

March 30, 1926.

1,578,354

G. W. O'KEEFFE

ELECTRIC SWITCH

Filed July 3, 1922

2 Sheets-Sheet 1

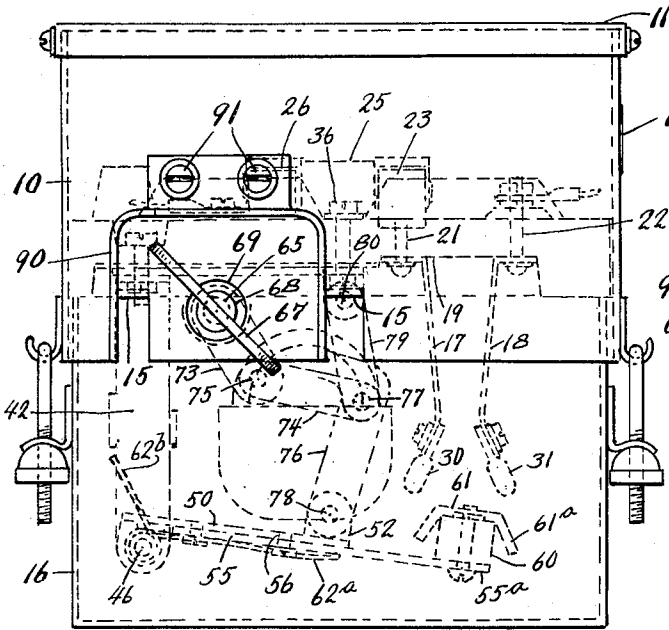


Fig. 1.

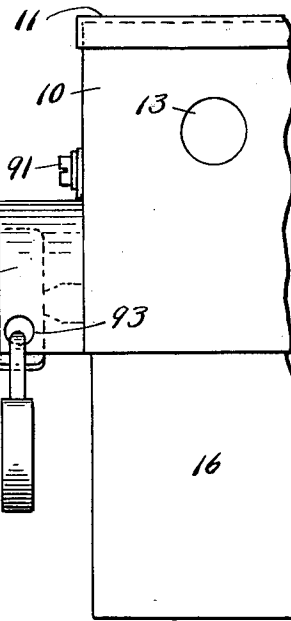


Fig. 2.

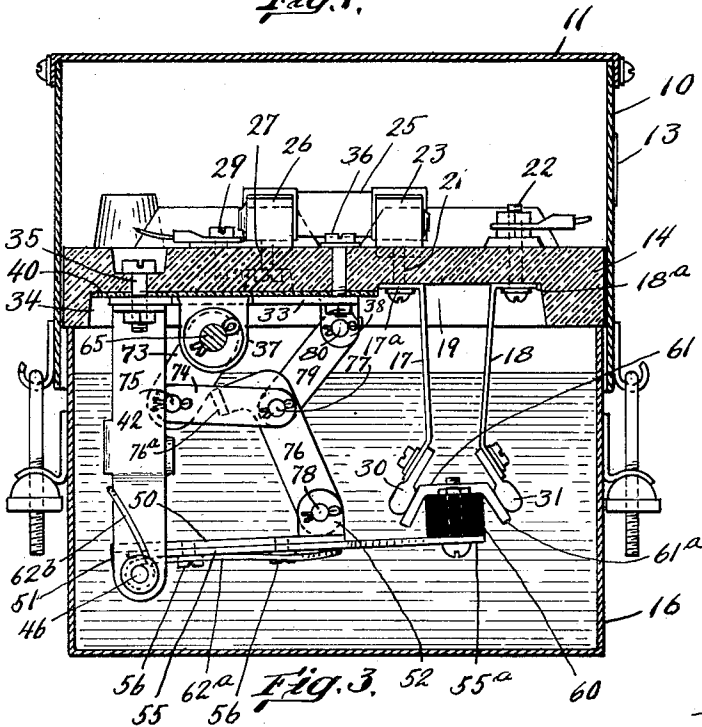


Fig. 3.

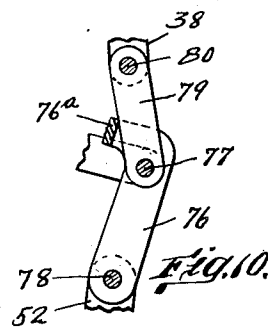


Fig. 10.

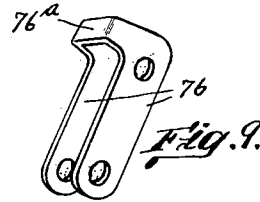


Fig. 9.

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 George W. O'Keefe  
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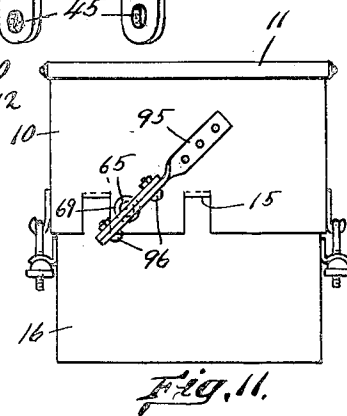
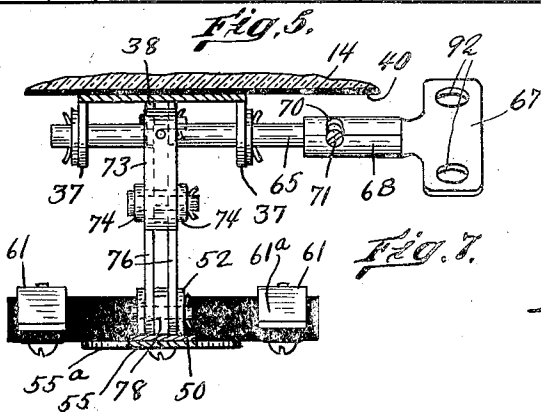
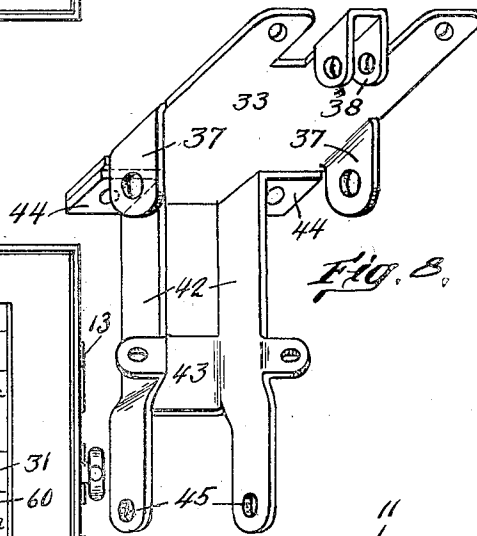
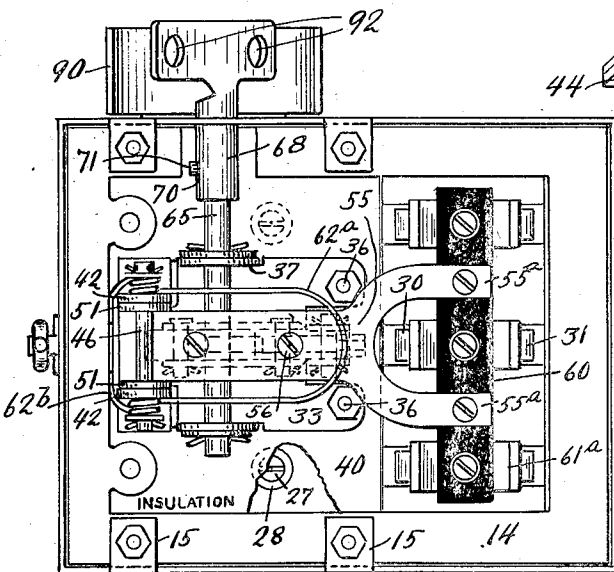
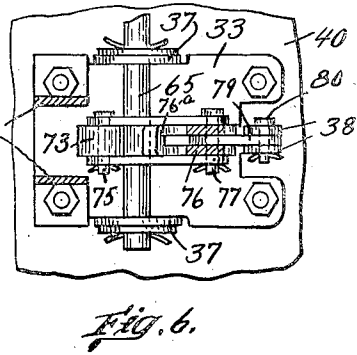
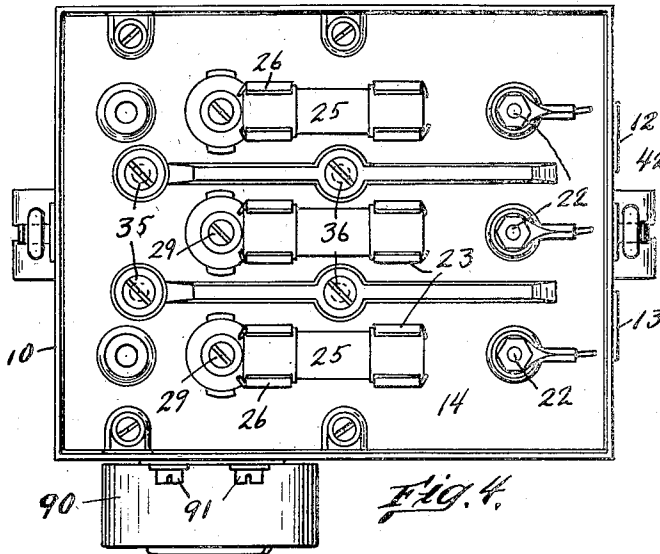
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ELECTRIC SWITCH

Filed July 3, 1922

2 Sheets-Sheet 2



Inventor,  
George W. O'Keefe  
by  
[Signature] atty

# UNITED STATES PATENT OFFICE.

GEORGE W. O'KEEFE, OF DORCHESTER, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONDIT ELECTRICAL MANUFACTURING CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

## ELECTRIC SWITCH.

Application filed July 3, 1922. Serial No. 572,536.

*To all whom it may concern:*

Be it known that I, GEORGE W. O'KEEFE, a citizen of the United States, residing at Dorchester, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Electric Switches, of which the following is a specification.

This invention relates to an electric switch particularly adapted, although not limited, to the control of small induction motors and has for an object to provide a switch having means to close the circuit rapidly, whereby to reduce arcing at the contact members at the instant of starting of the motor.

A further object is generally to improve the construction and operation of electric switches.

This invention is intended as an improvement on the invention disclosed in a co-pending application of George A. Burnham, Serial No. 572,527, filed July 3, 1922 and assigned to Sears B. Condit.

Fig. 1 is a front elevation of an electric switch embodying the invention.

Fig. 2 is a side detail of the switch.

Fig. 3 is a sectional elevation through the switch.

Fig. 4 is a plan view of the switch with the cover removed from the casing.

Fig. 5 is a plan view of the switch-operating mechanism.

Fig. 6 is a plan detail, partly in section, of the switch operating mechanism.

Fig. 7 is an end detail of the switch operating mechanism.

Fig. 8 is a perspective view of the support for the switch operating mechanism.

Fig. 9 is a perspective view of a link-member of the operating toggle.

Fig. 10 is a detail illustrating the action of the link-member in locking the toggle.

Fig. 11 is a side elevation of the switch arranged for mechanical remote control.

As here shown, the electric switch embodying the invention includes the rectangular casing 10 formed preferably of sheet metal and closed at the top by the removable cover 11. The side walls of the casing may have suitable openings 12 and 13, or be otherwise formed, through which suitable conductors may be passed for connection with switch components. A supporting plate 14 of suitable insulating material, as porcelain, is received in the lower

portion of said casing and may serve as a partition to isolate the switch terminals and fuses contained in the upper part of the casing from the switch members which are adapted to be immersed in oil contained in the lower part of the casing. Ears 15 are or may be formed integrally with the side walls of the casing and are or may be reflexed inwardly, and said plate 15 is received on and secured to said ears.

Said casing also includes the oil receptacle 16 which is received within the upper portion of the casing and depends therebelow and is adapted to contain oil in which the switch members are immersed. Said receptacle may be secured removably in position by the bolts 17.

The switch members and operating mechanism are secured to the lower face of said supporting plate 14 and depend therebelow into the oil receptacle 16. The switch here shown is adapted to control a three phase circuit and has three sets of stationary switch members 17 and 18. Each of said switch members is or may be formed of relatively resilient strip material having reflexed upper end portions 17<sup>a</sup> and 18<sup>a</sup> which are received respectively in transverse channels 19 and 20 formed in the under face of the insulating supporting plate 14. Screws 21 and 22 are passed through said plate and the reflexed ends of said switch members whereby to secure said switch members to the plate, and suitable conductors may be connected to the screws 22 on the upper side of said plate. Spring fuse clips 23 may be secured to said screws 21 on the upper face of said supporting plate and said clips are adapted to receive the cartridge fuses 25. Other spring fuse clips 26 may also be secured to the upper face of said supporting plate by suitable means as the screws 27 which may extend through said plate and the heads thereof may be received in suitable recesses 28 in the lower face of said plate. Electric conductors may be connected to said fuse clips 26 by suitable attaching means as the screws 29.

The lower ends of said stationary switch members are or may be reflexed outwardly and contact members 30 and 31 may be secured thereto.

The movable switch member is supported on a base plate 33 which is or may be re-

ceived in a depression 34 formed in the lower face of the insulating plate 14; and said plate 33 is secured to said insulating plate by the screws 35 and 36 which pass through the corner of said plate and into and through the insulating plate 14. Said base plate 33 is formed or provided with the intermediate integral and laterally-opposed depending ears 37, and end opposing and depending ears 38, both adapted to receive components of the switch operating mechanism. A sheet 40 of suitable insulating material, as press board for instance, is interposed between said plate 33 and the lower face of the depression 34 in said insulating plate, and conforms more or less to the shape of said depression and is adapted to cover the screws 27, or other live conducting parts of the switch extended through the insulating plate and reduce the possibility of an arc jumping from said screws or conducting parts to the plate 33.

A bracket which may have the two spaced arms 42 and the connecting and separating cross-member 43 all integrally formed, is received on and depends from said plate 33 and may be secured thereto by the screws 35 which may pass through the outwardly reflexed upper ends 44 of said arms 42. The lower ends of said arms are formed with the aligned openings 45 therethrough adapted to receive a pivot pin 46.

The movable switch member includes a plate 50 which is received between the arms 42 and which has the opposed ears 51 at one end; and said ears have aligned openings through which said pivot bolt 46 is passed loosely. The other end of said plate 50 is formed with the spaced ears 52 adapted to receive a link of the operating mechanism.

An arm 55 is or may be secured to the lower face of said plate 50 by suitable means as the screws 56, and said arm extends outwardly beyond said plate 50 and terminates in the forked ends 55<sup>a</sup>. A bar 60 of suitable insulating material, as wood, is secured to the upper faces of said ends 55<sup>a</sup> and spaced contact members 61 are carried by said insulating bar. Said contact members are formed, preferably, with the downwardly and outwardly reflexed end-portions 61<sup>a</sup> which are adapted to engage and bridge the contact members 30 and 31 of the movable switch members 17 and 18; and said switch members are resilient and flex outwardly when said movable contact members 61 are forced therebetween whereby to provide for a wiping contact.

A spring 62 is coiled about the extended ends of the pivot pin 46 and one end 62<sup>a</sup> thereof extends over and is in contact with the movable switch member. The other end 62<sup>b</sup> is arranged in engagement with said fixed supporting arms 42. Said spring is arranged to press the movable switch member

constantly toward switch-closed position and its action is permitted or opposed by the switch operating mechanism.

The switch operating mechanism includes the operating shaft 65 which is extended through and rotatably supported in the ears 37 of said plate 33 and may be secured in position in said ears by suitable means as the cotter pins 66 extended through the shaft on opposite sides of said ears. Preferably, said shaft is contained entirely within the switch casing. A key supported by said shaft and having the flat finger-engageable portion 67 forms means by which the shaft may be rotated and said key has a hub 68 which extends through an aperture 69 in the wall of the switch casing. Said hub is formed with an internal recess in which the end of the shaft is loosely received and is also formed with a transverse slot 70 therein. a projection of said shaft 65, as the screw 71, is loosely received in said slot 70 and forms means by which said key is secured against unintentional detachment from the shaft and also means by which both are loosely connected and the shaft may rotate independently of the key.

A crank arm 73 is fixed to said shaft 65 intermediate the ears 37 of said plate 33 and links 74 are pivotally connected thereto by the pin 75. A link-member having the parallel and spaced arms 76 and the end integral connecting and separating member 76<sup>a</sup> at its upper end is pivotally connected at its upper end to the other end of said links 74 by the pin 77 and the lower ends of said arms 76 of the link-member are pivotally connected to the movable switch member by a pin 78 passed through the ears 52 of the plate 50. Said connecting and separating member 76<sup>a</sup> of the link-member is adapted to serve as means to limit the movement of the movable switch member in both directions, as will hereinafter be set forth. A link 79 is also pivotally received on the pivot pin 77 and extends upward and is received between and is pivotally connected to the ears 38 of the plate 33 by the pin 80. Said links 76 and 79 form members of a toggle by which the movable switch member is operated.

In the switch-open position, the operating mechanism is in the dotted line position illustrated in Fig. 2 and the toggle is in an over-shot position and is held yieldingly in such position by the spring 62 which forces the connecting member 76<sup>a</sup> of the link member of the toggle against the link 79 of the toggle. The connection between the operating key 67 and the shaft 65 is so arranged that said key serves to rotate the shaft to move the toggle toward the right beyond the dead-center position whereupon the spring 62 operates to remove the movable switch member rapidly into closed position and ro-

tate the shaft independently of the key, the projection 71 of the shaft moving in the slot 70 of the key, for this purpose, and the connecting member 76<sup>a</sup> of the link-member of the toggle is adapted to contact with the arm 73 on the operating shaft and restrict further movement of the switch mechanism in a switch opening direction. The mechanism is so arranged that the operative initiates the switch closing movement but, after the toggle has passed beyond dead-center position the control is taken from the operative and the spring 62 completes the switch-closing operation and moves the movable switch member rapidly into closed position. The rotation of the key in the reverse direction serves to move the movable switch member against the action of the spring 62 toward open position at a rate dependent upon the rate of rotation of the key, and said spring also holds the switch in open position. With this arrangement, arcing between the contact members during the switch closing movement is largely prevented.

A guard 90 is disposed to enclose the key and shield it, whereby to prevent accidental operation thereof, and said shield is, preferably, removably secured to the casing by suitable means, as the screws 91. The finger portion 67 of the key is or may be formed with the apertures 92, and said guard may have the apertures 93 therein; and the hasp of a padlock 94 may be passed through said apertures 93 and an aperture in the key whereby to lock the switch in set position, as for instance, open position.

The switch may be arranged for remote control and for this purpose, the guard 90 may be removed and a bar 95 may be secured to said operating key by suitable means as screws 96 passed through said bar and the apertures in said key, Fig. 11; and said bar may be formed with a plurality of apertures 97 spaced at different distances from the center of the operating shaft 65 whereby to provide for connection with suitable remotely-extended switch-operating means.

The construction herein shown may be modified without departing from the spirit of the invention.

I claim:

1. In an electric switch, a movable switch member including a pivoted arm, a spring connected with said arm arranged to urge said arm to switch-closed position, and means to open the switch including a toggle member connected with said arm, and means to straighten said toggle, whereby to hold the switch open, including an operating shaft having a crank arm, and a link connecting said crank arm and toggle.

2. An electric switch including a supporting plate, stationary switch members depending therefrom, a movable switch member

including a pivoted arm carried by and below said plate and having means to bias it for movement toward switch-closed position, and switch-operating mechanism arranged to open the switch including links comprising a toggle pivotally connected with said arm and with said supporting plate, and means to straighten said toggle, whereby to hold the switch open, including an operating shaft, and a link connecting said operating shaft and toggle.

3. An electric switch including a supporting plate, stationary switch members depending therefrom, a bracket secured to and depending below said plate, a movable switch member including an arm pivotally connected with said bracket, a spring carried by said bracket and bearing against said arm, and arranged to bias said arm for switch-closing movement, links comprising a toggle connected with said arm and said supporting plate and means to operate said toggle whereby to effect movement of said arm between open and closed position of the switch.

4. An electric switch including a supporting plate, stationary switch members depending therefrom, a bracket secured to and depending below said plate, a movable switch member including an arm pivotally connected with said bracket, a spring carried by said bracket and bearing against and urging said arm toward said stationary switch members, links comprising a toggle connected with said arm and said supporting plate, and operating means for said toggle arranged to straighten said toggle to hold said arm in switch open position against the action of said spring, and break said toggle to permit said spring to move said arm to switch closed position.

5. An electric switch including a supporting plate, stationary switch members depending therefrom, a bracket secured to and depending below said plate, a movable switch member including an arm pivotally connected with said bracket, a spring carried by said bracket and bearing against and urging said arm toward said stationary switch members, links comprising a toggle connected with said arm and said supporting plate, and operating means for said toggle arranged to straighten said toggle to hold said arm in switch open position against the action of said spring and break said toggle to permit said spring to move said arm to switch closed position, said operating means comprising an operating shaft and a link connecting said shaft and said toggle.

6. An electric switch including an insulating supporting plate, two stationary switch members depending from one side of said plate, a base plate secured to the lower face of said supporting plate at one side of said stationary switch members, and a movable

switch member and switch-operating mechanism carried by said base plate, said movable switch member extended laterally in one direction beyond said base plate into a position beneath stationary switch members.

7. An electric switch including an insulating supporting plate having electrical conducting members extended through it and exposed at the lower face of said plate, stationary switch members depending from said supporting plate, a base plate secured to the lower face of said supporting plate, adapted to support components of the switch, and an insulating sheet interposed between said supporting and base plates to cover the exposed conducting members in said supporting plate.

8. An electric switch including an insulating supporting plate having electrical conducting members extended through it and exposed at the lower face of said plate, stationary switch members depending from said supporting plate, a base plate secured to the lower face of said supporting plate, adapted to support components of the switch, and an insulating sheet secured over the lower face of said supporting plate to cover the exposed conducting members in said supporting plate.

9. An electric switch including stationary and movable switch members and switch operating mechanism including an operating shaft, a toggle connected with said movable switch member and arranged to be set to hold the switch open, an operating member loosely connected with said operating shaft to rotate it in a switch closing direction and break said toggle, and means released for operation by the breaking of the toggle arranged to close the switch independently of said operating member.

10. An electric switch including stationary and movable switch members and switch operating mechanism including an operating shaft, an operating member loosely connected with said operating shaft to rotate it, a toggle connected with said movable switch member and arranged to be set to hold the switch open, and means released for operation by the breaking of the toggle arranged to close the switch and rotate said operating shaft independently of said operating member.

11. In an electric switch, an insulating supporting plate, a base plate carried by said supporting plate, a bracket secured to said base plate, a movable switch member comprising an arm pivotally connected with said bracket, links comprising a toggle pivotally connected to said arm, said base plate having two sets of integral ears to one set of which said toggle is pivotally connected, an operating shaft rotatably received in said other set of ears, and means operably connecting said operating shaft and toggle.

12. In an electric switch, the combination of a supporting plate, stationary switch members, a movable switch member cooperating with said stationary switch members, switch operating mechanism associated with said movable switch member, and a pivotal support for said movable switch member having two spaced arms and an intermediate connecting and separating member integrally formed with said arms, the upper ends of said arms having means for pivotal connection with said movable switch member, and the lower ends of said arms having laterally reflexed portions supported by said supporting base.

13. In an electric switch, the combination of stationary switch members, a movable switch member cooperating with said stationary switch member including an arm having integrally formed reflexed ears at its opposite ends extended in opposite directions, a member secured to said arm and extended outwardly beyond one end of said arm, contact members carried by said member, a supporting bracket pivotally connected with one set of ears of said arm, and switch operating mechanism pivotally connected with the other set of ears of said arm.

14. In an electric switch, the combination of stationary and movable switch members, and switch operating mechanism including link-members comprising a toggle, an operating shaft having a crank arm, a link connecting said crank arm with said toggle, and means carried by one of said link members of said toggle arranged to engage the other link-member of the toggle to hold the switch in open position and engage the crank arm of said operating shaft to fix the switch-closed position of the movable switch member.

15. In an electric switch, the combination of stationary and movable switch members, and switch-operating mechanism including link-members comprising a toggle associated with the movable switch member, one of said link-members having two spaced and parallel arms and an integral end connecting and separating member.

16. In an electric switch, the combination of stationary and movable switch members, and switch operating mechanism including link-members comprising a toggle associated with the movable switch member, one of said link-members having two spaced and parallel arms and an integral end connecting and separating member, an operating shaft having a crank arm, and a link connecting said crank arm with said toggle, said connecting and separating member of said link-member of said toggle arranged to engage the other link-member of the toggle to hold the toggle in straightened position whereby to hold the switch open, and engage

said crank arm whereby to limit the movement of the movable switch member in switch-closed position.

5 17. An electric switch including an enclosing casing, switch operating mechanism disposed within the casing including an operating shaft, a key extended through an aperture in said casing and connected loosely with said operating shaft, whereby said  
10 shaft may rotate independently of said key, and a guard secured removably to said casing in position to enclose said key.

15 18. An electric switch including an enclosing casing, switch operating mechanism disposed within the casing including an operating shaft, a key extended through an aperture in said casing, a guard secured to said casing in position to enclose said key, and means to lock said key to said guard.

20 19. An electric switch including an enclosing casing, switch operating mechanism disposed within the casing including an operating shaft, a key extended through an aperture in said casing and connected loosely  
25 with said operating shaft, whereby said shaft may rotate independently of said key,

and a guard secured removably to said casing in position to enclose said key, said guard having an aperture through a wall thereof, and said key having an aperture  
30 and both adapted to receive a locking member.

20. Operating mechanism for an electric switch comprising a supporting bracket including a base having an arm extended  
35 therefrom, a switch arm pivoted to said extended arm, a spring connecting said bracket and pivoted arm and arranged to bias said pivoted arm for movement in one direction, a toggle member  
40 connecting said pivoted arm and base and arranged to move said pivoted arm in one direction against the action of said spring, an operating shaft having an offset, a link connecting said toggle and  
45 offset, whereby to actuate said toggle, and means to lock said toggle substantially in set condition, whereby to hold said pivoted arm against movement by said spring.

In testimony whereof, I have signed my  
50 name to this specification.

GEORGE W. O'KEEFFE.