A. L. FRERET.

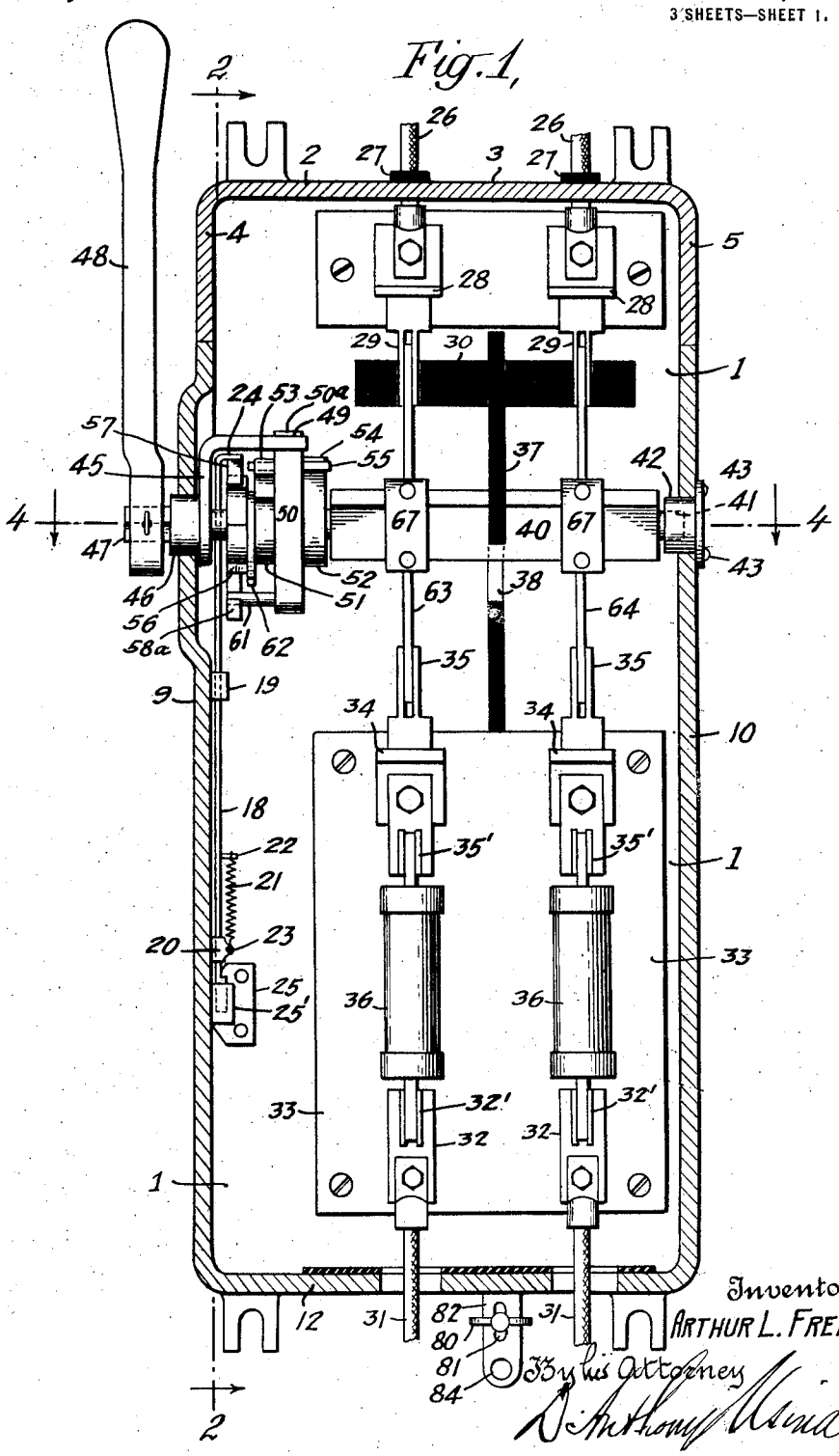
SNAP SWITCH MECHANISM.

APPLICATION FILED APR. 9, 1921.

1,428,542. Patented Sept. 12, 1922.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 3.

Fig. 3.

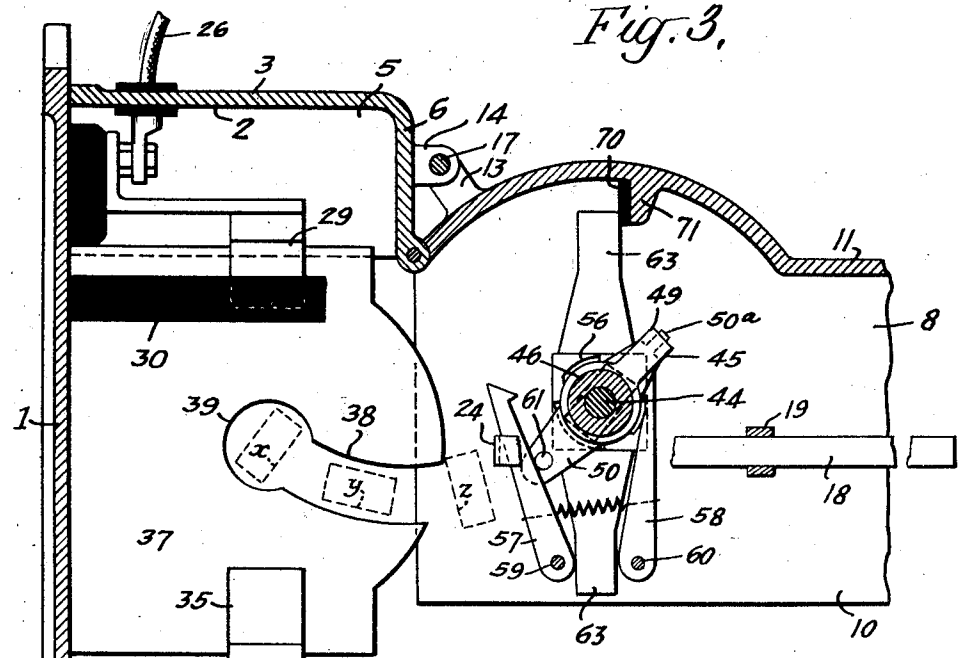
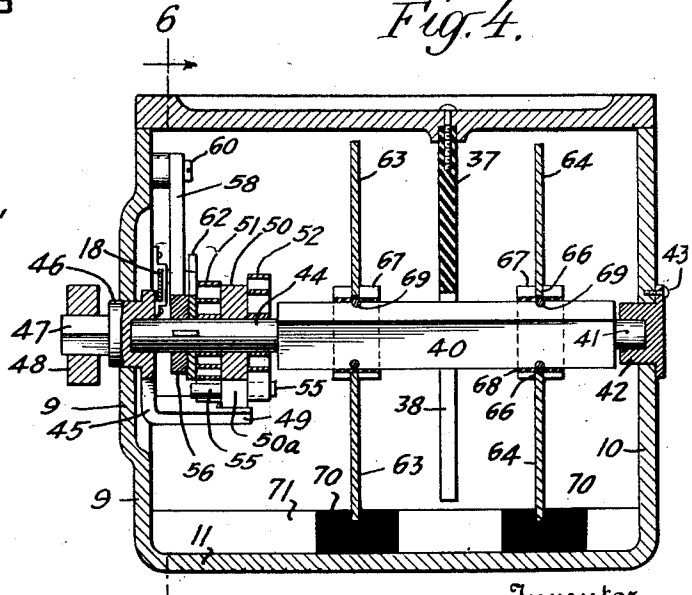
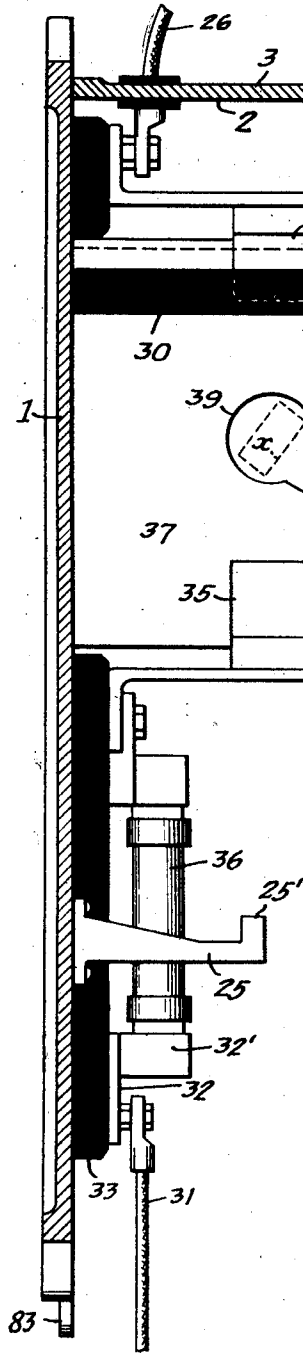


Fig. 4.





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3 SHEETS—SHEET 2.

Fig. 2.

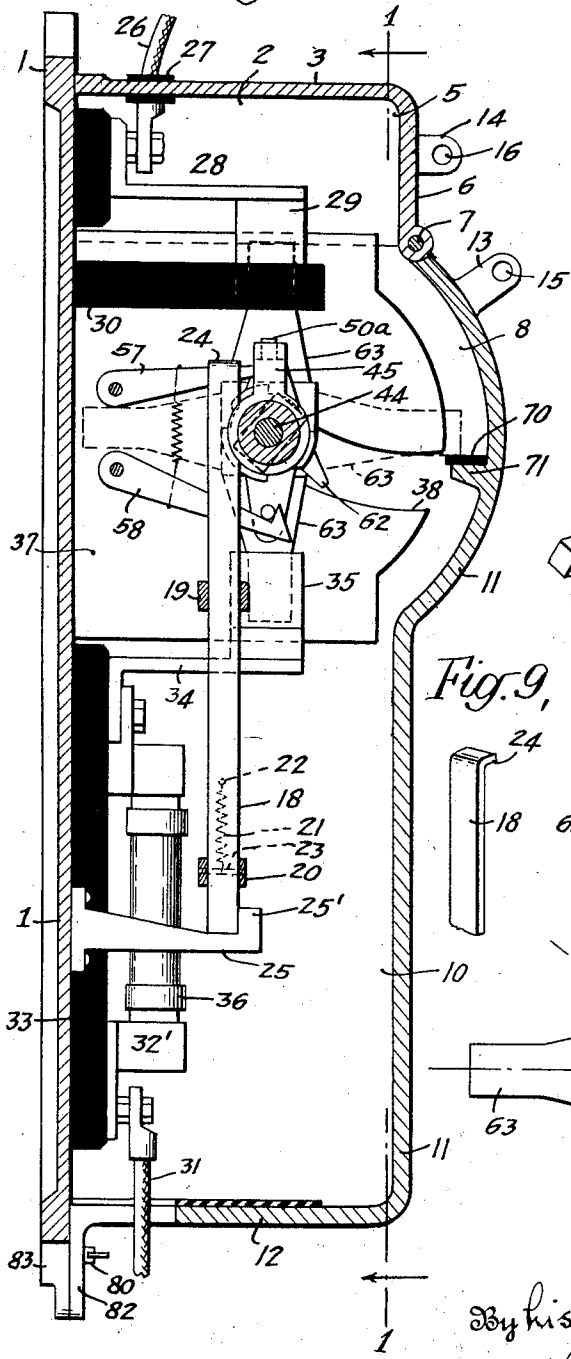


Fig. 5,

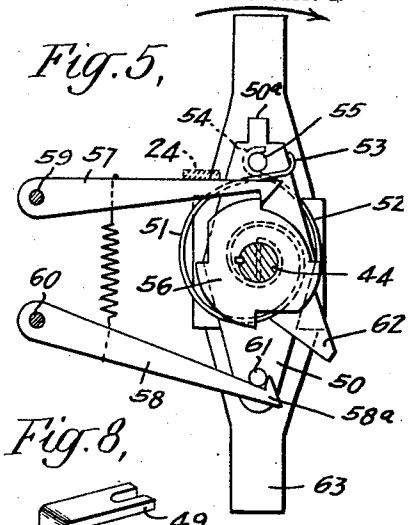


Fig. 8,

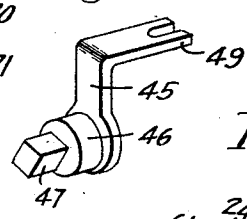


Fig. 6.

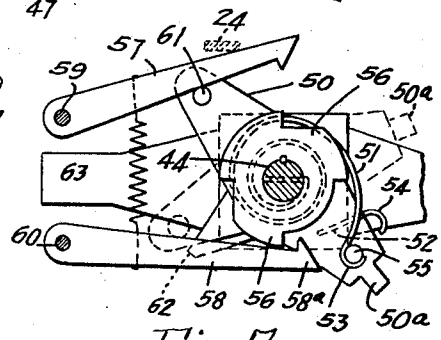
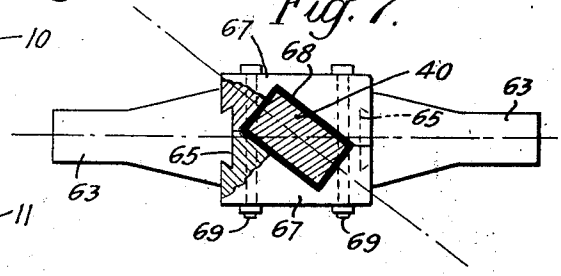


Fig. 9,

Fig. 7.



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Patented Sept. 12, 1922. 1,428,542

UNITED STATES PATENT OFFICE.

ARTHUR L. FRERET, OF ENSLEY, ALABAMA.

SNAP-SWITCH MECHANISM.

Original application filed May 22, 1918, Serial No. 235,924. Divided and this application filed April 9, 1921. Serial No. 460,053.

To all whom it may concern:

Be it known that I, ARTHUR L. FRERET, a citizen of the United States, residing in Ensley, Alabama, have invented certain new and useful Improvements in Snap-Switch Mechanism, of which the following is a specification.

This invention is a division of my application Serial Number 235,924 filed May 22, 1918, and relates to improved quick acting mechanism for actuating switch blades.

The objects of the invention will be apparent from the following description when read in connection with the accompanying drawings in which—

Fig. 1 is a front elevation of the improved switch with the front of the cover sectioned off as indicated by line 1—1 of Fig. 2;

Fig. 2 is a vertical sectional view taken on the plane indicated by the line 2—2 of Fig. 1; the switch blades and the enclosing cover being shown in their respective closed positions;

Fig. 3 is a view similar to Fig. 2 but showing the enclosing cover and the switch blades in their respective open positions;

Fig. 4 is a sectional view on the plane indicated by line 4—4 of Fig. 1 the switch blades however being shown in their open position in the interest of clearer illustration;

Fig. 5 is a detail view of the switch operating mechanism, the parts being shown in the positions they assume when the switch blades are in closed position;

Fig. 6 is a similar view showing the positions assumed by the parts when the switch blades are in open position, being a section on line 6—6 of Fig. 4;

Fig. 7 is a detail showing the rectangular switch shaft with the switch blades secured thereto;

Fig. 8 is a detail perspective view of the operating dog; and Fig. 9 is a detail perspective view of the locking bar.

The switch comprises a fixed back plate 1 having an overhanging hood 2 secured thereto which comprises a top 3 and short side walls 4 and 5 and a front wall 6 extending downwardly therefrom. A hinged portion 7 formed in the front wall 6 forms a pivotal support for the enclosing cover 8 which cover includes side walls 9 and 10, a front wall 11 and a bottom wall 12. A lug 13 is formed integral with the front wall 11 of the hinged cover and a similar lug 14 is formed on the front wall 6 of the fixed portion of the casing. When the cover is in open position the apertures 15 and 16 in the respective lugs 13 and 14 will come into register and as shown in Fig. 3 the cover may be securely held in open position by inserting a pin 17 through the registering apertures.

All the movable parts of the switch mechanism are supported by the hinged enclosing cover and all electrical terminals and connections are carried or supported by the fixed back plate. It will be seen that when the cover is held in open position as shown in Fig. 3, that even though the switch mechanism were accidentally operated no harmful results could occur, and it will further be noted that free access may be had to the terminals and switch jaws for replacement or repair or the renewal of fuses.

The hinged cover 8 is provided with a locking means actuated by the switch mechanism which co-operates with a stationary jaw secured to the back plate. This mechanism comprises a locking bar 18 guided in brackets 19 and 20 secured to the side wall 9 of the cover. A spring 21 anchored to pins 22 and 23 carried respectively by the bar 18 and bracket 20 serves to normally keep the locking bar in the locked position shown in Fig. 2. At its upper end the bar 18 is provided with an angular lip 24 for engagement with one of the trip pawls of the switch mechanism to be hereinafter described.

The lower end of the locking bar 18 co-operates with a lug 25′ formed on the fixed bracket 25 which is secured to the back base 1 to securely hold the cover in locked position as long as the switch blades are closed and in contact with their co-operating terminal switch jaws. When the switch mechanism is operated to break the circuit the locking bar 18 is raised to such position to permit the end of said bar to clear the locking lug 25′.

The feeder terminals 26—26 enter the casing through suitable insulating bushings 27—27 in the top wall 3 of the casing 2 and are connected in the usual manner to the switch terminals 28—28 having down-

wardly extending bifurcated jaws 29—29 which project into recesses provided therefor in the insulating block 30 which is suitably secured to the back base 1.

The motor leads 31—31 are connected to the fuse terminals 32—32 secured to an insulating base 33 carried by the back base 1. Switch terminals 34—34 having jaws 35—35 are secured to the upper part of the insulating base 33 and suitably replaceable fuses 36—36 are interposed between other jaws 35′—35′ of the switch terminals 34—34 and the jaws 32′—32′ of the motor outlet terminals 32—32 in the usual well known manner.

An insulating barrier 37 is rigidly secured to the back base 1 of the switch and is provided with a slot 38 concentric with the hinge 7 and terminating in an enlarged circular inner orifice 39. This slot co-operates with the shaft of the switch mechanism to prevent the closing of the switch cover when the blades of the switch mechanism are in closed position, as will be hereinafter described.

The switch mechanism is carried wholly by the hinged enclosing cover and is mounted therein in such a way that it can be easily and quickly removed for replacement or repair when necessary.

This mechanism comprises a detachable unit or subassembly of parts including a shaft 40 the greater part of which is rectangular in cross-section as shown in Figs. 4 and 7. The ends of the shaft are cylindrical, one end 41 is supported in a bearing 42 which is detachably secured by screws 43 to the side wall 10 of the enclosing cover. The other cylindrical portion of the shaft 40, indicated at 44, is of greater length and is journalled in a suitable bearing formed in the operating dog 45. The dog 45 is provided with a cylindrical hub portion 46 which is rotatably mounted within a suitable aperture in the side wall 9 of the hinged cover. By removing the bearing 42 the whole switch mechanism can be taken out as a unit for inspection or replacement. The dog 45 (Fig. 8) is also provided with a square shank 47 for engagement with the operating handle 48, and an extended bifurcated jaw 49 for engagement with a tenon 50^a of the control lever 50, which is loosely mounted on the portion 44 of the operating shaft 40.

On either side of the control lever (Figs. 4, 5 and 6) are located the oppositely wound volute springs 51 and 52, the inner ends of which are fixedly secured to the shaft 44 and the outer free ends of which are hooked at 53 and 54 for engagement with the driving pin 55 carried by the control lever 50. A ratchet 56 keyed to the operating shaft cooperates with trip pawls 57 and 58 which are pivotally secured at 59 and 60 to the side wall 9 of the hinged cover. The control lever 50 is provided with a projecting pin 61 adapted to alternately disengage the trip pawls 57 and 58 from the ratchet 56 and to also be engaged by the hooked tooth 58^a of the trip pawl 58. An auxiliary trip cam 62 keyed to the cylindrical portion 44 of the operating shaft is adapted to engage the pin 61 of the control lever to rotate the shaft 44 in the event that the spring snap mechanism should for any reason fail to operate.

Referring to Figs. 4 and 7 the switch blades 63—63 and 64—64 are secured in dove-tailed slots 65—65 of the split supporting collars 67—67 which embrace the rectangular portion 40 of the operating shaft and are insulated therefrom by layers of fiber 68—68. Suitable bolts 69 securely clamp the collars 67 in position on the operating shaft. In Fig. 7 it will be seen that a line passing through the major axis of the cross-section of the shaft 40, is approximately at an angle of 45 degrees from a center line passing through the length of the blades 63.

When the switch is in closed position as illustrated in Fig. 2 with the blades 63—63 in the vertical position, the major axis of the rectangular section of the shaft 40 will be at an angle of approximately 45 degrees with the horizontal and coincident with a radial line passing through the hinge 7. In this position as more clearly seen in dotted lines at x in Fig. 3, it is clear that if for any reason the locking bar 18 did not operate to effectively lock the cover to the back base of the switch, that if an opening movement were given to the cover the same would be prevented from opening by the interference of the shaft with walls of the orifice 39 formed in the barrier 37. However, when the switch blades 63 and 64 are in their open position as indicated in Fig. 3, the blades and the shaft having been rotated through approximately 90 degrees will so position the rectangular portion of the shaft that the minor axis of its cross-section will be opposite the arcuate slot 38 formed in the barrier 37. The slot being of greater depth than the minor axis of the shaft will permit the shaft to freely pass therethrough when the cover is raised to the open position as clearly shown by the dotted position y which indicates an intermediate position of the switch mechanism.

In operation when the switch is closed the parts are in the positions indicated in Figs. 1, 2 and 5, the hinged cover being locked in the closed position by the cooperation of the spring actuated locking bar 18 carried by the cover and the lug 25′ of the bracket 25 secured to the back base 1. The cover 8 cannot be opened without first moving the switch blades to their open position by operating the handle 48 which act will raise

the locking bar 18 by reason of engagement between the lip 24 thereof with the trip pawl 57 which is raised to the position shown in Fig. 6 when the switch blades are opened. Should the locking bar 18 fail to operate through breakage or any other reason the rectangular portion of the shaft 40 will be in such position (as indicated at x in dotted lines in Fig. 3) as to prevent the passage of said shaft through the slot 38 which is of less width than the major axis of the rectangular portion of the shaft.

When the switch blades are operated they quickly snap through an angle of approximately 90 degrees and their travel is arrested by coming into contact with rubber bumpers 70—70 carried by a lug 71 formed on the interior of the hinged cover.

The opening movement is effected by turning the handle 48 which is carried by the squared portion 47 formed on the driving dog 45 and its motion is transmitted by the bifurcated end 49 to the control lever 50 by engagement with a tongue 50^a formed on the upper end of said control lever. As this lever is swung around in clockwise direction as indicated by the arrow in Fig. 5, the pin 55 carried thereby will come into engagement with the hooked end 53 of the spring 51 and a further movement thereof will wind said spring around the shaft 44 which at this time is held against rotation by the trip pawl 57 which is in engagement with the ratchet 56 secured to the shaft, the action of which is to store considerable torque within the volute spring 51. Continued movement of the handle 48 and control lever 50 will bring the pin 61 carried by said control lever into engagement with the underside of the trip pawl 57 and raise the same as shown in Fig. 6. This releases the ratchet 56 and permits the shaft 44 and the switch blades carried thereby to be quickly snapped around into a position shown in Fig. 6 by the energy previously stored in the volute spring, the movement of the switch blades being positively stopped by coming into contact with the rubber shock absorbing bumpers 70 carried by the ledge 71 of the cover. As the trip pawl 57 was being raised by the pin 61 carried by the control lever 50, above described, its upward movement caused the locking bar 18 to be also raised due to the engagement of the lip 24 of the locking bar with the upper surface of the trip pawl 57, as indicated in Figs. 2, 3, 5 and 6. With the switch blades in this position the rectangular portion of the shaft 40 will be so positioned that it will freely pass through the slot 38 in the insulating barrier 37 and the locking bar 18 will be raised a sufficient distance to permit its lower end to clear the tooth 25′ on the bracket 25, thus rendering all the parts in position to permit the switch cover to be swung upward about its hinge 7 to the position shown in Fig. 3, to permit access to the interior of the switch.

To effect the closing movement of the cover, the switch blades must be in the open position as illustrated in Fig. 3 so that the rectangular portion of the shaft 40 will be able to enter the slot 38 of the barrier and the locking bar 18 set to clear the tooth 25′ of the locking bracket 25.

It is clear that should the switch handle 48 be inadvertently moved so as to bring the switch blades into closed position when the cover is open it will be impossible to swing the cover about the hinge 7 to a position whereby the switch blades will come into contact with the jaws 29 and 35 due to the interference of the rectangular portion of shaft 40 and the barrier wall 37, as indicated by dotted lines at z in Fig. 3.

After the switch cover been closed down it may be additionally locked by a suitable winged thumb screw 80 passing through a slot 81 in a depending lug 82 secured to the cover and entering a tapped hole in a similar lug 83 formed on the back base 1. The lugs 82 and 83 are provided with registering apertures 84 through which a suitable padlock may be inserted to preclude the possibility of meddlers opening the switch.

When the cover is locked in the position shown in Fig. 2, and the switch blades are in the opened position indicated in dotted lines, the switch may be closed by swinging the operating handle in the direction indicated by the arrow in Fig. 6. The closing operation being very similar to the above described opening operation.

The driving dog 45 rotating the control lever 50 in the direction indicated permits the trip pawl 57 to fall into position to co-operate with the ratchet 56. Further movement causes the pin 55 to engage the hooked end 54 of the closing spring 52, storing energy in the said spring while the trip pawl 58 engaging the ratchet 56 prevents the rotary movement until the pin 61 of the control lever is swung around to a position to trip the pawl 58 from engagement with its co-operating ratchet whereupon the switch blades will be quickly snapped to the position shown in Figs. 2 and 5, the movement of the control lever being arrested by the pin 61 engaging the hooked end 58^a of the trip pawl 58.

Provision is made for opening the switch blades independent of the snap mechanism in the event that for any reason this mechanism should become inoperative due to the accidental breakage of one of the opening springs or failure of other parts to properly operate. This auxiliary operating means comprises the cam 62 keyed or otherwise

secured to the switch shaft. The pin 55 carried by the control lever 50 is of such length that it projects within the path of said cam 62 as shown at the left of Fig. 4. As thus constructed it is clear that if for any reason upon the rotation of the control lever in the direction indicated in Fig. 5 the switch blades do not operate, a continued movement thereon will carry the pin 55 around and into engagement with the cam 62 which being keyed to the shaft will cause the rotation thereof thus effecting an opening movement of the switch blades.

Though I have described with great particularity of detail the embodiment herein shown, it is not to be construed that I am limited thereto, as it is clear that structural changes may be made by those skilled in the art without departing from the spirit and scope of the invention as set forth in the following claims.

What I claim is:

1. In an electric switch a quick throw snap mechanism comprising an operating shaft having switch blades secured thereto, a pair of oppositely wound volute springs secured to said shaft for moving said blades alternately in opposite directions, a ratchet secured to said shaft, trip pawls to alternately prevent the movement of said operating shaft arranged for engagement with said ratchet, a control lever provided with means for engaging said springs to store torque therein upon the movement thereof and means carried by said control lever for disengaging the said trip pawl acting to prevent the rotation of said ratchet.

2. In an electric switch a quick throw mechanism including an operating shaft carrying switch blades, a control lever loosely mounted on said shaft having a spring engaging pin, oppositely wound volute springs having their inner ends secured to said shaft and their outer ends hooked for engagement with the pin carried by said control lever, a driving dog having a forked end for engagement with said control lever, a ratchet wheel secured to said shaft, trip pawls arranged to co-act with said ratchet wheel and to be alternately actuated by a trip pin carried by said control lever, whereby the initial rotation of the control lever in one direction will store energy in one of the volute springs and a further rotation will trip one of the pawls thereby permitting the switch blades to quickly snap from one operative position to another substantially as described.

3. An electric switch comprising a fixed base, an enclosing cover hinged thereto, a snap switch mechanism enclosed by said cover including an operating shaft carrying contact blades, actuating springs and a control lever and means for supporting said shaft which will permit the removal of said shaft and the parts carried thereby as a separate unit.

4. An electric switch comprising a supporting cover, a snap switch mechanism including an operating shaft, said shaft supporting a control lever, a ratchet, and switch actuating springs operated by said control lever, a driving dog for actuating said control lever, said driving dog being provided with a bearing for supporting one end of the operating shaft and means for engaging said control lever which will permit the removal of the switch operating shaft from the bearing in said driving dog and a detachable bearing for supporting the other end of said shaft, to permit the removal of the switch operating mechanism from the supporting cover as a separate unit.

5. In an electric switch a shaft carrying switch blades, a control lever carried by said shaft, volute springs secured to said shaft and co-acting with said control lever to effect a quick movement of the switch blades carried by said shaft and a fixed member on said shaft arranged to co-act with said control lever to effect an opening movement of said switch blades in the event of the failure of the snap mechanism to operate.

6. In an electric switch a shaft carrying switch blades, a control lever carried by said shaft, volute springs having their inner ends secured to said shaft, means carried by said control lever arranged to alternately engage the free ends of said volute springs, a ratchet secured to said shaft, trip pawls co-acting with said ratchet, and arranged to be actuated alternately by said control lever to release said ratchet and permit a quick movement of the switch shaft, and a fixed member on said shaft arranged to co-act with said control lever to effect a movement of the switch blades in the event of the failure of the volute springs and associated parts to function properly.

In witness whereof, I have hereunto signed my name.

ARTHUR L. FRERET.