

Sept. 28, 1943.

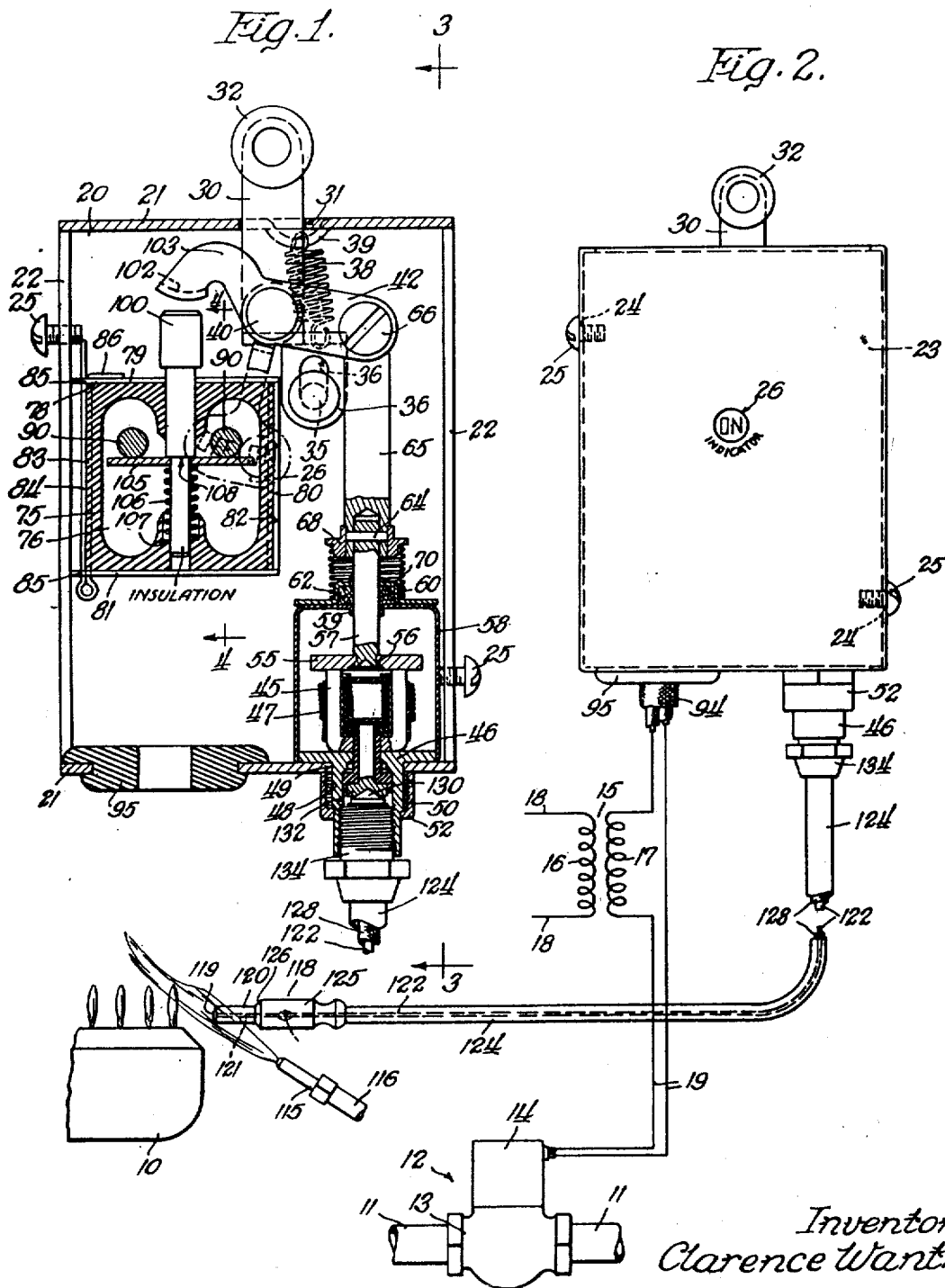
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2,330,461

SAFETY SWITCH

Filed May 31, 1941

2 Sheets-Sheet 1



By

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2 Sheets-Sheet 2

Fig. 3.

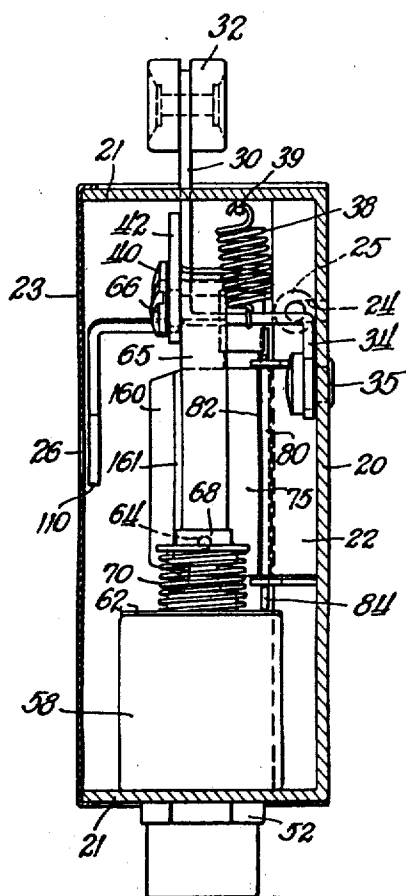


Fig. 6.

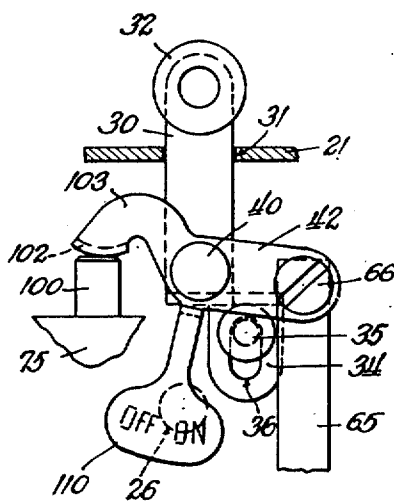


Fig. 5.

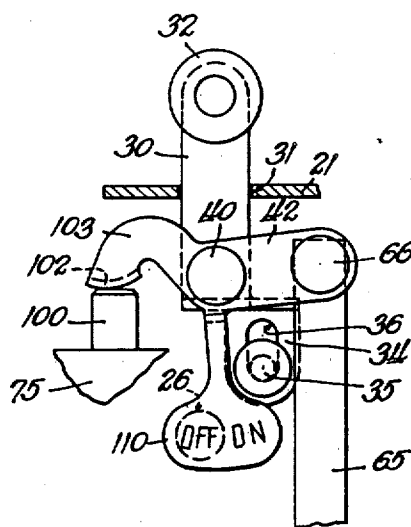
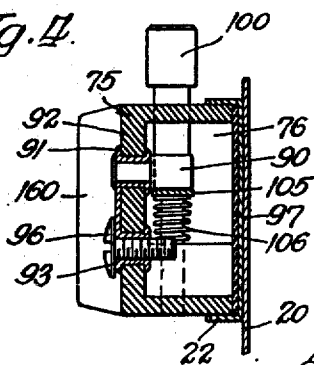


Fig. 4.



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UNITED STATES PATENT OFFICE

2,330,461

SAFETY SWITCH

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Application May 31, 1941, Serial No. 395,956

14 Claims. (Cl. 175—335)

This invention relates, generally, to protective devices for burner apparatus, and it has particular relation to a safety switch adapted to be controlled by condition responsive means and operative to prevent the escape of unburned fuel.

While the particular device which I shall describe hereinafter in connection with the drawings is a safety switch, operative to cause a valve in the fuel supply pipe leading to a burner to close whenever a flame to which the device is responsive, as a pilot flame, goes out, it is to be understood that the invention, in its broader aspects, is not limited to this particular use but may be employed in all similar work as suitable or desired.

Moreover, while I have shown and shall describe the switch of the present invention in connection with a valve that requires current only for opening the same, the invention is not limited to use with valves of this particular type, but may be employed with valves that require current for both opening and closing the valve, and it is to be understood that the switch may be used for controlling other circuits and other devices than the particular circuit and particular device selected for illustration.

One of the main objects of the invention is to provide an improved form of switch embodying a simple and improved mode of operation for opening the circuit into which the switch is connected, for example, upon extinguishment of the flame to which the device is responsive, or upon the occurrence of some other abnormal condition or malfunctioning of the apparatus; also a simple and improved mode of operation which will permit resetting the switch to closed position only when the flame to which the device is responsive is burning or when the other abnormal condition or malfunctioning of the apparatus is cured.

Another object of the invention is to provide a switch of the character described which is of simple, inexpensive, and improved construction embodying few parts and operative effectively to accomplish the purposes set forth.

Another object of the invention is to provide, in a switch of the character described, simple and improved means for indicating the position of the switch.

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

In order to acquaint those skilled in the art with the construction and operation of a safety

switch embodying the present invention, I will now describe, in connection with the drawings, one preferred embodiment of the invention.

In the drawings:

Figure 1 is a sectional view through a safety switch embodying the present invention, showing the same in closed position;

Figure 2 is a more or less diagrammatic view showing the switch in connection with burner apparatus;

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 1;

Figure 4 is a fragmentary detail section taken on the line 4—4 of Figure 1;

Figure 5 is a fragmentary detail view showing the position of the switch actuator and reset means with the switch in open position and the reset stem and reset member released; and

Figure 6 is a view similar to Figure 5 showing the position of the switch actuator and reset means with the reset arm pressed inwardly to cock or reset the device.

In Figure 2 of the drawings, a gas or other fuel burner of any suitable or preferred type is conventionally illustrated at 10. The burner 10 may be the burner of a room or space heater, water heater, floor furnace, gas range, or any other burner. A gas or other fuel supply pipe 11 leads to the burner 10 for the delivery of gas or other fuel thereto—for example, through a mixing chamber (not shown) to which air is admitted in the usual way, as well understood in the art.

A power actuated or electroresponsive valve 12, such as a solenoid or motor valve, is interposed in the fuel supply pipe 11. The valve 12 is shown as comprising a valve body 13 and a hood 14 having suitable power operated valve actuating means therein. A step-down transformer 15 supplies power for the operation of the valve 12. This transformer comprises a line voltage primary 16 and a low voltage secondary 17. The primary 16 is connected to line wires 18 leading to any suitable source of current or power (not shown). The valve actuating means for the valve 12 is connected into the secondary circuit 19. The control switch of the present invention is also connected into the secondary circuit 19, as will presently appear.

For purposes of illustration, it may be assumed that the valve 12 is of a character to be actuated to open position by closing of the circuit 19, and to be held in open position to supply fuel or operative energy to the burner 10 as long as the circuit 19 is closed. The valve 12 may have spring means, or other suitable means, for actuating the valve to closed position to shut off

the supply of fuel to the burner 10 when the circuit 19 is opened or otherwise disabled.

The control switch of the present invention is shown as located within a housing 20. The opposite ends of the back wall of the housing are turned in to form end walls 21, and at the opposite sides of the back wall are inturned flanges 22. The cover 23 is of generally U-shaped cross section and fits over the inturned end walls 21 with the inner marginal edges of the sides of the cover fitting over the flanges 22. Slots 24 opening inwardly from the inner marginal edges of the side walls of the cover fit over the shanks of screws 25 which are adapted to be tightened to secure the cover in place on the base of the housing and to be loosened to permit removal of the cover.

The front wall of the cover 23 has an opening 26 through which an indicator is adapted to be viewed to indicate the position of the switch, as will hereinafter appear.

An actuator or reset member 30 operates between open and closed positions by rectilinear movement through an opening 31 in the adjacent end wall 21 of the housing. The outer end of the actuator member 30 is provided with an operating button 32. The inner end of the actuator or reset member 30 is turned toward the back wall of the housing, and at the back wall of the housing the actuator member is turned at substantially right angles at 34 for sliding movement on the back wall of the housing. A rivet 35 retains the adjacent angular end 34 of the actuator member on the back wall of the housing, and the shank of the rivet 35 passes through an elongated slot 36 in the angular end 34 of the actuator member to permit the rectilinear sliding movement of this member.

The actuator member 30 is yieldingly retained in its outwardly projected position as shown in Figures 1 and 5, and, upon release of the button 32, as will presently appear, is returned to this outwardly projected position by a coiled spring 38 connected between the rearwardly turned intermediate portion of the actuator member and a spring anchoring lug 39 pressed inwardly from the adjacent end wall 21 of the housing. The screws 25 and slots 24 may be positioned at different distances from the opposite ends of the device to assure proper mounting of the cover 23. Pivoted at 40 on the actuator or reset member 30 is a lever 42.

The means for holding the switch closed is shown in the form of an electromagnet located within the housing 20. The electromagnet selected for illustration comprises a magnet frame 45 secured, for example, to a terminal bushing 46 in the manner more fully disclosed in my copending application Serial No. 328,923, filed April 10, 1940. The coil 47 of the electromagnet is wound around the legs of the magnet frame 45. The bushing 46 is shown as splayed at 48 to prevent its turning in the opening 49 in the adjacent end wall 21. The bushing 46 is also externally threaded for threaded engagement at 50 with a nut 52 by means of which the bushing is clamped in place in the end wall 21 of the switch housing, the externally threaded and tubular shank of the bushing extending from the head at the inner end of the bushing out through the opening 49 for this purpose.

The electromagnet has an armature 55 attached at 56 to the adjacent end of a stem 57, if desired, in a manner to permit self-accommodation of the armature, when in attracted position,

to the pole ends of the magnet frame 45. The electromagnet and armature are enclosed within a cup 58. The stem 57 extends for reciprocatory movement through an opening 59 in the inner end of the cup 58. The opening 59 is sealed by suitable sealing material, such as a leather washer, felt packing or the like, as indicated at 60, interposed between the inner end of the cup 58 and a spring seating disc 62.

The end of the stem 57 opposite the end on which the armature 55 is mounted is secured by a pin 64 to the adjacent end of a reset stem 65. The opposite end of the reset stem 65 is pivoted, for example, by a screw 66 to one arm of the lever 42 on one side of its pivotal attachment at 40 to the actuator member 30. The reset stem 65 is of square or polygonal section, with a rounded or cylindrical end fitting into a valve spring seat member 68. A coiled spring 70, interposed between the spring seat member 68 and the spring seating disc 62, actuates the armature 55 to retracted position and the reset stem 65 and pivoted lever 42 to the position shown in Figure 5 when the electromagnet is de-energized, for example upon extinguishment of the flame to which the device is responsive.

The particular switch shown in the drawings comprises a switch base 75 in the form of a block of suitable insulating material closed at the front and hollowed out from the back to form the switch cavity 76. A switch bracket 78 in the form of a cup having its back wall spot-welded or otherwise suitably secured to the back wall of the housing 20 has three outstanding side flanges 79, 80, and 81, the fourth side being closed by the adjacent side flange 22 of the housing 20. The switch base 75 fits removably in the bracket 78 with its open back side presented to the back wall of the housing 20, and has along one side a ridge or ledge 82 which is engaged by the inturned outer edge of the flange 80. The opposite side of the switch base 75 has a corresponding ridge or ledge 83, and a cotter pin 84 is passed through openings 85 in the flanges 79 and 81 and engages the ridge or ledge 83 firmly and removably to secure the switch base 75 in place on the back wall of the housing 20. One shank of the cotter pin 84 is spread or turned inwardly at 86 to prevent accidental displacement of the pin.

Positioned in spaced relation within the switch cavity 76 are a pair of contact pins 90 secured to separate spaced terminal members 91, which terminal members pass through and are secured in the front wall 92 of the insulating switch base 75. Each terminal member has an integral inwardly spaced terminal portion 93 also secured in the front wall 92 of the switch base 75. The conductors 19 of the circuit for the valve 12, which are insulated at 94, enter the housing 20 through an insulating grommet 95. One of the conductors 19 is connected by a terminal screw 96 to the terminal member 91 for one contact 90, and the other conductor 19 is connected by a corresponding terminal screw to the corresponding terminal member 91 for the other contact 20. A switch insulator piece 97 is preferably interposed between the open back of the switch base 75 and the base of the bracket 78.

The switch stem 100 has rectilinear sliding movement in the switch base 75 with the headed outer end of the stem operating in position for cooperation with the inturned end 102 of an arm 103 on the switch lever 42, this arm 103 being on the side of the pivot 40 opposite the side of the

lever which is pivoted to the reset stem 65. Within the switch cavity 76 the reduced inner end of the stem 100 passes through a bridging contact plate 105. A coiled spring 106, surrounding the reduced inner end of the stem 100 and interposed between the contact plate 105 and a shoulder 107 on the switch base 75, yieldingly urges the plate 105 into bridging contact with the contacts 90 to complete the circuit 19. By engagement of the contact plate 105 with the shoulder 108 on the stem 100, the spring 106 also yieldingly urges the stem 100 to its outwardly projected position as shown in Figure 1.

The pivoted arm 42 as a flag or indicator member 110 formed integral therewith. This indicator member 110 has "on" and "off" markings thereon as shown, or is provided with colored or other appropriately marked portions for indicating through the opening 26 in the switch cover 23, the position of the switch, as will presently appear.

The pilot burner 115, which is located in juxtaposition to the main burner 10 to maintain a pilot light for lighting the main burner, is supplied with gaseous fuel by a pilot supply pipe 116. The pilot supply pipe 116 may be connected with the main fuel supply pipe 11 anterior of the valve 12, or it may be supplied with fuel for delivery to the pilot burner in any other desired manner.

A thermocouple, indicated at 118, is placed in position so that the hot junction 119 thereof will be heated by the pilot flame as long as the pilot flame is burning. The construction of the thermocouple may be similar to that more fully disclosed in Oscar J. Leins Patent No. 2,126,564, granted August 9, 1938, or a thermopile or any other form of thermoelectric generator may be employed.

For the purpose of the present description, suffice it to state that the particular thermocouple 118 selected for illustration comprises an outer tubular metallic thermocouple member 120 and an inner metallic thermocouple member 121 of different thermoelectric characteristics. The inner thermocouple member 121 is joined at one end to the outer end of the outer thermocouple member 120 to form the thermojunction 119 which is placed in position to be heated by the pilot light. An inner lead conductor 122 is joined to the inner thermocouple element 121 to form an internal thermojunction 123, and an outer tubular lead conductor 124 is connected to the outer thermocouple member 120, for instance through a sleeve 125, to form a third thermojunction 126. The inner lead conductor 122 is insulated from the outer lead conductor 124, for instance, by a wrapping of insulation on the inner lead conductor as indicated at 128.

A quick detachable, or removable connection is preferably provided between the opposite ends of the leads 122 and 124 and the coil 47 of the electromagnet. This removable lead connection may be of the form disclosed in my copending application hereinbefore identified, and is illustrated in that form, although it may be of any other suitable or preferred form. Suffice it to state that the inner lead 122 has a connector cone 130 which seats in the correspondingly recessed outer end of the terminal tip 132 and is clamped in contact therewith by a connector sleeve 134. The adjacent end of the outer tubular lead conductor 124 is connected in circuit with one side of the coil 47 through the bushing 46, and the other side of the coil is connected to the terminal tip 132, the parts being suitably insulated as shown.

To start the operation of the system shown in the drawings, the following sequence is followed:

The actuator or reset member 30 is pressed inwardly from the position shown in Figure 5 by engaging the button 32 with the hand or fingers and imparting pressure thereto. The spring 70 at this time, and when the actuator member 30 is in projected position as shown in Figure 5, tends to rock the lever 42 about its pivot 40, holding the intumed end 102 of the lever against the switch pin 100, and the spring 70, being stronger than the spring 106, holds the switch pin in its inwardly retracted position and the bridging contact 105 out of contact with the contacts 90. As the actuator or reset arm 30 is pressed inwardly, the spring 70 continues to hold the switch plate 105 in open position, and the inward movement of the actuator arm 30 rocks the lever 42 about the cooperating end of the switch pin 100 as a fulcrum until the armature 55 is cocked or set into attracted position against the pole ends of the magnet frame 45.

The pilot burner 115 is lighted, or, having been lighted, heats the thermoelectric generator, and the actuator member 30 is held pressed inwardly until the heat of the pilot flame on the thermoelectric generator has energized the electromagnet sufficiently so that it will hold the armature 55 attracted thereto.

When the electromagnet is energized sufficiently to hold the armature 55 in attracted position, the actuator member 30 is released and the reset stem 65 remains in cocked position holding the pivot 66 in fixed position so that the outward movement of the actuator member 30, through its connection at 40 with the arm 42, swings this arm in a clockwise direction about the pivot 66 and under the action of the spring 38 to the position shown in Figure 1. The switch pin 100 is released upon separation of the cooperating portion 102 of the arm 42 therefrom, and the spring 106 moves the contact plate 105 into bridging contact with the contacts 90 to close the circuit 19. The circuit is thus closed not by the inward movement of the reset member 30, but by the movement of this reset member 30 to its outwardly projected position following the resetting operation and only when the electromagnet is effective to hold the armature 55 in attracted position.

If the pilot burner is not lighted to produce the thermoelectric current for holding the armature 55 in attracted position upon setting the same to that position by the actuator member 30, the armature 55 and the stem 65 will move to retracted position with the movement of the actuator member 30 to its outwardly projected position, the spring 70 at such time maintaining the switch plate 105 in open position through the pivoted arm 42.

If, after the parts are set as shown in Figure 1 and the pilot burner is lighted to hold the parts in the positions shown in this figure, the pilot burner is extinguished, the armature 55 is released. The spring 70 then operates to move the armature to retracted position and, through the reset stem 65, swings the pivoted arm 42 in a counterclockwise direction about its pivot 40 on the actuator member 30, causing the intumed end 102 of the arm 42 to engage the switch pin 100, forcing the same inwardly and separating the switch plate 105 from the contacts 90 to open the switch. This opens or interrupts the circuit 19 and the valve 12 operates to closed posi-

tion to shut off the supply of fuel to the main burner.

When the armature is in retracted position and the switch is in open position as shown in Figure 5, the "Off" marking on the indicator arm 110 is positioned to be viewed through the opening 26 to indicate that the switch is "Off." When the armature is in attracted position and the actuator member 30 is in its outwardly projected position, the "On" marking on the indicator arm 110 is positioned to be viewed through the opening 26 to indicate that the switch is "On."

The front wall of the insulating switch base 75 may be provided with an integral insulating rib 160 forming an insulating barrier between the terminals 91. It may also have integral insulating side ribs 161 forming insulating barriers at opposite sides thereof.

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

I claim:

1. In a switch of the class described, in combination, a reset member, a lever having pivotal connection with said reset member, a switch having a switch stem cooperable with said lever and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem connected to said lever and adapted to be reset by the rocking movement imparted to said lever about said switch pin as a fulcrum by resetting movement of said reset member, and means for holding said reset stem in reset position.

2. In a switch of the class described, in combination, a reset member, a lever having pivotal connection with said reset member, a switch having a switch stem cooperable with said lever and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem having pivotal connection with said lever and adapted to be reset by the rocking movement imparted to said lever about said switch pin as a fulcrum by resetting movement of said reset member, means for holding said reset stem in reset position, and means operative upon release of said reset member for actuating said member to its outwardly projected position and operative when said reset member is released with said reset stem held in reset position to swing said lever about its pivotal connection with said reset stem in a direction to release said switch stem.

3. In a switch of the class described, in combination, a reset member, a lever having pivotal connection with said reset member, a switch having a switch stem cooperable with said lever and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem connected to said lever and adapted to be reset by the rocking movement imparted to said lever about said switch pin as a

fulcrum by resetting movement of said reset member, means for holding said reset stem in reset position, an enclosing housing having an opening in the wall thereof, and an indicator arm on said lever and having indicator means visible through said opening to indicate the position of the switch.

4. In a switch of the class described, in combination, a reset member, a lever having pivotal connection with said reset member, a switch having a switch stem cooperable with said lever and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem having pivotal connection with said lever and adapted to be reset by the rocking movement imparted to said lever about said switch pin as a fulcrum by resetting movement of said reset member, means for holding said reset stem in reset position, means operative upon release of said reset member for actuating said member to its outwardly projected position and operative when said reset member is released with said reset stem held in reset position to swing said lever about its pivotal connection with said reset stem in a direction to release said switch stem for movement to closed circuit position, an enclosing housing having an opening in the wall thereof, and an indicator arm having on and off indications thereon, with the off indication visible through said opening when the reset stem and reset member are released, the on indication being visible through said opening when the reset stem is held in reset position and the reset member is released.

5. In a switch of the class described, in combination, a support, a reset member slidable on said support, a lever having pivotal connection with said reset member, a switch having a switch stem cooperable with said lever and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem having pivotal connection with said lever and adapted to be reset by the rocking movement imparted to said lever about said switch pin as a fulcrum by resetting movement of said reset member, and means for holding said reset stem in reset position.

6. In a switch of the class described, in combination, a reset member actuated between resetting and projected positions by rectilinear movement, a lever having pivotal connection with said reset member intermediate its ends, a switch having contact means and a switch pin spring-pressed to "on" position, said switch pin cooperating with said lever on one side of its pivotal connection with said reset member and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem operatively connected to said lever on the other side of said pivotal connection and condition responsive means for holding said reset stem in reset position.

7. In a switch of the class described, in combination, a reset member actuated between resetting and projected positions by rectilinear movement, a lever having pivotal connection with

said reset member intermediate its ends, a switch having contact means and a switch pin spring-pressed to "on" position, said switch pin cooperating with said lever on one side of its pivotal connection with said reset member and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem operatively connected to said lever on the other side of said pivotal connection, condition responsive means for holding said reset stem in reset position, and spring means for actuating said reset stem to retracted position and operative to swing said lever about its pivotal connection with said reset member in a direction to actuate said switch pin and contact means to "off" position.

8. In a switch of the class described, in combination, a support, a reset member having rectilinear sliding movement on said support between resetting and projected positions, a lever having pivotal connection with said reset member intermediate its ends, a switch having contact means and a switch pin, first spring means for actuating said contact means and said switch pin to "on" position, said switch pin cooperating with said lever on one side of its pivotal connection with said reset member and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem having pivotal connection with said lever on the other side of its pivotal connection with said reset member, condition responsive means for holding said reset stem in reset position, and spring means stronger than said first spring means and operative to actuate said reset stem to retracted position upon release of said holding means and to swing said lever about its pivotal connection with said reset member in a direction to actuate said switch pin and contact means to "off" position against the tension of said first spring means.

9. In a switch of the class described, in combination, a support, a reset member having rectilinear sliding movement on said support between resetting and projected positions, a lever having pivotal connection with said reset member intermediate its ends, a switch having contact means and a switch pin, first spring means for actuating said contact means and said switch pin to "on" position, said switch pin cooperating with said lever on one side of its pivotal connection with said reset member and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem having pivotal connection with said lever on the other side of its pivotal connection with said reset member, condition responsive means for holding said reset stem in reset position, spring means stronger than said first spring means and operative to actuate said reset stem to retracted position upon release of said holding means and to swing said lever about its pivotal connection with said reset member in a direction to actuate said switch pin and contact means to "off" position against the tension of said first spring means,

and spring means operative to actuate said reset member to its projected position.

10. In a switch of the class described, in combination, a support, a reset member having rectilinear sliding movement on said support between resetting and projected positions, a lever having pivoted connection with said reset member intermediate its ends, a switch having contact means and a switch pin, first spring means for actuating said contact means and said switch pin to "on" position, said switch pin cooperating with said lever on one side of its pivotal connection with said reset member and constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem having pivotal connection with said lever on the other side of its pivotal connection with said reset member, an electro-magnet adapted, when energized, to hold said reset member in reset position, a thermoelectric generator responsive to the heat of a flame and connected in circuit with said electromagnet, spring means stronger than said first spring means and operative to actuate said reset stem to retracted position and to swing said lever about its pivoted connection with said reset member in a direction to actuate said switch pin and contact means to "off" position against the tension of said first spring means, an enclosing housing having an opening in the wall thereof, and an indicator arm on said lever and having indicator means visible through said opening to indicate the position of the switch.

11. In a switch of the class described, in combination, a support, a reset member mounted on said support, a lever having pivotal connection with said reset member, a switch comprising an insulating switch base detachably secured to said support and having a switch cavity therein, a pair of contact pins in said switch cavity, a switch pin having rectilinear movement in said switch base, a contact plate on said pin, spring means for actuating said switch pin to projected position and said contact plate into bridging contact with said contact pins, said switch pin constituting a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said switch pin holding said switch pin in open circuit position during the resetting operation, a reset stem pivotally connected to said lever and adapted to be reset by the rocking movement imparted to said lever by resetting movement of said reset member, condition responsive means for holding said reset stem in reset position, and second spring means for actuating said reset stem to retracted position and operative to swing said lever about its pivotal connection with said reset member in a direction to actuate said switch pin and contact means to "off" position against the tension of said first spring means.

12. In a switch of the class described, in combination, switch means, spring means for actuating said switch to "on" position, a reset member, a lever having pivotal connection with said reset member and cooperable with said switch, a reset stem pivotally connected to said lever and adapted to be actuated to reset position by resetting movement of said lever about said switch means as a fulcrum, condition responsive means for holding said reset stem in reset position, and

spring means operative upon release of said condition responsive holding means for actuating said reset stem to retracted position and operative to actuate said switch to "off" position through said lever and its cooperation with the switch.

13. In a switch of the class described, in combination, a reset member, a lever having pivotal connection intermediate its ends with said reset member, switch means cooperable with said lever on one side of its pivotal connection with said reset member, and means having operative connection with said lever on the other side of its pivotal connection with said reset member and adapted to be actuated to cocked position by swinging movement imparted to said lever about said switch means as a fulcrum by resetting movement of said reset member.

14. In combination, a reset member, a lever having pivotal connection with said reset mem-

ber, a controlling member having an operating position and a safety position and cooperable with said lever to constitute a fulcrum about which said lever is adapted to be rocked by resetting movement of said reset member, the cooperation of said lever with said controlling member holding said controlling member in safety position during the resetting operation, a reset stem connected to said lever and adapted to be reset by the rocking movement imparted to said lever about said controlling member as a fulcrum by resetting movement of said reset member, and means for holding said reset stem in reset position, the pivotal connection between the lever and said reset member constituting a fulcrum about which said lever is adapted to rock to actuate said controlling member to safety position upon release of said holding means.

CLARENCE WANTZ.