

May 20, 1930.

B. E. GETCHELL
AUTOMATIC SAFETY SWITCH

1,759,395

Filed Dec. 22, 1928

3 Sheets-Sheet 1

Fig. 1.

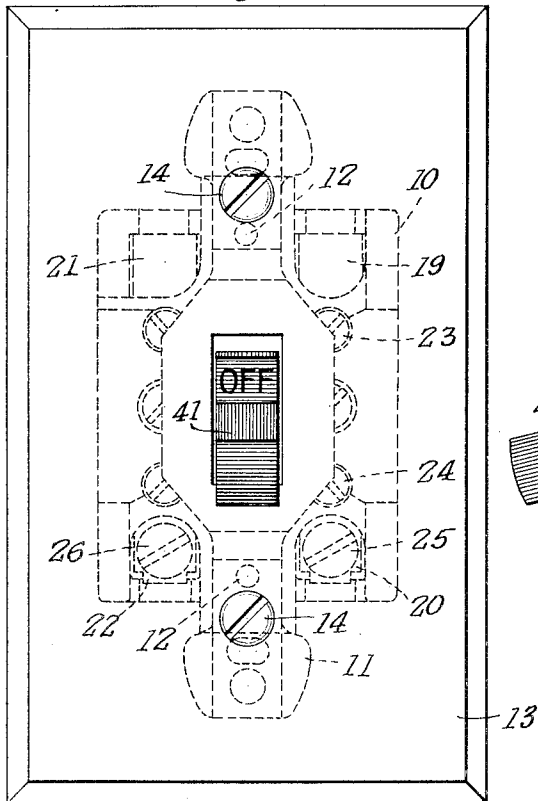


Fig. 2.

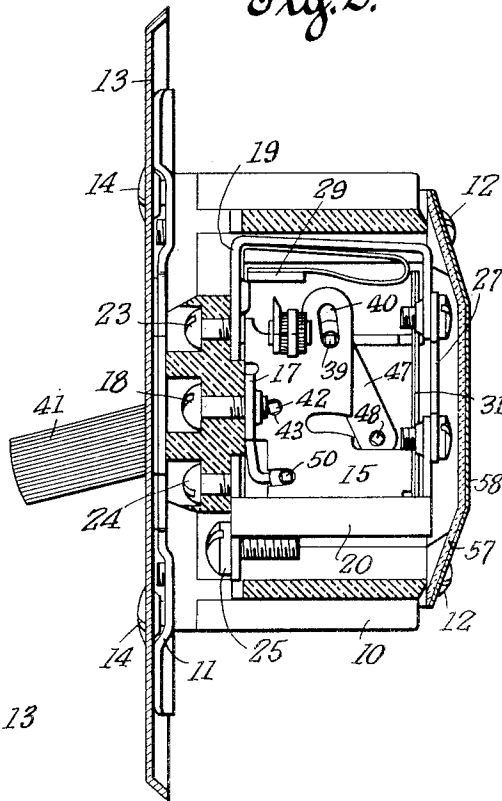
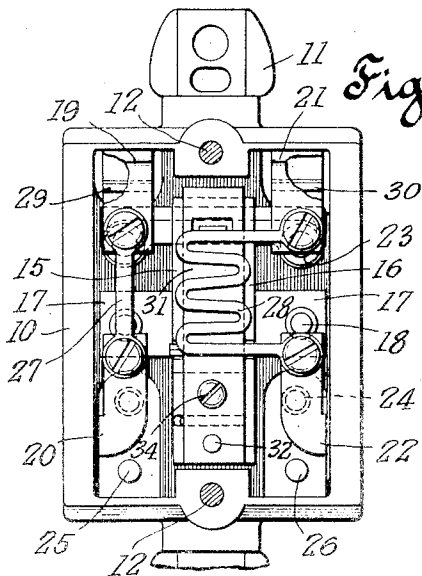


Fig. 3.



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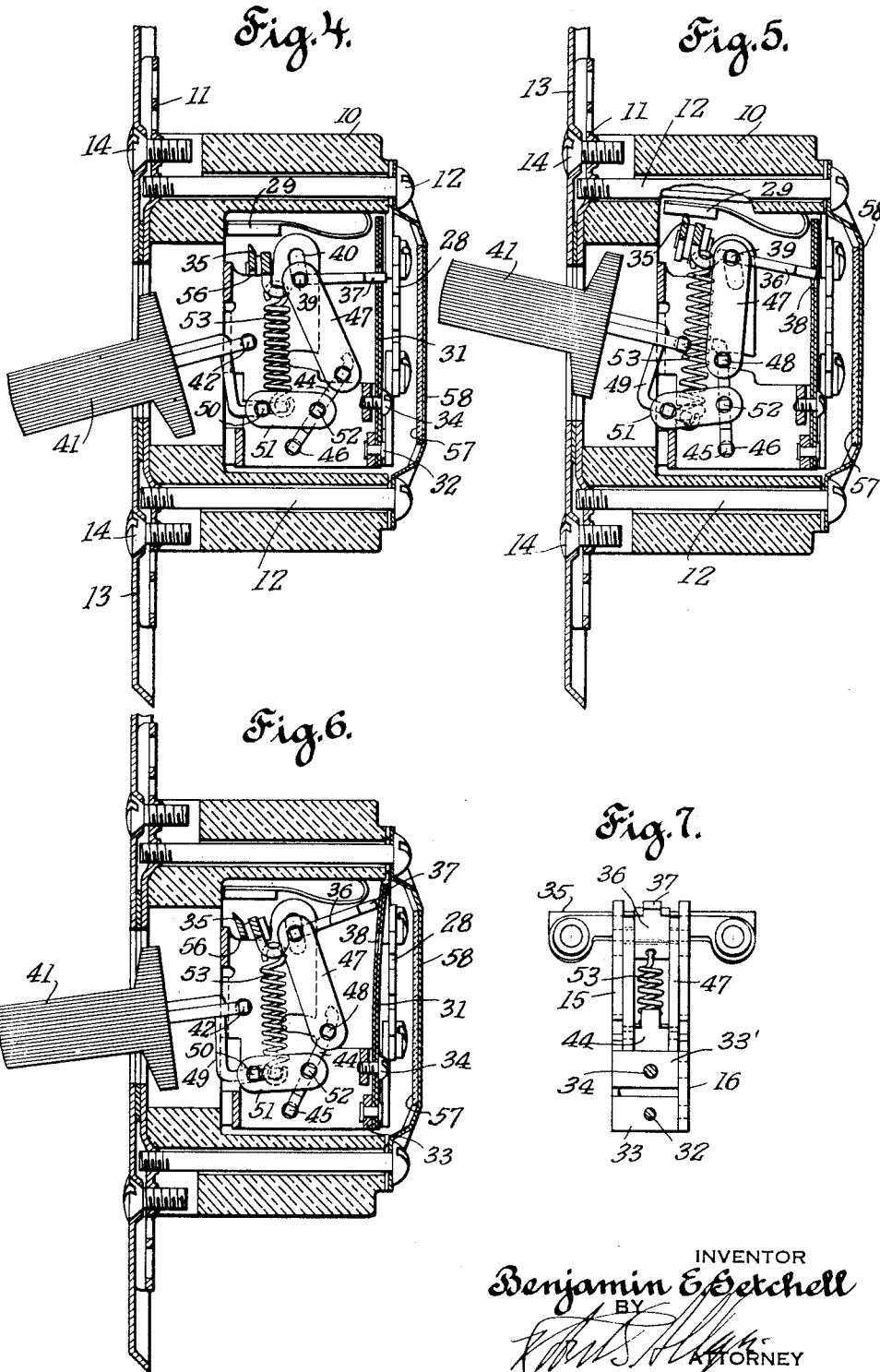
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3 Sheets-Sheet 2



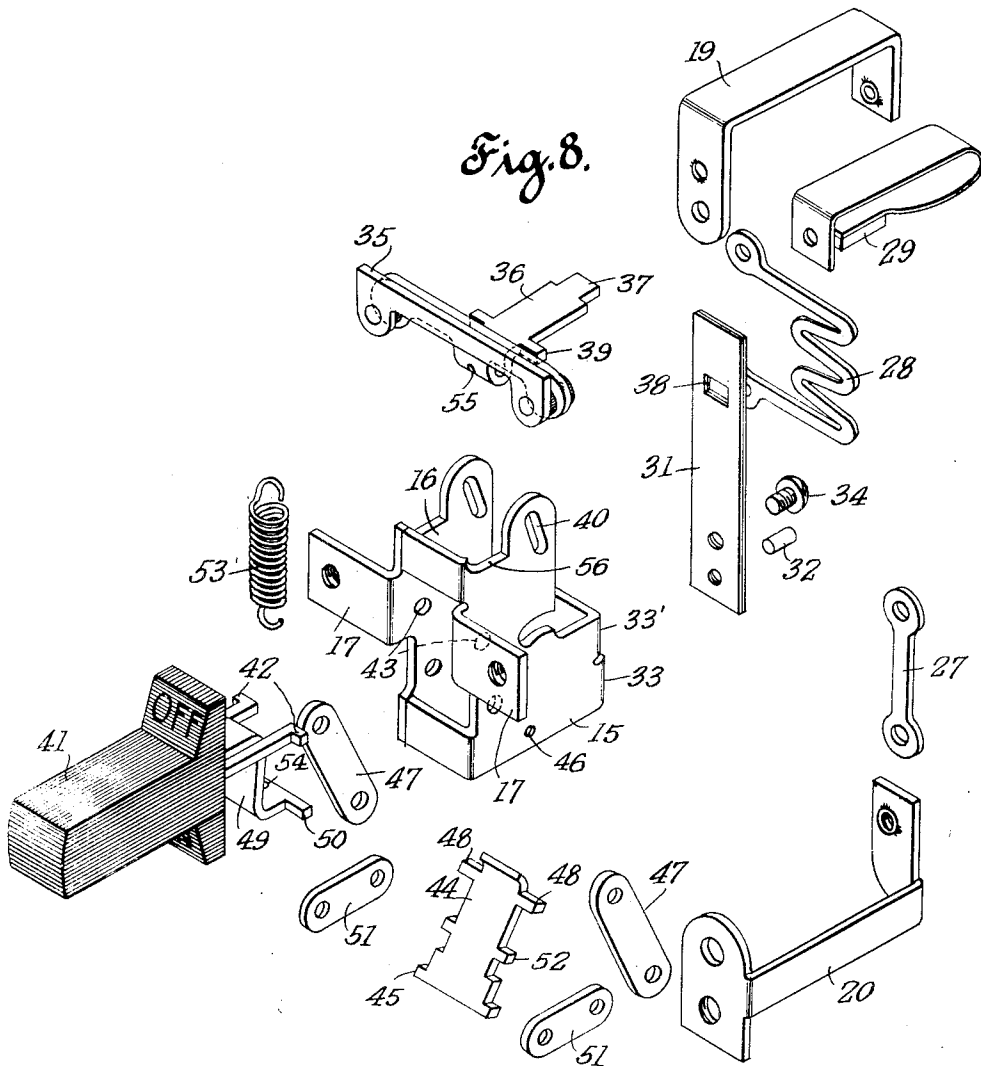
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3 Sheets-Sheet 3



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AUTOMATIC SAFETY SWITCH

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This invention relates to a switch construction of the well known toggle type having an operating handle for manually operating the switch in the same manner as an ordinary toggle switch under normal circuit conditions; it is also provided with thermostatic means for latching the co-related parts in operative position under normal circuit conditions and which means also further operates to unlatch the co-related parts under overload conditions and thus permits the switch to automatically snap to the open circuit position.

This switch is particularly adapted for use in starting, stopping and automatically protecting small motors from over-loaded circuit conditions. In starting a motor, the initial rush of current is usually from three to six times greater than the full load capacity of the motor and, if the motor is to be protected by fuses, some special means such as a two-position switch or an equivalent must be provided to shunt or otherwise protect the fuses during the starting period for the reason that the capacity of the fuses should be limited to not more than fifty percent greater than the full load capacity of the motor and obviously, fuses of such comparatively limited capacity cannot cope with the full starting load.

When such a shunting device is used for the protection of the fuses during the motor starting period, the motor is unprotected during that period except by means of the much greater capacity main line fuses which condition is, of course, decidedly objectionable.

The special object of my invention is to provide a protective switch for relatively small motors which will permit the motor to receive the necessary starting load, or a reasonable overload, but which switch is further provided with normally inactive means for automatically opening the circuit as soon as the dangerous overload period has been reached.

Another object is to provide a cut-out of the foregoing description which will automatically open the circuit on predetermined overload conditions and which will also automatically carry the switch releasing latch

back into position to be re-engaged by the thermostatic member as soon as the latter has cooled and recovered its normal condition after its automatic operation.

Another object is to provide an automatic device which will function both as a manually operable switch for normal switching use and as an automatic means for opening the circuit in case of overload and to so arrange the device that it may be accurately calibrated or pre-set at the factory and to house the parts in such a manner that it would be practically impossible for the tenant or user to change the pre-set calibration.

Another object is to provide a device of this type which is so simple, cheap and practical that it may readily be adapted to general public use.

Another object is to provide a device of this character which will positively and automatically operate to open the circuit even when the operator is holding the operating handle in the on position.

Another object is to provide an automatic cut-out of such general dimensions and character that it is interchangeable with standard snap switches and thus may be mounted in any standard switch box whether already installed or not.

Another object is to provide a device of this character in which the thermostatic latch is caused to operate by the heat generated by a separate adjacent heater element.

Another object is to provide an automatic switch cut-out in which all of the required switching, latching and relatching movements are accomplished by the aid of but a single spring.

Another object is to provide an automatic overload switch which cannot be held in closed circuit position against overload.

Another object is to provide an automatic overload switch normally operated by a two-position handle which will automatically move the handle from on to off position simultaneously with its automatic off movement and thus clearly indicate the correct position of the switch contacts.

Fig. 1 is a front view showing the switch

plate and in dotted lines the body of the switch.

Fig. 2 is a vertical sectional view showing the switch in the open circuit position.

Fig. 3 is a rear view, the back plate being omitted.

Fig. 4 is a vertical sectional view but on a different plane from Fig. 2, and showing the switch in the open circuit or off position.

Fig. 5 is a section similar to Fig. 4 but showing the switch in the closed circuit position.

Fig. 6 is a similar section but with the parts in the position which they occupy after they have been released by the operation of the thermostatic latch but before the moving parts have reached the fully open circuit position.

Fig. 7 is a detail of the movable switch member.

Fig. 8 is an exploded perspective view showing the various parts of the switch proper.

In the preferred form of the invention the various parts are carried by and housed in a base or body 10 of insulating material. For convenience in installation this base may be provided with a supporting yoke 11 at the front held in place by anchorage screws 12.

Such a construction may be installed in any usual manner and may have a front plate 13 held in place by screws 14 in the usual manner of such constructions.

The operating parts are supported in a frame having side plates 15 and 16 suitably secured together. This frame may be anchored to the insulating body by lugs 17 and screws 18.

The stationary current carrying members include contact posts 19, 20, 21 and 22 which may be conveniently formed of sheet metal cut and formed to the desired shape. These contact posts are secured to the base for instance by means of screws such as 23 and 24. The circuit wires are connected to the contact posts 20 and 22 by means of binding screws 25 and 26. The rear ends of the contact posts are electrically connected by the link 27 and the heater element 28. The two upper contact posts 19 and 21 are provided with spring contacts 29 and 30.

The heater element 28 is formed of suitable high resistance metal of the proper characteristics to serve as a heater for the bimetallic thermostatic spring latch plate member 31. This latch plate is secured to the supporting frame by means of a rivet 32 which anchors one end of the latch to the cross piece 33 at the rear of the frame. An adjusting screw 34 extends through the latch near its stationary end and is screwed into the cross piece 33'.

These two pieces 33 and 33' are arranged in different planes so that by tightening or loosening the screw 34 the latch plate may

be bent more or less to properly calibrate the device.

The movable switch member 35 is secured to the head of a T-shaped member 36 but insulated from it in any suitable manner. The rear end or tip of the carrier 36 is reduced in size to permit it to enter the hole 38 in the latch plate 31 so that, in the normal operation of the switch, the carrier 36 is in effect pivoted in the opening 38 in the thermostatic latch member. The carrier is provided with projecting pins 39 which are guided in inclined slots 40 in the main frame.

The switch handle or operating lever 41 is provided with pivots 42 supported in bearings 43 in the frame.

The toggle lever 44 is provided with integral pivot pins 45 supported in bearings 46 in the frame. The toggle links 47 connect the pins 48 with the hinge pins 39 on the carrier 36.

The operating lever 41 also has an off-set arm 49 provided with projecting pins 50. The links 51 connect the pins 50 with the hinge pins 52 on the opposite sides of the toggle lever 44. The tension spring 53 is connected at 54 to the arm 49 of the operating lever or handle, and at 55 to the contact carrier 36 at a point between the pivots 39 and the movable switch member 35. Normally when the switch is in the off position this spring holds the parts in the position shown in Fig. 4, where the contact 35 rests against the abutment edges 56 of the frame.

To close the circuit the end of the finger lever 41 is moved from the position as shown in Fig. 4 to that of Fig. 5. This tilts the lever about the pivots 42 and draws the links 51 toward the front plate thus swinging the toggle lever 44 about its pivots 45. This swinging movement of the toggle lever 44 thrusts the links 47 upwardly so that the pins 39 are moved upwardly in the inclined slots 40 thus swinging the contact carrier 36 about its rear end 37 and forcing the contact blade 35 against the contacts 29 and 30 in the position shown in Fig. 5 where the toggle action is in the reverse position to that shown in Fig. 4. In this position it will be seen that the pull of the spring 53 on the arm 49 of the operating lever is substantially in line with the pivot 42 of the lever so that the spring has very little tendency to throw the lever to the open circuit position. Whatever tendency there is to move the lever is entirely overcome by the pressure of the contact springs 29 and 30 against the movable contact 35 and the toggle action of the members 44 and 47. The switch being in the closed circuit position, the circuit may be traced through the following successive elements: binding screw 25—contact post 20—link 27—contact post 19—spring contact 29—movable switch member 35—spring contact 30—contact post 21—heater element 28—contact post

22 to binding screw 26. Obviously the coaction of the parts would be the same if the circuit direction should be reversed.

that the latching end of the contact carrier be engaged by the thermostatic latch so as to form a pivotal bearing against which the toggle action may be exerted. In the absence of such a bearing the device would be inoperative as a switch.

The circuit may be opened by hand by simply pressing the lever 41 downwardly from the position shown in Fig. 5. The lever swings about the pivot 42, the arm 49 thrusts the link 51 to the right, the lever 44 swings on its pivot 45, the connection 48 carries the lower end of link 47 to the right of the line of centers (45—48—39) and the spring 53 pulls the contact end 35 away from contact 29. The spring 53 may press against the upper end or tip of lever 44 to aid the opening movement.

When the circuit is overloaded the heater 28 warps or bends the free end of the thermostatic latch member 31 so that the latching end 37 of the contact carrier 36 is released and the spring 53 accordingly draws the contact 35 away from the stationary contacts 29 and 30 with a snap action so as to quickly open the circuit and protect the switch and other parts from the danger of the overload.

It will be seen that this action will take place even though the operating lever 41 is held in the on position as shown in Fig. 5. In other words, it is impossible for the operator to hold the switch closed if the circuit has been overloaded. To protect surrounding parts and to conserve the heat of the resistance 28 I prefer to provide an asbestos covering 57 and a back plate 58 which may conveniently be secured to the base by the screws 12.

It will be understood that, when the thermostatic latch member releases the latching end of the contact carrier member 36, the spring 53 will tilt the carrier 36 into the position shown in Fig. 6. The tension on the arm 49 then swings the operating lever 41 about the pivots 42 and pushes rearwardly on the links 51 so as to throw the toggle action into the position of Fig. 6.

When the parts have reached the position of the partially completed operating movement shown in Fig. 6, the upper cross projecting portions of the contact carrier 36 will rest against the abutment edges of the frame as at 56 and thus form a fulcrum bearing against which the spring 53 will draw the outer end of the carrier 36 and will then draw the rear or latching end 37 of the carrier 36 back into the position shown in Fig. 5 in which position it will again be engaged in the hole 38 of the thermostatic latch after the latch has cooled and resumed its normal position and condition.

It will be particularly noted that, when the thermostatic latch is heated and bent into switch releasing position, the movable switch member cannot be moved towards the closed circuit position for the reason that the operation of this particular construction requires

An outstanding feature of novelty in my construction is that the use of but a single spring is required to accomplish the quick-break movement of the movable contact whether the switch is tripped manually or automatically, the automatic return of the latch to relatching position and the automatic movement of the operating handle from on to off position when the switch is tripped automatically.

It will be understood that this switch construction may or may not be used in connection with other circuit protecting devices if desired.

It should be understood that I contemplate that various changes may be made in the construction and arrangement of various details but without departing from the spirit or scope of my invention.

I claim:

1. A snap switch having a movable switch member having projecting guide pins, guides therefor, a thermostatic latch coacting with one end of said member, an abutment for the other end of said switch member and spring contacts coacting with said switch member to assist in opening the circuit.
2. An electric switch having a movable switch member having guide pins, inclined guide slots therefor, and a thermostatic latch coacting with one end of said member.
3. A movable switch member having a projecting pin, a guide therefor, a thermostatic spring latch for said member, means for adjusting said latch, snap mechanism coacting with said member and a single lever to operate and to reset the same.
4. A movable switch member having pins, guides therefor, a spring latch for one end of said member, means for adjusting said latch, and snap mechanism coacting with said member to operate and reset the same.
5. In a safety switch, a movable switch member, having a guide pin, a guide therefor, a thermostatic member for normally supporting one end of said switch member and means for adjusting said thermostatic member.
6. An electric switch having a movable switch member provided with projecting pins, guide slots for said pins, a spring support for one end of said member, means for adjusting said support and mechanism coacting with said member to operate and reset the same.
7. A safety switch comprising an insulating housing, two pairs of conducting brackets mounted therein, circuit terminals for one pair and stationary switch contacts for the other pair, links connecting the respective

pairs of brackets, one of said links constituting a heater, a bi-metallic thermostatic latch adjacent said heater, a movable switch member normally pivotally stepped in said bar and toggle mechanism having a single handle for normally operating said switch and for resetting said switch member.

8. In a safety switch, a tilting lever having a movable abutment for one end and a stationary abutment for the other end, a movable contact carried by said lever, a guide for an intermediate part of said lever, a jointed toggle member hinged at one end to said lever and having a stationary bearing at the other end, a pivoted operating member having an offset arm, a link connecting said arm with said toggle member and a spring connecting said arm with said lever.

9. An electric switch construction including stationary contacts, a movable contact having a latching tip, a rocking handle for manually operating said movable contact under normal circuit conditions, toggle links and a spring connecting said handle and said movable contact, a bi-metallic thermostatic latch having operable engagement with the latching tip of said movable contact under normal circuit conditions and a heater element for bending said thermostatic latch to release the said latching tip on overloaded circuit conditions.

10. An electric switch construction including stationary contacts, a movable contact having a latching tip, a rocking handle for manually operating said movable contact under normal circuit conditions, toggle links and a spring connecting said handle and said movable contact, a bi-metallic thermostatic latch having operable engagement with the latching tip of said movable contact under normal circuit conditions and a heater element for bending said thermostatic latch to release the said latching tip on overloaded circuit conditions, the said spring being tensioned to move said movable contact to open circuit position when said movable contact is released either manually or automatically by said bi-metallic latch.

11. An electric switch construction including stationary contacts, a movable contact having a latching tip, a rocking handle for operating said movable contact under normal circuit conditions, a bi-metallic latch for normally engaging the latching tip of said movable contact and for disengaging said tip on overload conditions, a heater element for said bi-metallic latch, toggle links connecting said rocking handle and said movable contact and a spring tensioned between said rocking handle and said movable contact to move said contact to open circuit position when said movable contact is released by said bi-metallic latch and to sequentially move the latching tip of said movable con-

tact into position for re-engagement with said bi-metallic latch.

12. An automatic switch construction including two stationary contacts, a movable contact for bridging said stationary contacts and having a latching projection, a rocking operating handle, toggle link connections between said handle and said movable contact, a spring tensioned between said handle and said movable contact, a normally inactive bi-metallic latch for engaging the latching projection on said movable contact to permit the normal manual operation of said contact and a heating element for heating and bending said bi-metallic latch to cause its disengagement with the latching tip of the movable contact under overloaded circuit conditions.

13. An electric switch construction including stationary contacts, a movable contact having a latching tip, a rocking handle for manually operating said movable contact under normal circuit conditions, toggle links and a spring connecting said handle and said movable contact, a bi-metallic thermostatic latch having operable engagement with the latching tip of said movable contact under normal circuit conditions and a heater element for bending said thermostatic latch to release the latching tip of said movable contact on overloaded circuit conditions, the said spring being trip-free from the rocking handle and operating to move the movable contact member to open circuit with a snap action when the switch is operated manually or automatically, said spring operating to move the rocking handle to off position and to move the latching tip of the movable contact into re-latching position after each circuit opening movement of said switch.

14. A safety switch including a quick break switch member having a latching tip, a bimetallic spring latch therefor, means for heating said latch for releasing the latch, a lever for operating said switch and for resetting the latch only when the heating means has cooled off and a single operating spring connecting said lever and said switch member, the said spring operating to open the circuit with a snap action, to force the rocking handle to off position and to move the latching tip of the movable switch member into position for re-engagement with the said bi-metallic latch when the latter has cooled off after each automatic operation of the switch.

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