arm.

4. A gas burner control apparatus comprising a main gas supply pipe for connection with the burner, a valve in said pipe tending to remain closed, a time controlled mechanism, motion imparting means between said time controlled mechanism and said valve and having a first position for opening the valve by means of said time controlled mechanism and movable to a second position in which it will not open said valve by said time controlled means, a pilot burner, disabling means associated with the pilot burner and movable upon extinguishment of the pilot burner to move said motion transmitting means to said second position to disable same, cocking means for moving said disabling means to non-disabling position, means operative to return said cocking means to its original position upon completion of the cocking operation and with said disabling means remaining in cocked position, and means actuated by said disabling means and free of the means for returning the cocking means to normal for indicating whether the device is cocked.

5. In burner control apparatus, the combination with a burner and a pilot burner associated therewith, of a control valve governing the flow of fuel to the burner, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and movable to a second position where it is incapable of transmitting motion to said valve, shifter means movable in a direction to shift said motion transmitting member into said second position, an electromagnet adapted for holding said last means against operation, a thermocouple placed in position to be heated by the pilot burner and connected in circuit with said electromagnet, cocking means movable in a generally lateral direction with respect to the direction of movement of said shifter means for moving said shifter means to the position where it is held by the electromagnet, and means operative to return said cocking means to its original position upon completion of the cocking operation and with the shifter means held in cocked position by the electromagnet.

6. In burner control apparatus, the combination with a burner and a pilot burner associated therewith, of a control valve governing the flow of fuel to the burner, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and movable to a second position where it is incapable of transmitting motion to said valve, shifter means movable in a direction to shift said motion transmitting member into said second position, an electromagnet adapted for holding said last means against operation, a thermocouple placed in position to be heated by the pilot burner and connected in circuit with said electromagnet, cocking means movable in a generally lateral direction with respect to the direction of movement of said shifter means for moving said shifter means to the position where it is held by the electromagnet, means operative to return said cocking means to its original position upon completion of the cocking operation and with the shifter means held in cocked position by the electromagnet, and an indicator operatively connected with said shifter means and actuated by the movement of said shifter means for indicating whether the device is cocked.

7. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmiting member having a first position where it is capable of transmitting motion to said valve and movable to a second position where it is incapable of transmitting motion to said valve, shifter means, said shifter means comprising a shifter member and a shifter arm pivoted to said shifter member, said shifter arm cooperating with said motion transmitting member and movable with said shifter member in a direction to move said motion transmitting member into said second position, an electromagnet, and an armature connected with said shifter member and, when attracted, holding said shifter member and said shifter arm against shifting said motion transmitting member into said second position.

8. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and movable to a second position where it is incapable of transmitting motion to said valve, shifter means, said shifter means comprising a shifter member and a shifter arm pivoted to said shifter member, said shifter arm cooperating with said motion transmitting member and movable with said shifter member in a direction to move said motion transmitting member into said second position, an electromagnet, an armature connected with said shifter member and, when attracted, holding said shifter member and said shifter arm against shifting said motion transmitting member into said second position, cocking means cooperating with said shifter member for cocking the armature to attracted position and the shifter means to the position in which it is held when the armature is attracted, means on said cocking means and cooperable with the shifter arm for swinging said arm about its pivot in the cocking operation to move said motion transmitting member to a third position in which it is incapable of transmitting motion to said valve, and spring means connected to said arm for swinging same in a direction to return the cocking means to normal when same is released upon completion of the cocking operation.

9. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and a second position where it is incapable of transmitting motion to said valve, shifter means tending to shift said motion transmitting member into said second position, said shifter means comprising a shifter member and a shifter arm pivoted to said shifter member and cooperating with said motion transmitting member, an electromagnet, an armature connected with said shifter member and, when attracted, holding said shifter member against shifting said motion transmitting member into said second

position, cocking means cooperating with said shifter member for cocking the armature to attracted position and the shifter means to the position in which it is held when the armature is attracted, means on said cocking means and cooperable with the shifter arm for swinging said arm about its pivot in the cocking operation, spring means connected to said arm for swinging same in a direction to return the cocking means to normal when same is released upon completion of the cocking operation, a roller at the pivotal connection between the shifter arm and the shifter member, and a guide for said roller.

10. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and a second position where it is incapable of transmitting motion to said valve, shifter means tending to shift said motion transmitting member into said second position, said shifter means comprising a shifter member and a shifter arm pivoted to said shifter member and cooperating with said motion transmitting member, an electromagnet, an armature connected with said shifter member and, when attracted, holding said shifter member against shifting said motion transmitting member into said second position, cocking means cooperating with said shifter member for cocking the armature to attracted position and the shifter means to the position in which it is held when the armature is attracted, means on said cocking means and cooperable with the shifter arm for swinging said arm about its pivot in the cocking operation, spring means connected to said arm for swinging same in a direction to return the cocking means to normal when same is released upon completion of the cocking operation, and a pivoted indicator arm having pivotal connection with said shifter means for indicating when the device is cocked.

11. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and a second position where it is incapable of transmitting motion to said valve, shifter means tending to shift said motion transmitting member into said second position, said shifter means comprising a shifter member having an inclined shoulder, an electromagnet, an armature connected with said shifter member and, when attracted, holding said shifter member against shifting said motion transmitting member into said second position, and a cocking member movable generally laterally with respect to the direction of movement of said shifter member and having an inclined shoulder cooperable with the inclined shoulder of said shifter member for actuating said member in a direction to cock the armature to attracted position and the shifter means to the position in which it is held when the armature is attracted.

12. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member, a shifter member having an inclined shoulder, an electromagnet, an armature connected with said shifter member and, when attracted, holding said shifter member against shifting said motion transmitting member, a cocking member movable generally laterally with respect to the direction of movement of said shifter member and having an inclined shoulder cooperable with the inclined shoulder of said shifter member for actuating said member in a direction to cock the armature to attracted position and the shifter member to the position in which it is held when the armature is attracted, and a shifter arm pivoted to said shifter member, said pivoted shifter arm having shifting cooperation with said motion transmitting member for disabling said motion transmitting member when the electromagnet is deenergized and cooperating with said cocking member for returning said cocking member to normal position upon release thereof and with said shifter member in cocked position.

13. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member, a shifter member having an inclined shoulder, an electromagnet, an armature connected with said shifter member, and, when attracted, holding said shifter member against shifting said motion transmitting member, a cocking member movable generally laterally with respect to the direction of movement of said shifter member and having an inclined shoulder cooperable with the inclined shoulder of said shifter member for actuating said member in a direction to cock the armature to attracted position and the shifter member to the position in which it is held when the armature is attracted, a shifter arm pivoted to said shifter member, said pivoted shifter arm having shifting cooperation with said motion transmitting member for disabling said motion transmitting member when the electromagnet is deenergized and cooperating with said cocking member for returning said cocking member to normal position upon release thereof and with said shifter member in cocked position, a roller at the pivotal connection between the shifter arm and the shifter member, a supporting frame, a member carried by said frame and having a guide for said roller, and an indicator arm pivoted to said frame and having pivotal connection with said shifter member for swinging movement therewith to indicate when the device is cocked.

14. In a burner control apparatus, the combination with a burner and a pilot burner associated therewith, of a control valve governing the flow of fuel to the burner, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and a second position where it is incapable of transmitting motion to said valve, shifter means tending to shift said motion transmitting member into said second position, an electromagnet adapted for holding said last means against operation, thermal means subject to the heat of the pilot burner for controlling said electromagnet, cocking means operable to cock said shifter means to the position where it is held by the electromagnet, and means operative to return said cocking means to normal upon completion of the cocking operation, said motion transmitting member being returned to said first position only upon completion of the cocking operation and the return of the cocking means to normal with the shifter means held in cocked position by the electromagnet.

15. In a burner control apparatus, the combination with a burner, of a control valve governing the flow of fuel to said burner, time controlled means, motion transmitting means effective to open and close said valve at different preselected times under the control of said time controlled means, a pilot for igniting the fuel at the burner, thermally controlled means subject to the heat of the pilot for rendering said motion

transmitting means ineffective to open said valve in the event the pilot is extinguished, and cocking means movable from a first position to a second position and back to said first position to cause said motion transmitting means to be set, when the pilot is ignited, in position where it is effective to open and close said valve under the control of said time controlled means, said motion transmitting means being movable to a position in which it is ineffective to open and close said valve under the control of said time controlled means and held in said position when said cocking means is in its second position.

16. In a device of the class described, a valve, mechanism for operating said valve comprising a motion transmitting member having a first position where it is capable of transmitting motion to said valve and a second position where it is incapable of transmitting motion to said valve, shifter means tending to shift said motion transmitting member into said second position, said shifter means comprising a shifter member and a shifter arm pivoted to said shifter member and cooperating with said motion transmitting member, an electromagnet, an armature connected with said shifter member and, when attracted, holding said shifter member against shifting said motion transmitting member into said second position, cocking means cooperating with said shifter member for cocking the armature to attracted position and the shifter means to the position in which it is held when the armature is attracted, and means on said cocking means and cooperable with the shifter arm to move said motion transmitting member to a third position in which it is incapable of transmitting motion to said valve and to hold said motion transmitting member in said third position until said cocking means is released.

17. A burner control apparatus comprising a fuel supply pipe for connection with the burner, a valve in said pipe tending to remain closed, valve actuating means, a motion imparting member between said valve actuating means and said valve and having a first position in which it is operable to open the valve by means of said valve actuating means, a second position in which it will not open said valve by said valve actuating means, and a third position different from both said first and second positions and in which it will not open said valve by said valve actuating means, thermally controlled means responsive to the heat of a flame and operable to hold said motion imparting member in said first position when the flame is burning and to move said motion imparting member to said second position upon extinction of the flame, and means movable in one direction from its original position to move said thermally controlled means to the position in which it is held by the heat of the flame and said motion transmitting member to said third position, said last means being movable in the opposite direction to its original position and operable in this last mentioned movement to free said motion transmitting member for movement to its first position.

18. In burner control apparatus, the combination with a burner, of a control valve governing the flow of fuel to the burner, mechanism for operating said valve comprising a motion transmitting member having a first position wherein it is capable of transmitting motion to said valve and movable to a second position wherein it is incapable of transmitting motion to said valve, shifter means movable in a direction to shift said motion transmitting member into said second position, an electromagnet adapted for holding said last means against operation, a thermocouple placed in position to be heated by a flame in proximity to the burner and connected in circuit with said electromagnet, cocking means movable from a first position to a second position to move said shifter means to the position where it is held by the electromagnet, and means operative to return said cocking means to its first position upon completion of the cocking operation and with the shifter means held in cocked position by the electromagnet, said motion imparting means being movable to a third position incapable of transmitting motion to said valve, upon movement of said cocking means to said second position.

19. A burner control apparatus comprising a fuel supply pipe for connection with the burner, a valve in said pipe tending to remain closed, valve actuating means, a motion imparting member between said valve actuating means and said valve and having a first position in which it is operable to open the valve by means of said valve actuating means, a second position in which it will not open said valve by said valve actuating means, and a third position different from both said first and second positions and in which it will not open said valve by said valve actuating means, thermally controlled means operable to permit maintenance of said motion imparting member in said first position, reciprocatory reset means for said thermally controlled means, said reset means having a normally outwardly projected position and movable to an opposite position, said motion imparting member being positioned in said third position by said reset means when said reset means is in said opposte position, and means for returning said reset means to its outwardly projected position and for moving said motion imparting member from its third position to its first position and maintaining it in said first position when said thermally controlled means is operable to permit maintenance of said motion imparting member in said first position.

20. In valve control apparatus, the combination with a valve, automatic valve actuating means, motion transmiting means effective to open and close said valve under the control of said automatic valve actuating means, means for rendering said motion transmitting means ineffective to open said valve, and cocking means movable from a first position to a second position and back to said first position to cause, by its movement to said second position and back to said first position, said motion transmitting means to be set in position where it is effective to open and close said valve under the control of said automatic valve actuating means, said motion transmitting means being movable to a position in which it is ineffective to open and close said valve under the control of said automatic valve actuating means and held in said position when said cocking means is in its second position.

21. In valve control apparatus, the combination with a valve, automatic valve actuating means, motion transmiting means effective to open and close said valve under the control of said automatic valve actuating means, means for rendering said motion transmitting means ineffective to open said valve, and cocking means movable from a first position to a second position and back to said first position, said motion transmitting means being adapted by the movement of said cocking means from its first position to

its second position to be actuated from the position in which it is ineffective to open the valve to a second position in which it is ineffective to open the valve, said motion transmitting means being adapted upon movement of said cocking means from its second position back to its first position to move back either to the first position in which said motion transmitting means is ineffective to open the valve or to a third position in which said motion transmitting means is effective to open the valve depending upon the position of the means for rendering the motion transmitting means ineffective.

22. In combination, a fluid supply conduit, a valve for controlling the supply of fluid through said conduit, motion transmitting means, an automatic timer for actuating said valve through said motion transmitting means, means comprising a movable armature operable to retracted position to disable said motion transmitting means, an electromagnet for holding said armature in attracted position in which position of said armature said motion transmitting means may be positioned for actuation of the valve therethrough, a thermoelectric generator energized by the heat of a flame and connected in circuit with said electromagnet for energizing said electromagnet when the thermoelectric generator is energized by the heat of the flame, and means for resetting the armature to attracted position and including means for preventing setting of said motion transmitting means in operating position during the resetting operation and until the electromagnet is energized to hold the armature in attracted position.

23. In combination, a fluid supply conduit, a valve for controlling the supply of fluid through said conduit, an automatic timer for actuating said valve, means comprising a movable armature operable to retracted position to prevent actuation of said valve by said automatic timer, an electromagnet for holding said armature in attracted position in which position of said armature said automatic timer may be operable to actuate said valve, a thermoelectric generator energized by the heat of a flame and connected in circuit with said electromagnet for energizing said electromagnet when the thermoelectric generator is energized by the heat of the flame, and means for resetting the armature to attracted position and including means for conditioning the automatic timer for opening said valve only if said electromagnet is energized to hold said armature in attracted position, said automatic timer being incapable of opening said valve until the resetting operation is completed.

24. In combination, a main burner, a fuel supply line for said burner, a pilot burner for said main burner, valve means in said fuel supply line for controlling the supply of fuel through said line, an automatic timer for actuating said valve means, means comprising a movable armature operable to retracted position to prevent actuation of said valve means by said automatic timer, an electromagnet for holding said armature in attracted position, in which position of said armature said automatic timer may be operable to actuate said valve means, a thermoelectric generator adapted to be energized by the heat of the pilot burner and connected in circuit with said electromagnet for energizing said electromagnet when the thermoelectric generator is energized by the heat of the flame, and means for resetting the armature to attracted position and including means for conditioning the automatic timer for opening said valve means only if said electromagnet is energized to hold said armature in attracted position, said automatic timer being incapable of opening said valve means until the resetting operation is completed.

25. In combination, a fluid supply conduit, a controlling member operable to control the supply of fluid through said conduit, an automatic timer for actuating said controlling member, means comprising a movable armature operable to retracted position to prevent actuation of said controlling member by said automatic timer, an electromagnet for holding said armature in attracted position, in which position of said armature said automatic timer may be operable to actuate said controlling member, a thermoelectric generator energized by the heat of a flame and connected in circuit with said electromagnet for energizing said electromagnet when the thermoelectric generator is energized by the heat of the flame, and means for resetting the armature to attracted position and including means for conditioning the automatic timer for actuating said controlling member to operating position only if said electromagnet is energized to hold said armature in attracted position, said automatic timer being incapable of opening said valve until the resetting operation is completed.

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