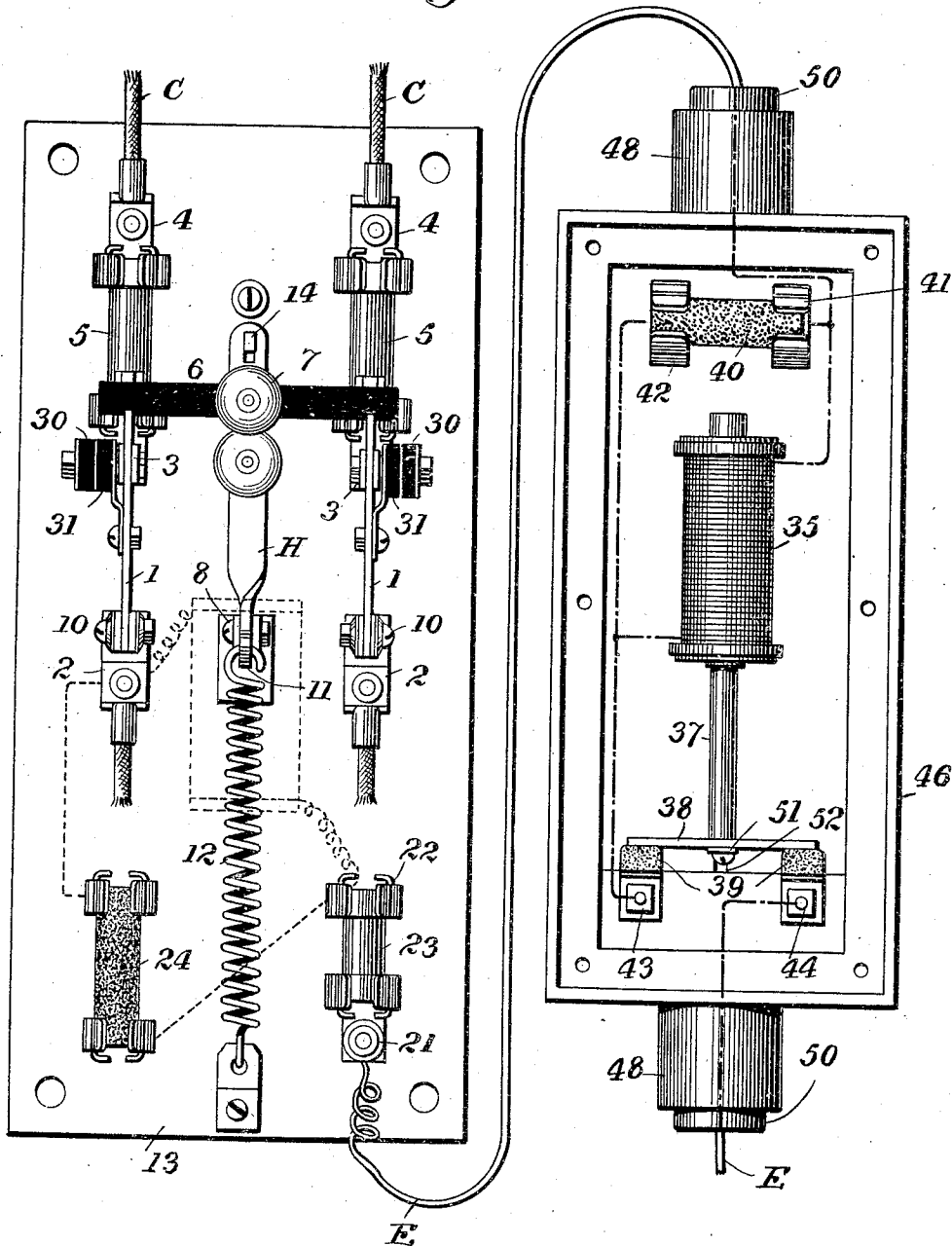


W. F. METER & W. L. RIDEOUT.
 AUTOMATIC ELECTRIC CIRCUIT BREAKER.
 APPLICATION FILED JULY 22, 1908.

939,730.

Patented Nov. 9, 1909.
 2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
J. J. McKel
J. J. McCarty

Inventors
William F. Meter
William L. Rideout
 by *Foster Freeman Water & Co.*
 Attorneys

939,730.

2 SHEETS—SHEET 2.

[illegible]

J. P. Stinkul
J. J. McCarthy

William F. Meter
William L. Tideman

by Foster, Freeman, Watson & Coit

Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM F. METER AND WILLIAM L. RIDEOUT, OF OSHKOSH, WISCONSIN, ASSIGNORS
TO ELECTRICAL MANUFACTURING COMPANY, OF OSHKOSH, WISCONSIN, A COR-
PORATION OF WISCONSIN.

AUTOMATIC ELECTRIC-CIRCUIT BREAKER.

939,730.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed July 22, 1908. Serial No. 444,842.

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.

This invention relates to automatic means for cutting out or breaking an electrical circuit when for any reason the voltage of the current passing through the circuit is increased beyond a safe limit.

The present invention is more particularly an improvement upon automatic circuit breakers of the class illustrated in our pending application No. 424,215, filed March 30, 1908, the particular object of this improvement being to provide means for breaking the line leading from the switch to the ground to prevent arcing at the switch proper.

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

Figure 1 is a face or plan view of a switch embodying the present invention; Fig. 2 is a central sectional view of the same; Fig. 3 is a sectional view of the inclosed spark gap.

We have shown at the left of each of the views the switch which forms the subject-matter of our said pending application and at the right of each of the views we have shown the present safety device connected to the ground wire of said switch.

Referring to the drawing, 1, 1, indicate the blades of a knife switch which are pivotally connected with the binding posts 2, 2, and which cooperate with suitable contacts 3, 3, fixed upon the base 13. As shown the contacts 3, 3, are electrically connected with the binding posts 4, 4, by means of fuses 5, 5. The incoming and outgoing conductors of the circuit are indicated at C, C, said conductors being connected with the binding posts 4, 4 2, 2. The switch blades 1, 1, are connected at their free ends with a cross bar 6 of insulating material which is preferably provided with a handle 7. A hammer H in the form of a lever 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 against the cross bar of the switch. The hammer is normally held with its free end near the base 13, 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 of 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 thereof. The rod 16 is loosely engaged with the detent 14 by means of a hook 18 which passes through an eye in the rod. The solenoid S is provided with a core or plunger 19 of soft iron which is normally supported on a rest 20 some distance below the solenoid, the upper end of the core being normally at some distance below the detent operating rod 16. When the solenoid is energized the core is thrown up quickly and it strikes the rod 16 a hammer blow, thus releasing the hammer H from the detent and permitting it to fly outward and strike the switch a hammer blow. The weight of the hammer H and the strength of the spring 12 are so regulated that the stroke of the hammer H will invariably open the switch.

A binding post 21 is connected to the earth by a ground line E and devices which will be hereinafter described. A second binding post 22 is connected with the post 21 by a conductor inclosed in a casing 23, the said conductor having in it a break or spark gap. The winding of the solenoid S is connected with one of the binding posts 2 and with the post 22, and a high resistance carbon 24 is also in circuit with one of the binding posts 2 and the post 22, as shown in Fig. 1, that is in shunt circuit with the solenoid S.

Referring to Fig. 3, the casing 23 of the inclosed spark gap 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 interposed between the carbon blocks and the caps 25. It will be seen that any current strong enough to jump the gap 27 will pass from

the cap 25 at one end of the spring gap device to the cap 25 at the other end. The casing 23 and the caps 25 form an airtight inclosure for the carbon blocks and the mica disk so that combustion will not take place in the space 27, excepting to a very limited extent, and the space will therefore not become filled with ash.

Supported on and electrically connected with each of the contacts 3 is a carbon plate 30 and a similar plate 31 is supported on and electrically connected with each of the switch blades 1. These carbon plates 31 rub on the plates 30 as the switch is opened and closed. They are arranged so that in closing the switch the carbon plates will engage before the switch blades reach the metal contacts so that they will disengage after the switch blades leave the metal contacts when the switch is open. In this way arcing is prevented between the switch blades and the metal contacts and hence burning and corrosion of the metal is also prevented.

The switch above described forms the subject of our said pending application and is described more in detail and claimed therein. In so far as the present invention is concerned, any equivalent switch may be included in combination with the means hereinafter described. The operation of the switch above described will be apparent and need only be briefly mentioned herein. A current of 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, which will release the hammer H and permit it to strike the switch and 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.

In a switch of the character described, after the high potential current has broken down the air gap 27 an arc will be established and when the switch contacts are broken there is an arc formed between the contacts. The carbon blocks 30, 31 take care of this arc to some extent, but this invention provides an additional means for breaking the ground circuit before the switch contacts 30, 31 are broken.

The solenoid 35 is suitably supported on an insulating base 36 and provided with a soft iron core 37 connected with a bar of conducting material constituting a bridge 38 extending between two carbon blocks 39, which are suitably supported upon the base

36 formed of insulating material. Rigidly connected with the core 37 and the bridge piece 38 is a guiding arm 51 which travels in the slot 52 in the base 36 and prevents the core and bridge from turning. A carbon block 40 of high resistance is removably supported between two metal clips 41, 42, and these clips are connected in shunt with the solenoid 35. The carbon blocks 39 are mounted upon and connected to suitable binding posts 43. The section of the wire E which leads to the ground is connected with the binding post 44.

The operation of the switch is as follows: If the line C becomes charged with a current of high potential, spark gap 23 is broken down, and the solenoid S is energized operating the plunger 19 to release the latch 15. The current in passing through the wire E to the ground energizes the solenoid 35 and breaks the circuit; that is breaks the connection between the carbon blocks 39. Since however the unlatching of the latch 15 is accomplished by a hammer blow delivered by the plunger 19 upon the bar 16, the latch 15 will be released before the circuit is broken, but since it takes some time for the hammer H to strike the switch and open the same it will be noted that the circuit in E is broken before the switch contacts 30 and 31 are broken, and therefore all arcing between these contacts 30 and 31 is avoided. After the switch has opened and the arc 23 is broken the plunger 37 will again drop down and make the contact between the carbon blocks 39.

The function of the non-inductive and high resistance carbon blocks 24, 40 is for the purpose of preventing burning out of the solenoids S and 35. Should a discharge of high frequency pass through the wire E this charge will be shunted around solenoids S and 35 through the blocks 24 and 40 and thus will prevent all burning out of the solenoids. This charge however will establish an arc in the gap 23 and therefore form a passage for the line current. This line current will energize the solenoids S and 35 and open the switch and break the contacts in the usual way. It will therefore be seen that this invention provides a double protective device; first, a protection against high voltage currents by leakage from a neighboring high voltage transmission line; and second, a protection against currents of high frequency and high voltage, for instance lightning discharges.

We prefer to inclose the solenoid 35 and its connected parts, together with the resistance block 40 in a tight casing, which must be filled with oil, or other material suitable for breaking an arc. Thus we show the insulating base 36 mounted on a second base 45 which is connected to the bottom of a box 46, the box is inclosed on all sides be-

ing provided with a detachable tight cover 47. On its ends the box is provided with cup-shaped recesses 48 filled with insulating material 49 and porcelain bushings are preferably used in the ends of said cups.

The insulating compound 49 is poured into the cups 48 while hot and then allowed to cool. The casing is then filled with oil and the cover 47 secured in place. The box is thus made entirely oil tight.

Since the casing is filled with oil there is no danger in breaking the contact between the bridge 38 and the blocks 39.

In the claims the term "switch" is used. This term is to be construed to mean a line switch as distinguished from a grounded contact in a lightning arrester circuit, which contact is broken to stop the flow of current.

Although we have shown solenoids S and 35 which operate their respective plungers 19 and 37, it is to be understood that this invention is not limited to the specific construction shown, since we may employ other means for performing the same function than those shown and described.

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

1. In an automatic circuit breaker, the combination with a switch, means for opening the switch upon the passage of a current of high potential, and a conductor leading from said switch to the earth, of a solenoid in circuit with said conductor, a block of high resistance carbon arranged in parallel with said solenoid, means controlled by the solenoid for breaking the line to the earth before the switch contacts have been broken, and a closed casing inclosing said solenoid and the make and break devices operated thereby.

2. In an automatic circuit breaker, the combination with a switch having contacts, of an electromagnet in series circuit with the switch contacts to open said switch, and means to open the circuit before the switch contacts are broken so as to prevent arcing at the switch contacts.

3. In an automatic circuit breaker, the combination with a switch, of an electromagnet in circuit with the switch to open said switch, and means constructed to open the said circuit before the switch contacts are broken.

4. In an automatic circuit breaker, the combination with a switch, of means to open the switch, an electromagnet in circuit with the switch to control said means, and means constructed to open said circuit after the opening means has been set in operation and before the switch contacts have been broken.

5. In an automatic circuit breaker, the combination with a switch, of means to open the switch, a latch to hold said means in closed position, an electromagnet in circuit with the switch to operate the latch, and means constructed to open said circuit after the latch has been operated and before the switch contacts have been broken.

6. In an automatic circuit breaker, the combination with a switch, of means to open the switch, a latch to hold said means in closed position, an electromagnet to operate the latch, and a second electromagnet to open the circuit of the first electromagnet after the latch has been operated and before the contacts have been broken.

7. In an automatic circuit breaker, the combination with the switch, of means connected in circuit with one of the switch contacts and controlled by the line voltage to open the switch when the line voltage rises above a predetermined value, and means constructed to open said circuit before the switch contacts are broken so as to prevent arcing.

8. In an automatic circuit breaker, the combination with a switch, of means connected in circuit with one of the said contacts and the ground constructed to open the switch, and means constructed to open said grounded circuit before the switch contacts are broken.

9. In an automatic circuit breaker, the combination with a switch, of electromagnetic means constructed to open the switch and to break its own circuit before the switch contacts are broken, and a non-inductive shunt to said means.

10. In an automatic circuit breaker, the combination with a switch, of electromagnetic means connected in circuit with the ground and the switch constructed to open the switch and break its own circuit before the switch contacts are broken, and a non-inductive shunt to said means.

11. In an automatic circuit breaker, the combination with a switch, of an electromagnet connected to the switch and the ground and constructed to open the switch, a non-inductive shunt to said electromagnet, a second electromagnet constructed to open the circuit of the first electromagnet and the switch before the switch contacts are broken, and a non-inductive shunt to said second electromagnet.

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

WILLIAM F. METER.

WILLIAM L. RIDEOUT.

Witnesses:

JOHN W. HUME,

CHAS. O. ELLERICK.