June 6, 1950 C. K. STROBEL 2,510,264

SAFETY CONTROL AND IGNITION APPARATUS FOR GASEOUS FUEL BURNERS

Filed Dec. 7, 1946 3 Sheets-Sheet 1

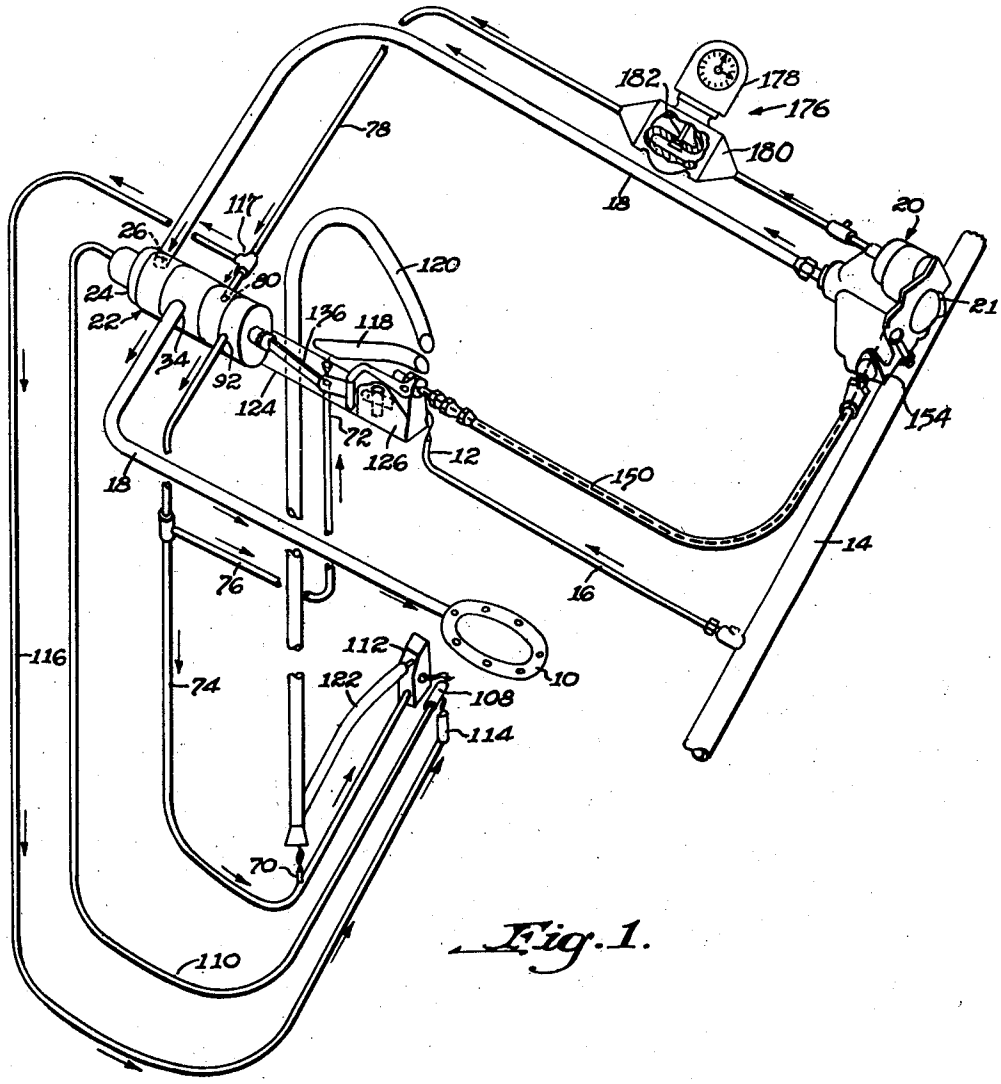


Fig. 1.

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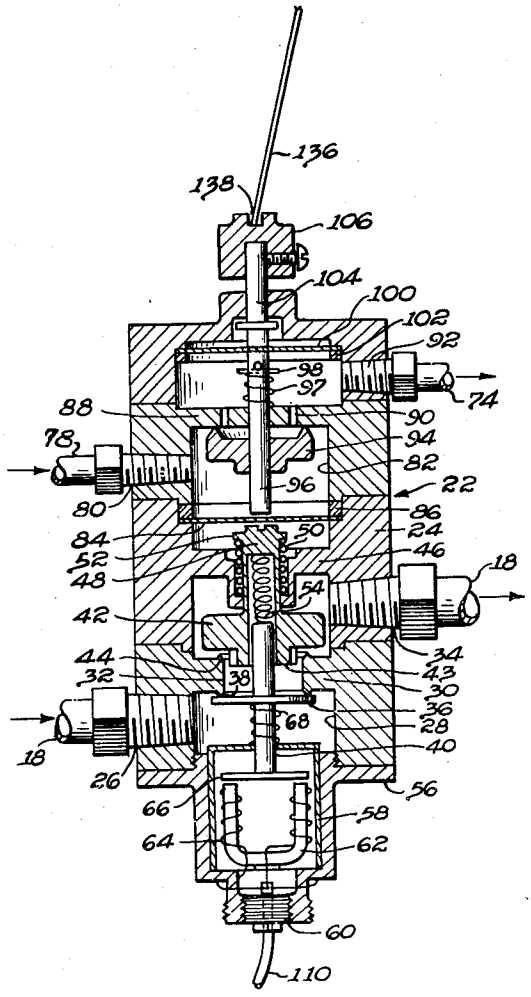


Fig. 2.

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Filed Dec. 7, 1946 3 Sheets-Sheet 3

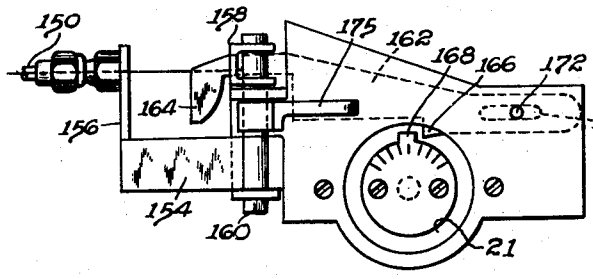


Fig. 4.

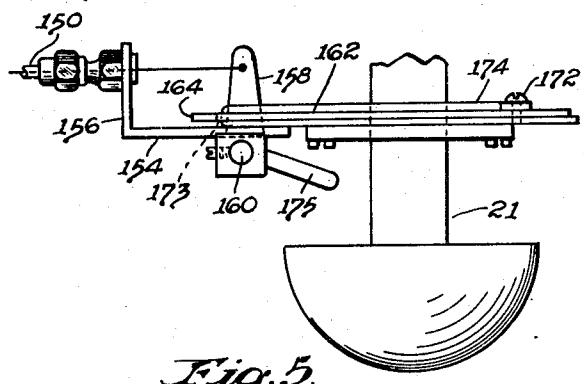


Fig. 5.

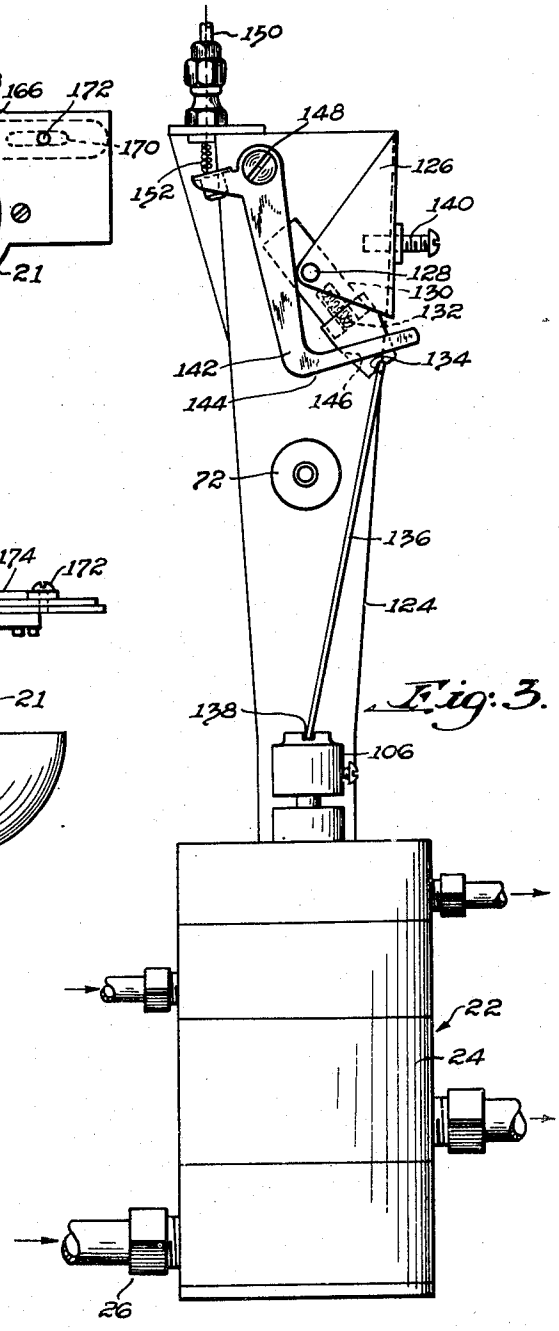


Fig. 3.

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Patented June 6, 1950 2,510,264

UNITED STATES PATENT OFFICE

2,510,264

SAFETY CONTROL AND IGNITION APPARATUS FOR GASEOUS FUEL BURNERS

Charles K. Strobel, Pittsburgh, Pa., assignor to Robertshaw-Fulton Controls Company, a corporation of Delaware

Application December 7, 1946, Serial No. 714,788

9 Claims. (Cl. 158—117.1)

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This invention relates to safety control and ignition apparatus for gaseous fuel burners and, more particularly, to electrically operated apparatus for oven burners independent of commercial current supply.

In copending application Serial No. 620,320 filed October 4, 1945 by Charles K. Strobel et al. and assigned to the assignee of the present application, there is disclosed a flash-tube ignition system embodying a thermoelectric safety device. The system is placed in operation by the usual manipulation of the oven gas cock which may include the thermostatic control for oven temperatures. An automatic thermal timing device determines the so-called starting period during which the thermoelectric device comes into operation. Upon termination of this period the fuel flow to the flash pilot burners is cut-off for the duration of the oven operation and only the thermocouple heating burner and the main burner remain in operation, the latter under control of the oven thermostat.

An object of the present invention is to render such apparatus more useful by improving the automatic nature thereof.

Another object of the invention is to utilize simple and economical timing means cooperable with the existing controls to start and stop the apparatus at desired times.

Another object of the invention is to permit the setting of dual controls at one time for automatic operation in proper sequence at a later time in the absence of the operator.

Another object of the invention is to preserve all the existing safety features intact while improving the performance of the apparatus as a unit.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of a safety control and ignition apparatus for an oven burner embodying the invention;

Fig. 2 is a longitudinal sectional view of the electromagnetic control device shown in Fig. 1;

Fig. 3 is an elevation of the resetting device for the control device shown in Fig. 2;

Fig. 4 is a front elevation of another portion of the resetting device; and

Fig. 5 is a plan view of the resetting device shown in Fig. 4.

Referring more particularly to Fig. 1 of the drawings, the safety control and ignition apparatus is shown in connection with a cooking range

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having the usual oven burner 10 and top pilot burner 12 located remotely from the oven burner 10. As is customary in equipment of this nature, the various burners receive fuel from the manifold 14 connected to a source of fuel supply. In this embodiment, the top pilot burner 12 is connected by a pipe 16 to the manifold 14 and is of the constant burning type.

The main oven burner 10 is supplied with fuel from the manifold 14 by a main fuel pipe 18 and the fuel supply therein is under control of means comprising a main fuel cock 20 which may also embody the usual thermostatic control device adjustable together with the cock by knob 21 and being responsive to temperatures in the oven where the burner 10 is located. As combined fuel cocks and thermostatic devices are well known, further description is deemed unnecessary, it being understood that the thermostatic device is capable of controlling the flow of fuel in the pipe 18 independently of the fuel cock 20 when the latter has once been opened. The flow of fuel in the pipe 18 to the main burner 10 is thus subject to the throttling action of the thermostatic device where included.

The flow of fuel in the pipe 18 to the main burner 10 is also under the control of a thermomagnetic control device designated generally by the reference numeral 22. This thermomagnetic control device 22 is interposed in the main fuel pipe 18 in proximity of the top pilot burner 12 between the main fuel cock 20 and the oven burner 10. As shown more clearly in Fig. 2, the control device 22 comprises a casing 24 having an inlet connection 26 extending through the side wall of the casing 24 adjacent one end and communicating with a main fuel chamber 28 extending axially of the casing 24. The main fuel chamber 28 is provided with a partition 30 having an opening 32 therethrough through which fuel may flow from the inlet 26 to an outlet 34 formed in the wall of the casing 24 at the opposite end of the chamber 28. The inlet 26 and outlet 34 serve as connections for opposite ends of the fuel pipe 18 as will be apparent from Fig. 1 of the drawings.

The passage 32 is controlled by a safety valve 36 which is movable into and out of engagement with a valve seat 38 formed on the side of the partition 30 adjacent the inlet opening 26. The valve member 36 is secured to a valve stem 40 which extends to the opening 32 and has slidable engagement with a closure disc 42. The purpose of the closure disc is to interrupt the flow of fuel through the passage 32 when the valve

member 36 is moved out of engagement with the seat 38 during the resetting operation to be described hereinafter. To this end, a second valve seat 44 is formed on the partition 39 on the side opposite the valve seat 38 and is adapted to be engaged by the closure disc 42 during the resetting operation. A guide portion 43 is formed substantially concentric with the closure disc 42 for cooperation with the walls of the opening 32 and may be serrated to permit free passage of fuel thereby until the closure disc is fully engaged with its seat 44.

The bottom of the chamber 28 is provided with an annular projection or housing 46 in which a stem portion 48 of the closure disc 42 is slidably mounted. A coil spring 50 is carried by the stem 48 and is operative between the housing 46 and a collar 52 mounted on the stem 48. Thus, when a force is applied to the end of the stem 48 to move the closure disc 42 into engagement with its seat 44, the coil spring 50 will be compressed. When the force is removed, the bias of the spring 50 will serve to return the closure disc 42 to its open position relative to the seat 44.

A yieldable connection is provided between the closure disc 42 and the valve member 36 to permit relative movement therebetween as will be more apparent hereinafter. To this end, there is provided an override mechanism in association with the closure disc 42 and valve stem 40 which may take the form of a coil spring 54 housed within an axial recess in the closure disc stem 48 and operative between the bottom of the recess and the end of the valve stem 40.

The end of the casing 24 adjacent the inlet 26 is provided with a closure cap 56 having a magnet housing 58 closely engaging the inner wall thereof. The closure cap 56 at its outer end supports a threaded terminal connection 60. The magnet housing 58 supports a horseshoe magnet 62 which is provided with the usual winding 64 having one end grounded on the closure cap 56 and the opposite end secured to the terminal connection 60. The electromagnetic device is completed by the provision of an armature 66 which is carried by the valve stem 40 for cooperation with the pole faces of the magnet 62. It will be noted that the armature is normally spaced from the magnet a less distance than the closure disc 42 is spaced from its seat. Thus, after the armature is in attracted position the override spring 54 permits further movement of the closure disc relative to the valve stem 40. When the valve member 36 is fully disengaged from its seat 38, then the armature 66 is in attracted relation relative to the pole faces of the magnet 62. The valve member 36 is biased to its seat 38 and the armature 66 to its released position by the provision of a coil spring 68 operative between the valve member 36 and the bottom of the magnet housing 58.

The control device 22 also includes means to control the supply of fuel to a flash pilot burner 70 and an auxiliary pilot burner 72. As shown in Fig. 1, the flash pilot burner 70 is located in the oven compartment adjacent the main burner 10 while the auxiliary pilot burner 72 is located adjacent the top pilot burner 12. Both burners are supplied with fuel by a pipe 74 extending from the control device 22, the auxiliary pilot burner 72 being conveniently connected to pipe 74 by a branch pipe 76. The inlet for fuel to the pipe 74 is connected to the control device 22 and may take the form of a pipe 78 connected at the opposite end to the main fuel cock 20. The fuel in the pipe 78 is preferably under control of the

main fuel cock 20 but is not controlled by the thermostatic device which may be included as previously described. Thus, when the main fuel cock 20 is open the flow of fuel in the pipe 78 is not subject to the throttling action of the thermostatic device as is the fuel in the pipe 18.

As previously indicated, the thermomagnetic control device 22 is also adapted to control the flow of fuel to the flash pilot burner 70 and the auxiliary pilot burner 72. To this end, as shown more clearly in Fig. 2, the pipe 78 is connected to an inlet opening 30 extending through the wall of the casing 24 and communicating with an auxiliary fuel chamber 82 formed axially of the casing 24 and separated from the main fuel chamber 28 by the housing 46. In order to prevent leakage of fuel from one chamber to the other, the auxiliary fuel chamber 82 is provided with a diaphragm 84 extending thereacross adjacent the end of the closure disc stem 48 and maintained in position by means of a clamping ring 86 carried by the casing 24.

The bottom wall 88 of the chamber 82 is provided with a plurality of apertures 90 providing passage for fuel from the inlet 30 to an outlet 92 formed in the wall of the casing 24 on the opposite side of the bottom wall 88 and adapted for connection to the fuel pipe 74. Passage of fuel through the apertures 90 is controlled by an auxiliary valve member 94 which is movable into and out of engagement with the bottom wall 88 of the chamber 82 within which the valve member 94 is located. A valve stem 96 is secured to the valve member 94 and extends on either side thereof. One end of the valve stem 96 is located in chamber 82 and terminates adjacent the diaphragm 84. The auxiliary valve member 94 is biased into engagement with the wall 88 by a coil spring 97 carried on the opposite end of the stem 96 and which is operative between the wall 88 and a collar 98 carried on the valve stem 96. This opposite end of the valve stem 96 terminates beyond the collar 98 for operative engagement with a second diaphragm 100 which serves to prevent leakage of fuel from the casing 24 and is held in position by a second clamping ring 102 carried on the casing 24. A reset stem 104 extends from adjacent the underside of the diaphragm 100 to the bottom wall of the casing 24 and is provided with a button 106 exterior of the casing 24 and by means of which the reset stem 104 may be reciprocated.

The electromagnet, comprising the winding 64 and horseshoe magnet 62, is adapted to be energized by current generated from a thermocouple 108 which is connected by suitable leads 110 to the terminal connection 60. The thermocouple 108 is located so that the hot junction thereof will be heated by a flame from a thermocouple heating burner 112 which receives a supply of fuel from the pipe 74 which also supplies fuel to the flash pilot burner 70. An ignition pilot burner 114 is provided intermediate the thermocouple heating burner 112 and the main burner 10 to receive fuel from a conduit 116 connected at a junction 117 with pipe 78. As will be more apparent hereinafter, the burner 112 and the portion of the pipe 74 beyond branch pipe 76 could be dispensed with if the burner 114 is arranged to heat the thermocouple 108 and also ignite the main burner 10.

A system of flash tubes is provided for igniting the various burners of the system from the constant burning top pilot burner 12. Accordingly, a short flash tube 118 is provided between the

constant burning top pilot burner 12 and the auxiliary pilot burner 72, it being apparent that fuel from the pipe 76 flowing from the auxiliary pilot burner 72 will enter the flash tube 118 and be ignited from the constant burning pilot burner 12. The flame so created will then be conducted back through the flash tube 118 and will ignite the fuel flowing from the auxiliary pilot burner 72. An elongated flash tube 120 is provided between the constant burning top pilot burner 12 and the flash pilot burner 70 which is remote therefrom. This flash tube 120 serves to cause ignition of the flash pilot burner 70 in a similar manner to that described in connection with the flash tube 118. In addition, a branch flash tube 122 extends from the flash tube 120 adjacent the flash pilot burner 70 to the thermocouple heating burner 112 and likewise serves to ignite the fuel flowing therefrom. It will be understood that if the burner 112 is dispensed with, then the flash tubes 120 and 122 would be arranged to ignite the ignition pilot burner 114 directly instead of this burner being ignited from the thermocouple heating burner 112.

The heat of the flame from the thermocouple heater 112 on the thermocouple 108 serves to energize the electromagnet sufficiently to hold the armature 66 against the pole faces of the magnet 62 but this thermoelectric current is incapable of moving the armature to this attracted position. Hence, resetting means is provided for placing the armature 66 in attracted position and will now be described in connection with the detailed views in Figs. 3, 4 and 5 together with the more general showing of Fig. 1.

The control device 22 is provided with a bracket 124 extending toward the top pilot burner 12 and forming a support for the auxiliary pilot burner 72. The bracket 124 is provided with a channel-shaped portion 126 at the end opposite the control device 22 and projecting substantially midway across the bracket. The channel-shaped portion 126 provides spaced bearings for a pivot 128 upon which a latching member 130 is mounted. The latching member 130 is preferably made in two parts, one slidable on the other which carries the pivot, and biased apart by means of a coil spring 132 interposed therebetween. The slidable portion of the latching member 130 is provided with a slot 134 extending across one end thereof and offset from the center. Extending between the slot 134 and the reset button 106 is a timing device comprising a bimetal strip 136 which is retained in position on the reset button 106 by the provision of a transverse slot 138 disposed centrally thereof. Pivotal movement of the latching member 130 is restricted by its engagement with a portion of the channel-shaped member 126 in a counter-clockwise direction and by its engagement with a set screw 140 carried by the channel-shaped portion 126 in the opposite direction.

As shown more clearly in Fig. 3, when the resetting button 106 is unoperated, the bimetal strip 136 occupies a position at an angle to the axis of the control device 22. In this position, the bimetal strip 136 is offset from the auxiliary pilot burner 72 which projects through the bracket 124 substantially midway between the control device 22 and the channel-shaped portion 126. Manually operated means for moving the bimetal strip 136 and latching member 130 into substantial alignment with the axis of the control device 22 are provided and it will be apparent that in such position the bimetal strip will

be subject to the heat of the flame from the auxiliary pilot burner 72. Moreover, in this position the reset button 106 will be forced inwardly of the control device 22 to effect the resetting operation.

The manually operable means includes a lever 142 provided with an angular portion 144 on one arm thereof having an aperture 146 therethrough in which the slidable portion of the latching member 130 is received. The lever 142 is pivoted on a pin 148 projecting from the bracket 124 on one side of the channel-shaped portion 126. The other arm of the lever 142 is engaged by a flexible connection in the form of a cable or pull wire 150 which is mounted on the bracket 124 and is provided with a coil spring 152 operative between the bracket 124 and the lever 142 for biasing the lever in a counter-clockwise direction. As shown in Fig. 3, when the lever is thus biased the bimetal strip 136 is held in its angular position out of the path of the flame from the auxiliary pilot burner 72.

The pull wire 150 extends toward the manifold 14 of the range and is connected by means now to be described with the main fuel cock 20 for operation by the knob 21. To this end, the fuel cock 20 is provided with a bracket 154 extending laterally therefrom and carrying a support 156 through which the pull wire 150 extends. The end of the wire 150 is connected to a lever 158 which is pivoted on a pin 160 carried by the bracket 154. Movement of the lever 158 in one direction serves to exert a pull on the wire 150 against the bias of the spring 152 and thus permits operation of the latching element 130. Such movement of the lever 158 is effected by a slidable member 162 having a hooked end 164 adapted to operatively engage the lever 158. The slidable member 162 having a hooked end 164 stantially normal to the axis of the fuel cock 20 by means of a toothed portion 166 on the slidable member 162 being adapted for engagement with a lug 168 carried by the knob 21. The slidable member 162 is supported on the bracket 154 and its movement relative thereto is limited by the provision of a slot 170 formed in the slidable member 162 for cooperation with a pin 172 carried by the bracket 154.

In order that the lug 168 on the knob 21 may pass beyond the toothed portion 166 on the slidable member 162, the latter is yieldably mounted on the bracket 154 to permit such movement. To this end, the slidable member 162 is maintained with the hooked end 164 thereon in engagement with the lever 158 by means of a spring wire 174 which may be mounted at one end on the pin 172 and having its opposite end hooked in a perforation 173 in slidable member 162. A stop in the form of an arm 175 is secured to the pin 160 and engages the bracket 154 to limit movement of the lever 158 as will be apparent hereinafter.

The apparatus so far described is fully disclosed and claimed in the copending application previously referred to herein. In the present embodiment of the invention a second timing device 176 is included and is of different form from the first timing device described comprising the bimetal strip 136 cooperable with the auxiliary pilot burner 72. The second timing device 176 comprises a clock timer 178 of any well known form which is manually adjustable to selected time positions for starting and stopping operation of the apparatus. To this end, the clock timer 178 includes a control valve 180

carried by the fuel pipe 78 between the fuel cock 20 and the junction 117 of pipe 116. The control valve 180 is provided with a valve member 182 which is operated between open and closed positions by the clock timer 178 and will prevent flow of fuel to the auxiliary pilot burner 72, the thermocouple heating burner 112 and the ignition pilot burner 114 when closed.

The operation of the apparatus is as follows: The clock timer 178 is first adjusted to a starting time position and stopping time position and the valve member 182 consequently will remain closed until the selected starting time is reached. The constant burning top pilot burner is assumed to be producing a flame. The fuel cock 20 is then opened by means of rotation of the knob 21 in a clockwise direction, as viewed in Fig. 4, to cause fuel to flow in the pipe 18 as far as the control device 22 and as far as the timing device 176 in pipe 78. This operation of the knob 21 will cause the lug 168 to be moved in a clockwise direction into engagement with the toothed portion 166 on the slidable member 162 causing the pull wire 150 to be operated by means of the lever 158. The latching lever 142 will thus be moved against the bias of the spring 152 in a clockwise direction causing the latching element 130 to move the adjacent end of the bimetal strip 136, also in a clockwise direction, until it is aligned with the axis of the control device 22 and in the path of the flame from the auxiliary pilot burner 72.

The set screw 140 is now engaged by the latching element 130 and it will be apparent that the reset button 106 is thus forced inwardly, and is maintained in such position while the bimetal strip is unheated, due to the clockwise torque applied at the slot 134 to the bimetal strip 136 and the counter-clockwise torque applied at the set screw 140 to the latching element 130. The lug 168 on knob 21 has moved under and released the toothed portion 166 during the opening movement of cock 20 due to the yieldable mounting of the slidable member 162. The reset spring 152 causes the slidable member 162 to be returned to its initial position as soon as the toothed portion 166 is released from the lug 168. The unheated bimetal strip 136 remains in the latched position independent of the force applied by the pull wire 150.

The inward movement of the reset button 106 causes the reset stem 104 to move the diaphragm 100 and cause movement of the auxiliary valve stem 96 axially against the bias of the coil spring 97 which causes movement of the auxiliary valve member 94 from its seat. It is apparent, however, that no fuel can flow to the pilot burners 72, 112 and 114 because the clock valve member 182 is still closed.

During this resetting operation the stem 48 of the closure disc 42 is engaged by the diaphragm 84 and is moved against the bias of the spring 50 into engagement with the seat 44. The valve member 36 is simultaneously moved away from its seat 38, but fuel is prevented from flowing from the passage 32 through the outlet 34 to the main burner 10 due to the immediate seating of the closure disc 42. It may be noted that immediately prior to engagement of the closure disc 42 with its seat 44 that the armature 66 has been placed in contact with the pole faces of the horseshoe magnet 62. However, the closure disc 42 can thereafter be moved into engagement with the seat 44 due to the provision of the override spring 54 which is compressed during such movement, due to the relative movement between the closure disc 42 and the valve stem 40.

When the clock timer 178 reaches its starting time position fuel will be admitted through pipe 78, inlet 80 and chamber 82 through apertures 90, outlet 92 and pipe 74 to the pilot burners 70 and 112. Simultaneously, fuel flows through the branch pipe 76 to the auxiliary pilot burner 72. The flash tubes 120 and 122 cause ignition of pilot burners 70 and 112 respectively after the auxiliary pilot burner 72 is ignited by flash tube 118 from the constant burning pilot burner 12.

After a predetermined time delay, during which the bimetal strip 136 becomes sufficiently heated by the flame from the auxiliary pilot burner 72, the strip warps and trips the latching element 130. This warping of the bimetal strip 136 causes the direction of the torque at the slot 134 to be changed from clockwise to counter-clockwise. Hence, the latching element 130 is rotated counter-clockwise when tripped and will move the bimetal strip 136 out of the flame of the auxiliary pilot burner 72 to its initial cold position and simultaneously relieve the force upon the reset button 106.

The system is now in its steady state operating condition. The retraction of the reset stem 104 has caused the auxiliary valve 94 to be moved under the bias of the spring 97 into engagement with its seat to prevent flow of fuel from the inlet 80 through the apertures 90 to the outlet 92 so that the flow of fuel through the pipe 74 to the flash pilot burner 70, thermocouple heating burner 112 and auxiliary pilot burner 72 is cut off. However, the time for heating the bimetal strip 136 sufficiently to cause it to warp is made long enough so that the thermocouple 108 can become sufficiently heated by the flame from the thermocouple heating burner 112 and the ignition pilot burner 114 to generate current for energizing the electromagnet before the auxiliary valve 94 is moved to closed position. As the armature 66 is now held in attracted position against the pole faces of the magnet 62, the valve member 36 remains open while the closure disc 42 becomes disengaged from the seat 44 under the bias of the coil spring 50. Flow of fuel from the inlet 26, passage 32 and outlet 34 to the main burner 10 is now permitted. This burner is ignited by the flame at the ignition pilot burner 114.

It has been mentioned that the thermocouple heating burner 112 could be dispensed with if desired provided that the ignition pilot burner 114 be positioned to ignite the main burner 10 and also heat the thermocouple 108. Consequently, the flash pilot burner 70 would be located in the pipe 116 and the flash tubes 120 and 122 rearranged accordingly. When the resetting operation is completed and auxiliary valve 94 closed, then the flow of fuel to the pilot burner 72 is cut-off. The ignition pilot burner 114 would, however, remain in operation as the pipe 116 is connected to the pipe 78 ahead of the control device 22.

If at any time during the interval between the starting and stopping time positions of the clock timer 178 the thermocouple 108 ceases to be heated by the ignition pilot burner 114, then the armature 66 will be released from the pole faces of the magnet 62 causing the safety valve member 36 to close and prevent further flow of fuel to the main burner 10. Otherwise, the apparatus will operate normally with the main burner under control of the thermostat combined with the main fuel

cock 20 until the clock timer 178 reaches its stopping time position.

At the stopping time position, the clock valve member 182 will automatically be closed to shut-off the fuel supply in the pipes 78 and 116. The ignition pilot burner 114 will thus cease to produce a flame and the thermocouple 108 will cool and cause the safety valve 36 to close. The apparatus is thus arranged for 100 per cent shut-off of fuel whenever the clock timer 178 operates to close its valve member 182.

It will be observed that the first and second timing devices described are operated independently by separate manual means. This arrangement makes it possible for the latching element 130 to be set at one time and the timing device therefor, comprising bimetal strip 136, to be set to operate at any time thereafter under control of the clock timer 178. Thus, although both the latching element 130 and its timing device 136 are placed in operative condition by a single manipulation of the handle 21, they are not actually rendered operative until the desired starting time as set by the clock timer 178. Moreover, the thermoelectric safety means is caused to serve two useful purposes instead of one. This occurs by reason of the use of the thermocouple 108 to determine the stopping time for the apparatus under control of the clock timer 178, as well as its more customary use as a safety device responsive to a pilot burner flame.

It will be apparent that many changes may be made in the details of construction and arrangement and combination of parts within the scope of the appended claims without departure from the invention disclosed herein.

I claim:

1. A safety control apparatus for fuel burners having main and pilot burners and a source of fuel supply, comprising electromagnetic means having a member operable between positions for controlling the flow of fuel to the main burner and being biased to a fuel supply preventing position, means responsive to the presence of a flame at the pilot burner for causing energization of said electromagnetic means for holding said member in a fuel supplying position, resetting means operable for positioning said member in said position to supply fuel to the main burner and including a timing device adopted to be conditioned for terminating the resetting operation upon expiration of a predetermined period during which said flame responsive means has time to become responsive, conditioning means for rendering said timing device effective, and a second timing device controlling said conditioning means and being adjustable between selected time positions for initiating said period at a selected time following operation of said resetting means.

2. A safety control apparatus for fuel burners having main and pilot burners and a source of fuel supply, comprising electromagnetic means having a member operable between positions for controlling the flow of fuel to the main burner and being biased to a fuel supply preventing position, means responsive to the presence of a flame at the pilot burner for causing energization of said electromagnetic means for holding said member in a fuel supplying position, resetting means operable for positioning said member in said position to supply fuel to the main burner and including a timing device adapted to be conditioned for terminating the resetting operation upon expiration of a predetermined period during which said flame responsive means has time to become responsive, conditioning means for rendering said timing device effective and a second timing device controlling said conditioning means and having means for controlling the flow of fuel to the pilot burner and being adjustable between selected time positions for preventing said flow until a selected time following operation of resetting means.

3. A safety control apparatus for fuel burners having a plurality of burners including main and pilot burners and a source of fuel supply therefor, comprising electromagnetic means having a member operable between positions for controlling the flow of fuel to at least the main burner and being biased to a fuel supply preventing position, means responsive to the presence of a flame at one of said pilot burners for causing energization of said electromagnetic means for holding said member in a fuel supplying position, resetting means operable for positioning said member in said position to supply fuel to the main burner and including a timing device operable only when the flame at another one of said pilot burners has existed for a predetermined period for terminating the resetting operation, and a second timing device having means for controlling the flow of fuel to the last said pilot burner and being adjustable between selected time positions for preventing said flow until a selected time following operation of said resetting means.

4. A safety control apparatus for fuel burners having a main burner, a pair of pilot burners and a source of fuel supply, comprising electromagnetic means having a member operable between positions for controlling the flow of fuel to the main burner and being biased to a fuel supply preventing position, means responsive to the presence of a flame at one of the pilot burners for causing energization of said electromagnetic means for holding said member in a fuel supplying position, resetting means operable for positioning said member in said position to supply fuel to the main burner and including a device responsive to a flame at the other pilot burner for terminating the resetting operation, and a timing device having means controlling the flow of fuel to at least said other pilot burner and being adjustable between selected time positions for preventing said flow until a selected time following operation of said resetting means.

5. A safety control apparatus for fuel burners having a main burner, a pair of pilot burners and a source of fuel supply, comprising valve means operable between open and closed positions for controlling the supply of fuel to at least the main burner and being biased to said closed position, electromagnetic means operatively associated with said valve means for holding the same in open position when energized, thermoelectric means responsive to the heat of a flame at one of the pilot burners and operative for energizing said electromagnetic means sufficiently to retain said valve means in said open position, resetting means operative for positioning said valve means in said open position and including a first timing device responsive to a flame at the other pilot burner and operative for terminating the resetting operation, means operatively associated with said resetting means for interrupting the flow of fuel to the main burner during the resetting operation, and a second timing device adjustable to starting and stopping time positions and having means for preventing flow of fuel to said pilot burners except in the interval between said positions, said first timing device being automatically rendered operative at said starting time

and said thermoelectric means being rendered inoperative at said stopping time.

6. A control apparatus for fuel burners having main and pilot burners, a main shut-off valve movable between positions for controlling the fuel supply to the burners, safety shut-off means operable between positions for controlling the fuel supply to at least the main burner and being located remote from the main valve, means for biasing said safety means to a fuel supply preventing position, operating means for positioning said main valve, connecting means between said operating means and said safety means for positioning the latter in a fuel supply permitting position, said connecting means including a timing device adapted to be conditioned during a predetermined period for rendering said connecting means inoperative upon expiration of said period, conditioning means for rendering said timing device effective and a second timing device controlling said conditioning means and being adjustable between selected time positions for initiating said period at a selected time following operation of said operating means.

7. A control apparatus for fuel burners having main and pilot burners, a main shut-off valve movable between positions for controlling the fuel supply to the burners, safety shut-off means responsive to a flame at one of the pilot burners and operable between positions for controlling the fuel supply to at least the main burner and being located remote from the main valve, means for biasing said safety means to a fuel supply preventing position, adjustable operating means for positioning said main valve to admit fuel to the burners, connecting means between said operating means and said safety means for positioning the latter to admit fuel to the main burner, said connecting means including a timing device responsive to a flame at another of the pilot burners and operable after a predetermined period for rendering said connecting means inoperative, and a second timing device adjustable independently of said main valve operating means to starting and stopping time positions, said second timing device having means for preventing flow of fuel to the pilot burners except in the interval between said positions, said first timing device being automatically rendered operative at said starting time and said safety means being rendered inoperative at said stopping time.

8. Safety control and ignition apparatus for fuel burners, comprising in combination, a main burner, a fuel supply pipe connected to the main burner, means for igniting said main burner including a flash pilot burner in proximity of the main burner and having separate connection with said fuel supply pipe, a constant burning pilot burner positioned remote from said flash pilot burner, a flash-tube extending between said pilot burners for conducting a flame therebetween, a safety shut-off valve yieldingly urged closed for controlling flow of fuel to said main and flash pilot burners, electromagnetic means effective when energized for holding said safety valve open, a thermoelectric generator adapted to be heated by a flame at the flash pilot burner for energizing said electromagnetic means but insufficiently to open said safety valve, means

operative for opening said safety valve, an auxiliary burner in proximity of said constant burning pilot burner, a flash-tube extending between said auxiliary and constant burning pilot burners, means responsive to a flame at said auxiliary burner for rendering said valve opening means operative for a predetermined period during which said thermoelectric generator has time to become heated, and a timing device having means for preventing flow of fuel to said auxiliary and flash pilot burners except during a selected time interval following operation of said valve opening means.

9. Safety control and ignition apparatus for fuel burners comprising in combination, a main burner, a fuel supply pipe connected to the main burner, means for igniting the main burner including a flash pilot burner in proximity of the main burner and having separate connection with said fuel supply pipe, a constant burning pilot burner positioned remote from said flash pilot burner, a flash-tube extending between said pilot burners for conducting a flame therebetween, a safety shut-off valve yieldingly urged closed for controlling flow of fuel to said main burner, electromagnetic means effective when energized for holding said safety valve open, a thermoelectric generator adapted to be heated by a flame at the main burner for energizing said electromagnetic means but insufficiently to open said safety valve, an auxiliary burner in proximity of said constant burning pilot burner, a flash-tube extending between said auxiliary and constant burning pilot burners, an auxiliary valve yieldingly urged closed for controlling flow of fuel to said auxiliary and flash pilot burners, manually operable means for opening said safety and auxiliary valves, means for interrupting flow of fuel to the main burner upon operation of said manually operable means, a latch operatively associated with said manually operable means for holding said valves open, a thermal element cooperable with said latch and responsive to a flame at said auxiliary burner for causing said auxiliary valve to close after said thermoelectric generator has had time to become heated, and a timing device adjustable to starting and stopping time positions and having means for preventing flow of fuel to said auxiliary and flash pilot burners except in the interval between said positions, said thermal element becoming automatically operable at said starting time position and said thermoelectric generator being rendered inoperative at said stopping time position.

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