W. F. METER & W. L. RIDEOUT.

AUTOMATIC ELECTRIC CIRCUIT BREAKER.

APPLICATION FILED MAR. 30, 1908.

980,812.

Patented Jan. 3, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

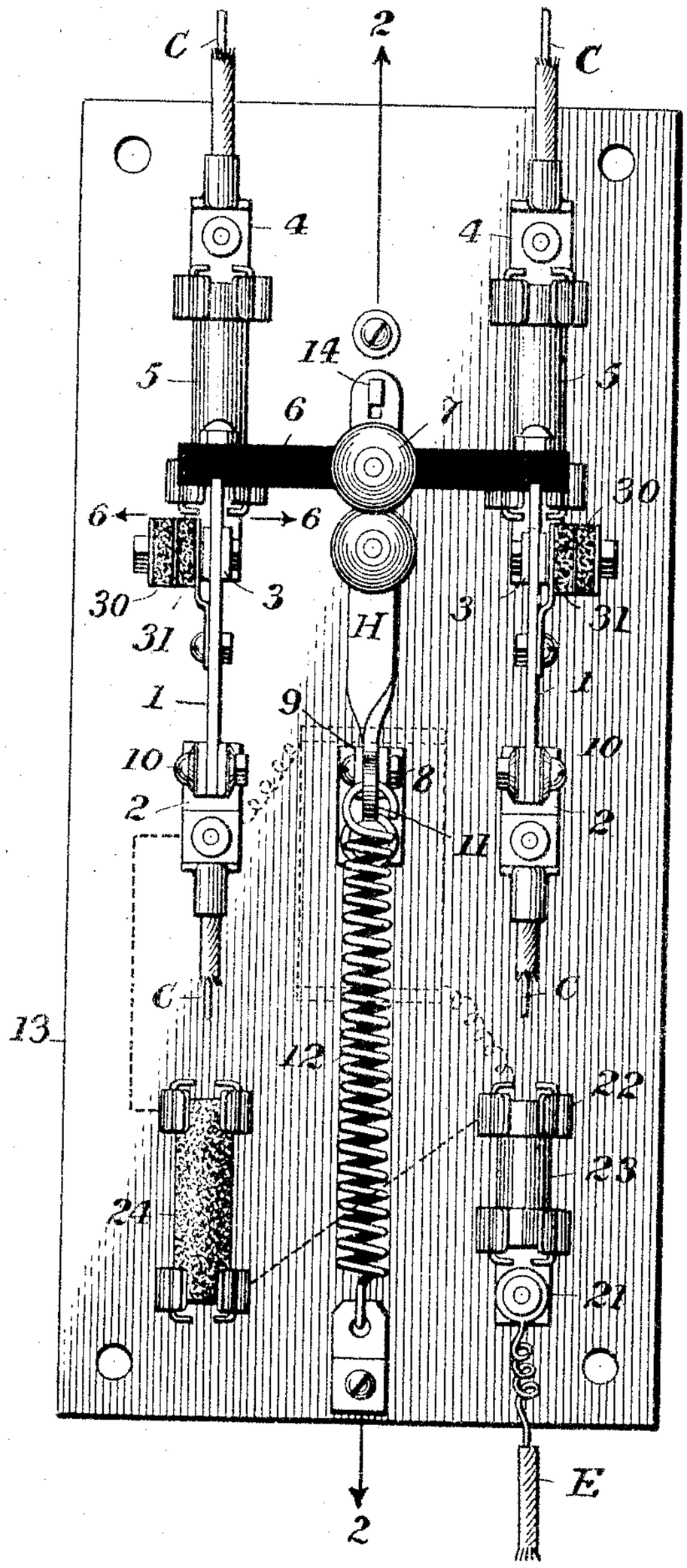


Fig. 4.

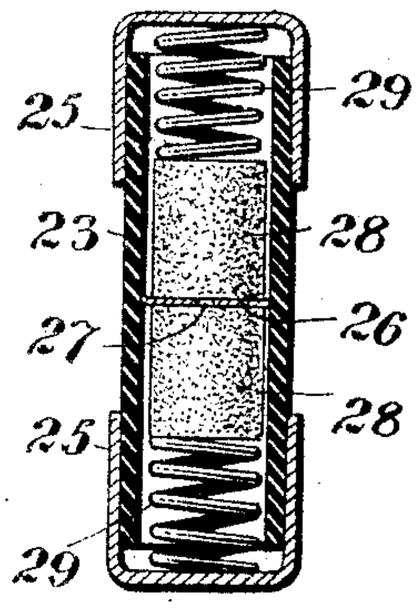
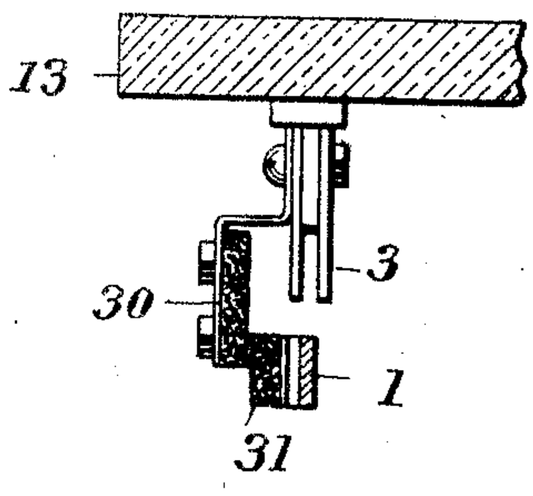


Fig. 6.



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2 SHEETS—SHEET 2.

Fig. 2.

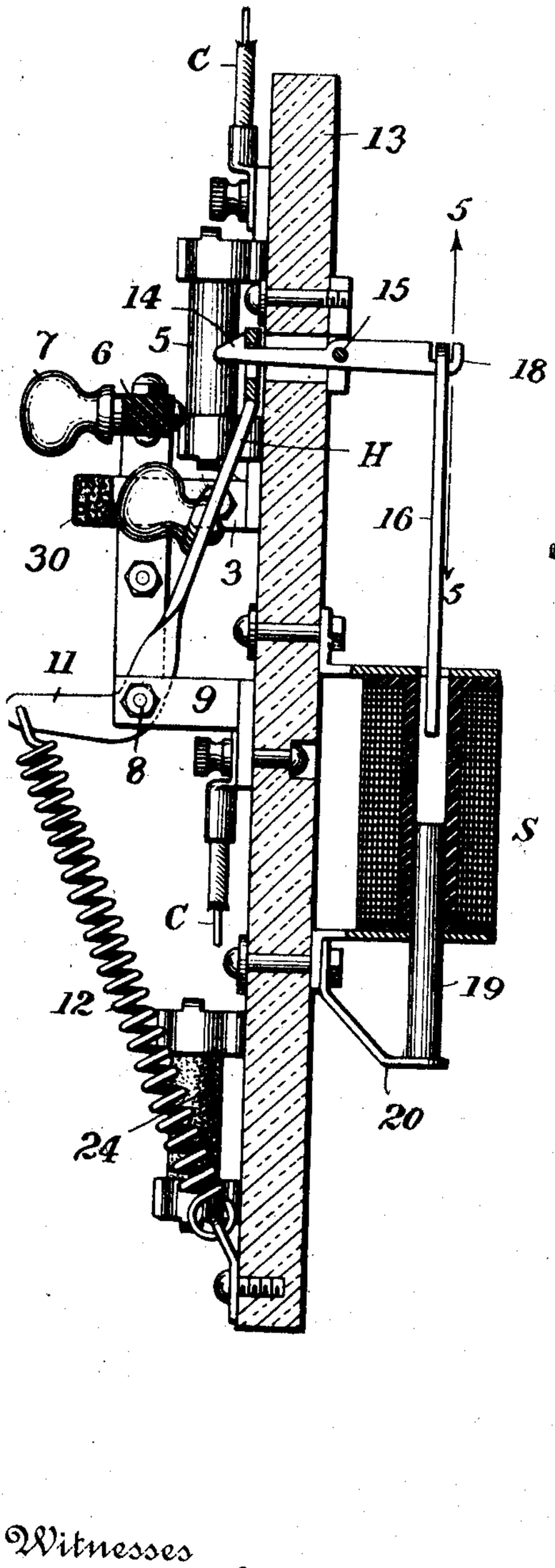
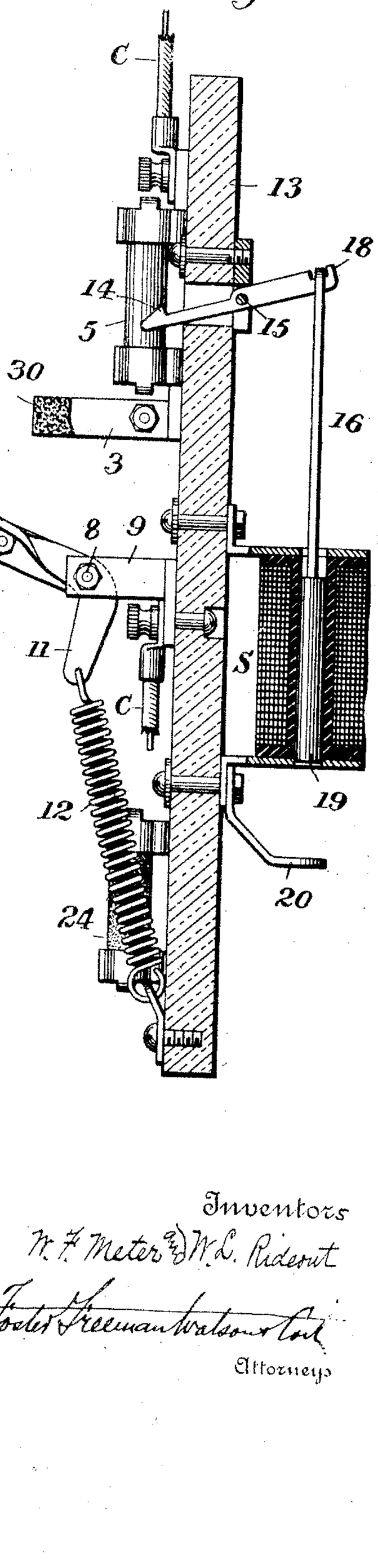


Fig. 3.



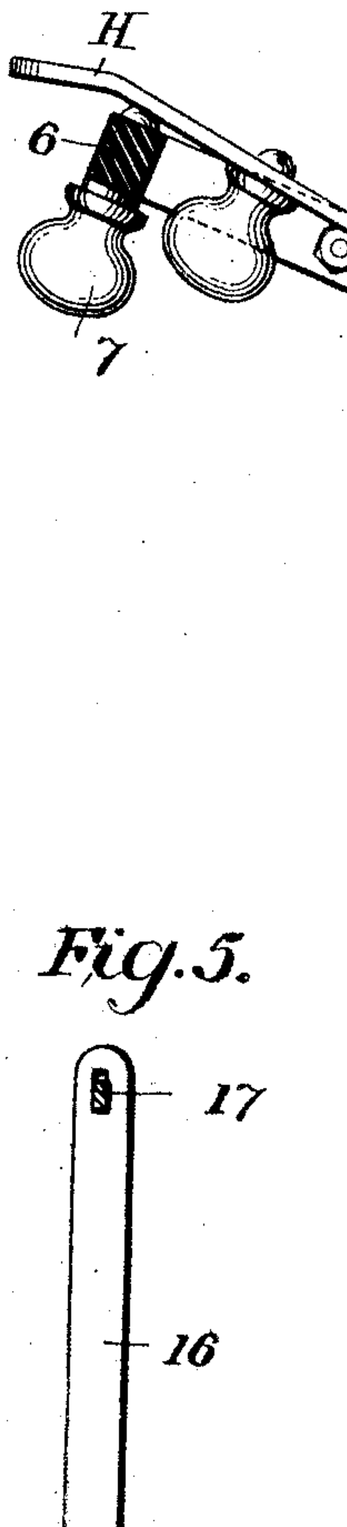


Fig. 5.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC ELECTRIC-CIRCUIT BREAKER

980,812. Specification of Letters Patent. Patented Jan. 3, 1911.

Application filed March 30, 1908. Serial No. 424,215.

To all whom it may concern:

Be it known that we, WILLIAM F. METER and WILLIAM L. RIDEOUT, citizens of the United States, and residents of Oshkosh, Winnebago county, State of Wisconsin, have invented certain new and useful Improvements in Automatic Electric-Circuit Breakers, of which the following is a specification.

The present invention relates to automatic means for cutting out an electric circuit when for any reason the voltage of the current passing through the circuit increases beyond a safe limit.

It is well known that wires which are designed for low potential currents often become accidentally charged through contact with high potential circuits, and that in this way considerable loss of life and loss of property through fire occurs.

The object of our invention is to produce an automatic cut-out which will instantly break the circuit when a current passes through it which is higher than the normal in potential.

Other objects of the invention are to produce an automatic cut-out which will be certain and positive in its operation and which will not interfere with the normal operation of the switch in opening and closing the circuit.

The invention will be described in connection with the accompanying drawing, in which,

Figure 1 is a face view of a switch embodying our invention; Fig. 2 is a section on the line 2—2 of Fig. 1 showing the switch closed; Fig. 3 is a similar section showing the automatic devices in the act of opening the switch; Fig. 4 is a sectional view of the inclosed air gap; Fig. 5 is a section on the line 5—5 of Fig. 2; Fig. 6 is a section on the line 6—6 of Fig. 1.

Referring to the drawings, 1, 1, indicate the blades of a knife switch which are pivotally connected with the binding posts 2, 2, and which coöperates with suitable contacts 3, 3, fixed upon the base. As shown the contacts 3, 3, are electrically connected with the binding posts 4, 4, by means of fuses 5, 5.

C indicates the incoming and outgoing conductors of the circuit which are connected with the binding posts 2 and 4.

The switch blades 1, 1, are connected at their free ends with the cross bar 6 of insulating material and preferably provided with a handle 7.

It will be understood that the binding posts, switch blades, and other parts through which the current passes should be made of copper or other suitable conducting material.

We claim no novelty for the switch thus far described as the same is of a well known construction.

It will be understood that our invention may be applied to many different forms of switches and that the one herein described is used merely for purposes of illustration.

It has heretofore been proposed to provide a knife switch with a detent which would be automatically released if the circuit were overloaded and with a spring for throwing the switch open when released. Such devices have been found to be unreliable for the reason that the contacts corrode more or less and the switch is likely to stick even when released from the detent. To obviate this difficulty we provide what may be termed a hammer which is normally under tension to move against the switch and is normally held away from the switch by a suitable detent. As shown in the drawing, the hammer H is in the form of a lever which is pivoted at 8 to a post 9, the pivot being preferably in line with the pivots 10 of the switch blades so that as the hammer follows the switch there will be no relative movement or friction between them. The hammer lever has an arm 11 to which is connected a spring 12 which constantly tends to throw the hammer outward into the position shown in Fig. 3. The hammer is normally held with its free end near the base 13 of the switch by means of a detent 14, as shown in Fig. 2. The detent is pivoted at 15 and to its rear end is connected a rod 16 which extends into the central opening in a solenoid S. The rod 16 is preferably made of brass or other non-magnetic material so that it will not be affected by the solenoid or stick to the core or plunger of the solenoid. The rod 16 is preferably provided with an eye 17 through which a hook 18 on the detent passes. This forms a very convenient means of connecting the two parts in such a way that they cannot separate accidentally, as shown in Figs. 2 and 5.

The hammer H is at some distance from the cross bar 6 of the switch when the parts are in normal position, as shown in Fig. 2, and the hammer therefore acquires considerable momentum before striking the switch. The inertia may be regulated as required by increasing or decreasing the weight of the hammer lever and the strength of the spring 12 which operates it and it will be understood that these parts will be proportioned to the size of the switch to be operated. We have found that when properly constructed the hammer will invariably open the switch when it is released. We also prefer to operate the detent to release the hammer by means of a blow instead of by pressure and for that reason we use the solenoid S and provide it with a core or plunger 19 of soft iron which is normally supported on a rest 20, its upper end being at some distance from the detent operating rod 16. When the solenoid is energized the core is thrown up quickly and strikes the rod 16 a hammer blow, thus releasing the hammer H from the detent and permitting it to fly outward against the switch and open the latter, as shown in Fig. 3.

Referring to Fig. 1, E indicates a line to the ground from a binding post 21. A second binding post 22 is connected with the post 21 by a conductor inclosed in a casing 23 provided with a spark gap, which will be hereinafter described in detail. The solenoid winding is connected with one of the binding posts 2 and with the post 22, and a high resistance carbon rod 24 is also in circuit with one of the binding posts 2 and the post 22, as shown in Fig. 2. An inclosed spark gap in the casing 23 is arranged as follows, referring to Fig. 4. The casing is constructed of paper or other non-conducting material and its ends are closed by metal caps 25. Centrally arranged in the casing is a mica disk or partition 26 having an opening 27 which forms an air gap between two carbon blocks 28 which are constantly pressed against the mica partition by springs 29 bearing on the caps 25. It will be seen that any current having an electromotive force high enough to jump the gap 27 will pass from the cap 25 at one end of the spark gap device to the cap 25 at the other end. Our invention contemplates inclosing the carbon blocks 28 and the mica disk 26 in an air tight manner so that combustion will not take place in the space 27, except to a very limited extent, and the space will not therefore become filled with ash.

Referring to Figs. 1 and 6, 30 indicates a carbon plate supported on and electrically connected with each of the contacts 3 and 31 indicates a similar plate supported on and electrically connected with each of the switch blades 1. These carbon plates are preferably spring supported and the plates 31 rub on the plates 30 as the switch is opened or closed. They are arranged so that in closing the switch the carbon plates will engage before the switch blades reach the metal contacts and so that they will disengage after the switch blades leave the metal contacts when the switch is opened. In this way we prevent arcs between the switch blades and the metal contacts and thus prevent burning and corrosion of the metal.

The operation of the switch has been heretofore described.

The operation of the circuits is as follows: A current of the normal potential for which the switch is designed will not pass the air gap 27 and hence the solenoid will remain inactive. Should the circuit C become charged with a current of higher potential than that for which it is intended, the current will pass through the solenoid and through the spark gap 27 to the ground, thus energizing the solenoid and causing the core 19 to be thrown up against the rod 16 and the hammer H to be released, which will instantly open the circuit C. The carbon block 24 is of higher resistance than the solenoid and is intended to provide an additional path for lightning or currents of extremely high voltage and frequency, to prevent the solenoid from being burned out.

It will be evident that the automatic operating device for the switch does not in any way interfere with the normal operation of the switch and that the same will remain either open or closed, as may be desired, while the hammer lever is locked by the detent 14.

Having described our invention what we claim and desire to secure by Letters-Patent is,

1. In an electrical switch, the combination with the movable contact supporting element of the switch, of a pivoted hammer adapted to strike the movable element and open the switch, means for holding the hammer in set position with its striking part behind the movable element to permit free operation of the switch when said hammer is in set position without disturbing the hammer.

2. In an electrical switch, in combination, a base, a movable element mounted on a pivot on said base, a hammer insulated from the movable element mounted on a pivot concentric with the pivot of the movable element, and means for latching the hammer in set position behind the movable element, said hammer being constructed to permit opening and closing movement of the movable element without disturbing the hammer.

3. In an electrical switch, in combination, a base, a movable element mounted on a pivot on said base, a hammer insulated from the movable element mounted on a pivot

concentric with the pivot of the movable element, means for latching the hammer in set position behind the movable element, said hammer being constructed to permit opening and closing movement of the movable element without disturbing the hammer, and means controlled by the voltage for releasing the latching means.

4. In an electrical switch, the combination with a movable element of the switch carrying switch contacts, of a hammer independent of the movable element and switch contacts located behind the switch and adapted to strike the movable element and open the switch, and electromagnetic means adapted to release the hammer whereby the switch may be opened and closed independently of the operation of the hammer.

5. In an electrical switch, the combination with a movable element of the switch carrying switch contacts, of a spring-actuated pivoted hammer independent of the movable element and switch contacts located behind the switch and adapted to strike the movable element and open the switch, a latch adapted to latch the switch under tension, a solenoid, a plunger in the solenoid, and a non-magnetic plunger connected to the latch and extending into the solenoid and constructed to receive the impact blow from the plunger to release the latch and the hammer.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM F. METER.
WILLIAM L. RIDEOUT.

Witnesses:
JOHN W. HUME,
CHAS. OELLERICH.