

APPLICATION FILED NOV. 12, 1900.

2 SHEETS—SHEET 1.

Fig. 1. Fig. 2.

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ELECTRIC SWITCH.

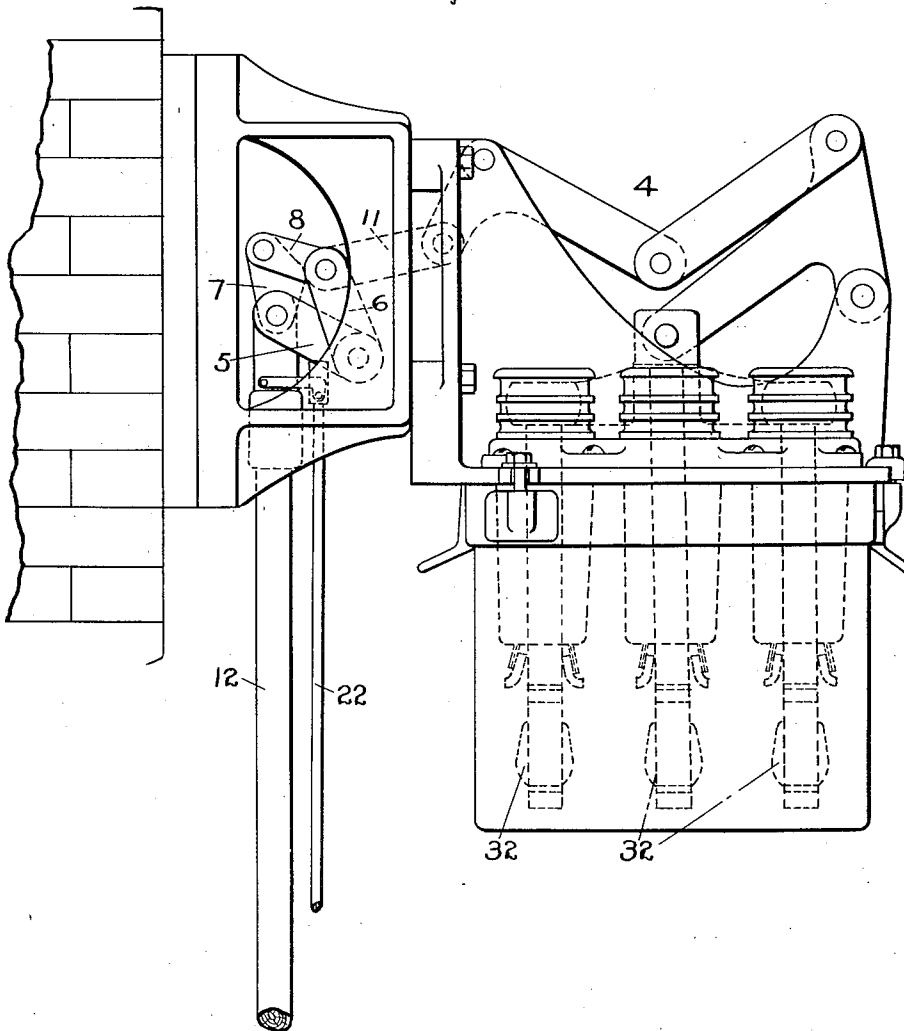
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1,050,021.

Patented Jan. 7, 1913.

2 SHEETS—SHEET 2.

Fig.3.



WITNESSES:

WITNESSES:
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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

1,050,021.

Specification of Letters Patent.

Patented Jan. 7, 1913.

Application filed November 12, 1900. Serial No. 36,174.

To all whom it may concern:

Be it known that we, EDWARD M. HEWLETT and CHARLES C. BADEAU, citizens of the United States, and residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

The object of this invention is to provide a switch for controlling the opening and closing of an electric circuit, having operating mechanism insuring the safety of the operator, and to prevent the switch from remaining closed or being closed while an excessive current is in the line. In Patent 942,491, issued Dec. 7, 1909, to Edward M. Hewlett and William LeRoy Emmet, is described a switch of this type in which broad claims are made on this feature. Our invention carries out the same end by modified controlling mechanism.

In carrying out the invention we provide means such as a locking or collapsible toggle for disconnecting the contacts, or the lever system controlling the same, from the operating handle, said means or toggle being automatically controlled by an overload magnet so that the switch may automatically open, irrespective of the motions of the operator when necessity arises. In some cases the overload magnet may, if desired, be mounted upon and move with the switch controlling mechanism.

In some forms of our invention, such as the particular form shown merely for purposes of illustration, our invention involves the employment of a collapsible crank which may be rendered rigid by the action of the operator to set the switch, but may be collapsed by the overload magnet so as to permit an opening of the switch.

The novel features will be more particularly pointed out hereinafter and will be definitely indicated in the claims appended to this specification.

In the accompanying drawings, which illustrate the invention, Figure 1 is a side elevation of a switch embodying our improvements; Fig. 2 is an enlarged detail view of part of the operating devices; and Fig. 3 is an enlarged view of the switch

showing the circuit open and the toggle collapsed.

The particular type of switch shown in the drawings is one in which the break occurs in oil and which is adapted for controlling currents of high potential, 1 representing the tank or reservoir containing the contacts beneath the oil level, and 2, 2^a, etc., a series of insulating rods carrying the movable contacts controlled by a bell-crank lever 3 adapted to be raised through the action of an actuating toggle 4. In the drawings the switch is shown as set and the rods 2^a as in their elevated position, the contacts carried by these rods opening when they are pushed down. This occurs when the controlling toggle collapses permitting the weight of the parts to open the switch. The invention however is not necessarily limited to switches of the oil-break type, but is generally applicable to all types. The actuating toggle 4 is straightened or collapsed by means of a normally positive collapsible or locking toggle, which in the form shown is a part of a toggle-crank composed of four links 5, 6, 7 and 8 (see Fig. 2) arranged in the form of a triangle, the two short links 7 and 8 forming one side of the triangle and constituting a collapsible or locking toggle which, when set in the position indicated in Fig. 2, locks the links or arms 5 and 6 to each other and forms of the four links a normally rigid collapsible bell-crank lever. The link 7 is governed by the helical spring 9, tending to straighten the link 7 and 8 until they are brought to rest against pin 10 in an off-center position, in which position the locking toggle is overset or cramped and is rigid, so that the system of links acts as a bell-crank, as before noted. The levers or arms 5 and 6 are journaled on a fixed support, and the other corners of the triangular system are connected, preferably by a pivotal connection, respectively with a link 11, controlling the actuating or switch-opening and closing toggle 4, and with the wooden rod 12 connecting mediately or immediately with an operating handle 13. It is generally desirable to have this handle located, and particularly where currents of extraordinary potential are employed, at a

distance remote from the switch and at a point where an insulating floor or wall intervenes between the operator and the switch. We have therefore provided a compound-lever system for leading the connections to a distant point. The rod 12 is connected with a bell-crank lever 14 which again connects with a wooden rod 15; this, according to the location of the controlling handle, may connect directly with the same or be held to it by other connections, as bell-crank 16, bell crank 17, and link 18, connected to the operating handle. The latter is provided with latching means for holding the switch closed and for permitting manual opening of it, such as a latch 19 and a push-pin 20 in the handle for releasing the latch, the latch being so arranged that when the handle is shifted to a position to set the switch, it will engage and detain the handle.

With an organization of this kind it is desirable to prevent the switch from being closed in case an overload condition exists on the circuit and also to permit the switch to automatically open in case such overload arises when it is set, since by such an arrangement the switch and the apparatus it controls are put beyond accident while the handle is grasped by the operator's hand or is being shifted by other control devices. It is evident that an overload in the circuit controlled by the switch may occur during the period of closure of the switch, and as the operator is pushing home the contacts the overload tripping devices of switches as commonly organized are prevented from opening the circuit. In our organization however the circuit may be opened in case of an overload notwithstanding the operator is forcibly pushing in on the control handle. We effect both these results by means of the collapsible toggle between the contacts and the operating handle, such as the bell-crank lever already described. One of the links 7 of the collapsible toggle is provided with a projection which lies in the path of some suitable electroresponsive tripping device. The particular form of tripping device shown carries a metal shoe 21, in which is socketed a wooden rod 22, the rod being hung at its upper end on a link 23 pivoted on the rod 12 and at its lower end pivoted to the armature 24 of an overload-magnet 25. This magnet is mounted rigidly with respect to the rod 12 and carried as a part of the same. The magnet leads 26 and 27, as indicated in Fig. 2, are flexible and in circuit with the switch in a manner usual in overload devices. The magnet is iron-clad, the coil being mounted on an iron core 28 screwed into an iron casing 29, into which the spool of wire may be inserted.

30, 31 represent clamps connecting the metal parts to the wooden rod 12, and are

made of two pieces and threaded to take over a thread formed on the rod, and are provided with bolts for clamping the parts firmly together, sufficient clearance being permitted to allow for tightening the clamps when the rod shrinks.

In the operation of the mechanism in ordinary cases, when the locking or collapsible toggle is overset and rigid and the collapsible bell-crank lever is set in the position shown in Figs. 1 and 2, a movement of the operating lever simply raises and lowers the switch contacts by stretching or collapsing the actuating toggle 4. If, when the switch is set, an overload condition arises, the armature 24 is drawn down to the magnet 25, which being carried with the movable mechanism, is ready to act instantly upon the toggle to free the movable switch element the instant the circuit is closed, the rod 22 is lifted, and the shoe 21 strikes the link 7 a sharp upward blow, thereby pushing the locking toggle beyond the center and permitting the weight of the switch parts to collapse the locking toggle against the tension of the spring 9.

The mechanism described is of particular advantage in controlling currents of high tension, and it will be seen that the control devices are carried a safe distance from the operator, insuring his safety in manipulating the switch. The broad features of the invention are however applicable to low-potential as well as high-potential switches, and may be employed wherever an automatic opening device is provided with the switch.

To reset the switch, the push-pin 20 in the operating handle is operated and the handle pulled out from the switchboard. This draws down the rod 12 and this movement of the rod 12 away from the link 11 and other mechanism connected to the contacts straightens out the toggle links 7 and 8, the spring 9 pushing them off-center and cramping or oversetting the locking toggle, thereby establishing a positive rigid connection between the operating handle connected to the rod 12 and the contacts, so that the contacts may be moved by means of the operating handle. The operating handle is then pushed up to the switchboard to the position shown in Fig. 1, and during this movement of the operating handle the rigid locking toggle 7, 8, holds the links 5 and 6 locked and causes the links to act as a rigid crank and set the switch. If, during this act of setting, an overload condition should arise, it is evident that the magnet 25 will be in condition to immediately collapse the locking toggle, thus permitting the switch to open. In Figs. 1 and 2 the switch is shown in closed position, with the toggle extended. The movable switch element drops by its weight when released away

from the fixed contacts, which latter are mounted in insulators supported in the cover, as shown in Fig. 3, the movable contacts being the metal bridges 32, the construction in this respect being the same as in the patent to Emmet and Hewlett, 942,491, December 7, 1909. Thus the arrangement of these parts permits the overload device to disconnect, as it were, the operating handle and the switch at any time if necessity should arise.

What we claim as new and desire to secure by Letters Patent of the United States, is—

1. In an electric switch, the combination with a movable contact, of an operating lever, means connected to said contact and to said operating lever for establishing the control of said contact by said lever, and a releasing device movable with said operating lever and engaging said means upon overload to release said contact from said lever.

2. In an electric switch, the combination with a movable contact, of a rod for shifting said contact, a connection between said rod and said contact permitting disabling of the operative relation of said rod thereto, and an overload releasing device disabling the connection when actuated and in operative relation thereto throughout the entire path of movement of the rod.

3. In an electric switch, the combination with a movable contact, of a rod for shifting said contact, a connection between the said rod and said contact permitting disabling of the operative relation of the rod to the contact, and an overload releasing device for disabling the connection mounted upon the rod.

4. In an electric switch, an operating lever for setting the contact or contacts open or closed, a bell-crank lever between the operating lever and the contact or contacts comprising two pivoted arms connected by a toggle, means for cramping the toggle, and an overload releasing device for collapsing the toggle.

5. In an electric switch, the combination with a movable switch element, of an actuating member, arms pivoted at a common point, one of said arms being connected to said movable element and the other to said actuating member, a normally positive connection between said arms, and a tripping means for breaking said connection.

6. In an operating mechanism for an electric switch, the combination of an arm connected to the switch, a pivot for said arm, an operating lever mounted on said pivot, and a locking toggle between said arm and said lever.

7. In an electric switch, the combination with a movable element, of an actuating member, arms pivoted at a common point,

one of said arms being connected to said movable element and the other to said actuating member, a normally positive connection between said arms, and means for breaking said connection.

8. In an electric switch, an arm connected to the movable element of said switch, a pivot for said arm, an actuating member mounted on said pivot, a locking toggle for locking said arm and said member to each other during manual operation, and means for breaking said toggle to operate the switch automatically.

9. An electric switch, comprising a movable element, an operating lever, and a collapsible locking toggle connected to said element and to said lever to transmit the thrust of said lever to said element, said toggle being set in non-collapsed position by the movement of said lever away from said element whereby a normally positive connection is established between the lever and the movable element.

10. An electric switch, comprising a movable element, an operating lever, a collapsible locking toggle connected to said element and to said lever to transmit the thrust of said lever to said element, said toggle being set in non-collapsed position by the movement of said lever and said element away from each other to establish a normally positive connection between the lever and the movable element, and means for collapsing said toggle to permit said element to move independently of said lever.

11. In an operating mechanism for an electric switch, the combination with two relatively movable members, of a locking toggle between said members overset by the movement of one of said members in one direction, thereby establishing a normally positive connection between said members.

12. In an operating mechanism for an electric switch, the combination with relatively movable members, of a locking toggle between said members overset by a separation of said members to form a normally-positive connection between said members, and means for breaking said connection.

13. An electric switch, comprising a switch member, an operating member, and a locking toggle between said members overset by relative movement of said members to form a normally-positive connection between them.

14. An electric switch, comprising a switch element, an operating member, a locking toggle connected to said element and said member and overset by relative movement of said member and said element to form a rigid collapsible connection between them, and electroresponsive means for breaking said toggle to permit movement of said element independently of said member.

15. An electric switch comprising a movable element, an actuating member, a toggle connected to said element and to said member to form a normally positive collapsible connection therebetween, and means for collapsing said toggle to permit said element to move independently of said member.

16. An electric switch comprising a movable element, an actuating member, a toggle for normally locking said element and said member to each other, and electroresponsive means for collapsing said toggle and thereby permitting said element to move independently of said member.

17. In an operating mechanism for electric switches, the combination with relatively movable members, of a toggle between said members set rigid by relative movement of said members to form a normally positive collapsible connection between them, and means for collapsing said toggle.

18. In an operating mechanism for electric switches, the combination with relatively movable members, of a toggle between said members set by movement of said members away from each other to form a normally positive collapsible connection therebetween, and means for collapsing said toggle to permit said members to move independently of each other.

19. In a circuit breaker, the combination with a movable switch member, an operating lever, jointed links which connect the lever to the switch member and are movable into self-sustaining alinement solely by the movement of said lever relatively to said switch member, and latching means for normally restraining said operating lever to maintain said member in circuit closing position, of tripping means acting directly upon one of said links to release said switch member independently of the operating lever.

20. A switch operating mechanism comprising two members pivoted adjacent each other, and a toggle between said members set by movement of said members away from each other to form a normally positive collapsible connection therebetween, and means for collapsing said toggle to permit said members to move independently of each other.

21. In a switch, switch operating mechanism including a plurality of interconnected members and a series of links and levers, one of said members being composed of two hinged parts, means for holding said hinged parts in locked position when the switch is closed and when opened manually, and means for automatically unlocking said parts for automatic operation.

22. In a switch, switch operating mechanism comprising pivotally connected members, one of said members consisting of two normally locked hinged arms, means for

holding the hinged arms in locked position when the switch is closed and when opened manually, and means for automatically unlocking the arms.

23. In a switch, switch operating mechanism comprising two sets of pivotally connected members, one of said members being in two parts forming a collapsible member, means for holding the parts of said collapsible member in a locked position when the switch is closed and when operated manually, and means for unlocking or "breaking" the parts of said collapsible member whereby the switch may be opened automatically.

24. In a switch, switch operating mechanism comprising pivotally connected members, one of said members having two parts forming a collapsible member, means for holding said parts in locked engagement when the switch is closed and when operated manually, means for automatically unlocking said parts to open the switch, and a toggle connected to said members to be actuated thereby.

25. In a switch, a stationary and movable contact, switch-operating mechanism including a toggle, and pivotally connected members connected thereto to actuate said toggle, one of said members having connected thereto an operating handle and serving to hold the toggle in its cramped or distended position, one of said members consisting of two hinged parts, means for holding said hinged parts in closed or locked position, and means for breaking or unlocking said parts to open the switch automatically.

26. In a switch-operating mechanism, a toggle and actuating members connected together so that force is transmitted from one to the other, one of said members having a collapsible arm, an operating handle connected to one of said members, whereby said toggle can be cramped or broken at will, means for holding the parts of said collapsible arm in locked position when the switch is closed and when opened manually, and means for collapsing said arm to break the toggle automatically.

27. In a switch, an operating mechanism therefor comprising a toggle and an actuating member connected thereto comprising two hinged collapsible arms, means for holding the arms in locked position during manual operation, and means for collapsing said arms for automatic operation.

28. In a switch operating mechanism, two normally locked hinged arms, a locking toggle for locking said arms during manual operation, and means for breaking said toggle to permit said arms to move independently of each other and thereby operate the switch automatically.

29. A switch operating mechanism comprising a bell crank, and a two part col-

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lapsible member, a locking toggle for locking the parts of said member during manual operation and an electroresponsive device for breaking said toggle upon the occurrence
5 of abnormal current in the circuit whereby said member will collapse and the switch will be opened.

In witness whereof we have hereunto set our hands this 10th day of November, 1900.

EDWARD M. HEWLETT.

CHARLES C. BADEAU.

Witnesses:

BENJAMIN B. HULL,

MARGARET E. WOOLLEY.