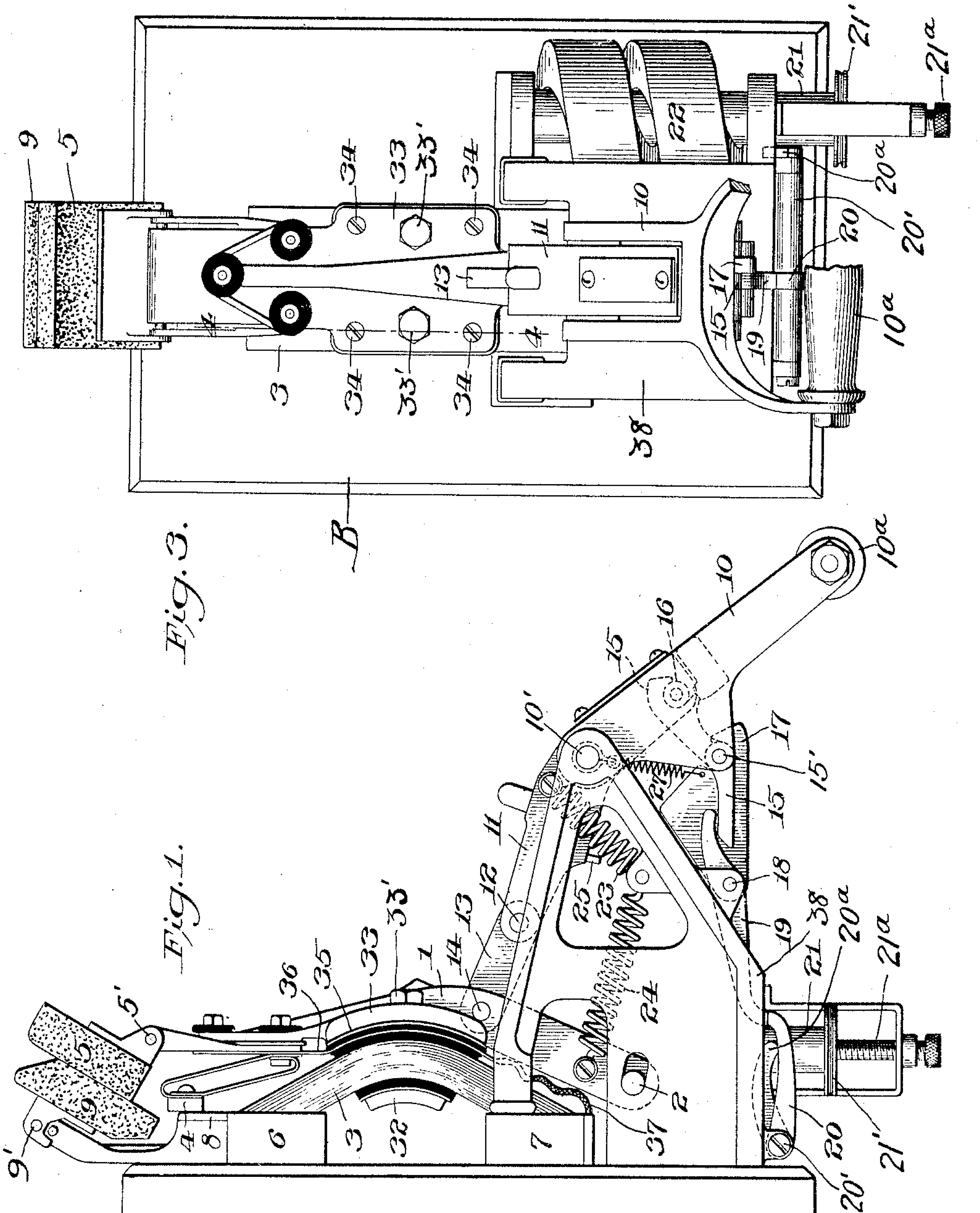
W. M. SCOTT.

AUTOMATIC MAGNETIC CIRCUIT BREAKER.

APPLICATION FILED JUNE 8, 1901.

966,708. Patented Aug. 9, 1910.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

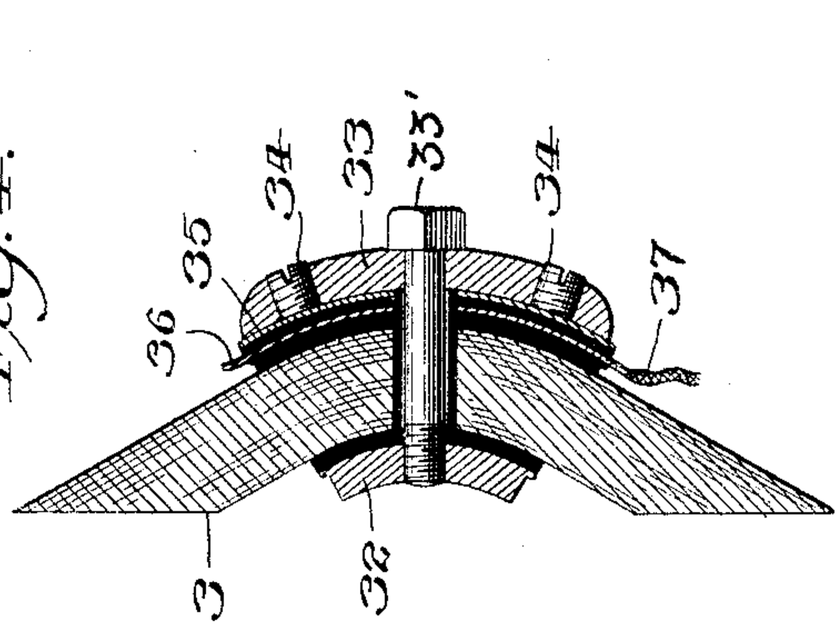


Fig. 5.

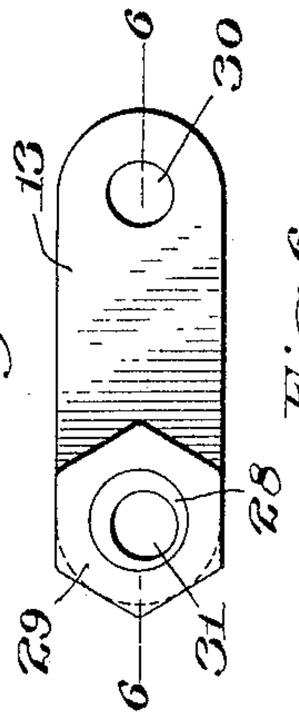


Fig. 6.

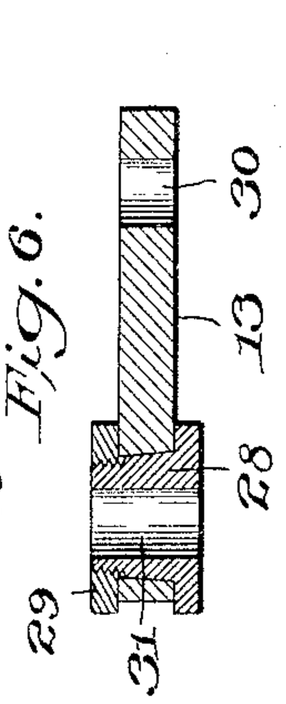
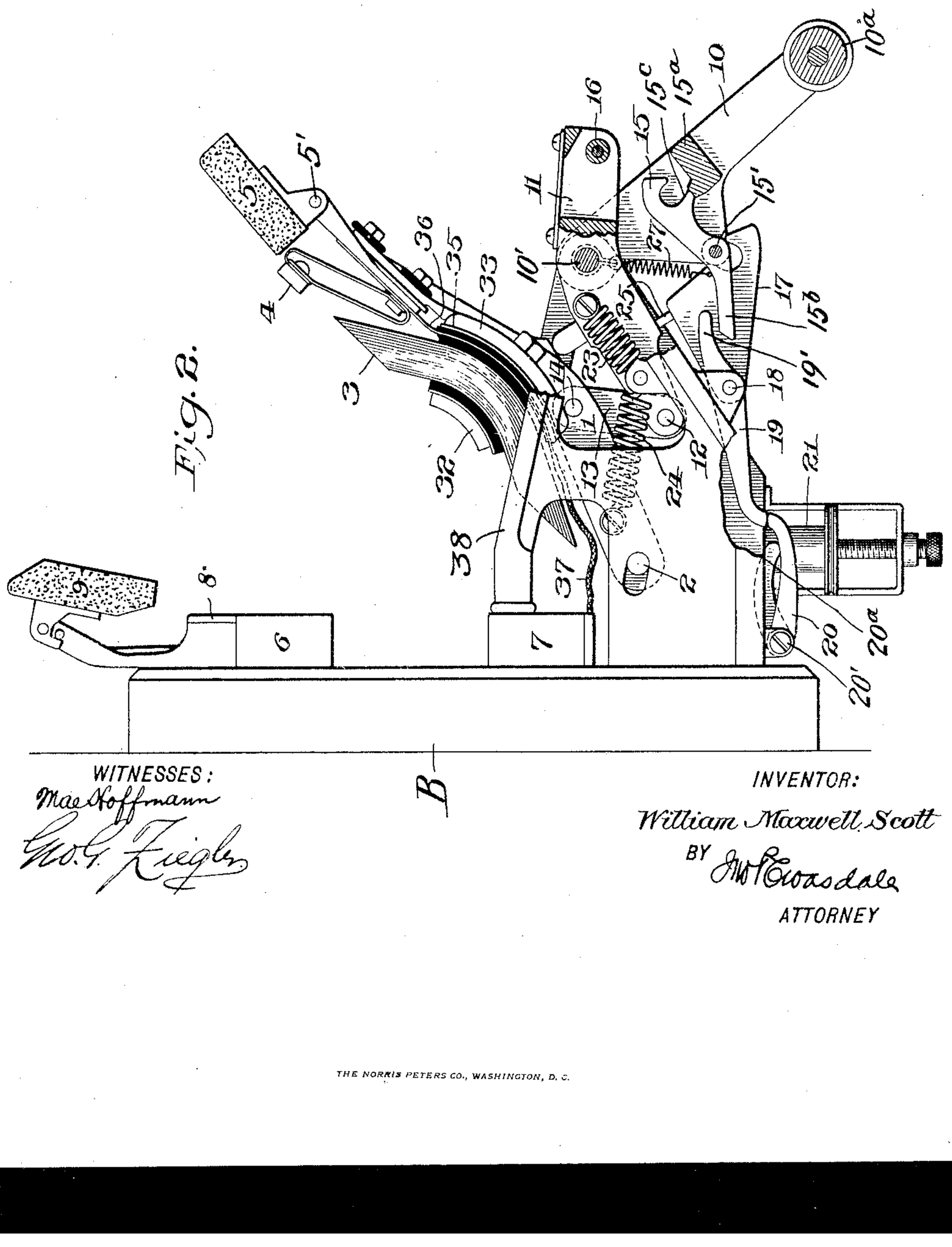


Fig. 2.



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AUTOMATIC MAGNETIC CIRCUIT-BREAKER.

966,708. Specification of Letters Patent. **Patented Aug. 9, 1910.**

Application filed June 8, 1901. Serial No. 63,690.

To all whom it may concern:

Be it known that I, WILLIAM M. SCOTT, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Automatic Magnetic Circuit-Breaker, of which the following is a specification.

My invention relates to automatic switches and more especially automatic magnetic circuit breakers, whose purpose is to control or interrupt a circuit upon the occurrence of predetermined electrical conditions.

It is the object of my invention to provide automatic electrical apparatus which shall control or interrupt a circuit carrying large lighting or power currents of either low or high potential, the structure of the apparatus being such that it is impossible to move the switch or circuit breaker to normal or closed position and retain it in such position during the continuance or existence of predetermined electrical conditions. By the structure hereinafter described it is impossible for an operator to reset a circuit breaker or to wilfully hold the same in normal or circuit closing position if abnormal circuit conditions exist or continue. The apparatus may be styled a "non-closable" circuit breaker.

My invention resides in other features hereinafter described and pointed out in the claims.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawings, in which:

Figure 1 is a side elevation of a circuit breaker embodying my invention and showing the same in normal or circuit closing position. Fig. 2 is a view similar to that of Fig. 1 showing the parts in open position, part of the framework being broken away to more clearly illustrate more essential parts. Fig. 3 is a front elevation of the circuit breaker when in circuit closing position. Fig. 4 is a vertical sectional view of the laminated bridging member, such view being taken on the line 4—4 of Fig. 3. Fig. 5 is a plan view of a toggle link fitted with adjusting means. Fig. 6 is a horizontal sectional view taken on the line 6—6 of Fig. 5.

Referring to Fig. 1, 1 is a supporting member or arm having a pivot 2 about which it may rotate in the housing or bracket 38 secured upon the base B of slate, marble, or other suitable insulating material. The laminated bridging member 3, built up of a plurality of sheets or plates of copper or other suitable conducting material, is secured to and insulated from the arm or supporting member 1. The metallic supplementary or shunt contact 4 is resiliently supported by and insulated from the arm 1. The movable carbon shunt contact is also carried by and insulated from the member 1 and is rotatable under spring control upon the pivot 5′. The main terminals or contact blocks 6 and 7 are secured upon base B and have their engaging or contact faces in practically the same vertical plane and are adapted to be engaged thereon by the ends of the laminæ constituting the bridging member 3. A metallic shunt contact 8, cooperating with contact 4, is secured upon and in electrical communication with the upper terminal block 6. Secured upon and in electrical communication with the contact 6 is a bracket on which the stationary shunt carbon 9 is rotatable under spring control upon the pivot 9′.

An actuator or operating lever 10 is pivoted upon the bracket 38 at 10′. A toggle link 11 is also pivoted at 10′ and is rotatable or movable independently of the actuator 10. The link 11 is pivoted at 12 to the second toggle link 13, which latter is pivoted at 14 to the supporting member or arm 1. The latch 15 is carried by the actuator 10 and pivoted thereto at 15′. 15ª is a web in the actuator 10 which serves as a stop for limiting the clock-wise rotation of the latch 15 about its pivot 15′ as viewed in Figs. 1 and 2. Approximate the outer end of the toggle link 11 is pivoted the roller 16 which is adapted to be engaged or embraced by the hook of the latch 15. The second latch 17 is pivoted at 18 to the bracket 38, the spring 27, attached at its one end to the bracket 38 and at its other end to the latch 17, serving to exert an upward pull upon the latch 17. The hook of the latch 17 is adapted to engage a roller pivoted independently of the latch 15 upon or concentric with the pivot 15′. The lever 19 also is pivoted at 18 but independently of the latch 17. Its outer end 19′ is adapted to engage upon the top of the tail 15ᵇ of the latch 15. The inner end of

the lever 19 is adapted to be engaged upon its under side by the lever 20 pivoted to the housing 38 at 20′. The core 21 of the solenoid winding 22 (consisting of turns of heavy copper conductor connected in series with the main contacts 6 and 7 and the bridging member 3, when the circuit breaker is designed to respond to an abnormal current flow) is provided with a head 21′ which is adapted to engage the under side of the lever 20ª mechanically connected to the lever 20 and rotatable therewith about the pivot 20′. The screw 21ª serves to adjust the height of the core 21 so that the apparatus may be set to respond to different current values.

With the parts in open circuit position as shown in Fig. 2, if it is desired to close the circuit breaker, the operator grasps the actuator or operating lever 10 by the handle 10ª and raises it until the hook of the latch 15, under the influence of either gravity or a spring, engages the roller 16 thereby locking the actuator to the toggle link 11, or in effect to the movable contact member. By then depressing the actuator 10 the toggle links 11 and 13 straighten out and come more nearly into the same straight line until the parts reach the position shown in Fig. 1. At this stage the pivot 12 falls slightly short of the imaginary straight line joining the pivots 14 and 10′. When this position is reached the hook of the latch 17 engages the roller pivoted at 15′ upon the actuator 10, thus locking the mechanism in circuit closing position. The locking strain is therefore transmitted in succession through both the connecting latch 15 and the second latch 17. Thus the connecting latch 15 intervenes between the second latch 17 and the movable contact member, and it is through the medium of the two latches in series or tandem, as it were, that the locking strain is transmitted. When the parts are in circuit closing position the springs 23 and 24 are under tension, the spring 24 intervening between the supporting member or arm 1 and the housing 38, and the spring 23 between the housing 38 and the toggle link 11.

In order to secure the desired pressure of the laminated bridging member 3 against the terminal blocks 6 and 7, the link 13 has an adjustable connection with one or the other of the members 1 and 11. This adjusting means consists, as shown in Figs. 5 and 6, of an eccentric bushing 28 slightly tapered exteriorly and fitting in a correspondingly tapered hole in one end of the link 13. The eccentric bushing 28 has a flange upon its one end while its other end is threaded to receive the nut 29. The axis of the hole 31 through the bushing 28 is eccentric with respect to the circumference of the bushing so that the distance between the centers of the holes 30 and 31 in the link 13 may be changed or varied by rotating the bushing 28 with respect to the link 13. The taper of the circumference of the bushing 28 and the corresponding taper in the opening or hole in link 13 serves, when the nut 29 is drawn up, to lock the bushing securely in the desired position.

The curvature or shape of the laminated bridging member 3 is maintained and determined principally by the rigid yokes 32 and 33 between which it is clamped by the bolts 33′, 33 being secured to or integral with the member 1. Adjustment of the curvature or shape is effected by the screws 34 threaded through the member 33 and pressing upon the steel plate 35 to cause a flattening out or closing up of the bridging member 3 according to the position of the screws 34. The metal strip 36 is carried between the steel plate 35 and the bridging member 3, is insulated from them and carries the resiliently supported metallic shunt contact 4. The strip 36 is maintained in permanent electrical communication with the lower main terminal 7 by means of the flexible conducting cord 37.

The operation is as follows: Assuming the parts in circuit closing position as shown in Fig. 1, if the current rises in value and attains or exceeds the value for which the solenoid core 21 has been set, that core is drawn forcibly upward by the magnetic effect of the current through the winding 22 and delivers a blow to the under side of the lever 20ª thus forcibly rotating the lever 20 in a counter-clockwise direction, as viewed in Figs. 1 and 2, and delivering a blow, through the medium of the lever 19, upon the top of the tail 15ᵇ of the latch 15. The result is that the latch 15 releases the link or member 11, permitting the movable contact member, under the influence of gravity, the tension of the springs 24 and 23, and the blow delivered to the roller 16 by the cam surface 15ᶜ of the latch 15, to fly to open position. At the beginning of the opening movement, the laminated bridging member 3 separates from the main contacts 6 and 7, thus shunting the current through the supplementary shunt contacts 4, 8 and 5, 9. Later, the metallic shunt contact 4 separates from the contact 8, and finally the carbon 5 separates from the carbon 9 causing the final break of the circuit and the arc to occur between said carbons, and relieving the metallic portions of the switch from detrimental effects of arcing, such as pitting or fusing. During the opening movement, the actuator 10 remains locked to the bracket 38 by the latch 17. As the opening movement approaches its end, the projection or stud 25, secured upon the under side of the toggle link 11, strikes upon the top of the latch 17 and rotates it in a clockwise direction about its pivot 18, as viewed in Figs.

1 and 2, releasing the actuator 10 so that it may be again lifted, as heretofore described, to permit the latch 15 to lock it to the link 11. Suppose, however, that the condition of the circuit causing the abnormal flow of current in response to which the circuit breaker was tripped, to still continue. If the operator raises the actuator 10 and couples it to the link 11, and then depresses the actuator 10 in the act of closing the switch, at the initial closure of the circuit and before the latch 17 engages and locks the actuator 10, the abnormal current will again instantly flow causing the core 21 to be again attracted and to deliver a blow through the levers 20^a, 20, and 19 to the latch 15, disconnecting the link 11 from the actuator 10 and permitting the circuit breaker to fly open while the operator still holds the actuator 10 grasped in his hand. That is to say, the circuit breaker is a "non-closable" one in the sense that the operator is robbed of control during the existence or continuance of abnormal circuit conditions.

While I have herein shown a circuit breaker operative upon excessive flow of current, it is obvious to those skilled in the art, that the latch 15 may be operated or controlled by any other suitable electro-responsive means.

What I claim is:

1. In an electric switch the combination of fixed and movable contacts, spring means for causing the opening of the switch, a manually operative member for closing the switch, an intermediate member for disengageably maintaining operative relationship between the manually operative member and the movable contact, a latch adapted normally to maintain engagement between the manually operative member and the intermediate member, a second latch adapted normally to maintain the manually operative member in the closed position, automatic magnetic means adapted to cause the operation of the first latch to release the intermediate member upon a predetermined flow of current, means controlled by the intermediate member to actuate the second latch to release the manually operative member after the release of the intermediate member, substantially as described.

2. In an electrical switch, a movable contact member, an operating member therefor, an actuator, a latch for locking said actuator and said operating member together, a second latch adapted to engage said actuator, electro-responsive means for unlocking said actuator from said operating member, and means operative after said movable contact member has moved to abnormal position for actuating said second latch to release said actuator.

3. In an electrical switch, a base, a movable contact member, an operating member for said movable contact member, an actuator, a latch for locking said actuator and said operating member together, a latch for locking said actuator to said base, means for unlocking said actuator from said operating member on attempted movement of said contact member to normal position during the existence or continuance of abnormal electrical conditions, and means operative after said contact member has begun to move to abnormal position for unlocking said actuator from said base.

4. In an electrical switch, a base, a movable contact member, an operating member for said movable contact member, an actuator, a latch for locking said actuator and said operating member together, a second latch for locking said actuator to said base, means for unlocking said actuator from said operating member on attempted movement of said contact member to normal position during the existence or continuance of abnormal electrical conditions, and means moving with said contact member for engaging said second latch to unlock said actuator from said base.

5. In an electrical switch, a base, a movable contact member, an operating member for said movable contact member, an actuator, a latch for locking said actuator and said operating member together, a second latch for locking said actuator to said base, and means for unlocking said actuator from said operating member on attempted movement of said contact member to normal position during the existence or continuance of abnormal electrical conditions, said operating member engaging said second latch upon movement of said contact member to abnormal position to unlock said actuator from said base.

6. In an electrical switch, a base, a movable contact member, an actuator therefor, means for connecting said actuator with said contact member, and means for locking said actuator to said base, means responding to predetermined electrical conditions for breaking the connection between said actuator and contact member, and means for thereafter unlocking said actuator from said base.

7. In an electrical switch, a base, a movable contact member, an actuator, a latch for locking said actuator and movable contact member together, a latch for locking said actuator to said base, electro-responsive means for unlocking said actuator from said contact member, and means associated with said contact member for unlocking said actuator from said base.

8. In an electrical switch, a base, a movable contact member, an actuator, a latch for locking said actuator to said contact member, a latch for locking said actuator to said base, electro-responsive means for unlocking said

contact member from said actuator, and automatic means for thereafter unlocking said actuator from said base.

9. In an electrical switch, a base, a movable contact member, an actuator therefor, a latch for locking said actuator to said contact member, a latch for locking said actuator to said base, electro-responsive means for unlocking said actuator from said contact member, said actuator being unlocked from said base by the movement of said contact member after it has been unlocked from said actuator.

10. In an electrical switch, a base, a movable contact member, an independent actuator therefor, means for locking said actuator to said base, said actuator being unlocked from said base by the movement of said contact member independent of said actuator.

11. In an electrical switch, a base, a movable contact member, an actuator, means for locking said actuator to said base, and electro-responsive means for causing movement of said contact member independent of said actuator, said actuator being unlocked from said base by the movement of said contact member independent of said actuator.

12. In an electrical switch, a base, a movable contact member, a toggle for operating said contact member, an actuator, means for locking said actuator to said base, and electro-responsive means for causing movement of said contact member independent of said actuator, said actuator being unlocked from said base by the movement of said contact member independent of said actuator.

13. In an electrical switch, a base, a movable contact member, an actuator, latches for locking said actuator and contact member together and for locking the switch in normal position, electro-responsive means for unlocking the actuator from the contact member, the actuator being unlocked by said contact member after the same is moved to open position.

14. In an electrical switch, the combination with a base, of a movable contact member, an actuator, a latch for locking said actuator and contact member together, a latch for locking said actuator to said base, whereby the switch locking strain is transmitted through both latches in succession, said actuator being unlocked from said base upon the movement of said contact member to open position.

15. In an electrical switch, the combination with a base, of a movable contact member, an actuator, a latch pivoted to said actuator for connecting the same to said contact member, and a latch for locking said actuator to said base and engaging at the pivot of said first named latch.

16. In an electrical switch, the combination with a base, of a movable contact member, a toggle for operating the same, an actuator, a latch for directly connecting said actuator to a link member of said toggle, a second latch for locking said actuator to said base, and electro-responsive means for disconnecting said actuator from said toggle link member.

WM. M. SCOTT.

Witnesses:
MAE HOFFMANN,
EUGENE ZIEGLER.