

March 29, 1927.

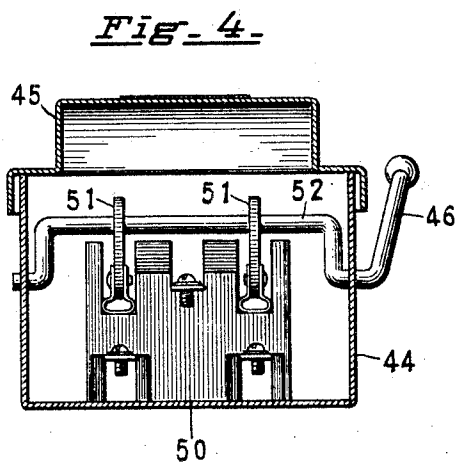
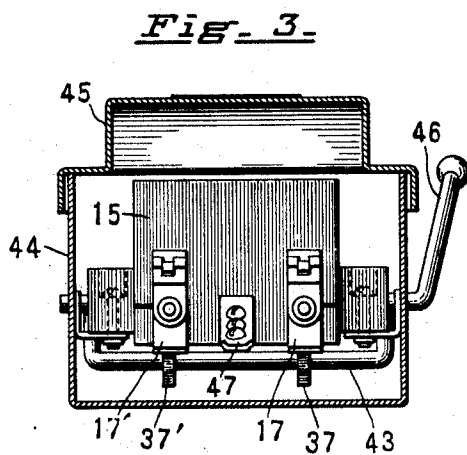
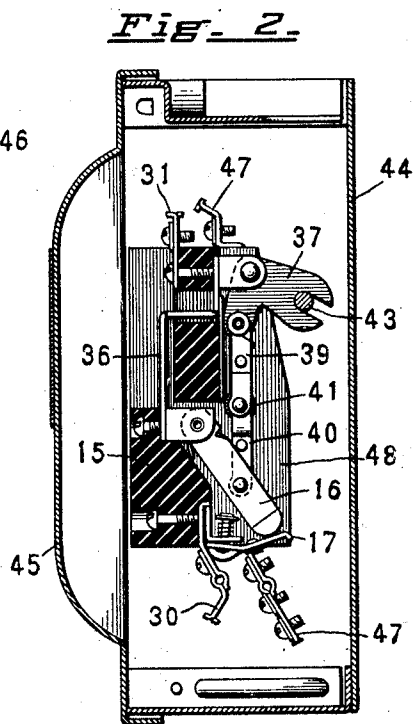
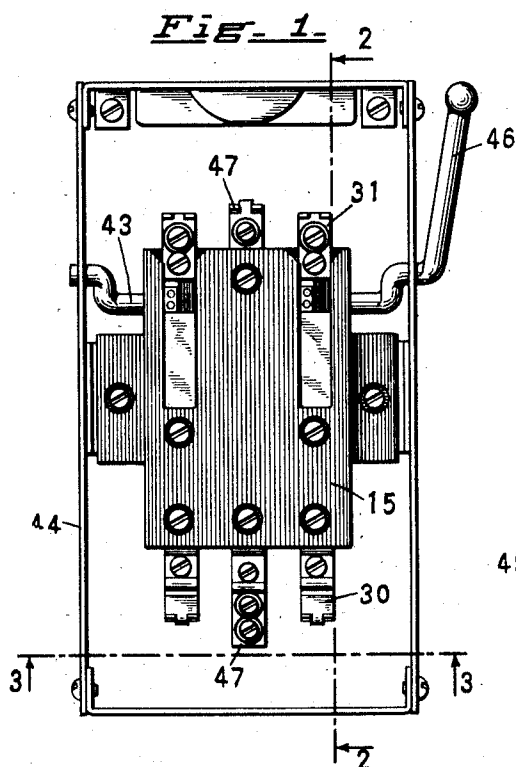
1,622,907

B. E. GETCHELL

ELECTRIC SWITCH

Filed April 6, 1925

4 Sheets-Sheet 1



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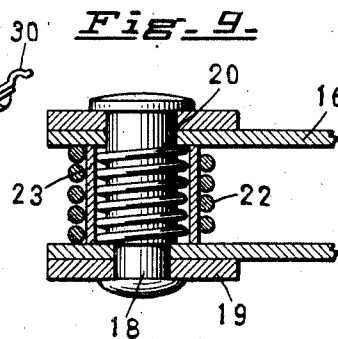
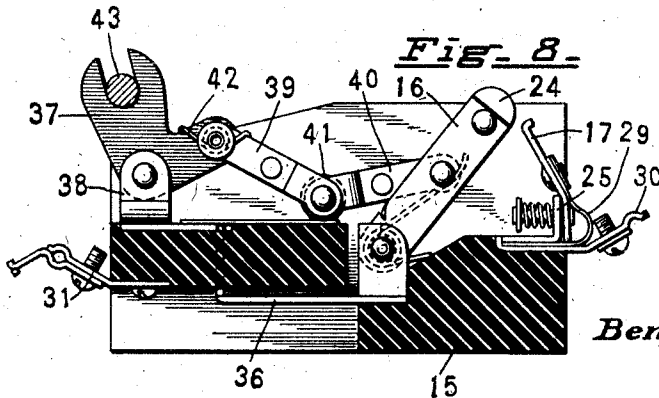
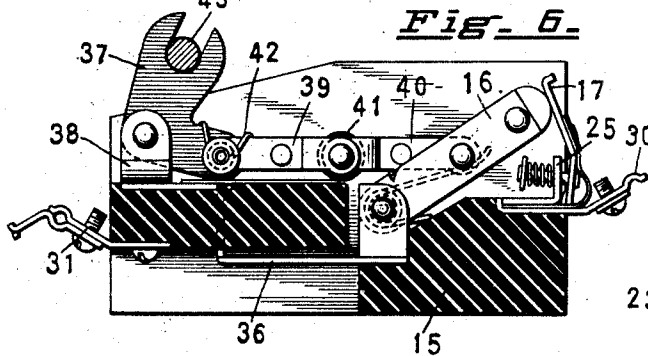
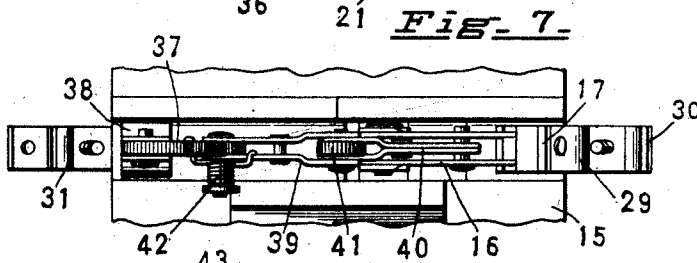
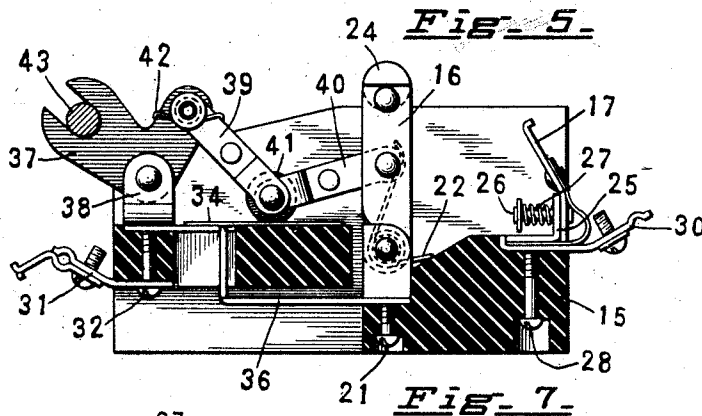
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ELECTRIC SWITCH

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4 Sheets-Sheet 2



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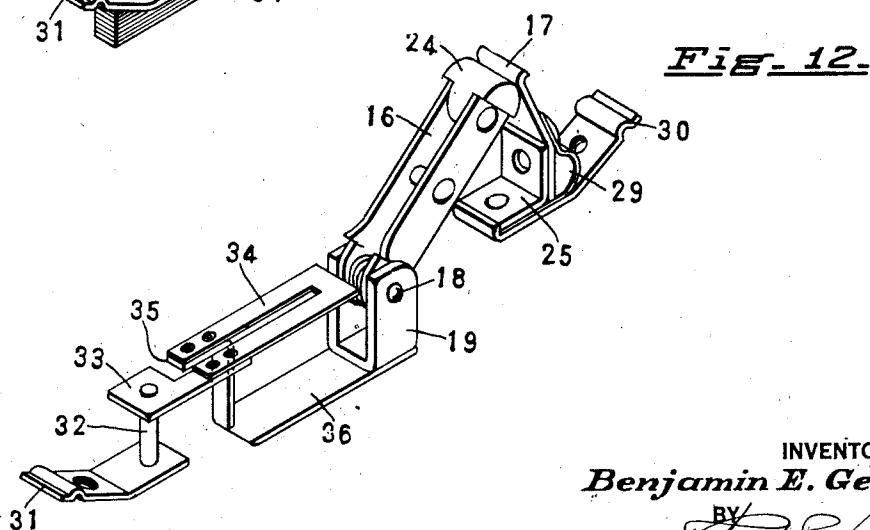
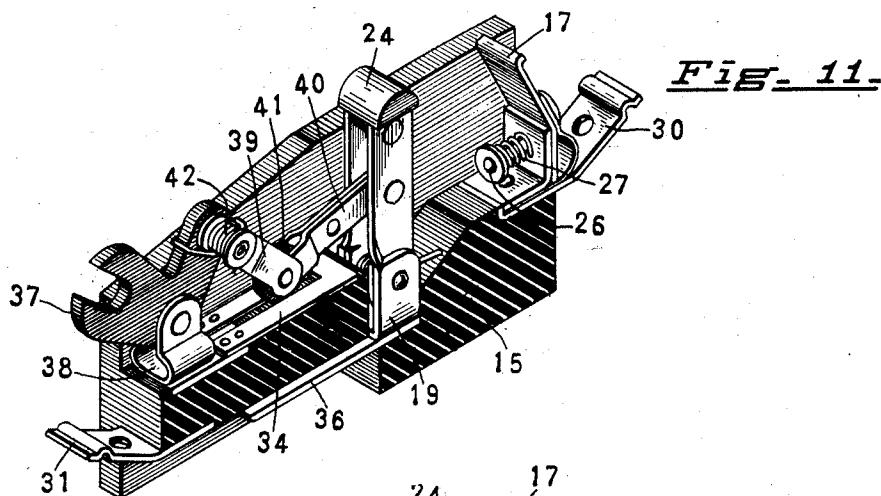
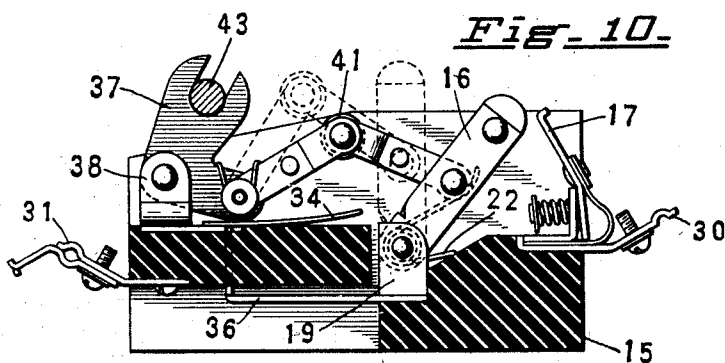
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ELECTRIC SWITCH

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4 Sheets-Sheet 3



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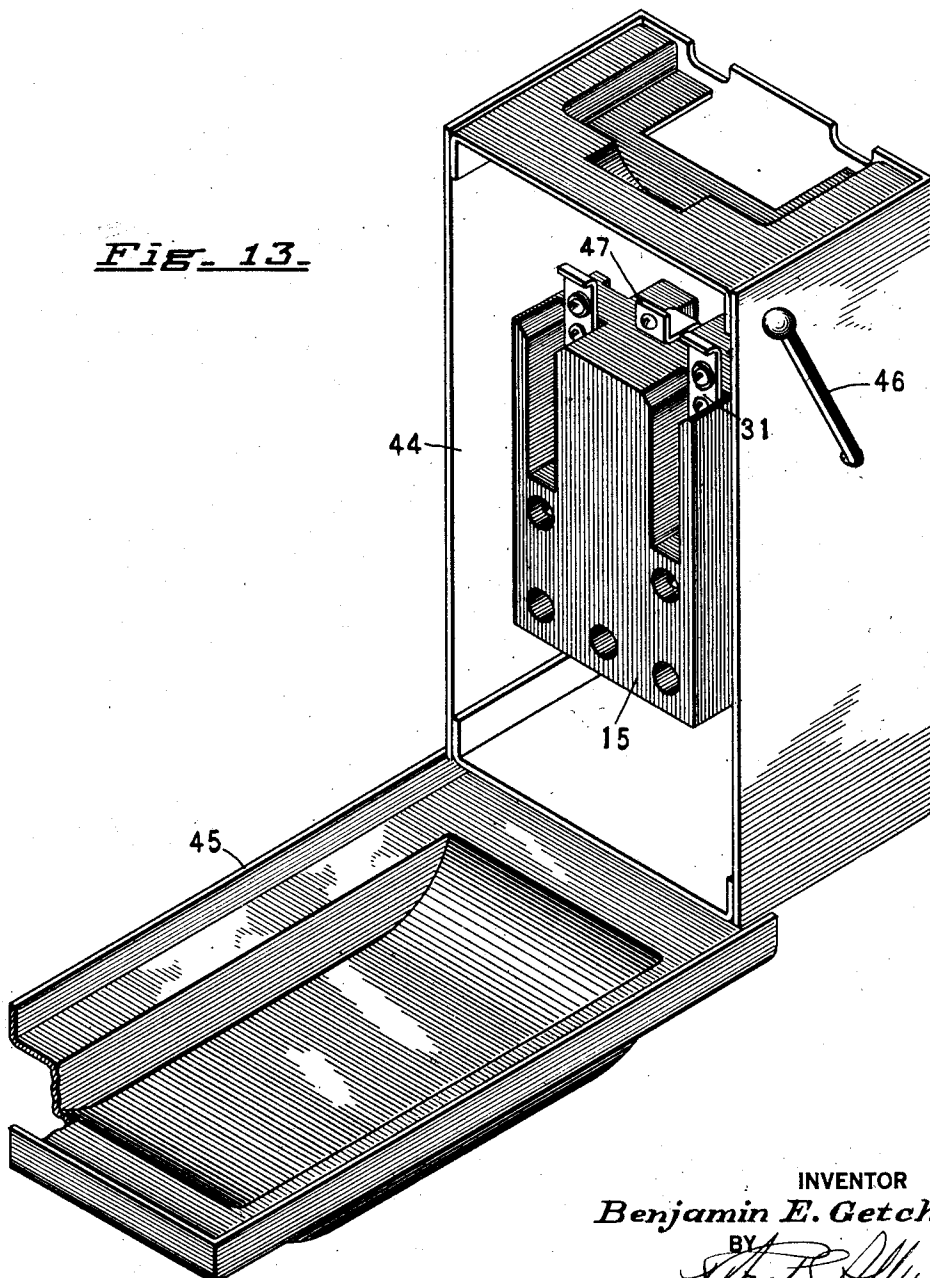
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FIG. 13.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

Application filed April 6, 1925. Serial No. 20,931.

My invention relates particularly to switches which can be operated by hand and which are adapted to automatically open the circuit in case of short circuits or dangerous overloads.

The main object is to do away with the use of fuses such as are customarily provided and to make it possible to safely restore service after an overload or short circuit without the trouble and hazard of renewing fuses.

Another object is to provide a construction of this type in which the circuit cannot be held closed against a dangerous overload or short circuit but which can be held closed long enough to permit temporary local or inconsequential short circuits to be burned out and thus permitting service to be restored without delay.

Another object is to provide an automatic overload switch without the use of magnetic coils which are not only expensive but frequently produce objectionable humming when used on alternating current circuits.

Another object is to provide an automatic tripping means which will positively open the circuit independently of the switch closing means.

Another object is to provide a slight time lag element so as to prevent unnecessary opening of the circuit on a temporary or non-dangerous overload.

Another object is to eliminate the fire and personal hazard caused by the increasing tendency on the part of ignorant and malicious persons to substitute coins or pieces of metal in the place of the ordinary fuses.

In carrying out the invention I provide a manually operable switch member for opening and closing the circuit and combine with this mechanism a thermostatic device so constructed and arranged with respect to the manually operable mechanism that the circuit will be opened automatically in case of a dangerous overload or short circuit. The manually operable mechanism is so constructed that this circuit opening action can occur automatically even though the operator attempts to hold the switch closed by hand. The parts are so constructed however that the switch cannot be closed again after the automatic opening without first returning the hand operated parts to the normal open circuit position thus assuring a com-

plete test of the operativeness of the device.

The invention is susceptible of embodiment in various forms and arrangements. In the accompanying four sheets of drawings I have illustrated the preferred form of mechanism and two simple arrangements.

Fig. 1 is a front view of an enclosed type switch embodying one form of the improvements of my invention, the cover being omitted.

Fig. 2 is a longitudinal sectional view and side elevation on the general plane of the line 2—2 of Fig. 1, the parts being shown in the closed circuit position.

Fig. 3 is a transverse sectional view on the plane of the line 3—3 of Fig. 1 looking upwards, the cover being shown in place.

Fig. 4 is a similar sectional view showing the construction and arrangement in which the switch parts are inverted.

Fig. 5 is a longitudinal sectional view and side elevation of a single unit switch mechanism showing the parts in the normal open circuit position.

Fig. 6 is a similar view showing the parts in the closed circuit position.

Fig. 7 is a plan view of the parts in the position of Fig. 6.

Fig. 8 is a longitudinal sectional view and side elevation showing the parts in the position they would occupy just as the circuit is being opened by a hand operation of the switch.

Fig. 9 is an enlarged fragmentary sectional view showing the means of supporting the main switch arm contact member.

Fig. 10 is another longitudinal sectional view and side elevation of the switch parts in the position which they would occupy just as the circuit is broken by the automatic thermal tripping or release action, and also showing in dotted lines the position of the switch arm and toggle links in their position of rest after such opening action and before the hand operated mechanism has been returned to its normal open circuit position.

Fig. 11 is a perspective view of a single unit of switch mechanism in a normal open circuit position corresponding to Fig. 5.

Fig. 12 is a perspective view of the current carrying parts of a single switch unit shown in the closed circuit position.

Fig. 13 is a perspective view of an en-

closed switch construction embodying my invention, the cover being shown open and the operating handle in the "on" or closed circuit position.

5 The switch parts are mounted in the suitable insulating block or body 15. The switch contact elements 16 and 17 are suitably constructed and mounted. The preferred form of contact is more fully shown and described, 10 in my co-pending application No. 20,611, filed April 4, 1925. It should be understood however that the invention herein claimed is not limited to the particular construction of contact elements. In the form shown for 15 the purpose of illustration the contact arm 16 is pivoted on a pin or shaft 18 which is supported in a yoke or bracket 19. The sides of the arm are pressed outwardly against the sides of the bracket by means of a spring 20 so as to provide a uniform contact engage- 20 ment between the arm and its support. The support 19 may be secured to the insulating base 15 by means of a screw 21. The spring 22 tends to throw the switch arm to the open circuit position shown in Figs. 5 and 11. A 25 sleeve 23 may be interposed between the springs 20 and 22 to prevent interference one with the other. The end or tip 24 of the contact arm is preferably formed of metal especially adapted to serve as a contact surface to engage the other contact member 17. The 30 latter is preferably supported by a bracket 25 and has a pin 26 secured to it which extends loosely through an opening in the bracket 25. A spring 27 on this pin 26 holds the contact member 17 resiliently in position so that it can tilt about the end of the 35 bracket 25 and twist sideways to permit it to accommodate itself to the tip 24 of the swinging contact arm. The bracket 25 may be secured to the base by a screw 28. I also preferably provide a flexible conductor 29 for electrically connecting the contact 17 to the terminal member 30 which is secured to 40 the base 15 by the same screw 28 which secures the supporting bracket 25 in place.

The other circuit terminal 31 of the switch is secured in place by a screw 32 which passes through the base and screws into the piece 50 33. A U-shaped bi-metallic thermostatic element 34 has one end of one arm secured to the member 33 and the corresponding end of the other arm secured to an angular extension 35 of the member 36 which is connected to the support 19 for the swinging 55 contact arm 16. When the switch is closed the circuit may be traced from terminal 31 through screw 32, connection 33, thermostatic element 34, members 35, 36, 19, arm 16, tip 24, contact 17, connector 29 to terminal 30 as shown in Fig. 12.

60 The operating lever 37 is pivotally supported by a U-shaped member 38 which is secured to the base 15 by the screw 32. This member 37 is connected to the switch arm

16 by a toggle member consisting of the two links 39 and 40. The opposite ends of these links are hinged respectively to the lever 37 and arm 16 and the intermediate adjacent 70 ends of the links 39 and 40 are hinged together and preferably provided with a roller 41 which is adapted to roll on the thermostatic member 34. A spring 42 exerts pressure on the link 39 to throw it and hold it yielding into the position shown in Fig. 5. 75

In the preferred form I provide a crank 43 which engages in the slotted end of the lever 37 and is suitably supported for 80 instance in a box or receptacle 44. While the invention is not limited to an enclosed switch it is particularly useful in that connection. I have shown a box 44 with a suitable form of cover 45. The crank is also preferably 85 provided with some suitable form of manually operable device or handle 46. In the form shown there are two units or switch elements as heretofore described. In Fig. 3 will be seen the operating lever 37 of the right hand unit and the operating lever 37' 90 of the corresponding left hand unit. I have also shown the invention as applied to a switch for a three wire circuit in which the neutral wire has a through connection 47 located between the two switch elements.

The insulating base 15 is preferably so 95 constructed as to provide insulating barriers such as 48 on opposite sides of each switch unit so as to prevent arcing.

In the normal open circuit position the 100 parts of the switch in operating mechanism occupy the relative positions as shown in Fig. 5. When it is desired to close the circuit the handle 46 is operated so as to swing the crank 43 and tilt the lever 37 from the 105 position shown in Fig. 5 to that shown in Fig. 6. The roller 41 travels along the surface of the thermostatic element 34 and the switch arm 16 engages the contact member 17 and pushes it back until the joint between members 37 and 39 passes below the 110 pivot axis of the member 37 (as viewed in Figs. 5 and 6). It will be understood that these figures actually show the switch upside down with respect to the positions of 115 Figs. 1, 2 and 3 and right side up with respect to the position of the parts in Fig. 4. When once the joint between members 37 and 39 passes the center line of the toggle the spring 22 holds the parts in position. 120 To open the circuit the handle 46 is moved in the reverse direction and the lever 37 tilted so as to break the toggle action and allow the spring 22 to return the parts to the normal open circuit position.

When the parts are in the closed circuit 125 position of Fig. 6 the overloading of the circuit causes the heating of the thermostatic member 34 and a consequent warping of it so as to force the roller 41 away from the support and break the toggle between the

links 39 and 40 as shown in Fig. 10. As soon as the toggle is broken the spring 22 throws the switch arm and links 39 and 40 to the dotted positions of Fig. 10 even though the operative crank 43 remains in its apparently closed circuit position. Of course as soon as the circuit is opened the thermostatic member 34 will begin to cool and return to its normal straight position.

To reset the switch it would be necessary to throw the handle and crank 43 to the open circuit position. When the lever 37 is swung (left handed) from the position of Fig. 10 the spring 42 throws the link 39 back into the position of Fig. 5, as soon as there is room enough for the toggle links 39 and 40 to straighten out and reverse themselves. It would be understood of course that the spring 22 is strong enough to throw the switch arm from the closed circuit to the open circuit position against the resistance of the spring 42.

In the form shown in Fig. 4 the insulating base 50 carries the switch units having operating levers 51 corresponding to the levers 37 and a crank 52 corresponding to the crank 43. The construction and method of operation however are the same as that above described.

I claim:

1. In an overload switch a movable switch member, an operating member, a double-action toggle connection between said switch member and said operating member and thermostatic means to operate said toggle connection to open the circuit while the operating member is in the closed circuit position.

2. In an overload switch a movable switch member, an operating member, a double-action toggle connection between said switch member and said operating member, a manual means for moving said operating member and thermostatic means for operating said toggle connection independently of said operating member.

3. In an overload switch a movable switch member, an operating member, a double toggle connection between said switch member and said operating member, thermostatic means for operating one part of the toggle and manual means for operating the other part of the toggle.

4. In an overload switch a movable switch member, an operating member, a double toggle connection between said switch member and said operating member, a thermostatic means for operating one part of said toggle to open the circuit and spring means for restoring one part of said toggle member to normal operative position.

5. In an overload switch an operating member a movable switch member, a toggle connection between said switch member and said operating member, manual means for

breaking the joint of said toggle at one side of the toggle centers and thermostatic means for breaking the joint of said toggle at the opposite side of the said toggle center.

6. A combination switch comprising a hinged switch member, a hinged manually operable member, a jointed toggle link connecting said members and a thermostatic member for moving said link and releasing said switch member while the manually operable member is in the closed circuit position.

7. A switch construction including a spring-pressed switch member, an operating member, a toggle connection between said switch member and said operating member, a roller on said toggle connection, and a thermostatic member serving as a bearing and a stop for said roller on normal circuit conditions and to move said roller to open the switch on overload conditions.

8. A switch construction including a spring-pressed switch member, an operating member, a link connected to said switch member, a link connected to said operating member, a hinge joint connecting said links, a roller connected to said links, and a thermostatic member for supporting said roller and for releasing said switch member independently of said operating member.

9. In a switch, a hinged operator, a hinged switch arm, a link hinged to said operator, a link hinged to said switch arm, a hinge joint connecting said links, a thermostatically operated member for supporting said joint and releasing said switch arm independently of said operator, and a spring for reversing the position of said links.

10. In a switch a movable switch member, an operating member, a double jointed connection between said switch member and said operating member, a handle for moving said operating member and thermostatic means engaging said double jointed connection for operating said switch member independently of said operating handle.

11. In a switch a movable switch member, an operating member, a double toggle connection between said switch member and said operating member, thermostatic means engaging one part of the toggle and a handle connected to another part of the toggle.

12. In a switch, a movable switch member, an operating member, a double toggle connection between said switch member and said operating member, a thermostatic means for supporting and operating one part of said toggle to open the circuit, spring means for restoring one part of said toggle member to normal operative position, and a handle for said operating member.

13. In a switch, an operating member, a movable switch member, a toggle connection between said switch member and said operating member, manual means for breaking

the joint of said toggle at one side of the toggle centers and thermostatic means for breaking the joint of said toggle at the opposite side of the said toggle center and a
5 spring joint connection between said operating member and said toggle connection.

14. A switch construction including a spring-pressed switch member, a manually-controlled operating member, a double-
10 jointed toggle connection between said switch member and said operating member, a roller on said toggle connection, and a thermostatic member serving as a bearing for

said roller and as a means for tripping the switch on overloaded circuit conditions. 15

15. A hinged operating lever, a hinged switch arm, a stationary contact, a double jointed toggle link connecting said lever and said arm, means for holding said lever and said toggle in an approximately straight line
20 when said arm engages said contact, and a thermostatic member for moving said toggle link independently of said lever while said lever is in the closed circuit position.

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