No. 757,853. PATENTED APR. 19, 1904.

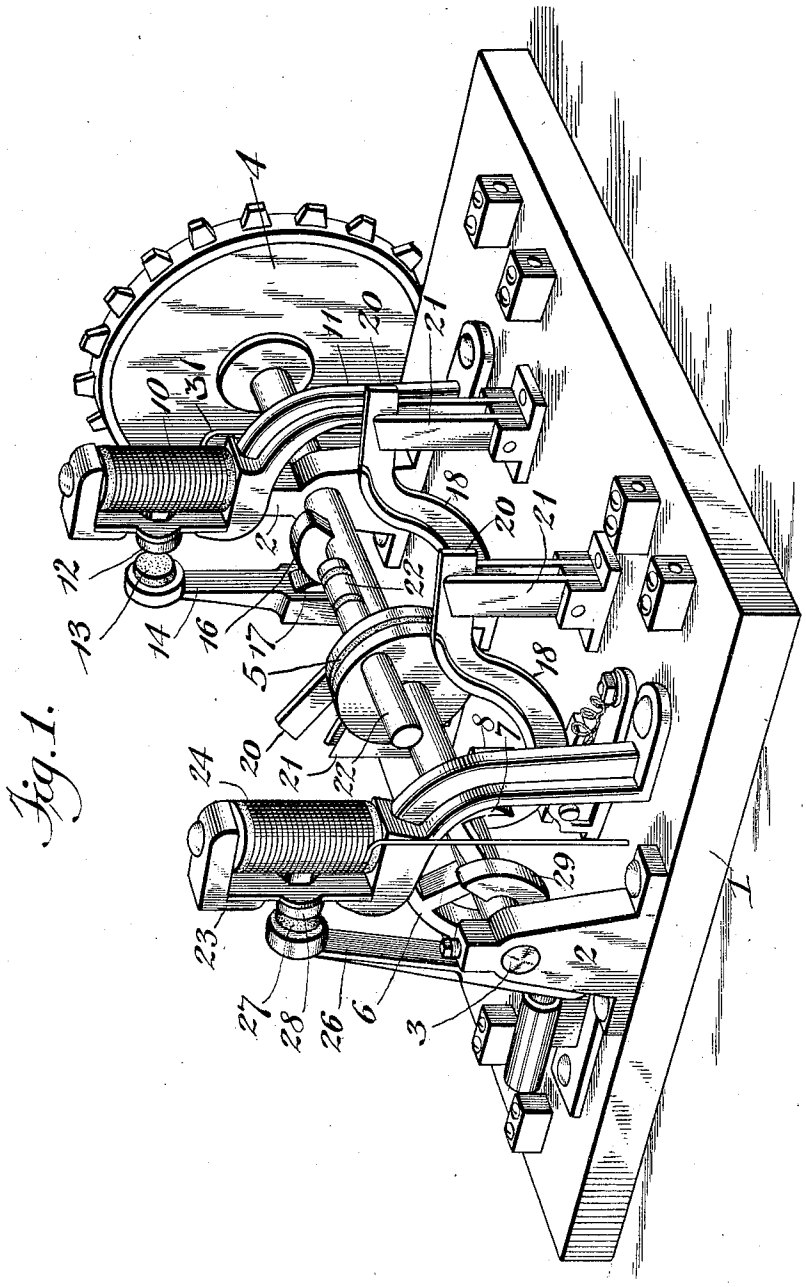
G. H. WHITTINGHAM.

ELECTRIC SWITCH.

APPLICATION FILED OCT. 29, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

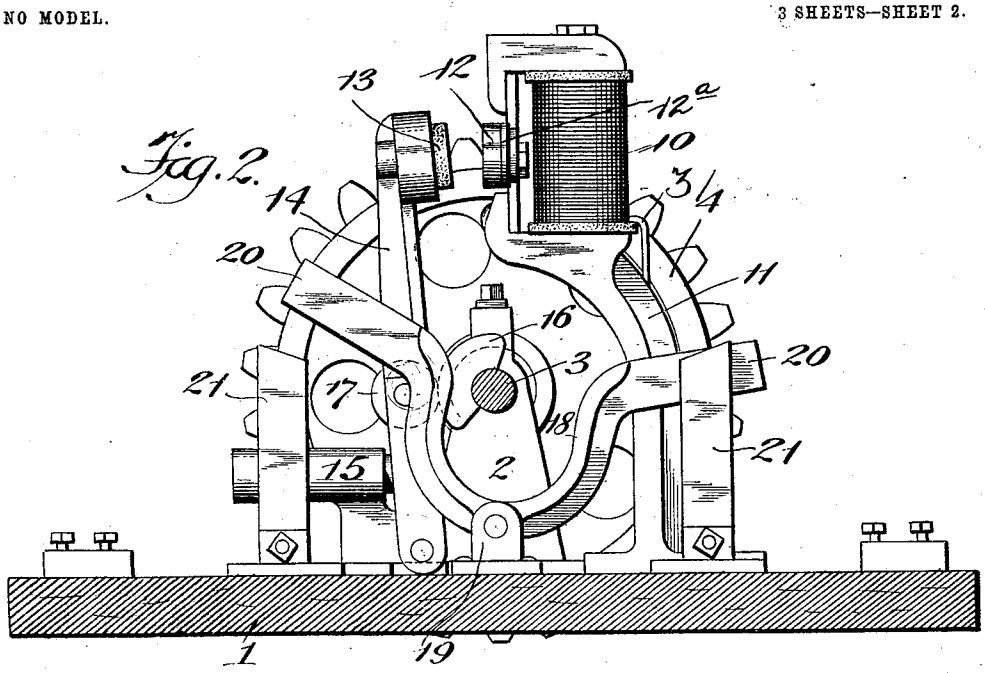


Fig. 5

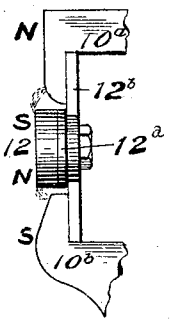


Fig. 3.

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NO MODEL. 3 SHEETS—SHEET 3.

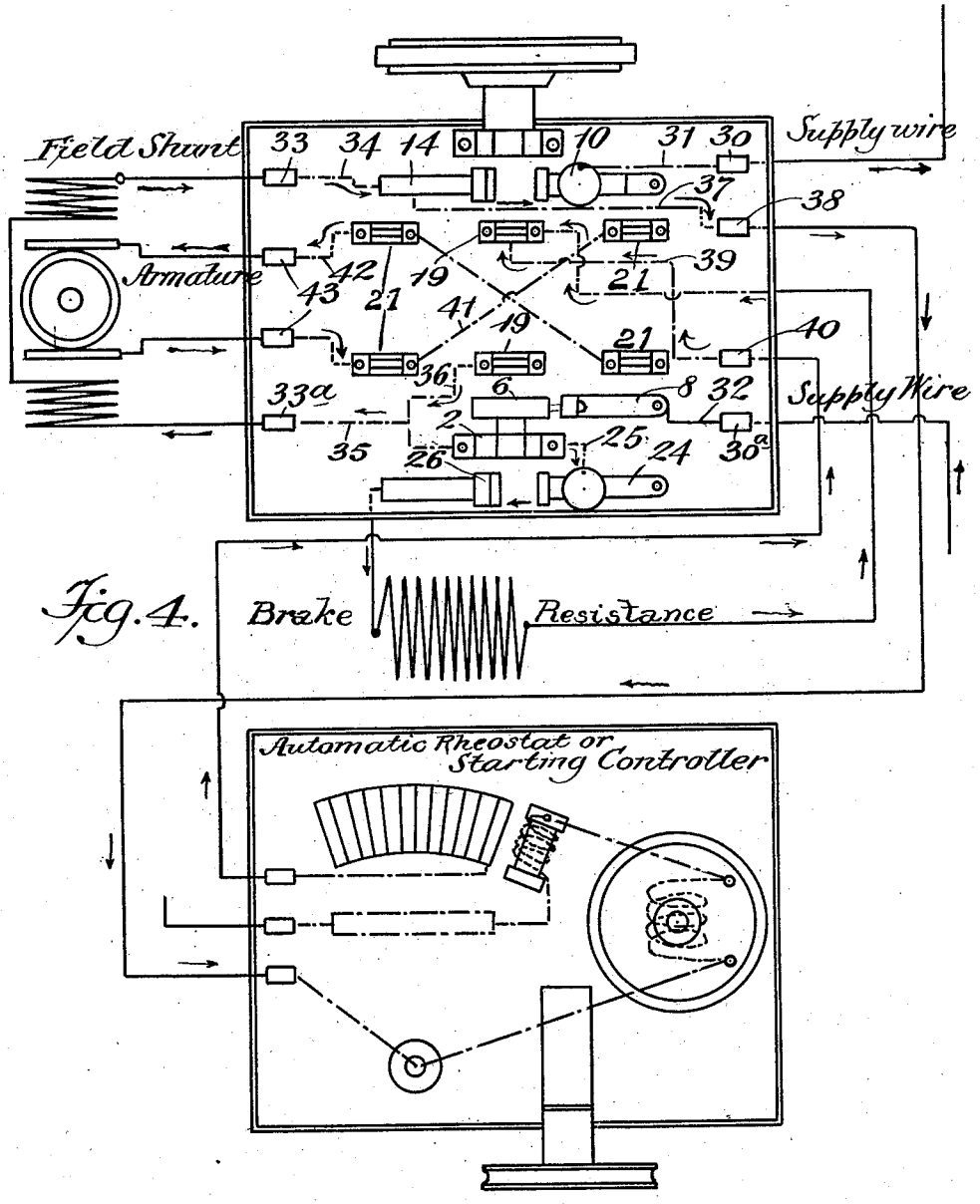


Fig. 4.

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No. 757,853. Patented April 19, 1904.

UNITED STATES PATENT OFFICE.

GEORGE H. WHITTINGHAM, OF NEW YORK, N. Y., ASSIGNOR TO AUTOMATIC SWITCH COMPANY OF BALTIMORE CITY, A CORPORATION OF MARYLAND.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 757,853, dated April 19, 1904.

Application filed October 29, 1903. Serial No. 179,013. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. WHITTINGHAM, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Switches; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to switches for reversing the current in electric motors, and contemplates particularly certain improvements embodying the principle described and claimed in my Letters Patent of the United States No. 716,504, dated December 23, 1902.

Briefly stated, the patent above referred to comprehends an electric switch so arranged and constructed that when the connection with the motor supply-circuit is broken or opened at one side of the switch for the purpose of stopping or reversing the motor the armature and field circuits remain closed and are not opened except when the opposite side of the line or supply circuit is just about to be closed, thereby affording time for the armature to slow down and stop (which is quickly effected by the automatic introduction of an electrodynamic brake-circuit) before the armature and field circuits are broken preparatory to reversing the current in the armature, and thus avoiding the destructive arcing of terminals and their contacts, which results when the armature and field circuits are opened while the armature is running.

My present invention, while embodying the same inventive idea, in addition thereto contemplates certain improvements whereby in the operation of the switch to stop or reverse the motor the motor supply-circuit is always opened first by a blow-out device and the connection with the supply-circuit is broken, even with high-tension currents, without any destructive arcing taking place at any point; and a further object is to provide improved automatic means for completely blowing out the current in the dynamic brake-circuit and disconnecting it from the armature-circuit at the moment the supply-circuit is about to be closed and work is required of the motor-armature, thereby adding to the durability and efficiency of the switch, especially in systems requiring frequent and rapid opening and closing of the circuits and reversing of the current.

In the accompanying drawings, Figure 1 is a perspective view of my improved switch, illustrating the parts in the position in which the supply-circuit is open while the armature-circuit remains closed and the dynamic brake-circuit is introduced into the armature-circuit. Figs. 2 and 3 are transverse sectional views through different portions of the switch, illustrating the correlated positions of the parts of the blow-out devices for the supply-circuit and dynamic brake-circuit, respectively. Fig. 4 is a diagrammatic view representing a top plan of the switch and illustrating it as incorporated in an electric elevator system. Fig. 5 is a detail view illustrating the specific construction of blow-out magnet.

Referring to the drawings, 1 designates the switch-base, of slate or any suitable insulating material, at opposite sides of which are mounted standards 2, in which a shaft 3 is journaled, said shaft having on one end a sprocket-wheel 4, by which it may be partially turned by the usual means to operate the switch. The shaft 3 is electrically divided into two parts by insulation 5, and on one of such parts is rigidly secured a segmental contact-shoe 6, the ends 7 of which are designed to alternately make contact as the shaft is turned one way or the other with a supply-circuit terminal 8, consisting of a pivoted finger spring-pressed by a button 9 into the path of movement of the shoe. The shoe 6 and terminal 8 constitute the means for opening and closing the supply-circuit at one side of the switch, and for opening and closing such circuit on the other side of the switch there is provided a blow-out device consisting of an electromagnet 10, mounted on an upright 11 and provided with a detachably-held metallic disk 12, designed to coact with a juxtaposed disk 13, preferably of graphite, said latter disk being detachably secured in

the free end of an upright arm 14, pivoted at its lower end to swing toward and from the electromagnet 10 and pressed normally toward the same by means of a spring-actuated push-rod 15. A cam 16 on the shaft 3 acts against a roller 17 on the arm 14 in order when the shaft is turned in either direction to swing the arm 14 away from the electromagnet 10.

The disk 12 is mounted upon a bar 12^b, secured between and connecting the two poles 10^a and 10^b of the electromagnet, and between the said disk and its supporting-bar is interposed another and comparatively thin disk 12^a of iron. By this arrangement four poles are produced, as will be seen by reference to Fig. 5, two of them being primary poles and two consequent poles—namely, an N primary pole at one of the metallic end supports 10^a, an S consequent pole at the contiguous point of the disk 12, an N consequent pole at the diametrically opposite point of the disk 12, and an S primary pole at the other metallic end support 10^b. Hence when the current is interrupted any tendency that the arc may have to follow lines coincident with the metallic end supports 10^a and 10^b of the magnet will be met by the opposing lines of the magnetic field, whereby such tendency will be counteracted, and the arc will be driven laterally at right angles to the plane of said end supports and will be effectually disrupted. As the blow-out device is included in the line-circuit, as is shown by the feed-wire 31, leading to it, and its core being thereby part of such circuit, this arrangement is manifestly especially advantageous.

The armature-circuit in the switch includes two rocking arms 18, substantially of U shape, with central bowed portions pivotally mounted at their middle in bearings 19, secured to the base underneath the shaft 3 and entirely independent thereof and with oppositely-extending blades 20, designed to alternately engage with either pair of armature-circuit terminals 21, secured on the base at opposite sides of the shaft 3 for the purpose of closing the armature-circuit with the current flowing either in one direction or the opposite direction. To move the rocking arms 18 in either direction, there are provided two oppositely-extending tappets 22, rigid with respect to the shaft 3 and arranged to strike the arms 18 at one side or the other to rock the same and force their blades into engagement with the respective terminals 21. It is to be noted that the bowed portions of the rocking arms 18 provide clearances for the tappets, permitting the same to be moved past the initial and operative point of contact, as is evident by reference to Fig. 1, and thereby avoiding any undue strain upon or bending of the blades should the shaft with the tappets be accidentally turned unnecessarily far.

The arrangement of parts above described, it being borne in mind that the shaft 3 can have a movement independent of the armature-circuit contact-blades until the tappets strike, is such that in turning the shaft to close the motor supply-circuit the armature-circuit contact-blades will be driven into engagement with one pair of their terminals to close the armature-circuit before the supply-circuit is closed by bringing the graphite disk 13 into contact with its complementary disk 12. Furthermore, it is to be noted that in the operation of the switch to open the motor supply-circuit for the purpose of stopping and reversing the motor the reverse movement of the shaft first blows out the supply-current by breaking the contact between the two disks 12 and 13 and does this before it has turned sufficiently to move the contact-shoe 6 at the opposite side of the switch out of contact with its terminal, thereby preventing the break or opening from ever occurring at such shoe, where it might result, or in reality always would result, in destructive arcing, and it is to be noted, further, that the continued movement of the shaft in the said reverse direction through the instrumentality of its tappets acting on the opposite pair of blades again closes the armature-circuit (with the current flowing in the opposite direction) before the opposite side of the line or supply circuit has been closed. I propose to use with this arrangement of blowing out the current an electrodynamic brake-circuit arranged to be automatically and instantly introduced into the armature-circuit for the purpose of quickly stopping the free rotation of the armature when the supply-circuit is disconnected, such introduction being rendered possible by the hereinbefore-described arrangement of maintaining the armature and field circuits closed after the supply-circuit has been opened. In the present instance this dynamic brake-circuit includes a magnetic blow-out device 23, similar in construction to the supply-circuit blow-out device above described and mounted on the opposite side of the base 1. The electromagnet 24 of the blow-out device 23 is connected by wire 25 to the adjacent shaft-standard 2, as illustrated in the diagrammatic view, and the swinging arm 26 is connected to one pole of a rheostat or resistance-coil, while the other pole of said rheostat is connected to the bearing 19 at the opposite side of the switch. The swinging arm 26 is spring-pressed in a direction to make contact between its graphite disk 27 and the complementary disk 28 of the electromagnet, in which event the brake-circuit is introduced into the armature-circuit, and to move such arm in the opposite direction to disconnect the brake-circuit I have provided a cam 29 on the shaft 3. The relation of the cam 29 with the other cam 16 is such that said cams work alternately—that is, when the rotation of the shaft 3 causes the cam 16 to open the supply-circuit by acting on the swinging arm 14 the cam 29 is always out of engagement with

the swinging arm 26, so as to allow such arm to immediately close or throw in the brake-circuit, and when the shaft is so turned as to take the cam 16 out of engagement with the swinging arm 14, so as to allow such arm to swing and close the supply-circuit the other cam, 29, works against its arm 26 to immediately open the brake-circuit. Hence when the supply-circuit is blown out the brake-circuit is then at once introduced into the armature-circuit, and the brake-circuit is blown out just before the supply-circuit is closed. This is manifestly an important feature, especially in systems of high voltage, because it insures the instantaneous and complete interruption of the brake-circuit, and without destructive sparking, when the supply-circuit is closed. For instance, if the switch is incorporated in an electric elevator system the elevator operator might, as will often happen in actual practice, open the supply-circuit with the intention of stopping the elevator at a certain floor and then instantly change his mind and close it again. Such manipulation would develop in the armature-circuit a current of high voltage before the brake-circuit has had a chance to expend the current maintained by the freely-rotating armature, and consequently would result, if an ordinary metallic contact and terminal were used to open the brake-circuit, in sparking and destructive burning. Furthermore, the arrangement of blow-out under the conditions just named insures the complete interruption or discharge of the current in the brake-circuit and its subtraction from the armature-circuit at the very instant work is required of the motor-armature. This brake-circuit is obviously effective whenever the supply-circuit is opened, whether the armature-circuit is reversed or not, and it is to be noted that the disks 12 and 28 of the electromagnets are held between the two poles thereof, causing the current to be broken in the intense field between said two poles.

Reference is to be had particularly to the diagrammatic view for an understanding of the different circuits, said view representing a top plan of the switch and illustrating it in an electric-elevator system.

The line or supply circuit is connected to the switch at the binding-posts 30 30ª, which are in turn connected by wires 31 32, respectively, to the electromagnet 10 and terminal 8, and the field-shunt for said circuit is connected to the binding-posts 33 33ª, one of which is connected by wire 34 to the swinging arm 14 and the other of which is connected by wire 35 to the adjacent shaft-standard 2, and hence also to the contact-shoe 6, and also by wire 36 to the bearing 19 of the adjacent rocking armature-circuit arm 18. The swinging arm 14 is connected by wire 37 to the binding-post 38, in turn connected to one pole of the automatic rheostat or starting controller, and the bearing 19 of the other armature-circuit arm 18 is connected by wire 39 and binding-post 40 to the other pole of said automatic rheostat. The armature-circuit terminals are coupled diagonally, as illustrated at 41, and are connected to the armature by wires 42, leading to binding-posts 43.

When the line or supply circuit is closed, the current will be introduced into the switch at the binding-post 30ª, whence it will flow through wire 32, terminal 8, and shoe 6, the adjacent shaft-standard 2, wire 35, the field-shunt, wire 34, and from arm 14 and magnet 10 back to the line. The current will be introduced into the armature-circuit from shaft-standard 2 by means of wire 36, the adjacent bearing 19, and the armature-circuit terminals 21, which are connected to the motor-armature, as illustrated, and from the armature the current will flow to the other bearing 19, thence to and through the starting-controller, back to the switch at the binding-post 38, to the arm 14, and then out through the blow-out device to the negative side or the line.

When the switch is in the off position, contact will be maintained between the disks 27 and 28, and then (tracing the current energizing the field) the current from the armature will flow in the direction of the darts to one of the bearings 19, whence a portion of it will flow through the brake-rheostat and back through the other bearing 19 to the armature, and the other portion will flow to the binding-post 33ª and thence through the field-shunt to the opposite binding-post 33, thence through arm 14 and wire 37 and starting-controller, then back again into the switch through wire 39 and bearing 19, and finally back to the armature. It is to be remembered that the darts on Fig. 5 of the drawings are intended for tracing the dynamic brake-circuit and not the armature-circuit when the switch is in the on position. The freely-rotating armature generates a current when the switch is in the off position, because the field-circuit is maintained and remains closed after the supply-circuit is disconnected, the said field-circuit being completed through the starting resistance or controller, as above described; but this starting resistance is so slight in proportion to the resistance of the field as to interfere in no wise with its proper action for the dynamic brake effect.

From the foregoing description, in connection with the accompanying drawings, it will be seen that I have provided sure means for preventing any destructive sparking or burning of any of the metallic circuit opening and closing parts of the switch and also sure automatic means for instantly introducing into the armature-circuit and instantly and completely subtracting therefrom a dynamic brake-circuit at the proper and essential times, which are desiderata in the art to which this invention appertains, adding greatly to the durability and endurance of the switch, es-

pecially when the same is incorporated in elevator systems or used under similar conditions in which a current to a motor is very frequently interrupted and reversed.

I claim as my invention—

1. An electric switch comprising means for opening and closing supply, armature, and brake circuits and including blow-out devices for the supply and brake circuits, respectively, actuated to blow out the currents in their respective circuits alternately with the closing of the other circuit.

2. The combination of an electric switch for reversing the current in motors, provided with means for maintaining the armature-circuit closed after the supply-circuit has been opened, an electrodynamic brake-circuit, means for automatically introducing said brake-circuit into the armature-circuit upon the opening of the supply-circuit, and blow-out devices for the supply and brake circuits, respectively, actuated to blow out the currents in their respective circuits alternately with the closing of the other circuit.

3. An electric switch, comprising opening and closing devices for supply and armature circuits, the opening and closing devices for the supply-circuit including a blow-out device, a second blow-out device designed to be included in a brake resistance-circuit, and means for actuating said blow-out devices alternately whereby one is open when the other is closed.

4. An electric switch, comprising opening and closing devices for supply and armature circuits, the opening and closing devices for the supply-circuit including a magnetic blow-out device consisting of an electromagnet and an arm movable toward and from the same and designed to close the circuit through such device, a second magnetic blow-out device designed to be included in a brake resistance-circuit and consisting of an electromagnet and an arm movable toward and from the same, a shaft provided with cams designed to move the said arms in one direction, and means for moving said arms in the opposite direction.

5. In an electric switch, opening and closing devices for an armature-circuit, supply-circuit opening and closing devices one of which is a blow-out device consisting of an electromagnet having a contact-surface and a swinging arm spring-pressed toward such surface to close the supply-circuit, a shaft provided with a cam designed to move said arm away from said surface whereby the magnet will blow out the current in the supply-circuit, and another opening and closing device for the supply-circuit consisting of a terminal and a segmental shoe mounted on said shaft, each end of said shoe being alternately brought into contact with said terminal as the shaft is turned.

6. An electric switch, comprising means for opening and closing a supply-circuit, armature-circuit terminals and contacts therefor consisting of rocking arms provided with central pivoted bowed portions and a blade at each end thereof, and a shaft provided with tappets designed to rock said arms so as to move their blades into and out of contact with the terminals, the said bowed portions providing clearances whereby the tappets may pass their points of operative contact with the arms, thereby preventing any undue strain from being exerted upon the blades.

7. In an electric switch, opening and closing devices for an armature-circuit, and supply-circuit opening and closing devices one of which is a blow-out device, the other consisting of a terminal and a segmental shoe each end of which is designed to be alternately brought into contact with said terminal, the blow-out device opening the supply-circuit in advance of the disengagement between either end of the contact-shoe and its terminal.

8. In an electric switch, opening and closing devices for an armature-circuit, a blow-out device constituting means for opening the supply-circuit at one side of the switch and comprising an electromagnet having a contact-surface and an arm provided with a contact movable thereby into contact with such surface and normally held thereagainst to close the supply-circuit, means for moving said arm away from such contact-surface against the means that tends to hold it against the same, and means for opening and closing the supply-circuit at the other side of the switch.

9. In an electric switch, opening and closing devices for an armature-circuit, a blow-out device constituting means for opening and closing the supply-circuit at one side of the switch and comprising an electromagnet having a contact-surface and a swinging arm carrying a contact movable thereby into contact with such surface, means for holding said arm normally under tension with its contact against such surface, a shaft provided with means for swinging said arm against such tension means, and means for opening and closing the supply-circuit at the other side of the switch.

10. In an electric switch, opening and closing devices for an armature-circuit, a blow-out device constituting means for opening and closing the supply-circuit at one side of the switch, and comprising an electromagnet having a contact-surface, a swinging arm carrying a contact movable thereby into contact with such surface and spring-pressed toward the magnet, a shaft provided with a cam for swinging said arm away from the magnet, and means for opening and closing the supply-circuit at the other side of the switch.

11. In an electric switch, opening and closing devices for an armature-circuit, a blow-out device constituting means for opening and closing the supply-circuit at one side of the switch and comprising a swinging arm spring-pressed in one direction and an electromagnet having a contact-surface for engagement by

the contact of said arm, and a shaft provided with means for moving said arm away from the magnet, and means for opening the other side of the line or supply-circuit after the blow-out device has operated to disrupt the arc at the opposite side of the switch.

12. An electric switch, comprising armature-circuit terminals and blades therefor, a blow-out constituting means for opening and closing the supply-circuit at one side of the switch and comprising an electromagnet provided with a contact-disk, a swinging arm provided with a disk adapted to be brought into contact with said first-named disk and held normally in the position in which the two disks are in contact, a shaft provided with means for actuating the armature-circuit blades and also provided with means for moving said arm away from the magnet, and means for opening and closing the supply-circuit at the other side of the switch.

13. An electric switch, provided with a magnetic blow-out device forming part of the line or supply circuit and whose supports constitute primary poles, a contact-disk held between said primary poles and provided with means for producing between said two primary poles two consequent poles, and a complementary disk adapted to contact with said first-named disk.

14. An electric switch, provided with a magnetic blow-out device forming part of the line-circuit and constituting two primary poles, means for producing between such primary poles two secondary or consequent poles, and means for opening or breaking the line-circuit at a point coincident with said consequent poles.

15. An electric switch, provided with a magnetic blow-out device forming part of the line-circuit and constituting two primary poles, a bar mounted between said two poles, a contact-disk secured to said bar, means for producing consequent poles between said two primary poles, and a complementary disk adapted to contact with the first-named disk.

16. An electric switch, provided with a magnetic blow-out device forming part of the line-circuit and constituting two primary poles, a bar mounted between said two poles, a contact-disk secured to said bar, an iron disk interposed between said contact-disk and said bar and adapted to produce two consequent poles between the two primary poles, and a complementary disk designed to contact with the first-named disk.

17. An electric switch, provided with a magnetic blow-out device provided with two primary poles, means for producing between the primary poles two consequent poles, and means for opening or breaking the circuit within the influence of the consequent poles.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GEORGE H. WHITTINGHAM.

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