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SAFETY CONTROL FOR GASEOUS FUEL BURNERS

Filed May 14, 1941

3 Sheets-Sheet 1

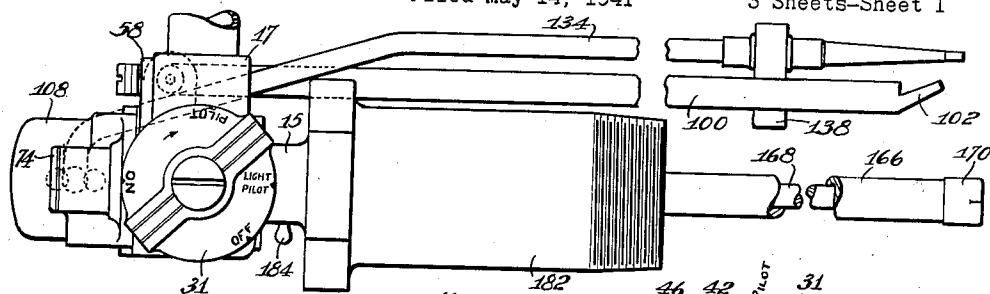


Fig. 1.

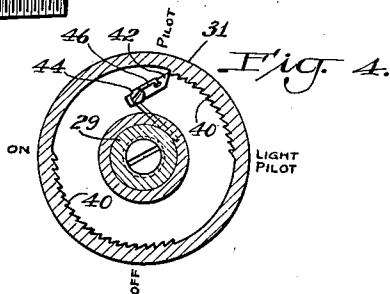


Fig. 4.

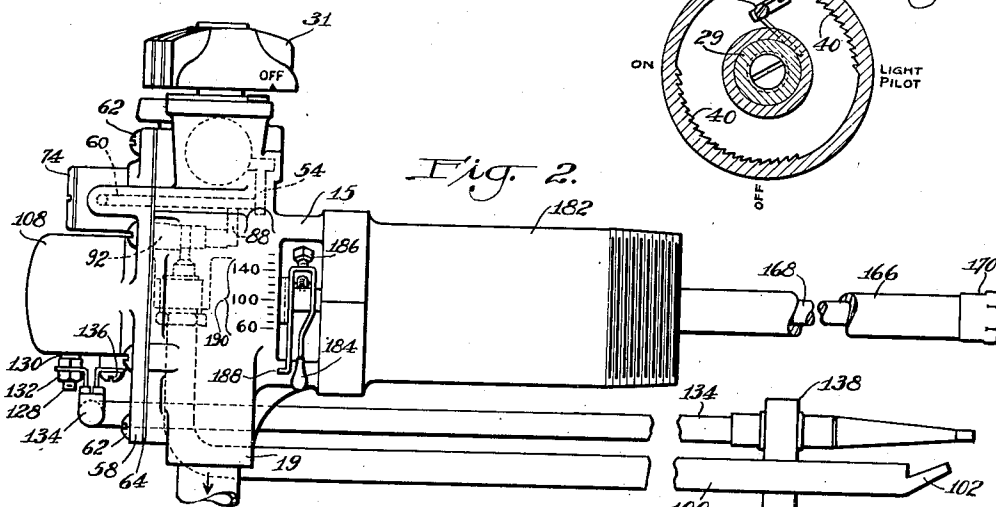


Fig. 2.

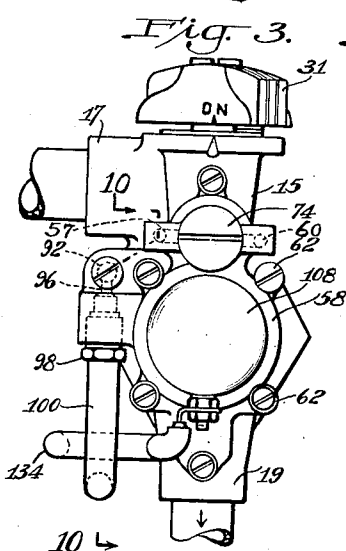


Fig. 3.

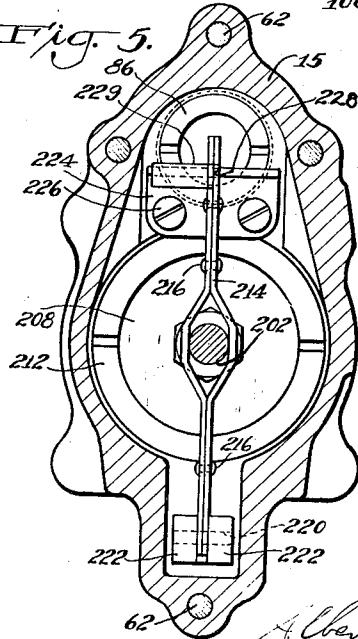


Fig. 5.

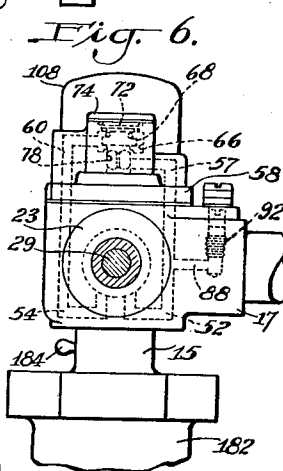


Fig. 6.

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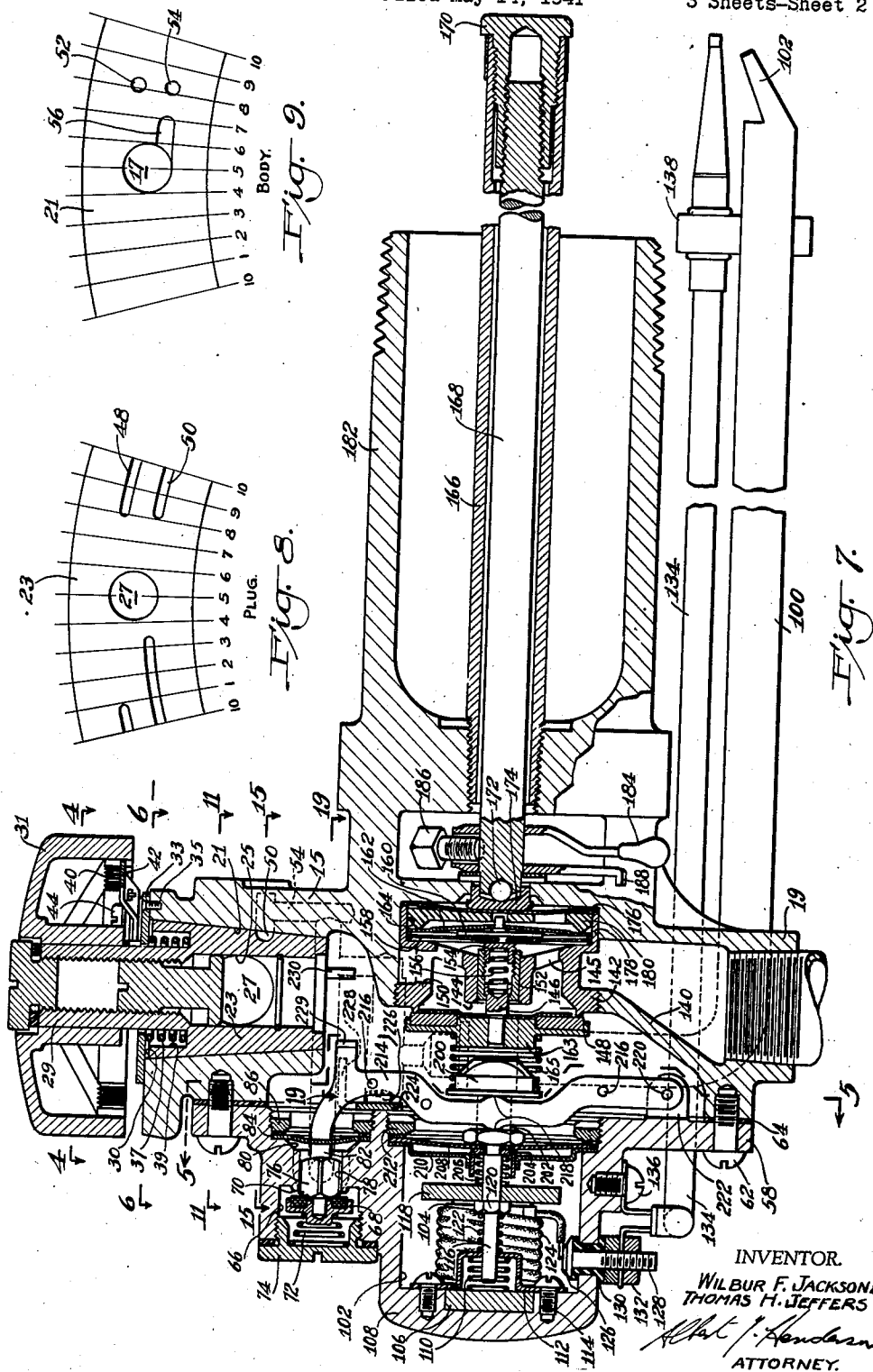
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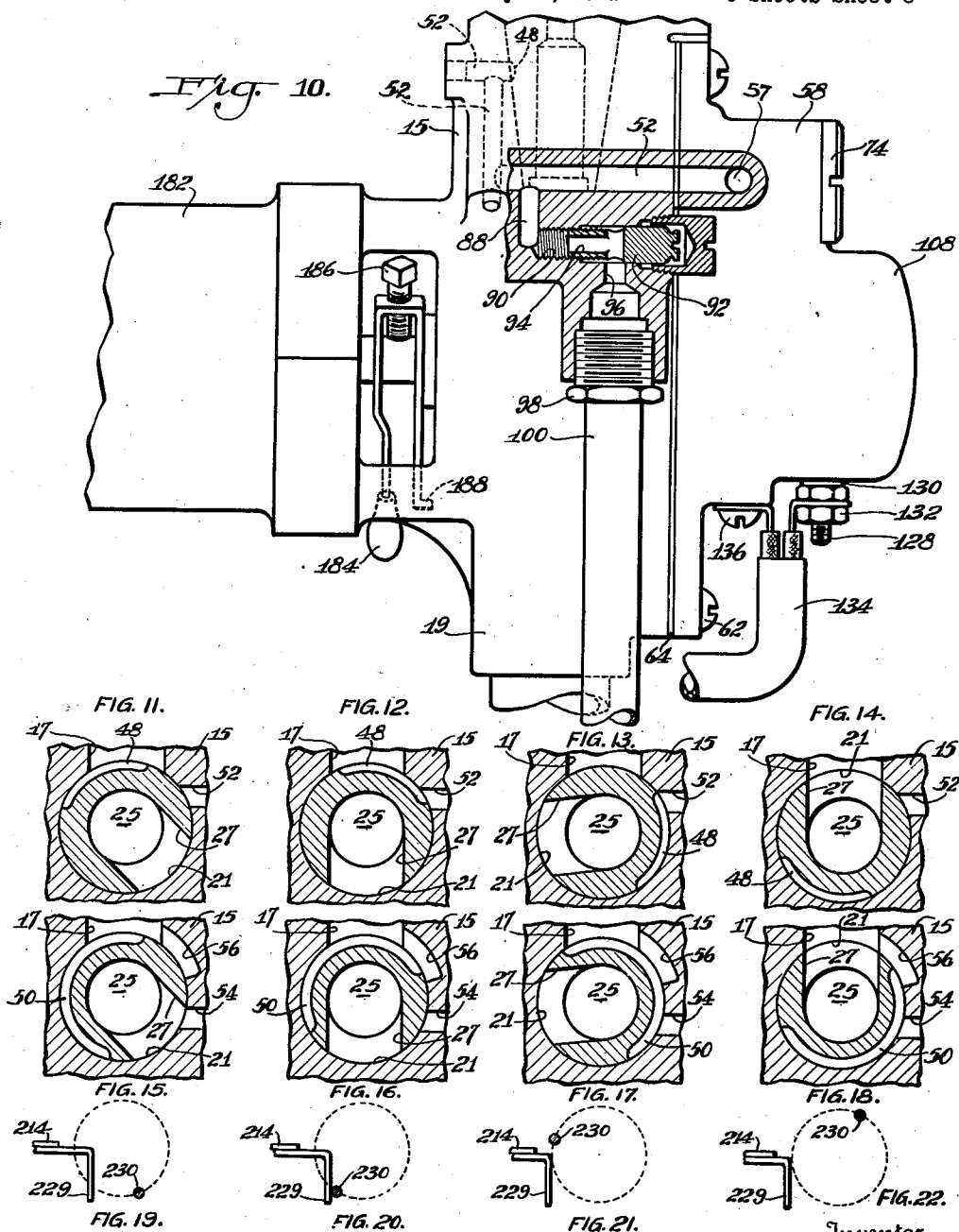
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SAFETY CONTROL FOR GASEOUS FUEL BURNERS

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SAFETY CONTROL FOR GASEOUS FUEL
BURNERS

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Application May 14, 1941, Serial No. 393,397

12 Claims. (Cl. 236—21)

This invention relates to safety controls for gaseous fuel burners and more particularly to controls for domestic water heaters and the like.

Fuel controlling devices have been proposed to permit manual opening of the pilot burner fuel passage and automatic opening of the main burner line only after the pilot burner is lighted. In normal operation fuel supply to the main burner is thermostatically regulated to maintain the water to be heated at a predetermined temperature. Should the flame of the pilot burner be extinguished for any reason, fuel supply to both the main and pilot burners is shut off and no fuel can flow to the burner until the device has been manually reset and the pilot burner relighted. Manual reset devices require the operator of the control to exert physical effort upon the device for a considerable period of time, usually against spring pressure before the pilot burner can be relighted. This operation has naturally proved tedious and fatiguing on many occasions to the average user of domestic appliances.

An object of this invention is to facilitate the operation of resetting the safety control by eliminating push buttons and similar manually operated devices.

Another object of the invention is to render the resetting operation entirely automatic.

Another object of the invention is to increase the safety features of such controls by reducing the number of parts.

Another object of the invention is to ensure complete and positive shut-off of the fuel supply to both main and pilot burners whenever the pilot burner is extinguished.

Another object of the invention is to utilize common means for resetting the safety control and operating the pilot valve.

Another object of the invention is to permit operation of the safety control not only during main burner operation but also when the appliance is being operated on the pilot burner alone.

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

Fig. 1 is a plan view of the improved control;

Fig. 2 is a side elevation;

Fig. 3 is an end elevation;

Fig. 4 is a reduced section taken on the line 4—4 of Fig. 7, looking in the direction indicated by the arrows;

Fig. 5 is a section taken on the line 5—5 of

Fig. 7, looking in the direction indicated by the arrows;

Fig. 6 is a section taken on the line 6—6 of Fig. 7, looking in the direction indicated by the arrows;

Fig. 7 is a longitudinal sectional view;

Figs. 8 and 9 are geometrical developments of the seating surfaces of the main fuel valve;

Fig. 10 is a section taken on the line 10—10 of Fig. 3, looking in the direction indicated by the arrows;

Figs. 11, 12, 13 and 14 are partial sections taken on the line 11—11 of Fig. 7 and showing different positions of the main fuel valve;

Figs. 15, 16, 17 and 18 are partial sections taken along the line 15—15 of Fig. 7 and showing different positions of the main fuel valve; and

Figs. 19, 20, 21 and 22 are partial sectional views taken along the line 19—19 of Fig. 7, showing the relative positions of the resetting device when the main fuel valve is in the positions of Figs. 11 to 14, respectively.

Referring more particularly to the drawings, the control comprises a casing 15 provided at one end with a laterally extending intake nipple 17 and at the other end with an outlet nipple 19 adapted to be connected by suitable piping with the main or heating burner of the water heater or other appliance (not shown).

The upper portion of the casing 15 is shaped to provide a tapered valve seat 21 within which a tapered plug cock 23 is seated. The plug cock 23 is provided with an axial bore 25 with which a port 27 extending through one wall of the cock 23 communicates. The port 27 affords communication between the inlet nipple 17 and the bore 25, in order that the fuel may flow into the body of the casing 15 when the cock is in the open position shown in Fig. 7.

The cock 23 is provided with a reduced stem 29 having a dial 31 mounted thereon against relative rotation and by means of which the cock 23 may be rotated in its seat 21. Movement of the cock 23 away from its seat is limited by a retainer plate 33 secured to the casing 15 by means of the screws 35 and overlying the shoulder 30 formed by the junction of the reduced stem 29 with the cock 23. A spring 37 is housed within a recess 39 at the junction of the stem 29 with the shoulder 30 and, by its engagement with the overlying portion of the plate 33, serves to maintain the cock 23 resiliently in its seat 21.

Rotation of the cock 23 in its seat is permitted in a clockwise direction without limitation, but

means are provided to limit counter-clockwise rotation thereof in certain positions. As shown in Figs. 7 and 4, the dial 31 is made hollow and is provided on its inner edge with diametrically opposite ratchet teeth sections 40 which cooperate with a pawl 42 mounted on the upper portion of the casing 15 above the retainer plate 33. The pawl 42 is secured to the casing 15 by means of a screw 44 and is maintained in yieldable engagement with the ratchet teeth 40 by means of a spring 46 of usual form. As will appear hereinafter, the ratchet teeth sections 40 are arranged in particular relationship with certain passages formed in the seating surface of the plug cock 23, it being understood that the cock forms the main fuel valve for controlling fuel flow for both the main and pilot burners of the appliance.

The pilot burner of this invention is adapted to receive fuel by either of two routes from the inlet 17, depending upon the position of the plug cock 23. To this end the seating surface of the plug cock 23, as shown in Figs. 8 and 9, is provided with an arcuate groove 48 opposite the port 27 and a second and longer arcuate groove 50 positioned therebelow. The grooves 48 and 50 are spaced one from the other within the margin of the inlet port 17 with which they are adapted to connect. Groove 48 communicates with a passage 52 which extends from the seat 21, while the groove 50 communicates with a passage 52 similarly extending from the seat 21. Extending from the inlet nipple 17 and formed in the plug seat 21, in alignment with the passage 54, is a shorter arcuate groove 56 which may also communicate with the groove 50 in the plug member 23 when in certain positions. As shown in Fig. 6, the passage 52 communicates with a passage 57 formed in an end casing 58, while the passage 54 communicates with a passage 60 also formed in the end casing 58. It should be noted that passages 52 and 54 in the main casing and passages 57 and 60 in the end casing are respectively in the same plane but on diametrically opposite sides of the casings.

The end casing 58 is secured to the main casing 15 by means of the screws 62 and a gas-tight joint between these casings is provided by a gasket 64. The passage 60 communicates with a chamber 66 in the end casing 58 and within which a pilot control valve 68 is housed. The pilot control valve 68 may be of any suitable form and, in this instance, is shown as being of the poppet type adapted to be moved into and out of engagement with its seat 70 against the pressure of a coil spring 72 retained in the chamber 66 by means of the cap 74. The stem 76 of the pilot control valve is suitably grooved to permit the passage of fuel therearound and is guided in an opening 78 formed in the end casing.

The passage 57 communicates with the opening 78 and it is thus apparent that when the pilot control valve is open the fuel from the passage 60 may flow past the valve seat and into the passage 57. A sealing chamber 80 formed in the end casing adjacent the opening 78 receives a projection 82 on the end of the valve stem 76. The sealing chamber 80 opens into the main casing 15 and leakage of fuel between the two casings is prevented by means of a diaphragm 84 which extends across the sealing chamber 80 and is secured in position by means of the threaded collar 86 engaging the end casing 58.

Intermediate the ends of the passage 52 in the main casing 15 is a transversely extending pas-

sage 88. This transverse passage 88, as shown in Fig. 10, communicates with one end of a threaded passageway 90 within which an adjustable plug 92 is adapted to rotate. A T-shaped passage 94 is formed in the plug 92, one leg of which communicates with the passage 88 and the other leg of which communicates with a passage 96 formed in the end casing 15. Rotation of the threaded plug will serve to move the passage 94 into and out of registry with the passage 96 to increase or diminish the effective area of the passage 94 and adjust the amount of fuel that flows through the passage 96. The latter passage communicates through a suitable coupling connection 98 with a conduit 100 connected, as shown in Fig. 7, with a pilot burner 102.

By referring to Figs. 11 to 18 inclusive, the flow of fuel in various positions of the shut-off cock 23 may be ascertained. In Figs. 11 and 15, the cock is shown in closed position and there is no communication between the inlet nipple 17 and the port 27, or between the arcuate grooves 48 and 50 and the passages 52 and 54, respectively. Upon being rotated from the closed position the cock first reaches the position designated "light pilot" on the dial 31. Such rotation of the cock is in a clockwise direction and, as will be clear from Fig. 4, the pawl 42 is out of engagement with either of the ratchet teeth sections 40 so that the dial can be rotated in a counter-clockwise direction toward the "off" position. The "light pilot" position of the cock is shown in Figs. 12 and 16, from which it will be apparent that the groove 48 is now in communication with both the inlet nipple 17 and the passage 52.

The next position of the plug cock 23, upon further rotation, is the "pilot" position, suitably marked upon the dial 31 and shown in Figs. 13 and 17, where the groove 50 affords communication between inlet 17 and passage 54. Further rotation of the dial 31 will move the plug cock 23 to the "on" position shown in Figs. 14 and 18. In this position the port 27 registers with the inlet nipple 17 and permits fuel to flow through the axial bore 25. Furthermore, communication between the inlet nipple and the pilot passage 54 is afforded by the arcuate groove 50 which extends across both the passage 54 and the groove 56 in the valve seat.

It will be apparent from Fig. 4 that counter-clockwise rotation of the dial from the "pilot" to the "light pilot" position is prevented by the engagement of the pawl 42 with the ratchet teeth section 40 provided on the dial between these positions. It will also be apparent that when the dial is rotated from the "on" to the "off" position, counter-clockwise rotation back to "on" position is also prevented by the pawl and the ratchet teeth section 40 between these positions.

As shown in Fig. 3, the pilot control valve assembly described is housed within part of the end casing 58 and is positioned on the vertical axis of the main casing 15. Positioned on the same vertical axis, and also in the end casing, is a chamber 102 (Fig. 7) within which a thermoelectric assembly is adapted to be housed. This assembly includes a horseshoe electromagnet 104 seated on its base 106 in an end cap 108 which is formed integral with the end casing 58.

In order to secure the magnet 104 yieldably in position and prevent distortion thereof, a coil spring 110 is held in position on the magnet base 106 by means of a magnet retainer 112 secured by means of the screws 114 to the end cap 108.

A stem 116 extends between the legs of the mag-

net 104 and through the magnet retainer 112, there being a clearance provided between the end of the stem 116 and the magnet base 106. The stem has slidable engagement with an armature bar 118, abutting a flange 120 on the stem and the bar is adapted to bridge the pole faces of the magnet 104 in the usual manner. An armature stem spring 122 extends between the nut 120 and the magnet retainer 112 and serves to urge the armature bar 118 away from the poles of the magnet 104.

The arms of the horseshoe electromagnet carry the coils of a wire 124, one end of which is connected by soldering or other suitable means to the head 126 of a terminal screw 128. The other end of the wire 124 is grounded as by connection to the magnet retainer 112 which is secured to the end cap 108. The terminal screw 128 is insulated from the end cap by means of the bushing 130 and is provided with nuts 132 between which one element of a thermocouple 134 is secured. The other element of the thermocouple 134 is grounded on the end casing by being connected thereto by means of the screw 136.

The thermocouple 134 may be supported by a bracket 138 in position to be heated by the pilot burner 102, thereby to establish an electric current to the coils 124 of sufficient strength to energize the magnet 104 and hold the armature bar 118 in contact with the pole faces thereof against the force of the spring 122, provided that the armature bar has been moved into contact with the magnet in a manner which will hereinafter be explained.

Thermostatic control of the main burner and safety control of the flow of fuel thereto should the pilot burner become extinguished, are provided in this invention by means of a single valve. In carrying out this feature of the invention the body of the main casing 15 is made of hollow form below the portion carrying the plug cock 23 and is provided with a web 140 within which an annular valve seat member 142 is removably mounted. The valve seat member 142 carries a hollow boss 144, connected thereto by a perforated flange 145, and in relation to which a valve stem 146 is adapted to reciprocate. A valve member 148 is secured on the valve stem 146 and co-operates with the valve seat 142 to control the flow of fuel through the ports 150 in the valve seat to the outlet nipple 19 with which the ports are aligned. It will be observed that the valve assembly is axially aligned with the thermoelectric assembly with which it is operatively associated.

The valve stem 146 is slidably mounted in a sleeve 152 which, in turn, is slidably mounted in the hollow boss 144. The sleeve 152 is internally threaded for a portion of its length and carries a threaded plug 154 suitably recessed for the reception of a spring 156 which is operative between the plug 154 and the valve stem 146. The end of the plug 154 projects beyond the sleeve 152 and is adapted to engage and be operated by a clicker mechanism comprised of a pair of opposed fulcrum levers 158, fulcrum button 160 and clicker disc 162, all of which are housed within a recess 164 formed in the annular valve seat 142. The valve member 148 is provided with a boss 163 for the support of a spring 165 which extends to the abutment member 200 and has its opposite end supported thereon.

Thermostatic means for operating the valve 148 through the clicker disc mechanism is provided and consists of an element of the rod-and-

tube type. A tube 166 of material having a high coefficient of expansion is securely mounted at its inner end on the casing 15. The rod 168 of the thermo-responsive unit, which is of material having a low coefficient of expansion, extends within the tube 166 and is threadedly connected at its outer end with a plug 170 anchored in the outer end of the tube 166. The inner end of the rod 168 is recessed for the reception of a ball 172 secured in position by means of a cap 174. The cap 174 engages a sealing disc 176 secured in a recess 178 in the casing 15 by the valve seat 142 and having its inner portion urged into engagement with a thrust member 180 by the cap member 174.

As is well known, the differential in the expansion of the rod and tube under the influence of the heat of the water in the appliance in which the device is mounted causes the rod to actuate the thrust member 180 to operate the clicker disc 162 which, in turn, operates the fulcrum button 160 and the opposed fulcrum levers 158. The levers 158 strike the plug 154 which, through the sleeve 152, actuates the valve member 148 to open position. It will be noted that the spring 156 is not compressed at this time as will be apparent hereinafter. Suitable means for mounting the control in the water heater or other appliance are provided by the elongated boss 182 projecting from the casing around the rod-and-tube element. The temperature at which the valve 148 will be operated may be adjusted by means of a manually operated lever 184 attached to the rod 168 by means of the set screw 186. The lever carries a pointer 188 for cooperation with indicia 190 on the casing. Movement of the lever in a vertical direction will serve to rotate the rod 168 and screw this rod further in or out of the plug 170 to change the expansion differential.

Movement of the valve 148 toward and away from its seat by the thermostatic device is governed by the condition of the thermoelectric mechanism previously described. Such governing action is effected by the provision of a valve operating mechanism for the thermoelectric assembly which will now be described. The armature stem 116 is provided, beyond the armature bar 118, with an extension carrying the abutment member 200. The abutment member is provided with an annular recess 202 intermediate its ends and is spaced from the valve member 148 when the armature bar 118 is in the attracted or active position shown in Fig. 7.

That portion of the armature stem extension which carries the abutment 200 is reduced in size and carries a retainer cap 204 within which an overload spring 206 is housed. The overload spring 206 acts between the retainer 204 and the armature bar 118 and serves to maintain uniform contact pressure between the armature and the electromagnet, as will hereinafter be described. Also carried on the reduced portion of the armature stem extension is a flexible sealing disc 208 which, together with a guide disc 210, is securely retained in position across the end of the chamber 102 by means of the threaded collar 212. As will be apparent, the function of the sealing disc 208 is to prevent the entrance of fuel into the magnet chamber 102 while at the same time permitting free movement of the armature bar 118 toward and away from attracted position with the pole of the magnet 104.

The means for actuating the armature 118 between active and inactive positions is entirely

automatic. A lever 214 is provided which is made of two substantially similar halves, secured together on either side of the central portion thereof by means of the rivets 216. The central portion of the lever 214 straddles the recessed portion 202 of the abutment member 200 and is provided with oppositely disposed rounded projections 218 which engage the opposite side walls of the recessed portion 202.

One end of the lever 214 is pivoted on a pin 220 extending between spaced bosses 222 on the end casing 58. The opposite or free end of the lever is curved and extends into engagement with the diaphragm 84 on the opposite side thereof to the pilot valve extension 82. In order to support the free end of the lever 214 against lateral movement and to provide a guide therefor, there is provided an angle plate 224, secured by means of the screws 226 to the end casing and having a slot 228 therein for the reception of the lever 214. The lever 214 is further provided with a projection 229 on the left-hand half thereof, as viewed in Fig. 5. The face of the extension 229 provides an abutment for an operating member in the form of a pin 230 which projects into the hollow casing 15 from the end of the plug cock 23.

As will be apparent, the positions of the dial are "off," "light pilot," "pilot" and "on." Fig. 7 of the drawings shows the control with the parts in the relationship they assume when the plug cock is in the "on" position and the thermo-electric control is in the active position, but when the thermostatic or control valve 148 is closed. The position of the plug cock 23 in the various positions of the dial and the relationship of the operating member 230 to the lever 214 in such positions are shown in Figs. 11 to 22 inclusive, to which reference is had during the description of the operation of the device which will now be given.

To operate the control from the "off" position of the dial, as shown in Figs. 11, 15 and 19, the dial is first rotated to the "light pilot" position. Until this position is reached, no gas can pass the shut-off cock 23 and both the pilot and the main burner valves are retained in closed positions.

In the "light pilot" position, as shown in Figs. 12, 16 and 20, the fuel may flow from the inlet nipple 17 by way of the arcuate groove 48 to the passage 52 and thence by way of passage 88 to the pilot adjusting screw 92. The pilot adjusting screw being in open adjusted position, the fuel can flow through the passages 94 and 96 to the conduit 100 and thence to the pilot burner 102. It will be observed that in reaching the "light pilot" position the operating member 230 has moved into abutting relation with the face of extension 229 of the lever 214, but has not rotated sufficiently to cause actuation of the lever. It will further be apparent that the fuel which flows to the pilot burner 102 in this position is not under control of any safety device.

When the "light pilot" position is reached, the pilot burner 102 is lighted and after a waiting period of about one minute the dial is rotated in a clockwise direction to the "pilot" position. As shown in Figs. 13 and 17, the supply of fuel is, in this position, cut off from the passage 52 but flow is provided between the inlet nipple 17 and the passage 54 by means of the arcuate groove 50. However, during the changeover there is an overlapping of grooving and passages

before the fuel supply is cut off from one passage and supplied to the other. Hence, the pilot flame is not extinguished during the movement of the plug cock 23 from the "light pilot" to the "pilot" position.

During this movement of the plug cock the operating member 230 is moved in a circular path against the face 229 of the lever 214 and serves to move it in a counter-clockwise direction about its pivot. Thus, when the "pilot" position is reached, the pilot valve 68 has been opened by this action of the lever 214 and the fuel may flow by way of passages 54, 60, 57 and 88 to the pilot burner 102, as shown in Fig. 6. Due to the counter-clockwise rotation of the lever 214, the center portion thereof carrying the rounded projection 218 will serve to move the armature stem 116, together with the armature bar 118, to the left as viewed in Fig. 7. When the movement of the plug cock 23 to the "pilot" position is completed, the armature bar 118 is thus seated against the pole faces of the electromagnet 104.

As shown in Fig. 21, the operating member 230 does not reach its extreme limit of movement against the face 229 of the lever 214 when the pilot valve is fully open. That is, after the pilot valve is fully opened and the armature bar is seated against the pole faces of the electromagnet, the operating member 230 continues to move in a circular path against the face 229 although no further movement of the lever in a counter-clockwise direction is required to perform these functions. Such movement of the operating member serves to compress the overload spring 206 while the armature stem extension 116 slides to the left in Fig. 7 relatively to the armature bar 118 for a short distance. Such supplemental action of the operating member 230 ensures uniform contact pressure between the armature bar and the pole faces and allows reasonable tolerance between the parts for manufacturing purposes. The final position of the operating member 230 is slightly beyond the face 229 of the lever and, in such position, the overload spring 206 being free of compression resumes its original length.

During the waiting period mentioned after lighting of the pilot burner, the flame from the burner, which impinges on the end of the thermocouple, serves to heat it. The thermocouple soon generates sufficient current to energize the magnet and, when the armature bar is moved into engagement with the pole faces thereof as described, the magnet will serve to retain the armature bar in attracted position. Consequently, although the operating member 230 moves beyond the face 229 of the lever 214 in the "pilot" position, the engagement of the lever with the armature stem abutment 200 will cause the lever to be retained in the position to which it was previously moved.

The main burner is lighted by moving the dial to the "on" position, as shown in Figs. 14, 18 and 22. Fuel is now permitted to flow through the inlet nipple 17 to the port 27 of the plug cock into the main body of the casing 15. In this position, it will be observed that the arcuate groove 50 permits gas to flow to the pilot burner also, by connecting groove 56 with the passage 54. The indicator lever 184 may then be set to the desired temperature indicated on the casing and the control will be placed in complete operation.

In the event that the armature is not maintained in the attracted position when the dial is rotated from "light pilot" to "pilot," the ratchet section 40 between these positions will prevent manual forcing of the operating member 230 back against the lever 142. Furthermore, when the dial is in the "off" position it cannot be moved in a counter-clockwise direction directly to the "on" position, due to the ratchet teeth section provided between these points. It is necessary, therefore, that the control be operated in the various stages of "light pilot" to "on," as any other mode of operation is prevented.

As previously described the rod 168 of the thermostatic means will actuate the valve 148 with a snap action through the clicker mechanism provided. The movement of the plug 154 and sleeve 152 which effects opening of the valve moves the spring 156 bodily without compressing it due to this spring being strong enough to overcome the spring 165 and the force resulting from the gas pressure on the top of the valve. The spring 156 is provided to permit the fulcrum levers to move under thermostatic operation when the valve is being held closed by the safety mechanism.

In the event that the pilot burner is extinguished, the thermocouple ceases to generate current, causing deenergization of the electromagnet and movement of the armature bar 118 away from the pole faces. Such movement of the armature bar is caused by the armature stem spring 122 which urges the abutment 200 toward the valve member 148. If the thermostatic mechanism is operating at this time to hold the valve 148 in open position, movement of the abutment 200 will serve to close it. Such action is due to the spring 122 of the armature stem being stronger than the spring 156 in the valve stem, thus overcoming it to move the valve 148 to closed position with a snap action.

During this movement of the abutment 200 toward the right, as viewed in Fig. 7, the lever 214 is rotated on its pivot in a counter-clockwise direction, permitting the pilot valve 68 to be closed by the pilot valve spring 72. Thus, when the pilot burner is extinguished for any reason, the safety mechanism operates to close both the main control valve 148 and the pilot control valve 68, giving a complete shut-off.

Due to the provision of the "light pilot" position, the operating member 230 can be positioned beyond the face 229 of the lever in the "pilot" position and the lever is thus free to move in a clockwise direction should the pilot burner be extinguished. It will be apparent that if no "light pilot" position were provided, then the operating member 230 would necessarily have to hold the lever 214 in its extreme counter-clockwise position in the "pilot" position, as the electromagnet would not then be energized. In such event, the engagement between the operating pin 230 and the lever face 229 would prevent the lever from moving in a clockwise direction to close the pilot valve, should the pilot burner become extinguished.

We claim:

1. In a safety control for gaseous fuel burners, the combination of rotatable means for controlling the supply of fuel to the burner, a thermostatic valve for regulating the supply of fuel to said burner, thermostat means for adjusting said valve between open and closed positions to maintain selected temperatures, means movable from

active to inactive position for causing movement of said thermostatic valve from open to closed position regardless of the condition of said thermostat, and means operable upon rotation of said controlling means for actuating said valve closing means to active position to permit thermostatic control of the thermostatic valve.

2. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve controlling the supply of fuel to both the main and pilot burners, a main control valve intercepting the supply of fuel from the main fuel valve to the main burner, means for moving the main control valve between open and closed positions, means responsive to the presence of a flame at the pilot burner for permitting operation of the main control valve to open position by the first said means and being adapted to move said valve to closed position independent of said first means upon extinguishment of said flame, and means operable by said main fuel valve for resetting said flame responsive means when the pilot burner is relighted.

3. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve controlling the supply of fuel to both the main and pilot burners, a main control valve intercepting the supply of fuel from the main fuel valve to the main burner, means for moving the main control valve between open and closed positions, a pilot control valve intercepting the supply of fuel from the main fuel valve to the pilot burner, means responsive to the presence of a flame at the pilot burner for permitting operation of the main control valve to open position by the first said means and for maintaining the pilot control valve in open position, said means being operable to move said main control valve and release said pilot control valve to closed position independent of said first means upon extinguishment of said flame, and means operable by said main fuel valve for resetting said flame responsive means when the pilot burner is relighted.

4. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve movable to different positions for controlling the supply of fuel to either the main or pilot burners, a main control valve intercepting the supply of fuel from the main fuel valve to the main burner, a pilot control valve intercepting the supply of fuel from the main fuel valve to the pilot burner, means for moving said main control valve to open position, means for moving said main control valve to closed position independent of said opening means said closing means being adapted to remain in an active position as long as the pilot burner is lighted, and means operable upon movement of said main fuel valve to one of said positions for moving said valve closing means to said active position.

5. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve movable to different positions for controlling the supply of fuel to either the main or pilot burners, a main control valve intercepting the supply of fuel from the main fuel valve to the main burner, a pilot control valve intercepting the supply of fuel from the main fuel valve to the pilot burner, thermostatic means for adjusting said main control valve to different positions to maintain selected temperatures, means movable from active to inactive position for causing movement of said main control

valve to closed position regardless of the condition of the thermostatic means, said means being adapted to remain in an active position as long as the pilot burner is lighted, and means carried by said main fuel valve and operable in one of said positions thereof for moving said valve closing means to said active position to permit adjustment of the main control valve by the thermostatic means.

6. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve movable to different positions for controlling the supply of fuel to either the main or pilot burners, a main control valve intercepting the supply of fuel from the main fuel valve to the main burner, a pilot control valve intercepting the supply of fuel from the main fuel valve to the pilot burner, thermostatic means for adjusting said main control valve to different positions to maintain selected temperatures, a pivoted member in operative relation with said main control valve and extending adjacent said main fuel valve, means engaging with said pivoted member for moving said main control valve to closed position regardless of the condition of the thermostatic means, said means being adapted to remain in an active position as long as the pilot burner is lighted, and means carried by said main fuel valve and engageable with said pivoted member in one of said positions of the main fuel valve for moving said valve closing means to said active position.

7. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve controlling the supply of fuel to both the main and pilot burners, a main control valve intercepting the supply of fuel to the main burner, a pilot control valve intercepting the supply of fuel to the pilot burner, thermostatic means for adjusting said main control valve to different positions to maintain selected temperatures, a safety control movable from active to inactive positions for causing movement of said main control valve to closed position regardless of the condition of said thermostatic means, and means for simultaneously actuating said safety control to active position to permit adjustment of the main control valve by the thermostatic means and opening said pilot control valve.

8. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve having a lighting and a running pilot position, a main control valve intercepting the supply of fuel from the main fuel valve to the main burner, means for operating said main control valve, a pilot control valve intercepting the supply of fuel from the main fuel valve to the pilot burner, said pilot control valve being closed in the lighting pilot position of the main fuel valve, means responsive to the presence of a flame at the pilot burner for permitting operation of the main control valve to open position and being adapted to move said valve to closed position together with the pilot control valve upon extinguishment of said flame, and means operable between the lighting and the running pilot position of said main fuel valve for resetting said flame responsive means when the pilot burner is relighted, said means being rendered inoperative in said running pilot position so as to permit said flame responsive means to operate.

9. In a safety control for gaseous fuel burners having main and pilot burners, the combination of a main fuel valve having a lighting and a running pilot position, a thermally operated valve intercepting the supply of fuel from the main fuel valve to the main burner, a pilot burner control valve intercepting the supply of fuel from the main fuel valve to the pilot burner, thermoelectric means energizable by said pilot burner, an armature for said thermoelectric means movable between free and attracted positions, means extending between said armature and said thermally operated valve to retain said valve in a closed position when said armature is free, a pivoted member in operative relation with said retaining means and engaging said pilot control valve, means carried by said main fuel valve and engageable with said pivoted member between said lighting and said running pilot position for moving said armature to attracted position and opening said pilot valve, said means being out of engagement with said pivoted member when the main fuel valve is in running pilot position so as to permit said armature to move to free position.

10. In a safety control for fuel burners, the combination of means for controlling the supply of fuel to the burner, means movable between positions for regulating the fuel supply from said controlling means to the burner, a safety control for preventing normal operation of said regulating means in one condition of the burner, said control comprising a thermocouple responsive to the heat of the burner, an electromagnet connected to the thermocouple, an armature for the electromagnet movable to an attracted position, and means operable by the controlling means for actuating the armature to attracted position without changing the position of said regulating means.

11. In a safety control for fuel burners, the combination of means for controlling the supply of fuel to the burner, means movable between positions for regulating the fuel supply from said controlling means to the burner to maintain a desired condition, a safety control for preventing normal operation of the regulating means in the absence of heat at the burner, said control comprising a thermocouple responsive to the heat of the burner, an electromagnet connected to the thermocouple, an armature for the electromagnet movable to an attracted position, a yieldable connection between the armature and regulating means, and means associated with the controlling means and operable on the connection for actuating the armature to attracted position without changing the position of the regulating means.

12. In a safety control for fuel burners, a main shut-off cock movable between open and closed positions, a combined thermostatic and safety valve interposed in the line between the shut-off cock and the burner, a thermostat for adjusting the valve to maintain selected temperatures, electromagnetic means responsive to the condition of the burner and operable upon the valve upon the occurrence of one condition at the burner, and connecting means between the shut-off cock and electromagnetic means for rendering the latter operable when the cock is moved to one of its positions.

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