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SAFETY CONTROL AND IGNITION APPARATUS FOR GASEOUS FUEL BURNERS

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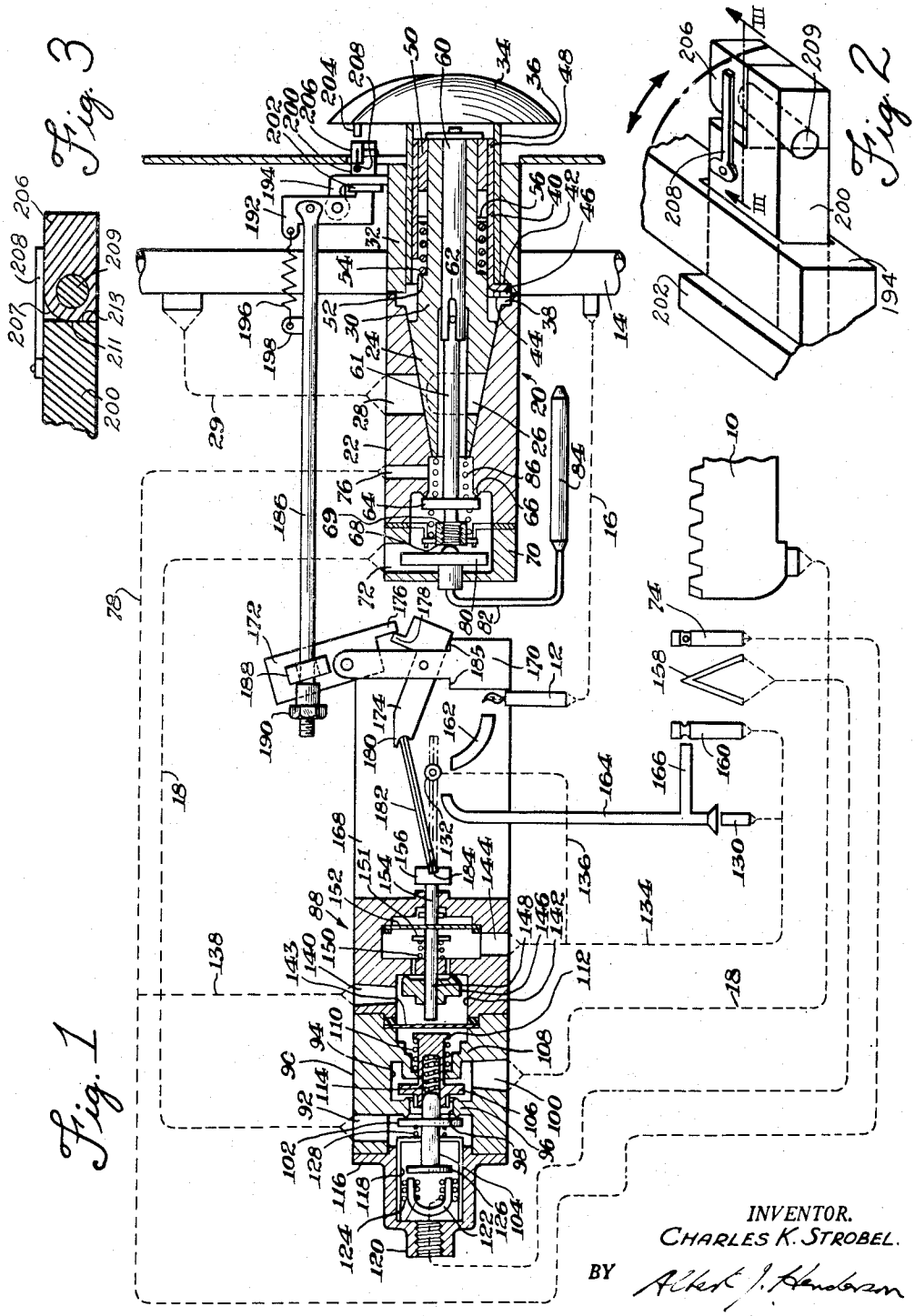

Fig. 1

Fig. 3

Fig. 2

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SAFETY CONTROL AND IGNITION APPARATUS FOR GASEOUS FUEL BURNERS

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4 Claims. (Cl. 158—130)

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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, there is disclosed a flash-tube ignition system embodying a thermoelectric safety device. The system is placed in operation by manipulation of the oven gas cock which may include a thermostatic device for control of oven temperatures. Such devices are disclosed in Weber Patent No. 2,303,011 as requiring an axial motion of the dial or handle prior to the rotary motion thereof which moves the cock to open position. In the copending application the rotary motion is made use of to operate a pull-wire arrangement during the starting period by which a thermal timing device is positioned to determine such period.

An object of the present invention is to render such apparatus more useful by eliminating objectionable torques due to the pull-wire arrangement.

Another object of the invention is to insure positive operation of the apparatus whenever a starting period is initiated.

Another object of the invention is to simplify the mechanism and, incidentally, to improve the operation of the flash-tube ignition portion of the apparatus.

Another object of the invention is to locate various parts of the apparatus in low ambient temperature zones to lengthen the useful life and improve the general performance.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing wherein Fig. 1 is a somewhat schematic plan view, shown partly in section, of a safety control and ignition apparatus for an oven burner embodying the invention; Fig. 2 is an enlarged view of a detail; and Fig. 3 is a sectional view taken on the line III—III of Fig. 2.

Referring more particularly to the drawing, the safety control and ignition apparatus is shown with a cooking range 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 connected to a

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main fuel pipe 18 in which the fuel supply is under control of a combined main fuel valve and thermostat 20 of the type disclosed in the aforementioned patent to Weber. As structures of this nature are well known, only the essential portions thereof will be described herein and reference may be had to the patent, if desired, for further details. The combined valve and thermostat 20 comprises a main casing 22 within which a tapered valve member or cock 24 is adapted to rotate. The valve member 24 is hollow and is provided with a port 26 in its side wall adapted to register with an inlet opening 28 formed in the main casing 22. A pipe 29 serves to connect the inlet 28 with the manifold 14 for supplying fuel to the interior of the valve member 24 when the latter is in open position.

Rotation of the valve member 24 is effected by the provision of a reduced stem 30 which projects from the larger end of the valve member 24 into an end casing or cover 32 secured to the main casing 22. A dial or handle 34 is mounted exteriorly of the cover 32 on a tubular projection 36 which fits closely in the cover 32 and is spaced from the stem 30. The projection terminates at its inner end within an annular recess 38 formed in the main casing 22 adjacent the larger end of the valve member 24. A sleeve 40 is slidably mounted within the projection 36 and is provided with an end flange 42 which enters a slot 44 in the inner end of the projection 36 and provides means by which rotation of the dial or handle 34 may be imparted to the sleeve 40.

The flange 42 extends radially beyond the projection 36 into engagement with a slot 46 formed in the cover 32 opposite the annular recess 38, the arrangement serving as will hereinafter be apparent to prevent rotation of the dial or handle 34 until axial movement thereof relative to the valve member 24 sufficient to move the sleeve 40 from a retracted position and release the flange 42 into the recess 38 has occurred.

The end of the sleeve 40 opposite the flange 42 is provided with a plurality of oppositely disposed tongues 48 which project therefrom into complemental slots (not shown) formed in the outer surface of a collar 50 secured to the end of the valve stem 30. That portion of the valve stem 30 which is located within the sleeve 40 is preferably reduced in diameter forming a shoulder 52 in which one end of the coil spring 54 abuts. The opposite end of the spring 54 abuts a plurality of projections 56 formed on the sleeve 40 and located intermediate the ends thereof and serves to bias the sleeve 40 to its retracted position.

The valve stem 30 is provided with an operating shaft 60 connected by a pin and slot connection 62 to an extension 61 which projects through the main casing 22. The opposite end of the extension 61 carries a reciprocable valve member 64 cooperable with an annular valve seat 66 formed in the casing 22. A projection 68 on the valve member 64 has threaded engagement with a nut 69 located within an end casing 70. The nut 69 is anchored to the end casing 70 in such manner as to permit relative axial movement while preventing relative rotation therebetween. Due to the connections described, it is apparent that rotation of the dial 34 will not only rotate the main valve member 24 but will also position the valve member 64 relative to its seat 66.

The end casing 70 is provided with an outlet 72 for passage of fuel from the inlet 28 when the main valve member 24 and valve member 64 are both in open position. In order that fuel may flow to a pilot burner 74 for the main burner 10 whenever the valve member 64 is closed, a passage 76 is formed in the main casing 22 intermediate the valve members 24 and 64 for this purpose. A pipe 78 serves to connect the passage 76 with the pilot burner 74. As will hereinafter be explained, the pilot burner 74 may be dispensed with if desired.

Thermostatic means for operating the valve member 64 include a diaphragm element 80 positioned within the end casing 70 in operative engagement with the projection 68 and having the usual capillary tube 82 and bulb element 84 associated therewith. The bulb element 84 may be located in the oven or other chamber being heated by the main burner 10. When the bulb member 84 responds to the temperature indicated on the dial 34, then the diaphragm element will be sufficiently expanded to seat the valve member 64 on its seat 66 against the bias of a coil spring 86 which is operative between the valve member 64 and the end of the main valve member 24.

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 88. This thermomagnetic control device 88 is interposed in the main fuel pipe 18 in proximity of the top pilot burner 12 between the combined main fuel valve and thermostat 20 and the oven burner 10. The control device 88 comprises a casing 90 having an inlet connection 92 extending through the side wall thereof adjacent one end and communicating with an axial main fuel chamber 94 therein. The main fuel chamber 94 is provided with a partition 96 having an axial opening 98 through which fuel may flow from the inlet 92 to an outlet 100 formed in the wall of the casing 90 at the opposite end of the chamber 94. The inlet 92 and outlet 100 serve as connections for opposite ends of the fuel pipe 18 as will be apparent.

The passage 98 is controlled by a safety valve member 102 which is movable into and out of engagement with a valve seat formed on the side of the partition 96 adjacent the inlet opening 92. The valve member 102 is secured to a valve stem 104 which extends through the opening 98 and has slidable engagement with a closure disc 106 which seats on the opposite side of the partition 96. The purpose of the closure disc 106 is to interrupt the flow of fuel through the passage 98 when the valve member 102 is moved out of engagement with its seat during the resetting operation to be described hereinafter.

The closure disc 106 is reduced opposite its seating area to slide within an annular projection or housing 108 on the bottom of the chamber 94. A coil spring 110 is carried by the reduced end of the closure disc 106 and is operative between the housing 108 and an abutment 112 formed on the reduced end. It should be observed that when a force is applied to the abutment 112 to move the closure disc 106 into engagement with its seat, the coil spring 110 will be compressed. When the force is removed, the bias of the spring 110 will serve to return the closure disc 106 to its open position relative to the seat. However, a yieldable connection is also provided between the closure disc 106 and the valve member 102 to permit relative movement therebetween and this connection forms an override mechanism which includes a coil spring 114 housed within an axial recess projecting from the closure disc 106 into the reduced end thereof and being operative between the bottom of the recess and the end of the valve stem 104.

The end of the casing 90 adjacent the inlet 92 is provided with a closure cap 116 having a magnet housing 118 closely engaging the inner wall thereof. The closure cap 116 at its outer end embodies a threaded terminal connection 120. The magnet housing 118 supports a horseshoe magnet 122 which is provided with the usual winding 124 having one end grounded on the closure cap 116 and the opposite end secured to the terminal connection 120. The valve stem 104 projects into the magnet housing 118 and the electromagnetic device is completed by the provision of an armature 126 which is carried by the valve stem 104 for cooperation with the pole faces of the magnet 122.

It should be noted that the armature 126 is normally spaced from the magnet 122 a less distance than the closure disc 106 is spaced from its seat on the partition 96. Thus, after the armature 126 is in attracted position against the pole faces of the magnet 122, the override spring 114 permits further movement of the closure disc 106 relative to the valve stem 104. When the valve member 102 is fully disengaged from its seat, then the armature 126 is in attracted relation relative to the pole faces of the magnet 122. The valve member 102 is biased to its seat and the armature 126 to its released position by the provision of a coil spring 128 operative between the valve member 102 and the bottom of the magnet housing 118.

The control device 88 also includes means to control the flow of fuel to a flash pilot burner 130 and an auxiliary pilot burner 132. The flash pilot burner 130 is located in the oven compartment adjacent the main burner 10 while the auxiliary pilot burner 132 is located adjacent the top pilot burner 12. Both burners 130, 132 are supplied with fuel by the pipe 134 extending from the control device 88, the auxiliary pilot burner 132 being conveniently connected to pipe 134 by a branch pipe 136. This fuel is under control of the thermomagnetic control device 88 by connection of one end of a pipe 138 to an inlet opening 140 extending through the wall of the casing 90 and having its opposite end connected to the pipe 78. The inlet opening 140 communicates with an auxiliary fuel chamber 142 formed axially of the casing 90 and separated from the main fuel chamber 94 therein by the housing 108. The bottom wall of the chamber 142 is apertured to provide passage for fuel from the inlet 140 to an outlet 144 formed in the wall of the casing 90

on the opposite side of the bottom wall and adapted for connection to the fuel pipe 134.

Passage of fuel from the inlet 140 to the outlet 144 is controlled by an auxiliary valve member 146 which is movable into and out of engagement with the apertured bottom wall of the chamber 142 by operation of a valve stem 148 which is secured to the valve member 146 and extends on either side thereof. One end of the valve stem 148 is located in the chamber 142 and terminates adjacent the abutment 112 with a sealing diaphragm 143 interposed therebetween. The auxiliary valve member 146 is biased into engagement with the apertured bottom wall of the chamber 142 by a coil spring 150 carried on the opposite end of the stem 148 and which is operative between the bottom wall and a collar 151 carried on the valve stem 148. This opposite end of the valve stem 148 terminates beyond the collar thereon for operative engagement with a second sealing diaphragm 152.

A reset stem 154 extends from the opposite side of the diaphragm 152 through the bottom wall of the casing 90 and is provided with a button 156 exterior of the casing 90 and by means of which the reset stem 154 may be reciprocated.

The electromagnet comprising the winding 124 and horseshoe magnet 122 is adapted to be energized by current generated from a thermocouple 158 which is connected by suitable leads to the winding 124 at the terminal connection 120. The thermocouple 158 is located so that the hot junction thereof will be heated by a flame from a thermocouple heating burner 160 which receives a supply of fuel from the pipe 134 which also supplies fuel to the flash pilot burner 130. It will be apparent that the thermocouple heating burner 160 and the portion of the pipe 134 beyond the branch pipe 136 could be dispensed with if the ignition pilot burner 74 is arranged to heat the thermocouple 158 and also ignite the main burner 10 and the burner 130 is connected into the supply pipe 78.

A system of flash tubes is provided for igniting the various burners of the apparatus from the constant burning top pilot burner 12. Accordingly, a relatively short flash tube 162 is provided between the constant burning top pilot burner 12 and the auxiliary pilot burner 132, it being apparent that fuel from the branch pipe 136 supplying the auxiliary pilot burner 132 will enter the flash tube 162 and be ignited from the constant burning pilot burner 12. The flame so created will be conducted back through the flash tube 162 and will ignite the fuel flowing from the auxiliary pilot burner 132.

An elongated flash tube 164 is provided between the auxiliary pilot burner 132 and the flash pilot burner 130 which is remote therefrom. This flash tube 164 serves to cause ignition of the flash pilot burner 130 in a manner similar to that described in connection with the flash tube 162. In addition, a branch flash tube 166 extends from the flash tube 164 adjacent the flash pilot burner 130 to the thermocouple heating burner 160 and likewise serves to ignite the fuel flowing therefrom. It will be understood that if the burner 160 is dispensed with, then the flash tubes 164 and 166 would be arranged to ignite the ignition pilot burner 74 directly, instead of this burner being ignited from the thermocouple heating burner 160.

The heat of the flame from the thermocouple heating burner 160 on the thermocouple 158 serves to energize the electromagnet 122, 124 sufficiently to hold the armature 126 in attracted position but the thermoelectric current so generated is incapable of moving the armature 126 to this attracted position. Hence, resetting means is provided and will now be described.

The control device 88 is provided with a bracket 168 extending toward the top pilot burner 12 and forming a support for the auxiliary pilot burner 132. The bracket 168 is provided with a support 170 upon which a pair of pivoted members 172, 174 are rotatably and separately carried. The pivoted members 172, 174 constitute a latch and have interengaging means thereon for rotating one from the other. Thus, the member 172 is provided with a projection 176 which is adapted to operably engage a complemental projection 178 carried on the member 174. The member 174 is provided with a slotted end 180 opposite the projection 178 thereon and being offset from the longitudinal axis.

Extending between the slotted end 180 and the reset button 156 is a timing device comprising a bimetal element 182 which is retained in position on the reset button 156 by the provision of a transverse slot 184 disposed transversely of the longitudinal axis of the reset stem 154. Pivotal movement of the member 174 is restricted by its alternative engagement with oppositely disposed shoulders 185 formed on the support member 170. As indicated in the drawing, when the reset button 156 is unoperated, the bimetal element 182 occupies a position on one side of and at an angle to the axis of the reset stem 154. In this position, the bimetal element 182 is offset from the auxiliary pilot burner 132 which projects through the bracket 168 substantially midway between the control device 88 and the support 170.

Manually operable safety means for moving the bimetal element 182 and latching member 174 into substantial alignment with the axis of the reset stem 154 are provided and it will be apparent that in such position the bimetal element 182 will be subject to the heat of the flame of the auxiliary pilot burner 132. In the preferred embodiment, the element 182 will be slightly out of alignment with the latching member 174 for a purpose which will more fully appear. In this position the reset button 156 will be forced inwardly relative to the control device 88 to effect the resetting operation. The manually operable means include connecting means between the dial or handle 34 and the pivoted member 172 and takes the form of a connecting rod 186 supported at one end in an apertured bracket 188 carried by the pivoted member 172 and providing sufficient clearance for rotation of the member 172 during axial movement of the connecting rod 186. An adjusting element for the connecting rod 186 takes the form of a nut 190 threadedly engaging the end of the rod 186 which projects through the bracket 188 and having a bearing thereon for this purpose.

The opposite end of the connecting rod 186 is pivotally mounted on a third pivoted member 192 intermediate the ends thereof. The pivoted member 192 is rotatable on a bracket 194 projecting from the cover 32 and serves with the pivoted member 172 to support the connecting rod 186 in substantially parallel arrangement with the control device 88 and the combined valve and thermostatic mechanism 20. A tension spring 196 extends between one end of the third pivoted member 192 and a lug 198 formed on the

connecting rod 186 for the purpose of returning the pivoted member 192 to normal position after operation of the resetting device. It will be apparent that the spring 196 would not be essential if sufficient bias force may be obtained from the pivoted members 172, 174 and the bimetal element 182 to effect the desired result.

As best shown in Figs. 2 and 3, the bracket 194 also supports a slidable key element 200 having an enlarged end 202 engageable with the free end of the pivoted member 192 and carrying on its opposite end a pivotable tooth member 206 engageable with an operating member or pin 204 projecting from the dial or handle 34. The member 206 is here shown as generally cubical in form, having one edge chamfered at 207, and being pivotally mounted on a pintle 209 extending from the key element 200. A flat spring 208 may be secured at one end to the slidable member 200 with its opposite end engaging the pivoted member 206 to bias the same in a clockwise direction, as viewed in Figs. 2 and 3, so that a plane surface 211 thereof, adjacent the chamfer 207, is normally held in engagement with a plane surface 213 formed on the element 200. The pin 204 is located on the dial 34 in such position that the described engagement will occur when the shut-off cock or valve member 24 is in its full closed position. Thus, upon axial movement of the dial 34 to free the flange 42 from the slot 38 as described herein, which motion is an essential preliminary to rotary motion of the dial 34, the pin 204 will engage the outer face of the pivoted member 206 and the slidable element 200 will be moved axially relative to the bracket 194. It will be apparent that rotary motion of the dial 34 will move the pin 204 out of engagement with the pivoted member 206 to thereby free the slidable element 200 for return movement to its initial position under the bias of the spring 196. Return movement of the dial 34 to the "off" position will not be interfered with since, upon such movement, the pin 204 will contact the side of the pivoted member 206 and cause rotation thereof about the pintle 209 against the bias of the spring 208 to permit the flange 42 to be aligned with the slot 38.

In the operation of the device, it may be assumed that the parts are in the position shown in the drawing and that the constant burning top pilot burner 12 is producing a flame. The dial or handle 34 is then pushed inwardly by the operator to release the flange 42 from the slot 46 preparatory to rotating the dial 34 to a desired temperature setting. The initial axial movement of the handle or dial 34 causes the pin 204 and the slidable member 200 to move inwardly also and the slidable member 200 thereupon rotates the pivoted member 192 in a clockwise direction. The connecting rod 186 is thus pulled to the right as viewed in the drawing and the interengagement of the pivoted members 172, 174 causes rotation of the latter in a counterclockwise direction on the support 170. The end of the bimetal element 182 which is engaged with the pivoted member 174 is thus caused to move in a clockwise direction whereupon the bimetal element 182 assumes the broken line position shown in the drawing.

The rotation of the bimetal element 182 to the broken line position causes the reset button 156 and stem 154 to be forced inwardly and to be maintained in such position during such time as the bimetal element 182 remains unheated. The diaphragm 152 and the auxiliary valve stem 148 move to the left to open the auxiliary valve member 146. Such movement of the auxiliary valve stem 148 is sufficient to overcome the bias of the spring 110 and move the closure disc 106 against its seat on the partition 96. The valve member 102 is moved away from its seat on the opposite side of the partition 96 while the armature 126 is moved into engagement with the pole faces of the magnet 122. It should be noted that immediately prior to engagement of the closure disc 106 with its seat the armature 126 has been moved into engagement with the pole faces of the magnet 122 but the closure disc 106 can thereafter be moved into engagement with its seat due to the provision of the override spring 114 between these elements.

While the description of the various movements which occur upon inward movement of the dial or handle 34 may appear lengthy, it will be apparent that only a momentary lapse of time has occurred prior to rotative movement of the dial 34 which now is conducted. In other words, the inward pushing action and subsequent rotation applied to the dial 34 are part of a single manual operation which is continuous. Assuming that the dial or handle 34 is now rotated to a desired temperature setting, then the port 26 in the shut-off cock or valve member 24 becomes registered with the inlet opening 28 and fuel is supplied by way of the inlet pipe 29 from the manifold 14 to the interior of the valve member 24. Moreover, due to the threaded engagement of the thermostatic valve member 64 with the nut 69, this valve member 64 is now disengaged from its seat 66 a predetermined distance corresponding to the selected temperature setting on the dial 34. Fuel is thus permitted to flow through outlet 72 and pipe 18 to inlet 92 of the control device 88, through the pipe 78 to the ignition pilot burner 74 and also by way of branch pipe 138 to the control device 88.

As the auxiliary valve member 146 is disengaged from its seat, the fuel from the branch pipe 138 passes by way of inlet 140 and outlet 144 to the pipes 136 and 134. The auxiliary pilot burner 132, the flash pilot burner 130 and the thermocouple heating burner 160 are now supplied with fuel, consequently, these burners become ignited from the constant burning top pilot burner 12 by the flash-tube system described. The ignition pilot burner 74 also becomes ignited from the thermocouple heating burner 160. It will be observed, however, that no fuel can flow to the main burner 10 at this time due to the engagement of the closure disc 106 with its seat and consequent shutting off of flow of fuel between the inlet 92 and the outlet 100 of the control device 88.

After a predetermined time-delay during which the bimetal element 182 becomes sufficiently heated by the flame from the auxiliary pilot burner 132, the element warps and trips the latch comprising pivoted members 174 and 172. Since the bimetal element 182 is disposed at an angle to the axis of the member 174 when cold, warping of the bimetal will bring these elements into alignment and cause axial compression of the bimetal element 182. Thus, further warping of the bimetal element will cause an over center snap action to effect the tripping operation as the compressive forces are released. As the pivoted member 174 is rotated in a clockwise direction when tripped, the bimetal element 182 is rotated in a counterclockwise direction about the slotted end 184 in the reset button 156 as a pivot. The

bimetal element 182 is thus moved out of the path of a flame from the auxiliary pilot burner 132 to its initial cold position and simultaneously the force upon the reset button 156 is released. The connecting rod 186 is moved to the left, partly under bias of the spring 196, and at the same time the pivoted member 192 and slidable element 200 resume their initial positions shown in the drawing. It will be noted that the pin 204 has been rotated with the handle or dial 34 out of operative engagement with the tooth member 206 so that resumption of the initial position of the slidable element 200 is not interfered with. However, the dial 34 is still occupying an inward position and will maintain such position until the flange 42 on the sleeve 40 can again enter the slot 46. Such entry of the flange 42 occurs when the dial 34 is returned to the initial "off" position shown in the drawing and is not effective at this time.

The system has now assumed its steady-state operating condition. The retraction of the reset stem 154 has caused the auxiliary valve member 146 to become engaged with its seat to prevent the flow of fuel from the inlet 140 to the outlet 144 so that the flow of fuel through the pipes 134 and 136 to the flash pilot burner 130, thermocouple heating burner 160 and auxiliary pilot burner 132 is cut off. However, the time for heating the bimetal element 182 sufficiently to cause it to warp is made long enough so that the thermocouple 158 can become sufficiently heated by the flame from the thermocouple heating burner 160 to generate current for energizing the electromagnets 122, 124 before the auxiliary valve member 146 is moved to closed position. As the armature 126 is now held in attracted position against the pole faces of the magnet 122, the valve member 102 remains open while the closure disc 106 becomes disengaged from its seat under the bias of the coil spring 110. Flow of fuel from the inlet 92 and outlet 100 to the main burner 10 is now permitted. This burner is ignited by the flame at the ignition pilot burner 74 or where the latter is dispensed with by the flame at the thermocouple heating burner 160.

It has been mentioned herein that the ignition pilot burner 74 may be dispensed with if desired. It then becomes necessary for the thermocouple heating burner 160 to be positioned to ignite the main burner 10. As the flow of fuel to this burner 160 is cut off by closure of the auxiliary valve member 146 when the resetting operation is completed and the closure disc 106 has only at that time left its seat, it is also necessary that the unconsumed fuel remaining in pipe 134 after the auxiliary valve member 146 closes be relied upon to continue the flame at this burner until the main burner 10 is ignited thereby. Moreover, after the thermocouple heating burner 160 ceases operating it will be necessary for the thermocouple 158 to be heated by the flame from the main burner 10. An advantage of the arrangement is that a hundred per cent shut-off of fuel is obtained upon operation of the safety control. Where the ignition pilot burner 74 is employed it is unnecessary to locate the thermocouple 158 to be heated by the main burner flame or to rely upon residual fuel in pipe 134 to ignite the main burner 10. In this arrangement, however, a hundred per cent shut-off is not possible due to the pipe 78 being connected to the combined valve and thermostatic device 20 ahead of the control device 88.

If at any time during the operation of the apparatus the thermocouple 158 ceases to be heated by the flame from the ignition pilot burner 74 or the main burner 10 where the ignition pilot burner is dispensed with, then the armature 126 will be released from the pole faces of the magnet 122 causing the valve member 102 to become engaged with its seat and prevent flow of fuel to the main burner 10. The dial or handle 34 may be operated in a counterclockwise direction to its original "off" position upon termination of the oven burner operation. During this return movement of the dial 34 the pin 204 will engage and rotate the toothed member 206 so that the return movement is not interfered with.

It will be apparent that an automatic means of resetting a thermomagnetic safety device has been provided and is operable by merely manipulating the usual knob of a fuel cock from "off" to "on" position or to a desired temperature setting where a combined thermostat and fuel cock 20 is provided. A positive rod connection operated by a push action has been substituted herein for the less reliable pull-wire operated by rotary motion as in the copending application.

It will be appreciated that, for most gas ranges, the desirable location of the safety device is directly in line with the range thermostat which is centrally disposed on the front of the range. The safety device is thus positioned in the rear section of the range while the partition between the oven and utility compartments provides a convenient mounting for the oven flash tube. The safety device with its valves and other movable parts is operated at relatively low ambient temperatures. If the oven flash tube terminates at the auxiliary pilot burner then the top bend of this flash tube is quite short or entirely eliminated to improve oven flashing. Terminating the oven flash tube at the auxiliary pilot burner also results in one less flash tube than is necessary in prior devices at the location of the constant burning pilot burner. The congestion of parts at this location is thus relieved.

It will be apparent that many changes may be made in the details of construction and arrangement of parts without departing from the scope of the invention so that this description and accompanying drawings are intended by way of illustration only and are not to be construed in a limiting sense.

I claim:

1. A control apparatus for fuel burners having main and pilot burners, a main shut-off valve rotatable between positions for controlling the fuel supply to the burners, operating means for rotating said valve between said positions, means for securing said operating means in relative non-rotatable but axially movable relation with said valve, safety shut-off means operable between positions for controlling the fuel supply to the burners and being located remote from said main valve, and connecting means between said operating means and said safety means and operable upon said axial movement for positioning said safety means to supply fuel to the pilot burner, said connecting means including a timing device responsive to a flame at the pilot burner for returning said connecting means to an inoperative position.

2. A control apparatus for fuel burners having main and pilot burners, a main shut-off valve rotatable between positions for controlling the fuel supply to the burners, operating means for rotating said valve between said positions, means for securing said operating means in relative

non-rotatable but axially movable relation with said valve, safety shut-off means operable between positions for controlling the fuel supply to the burners and being located remote from said main valve, a latch, a connecting rod between said latch and said main valve and operable upon said axial movement for effecting operation of said latch to a latching position, and a bimetal element between said latch and said safety means and movable for resetting said safety means to supply fuel to the pilot burner upon said latching operation, said bimetal element being moved by said latching operation into the path of a flame at the pilot burner, said element becoming warped when heated by said flame for movement out of said path and simultaneously releasing said latch for terminating the resetting operation.

3. A control apparatus as claimed in claim 2 wherein said latch comprises a pair of pivoted members having interengaging portions thereon, one said member being rotatable by said connecting rod for causing rotation of the other said member to said latching position, said other member operatively engaging said bimetal element for moving the same for resetting said safety means to supply fuel to the pilot burner and for moving said element into the path of said flame and being thereafter rotated by warping of said element when heated by said flame to release said latch and terminate the resetting operation.

4. A safety control apparatus for fuel burners having a main burner, a pair of pilot burners and a source of fuel supply, comprising a main shut-off valve rotatable between positions for controlling the fuel supply to the burners, operating means for rotating said main valve between said positions and being adapted for initial axial movement relative thereto, safety valve means operable between open and closed positions for controlling the supply of fuel to at least the main burner, electromagnetic means operatively associated with said safety 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 for energizing said electromagnetic means, and resetting means operative for positioning said safety valve means in said open position, said resetting means including a pair of pivoted members positioned intermediate said main valve and said safety valve means and having interengaging portions thereon, a third pivoted member rotatable by said operating means upon said axial movement thereof, a connecting rod between said third pivoted member and one of said pair of pivoted members, and a bimetal element located adjacent the other pilot burner and extending between said safety valve means and the other one of said pair of pivoted members, the arrangement being such that said axial movement of said operating means causes movement of said bimetal element into the path of a flame at said other pilot burner and simultaneous movement of said safety valve means to open position, said bimetal element thereafter warping to its initial position while said electromagnetic means holds said safety valve means in said open position.

CHARLES K. STROBEL.

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