(No Model.) 2 Sheets—Sheet 1.

H. H. BLADES.

ELECTRIC SWITCH FOR MOTORS.

No. 418,678. Patented Jan. 7, 1890.

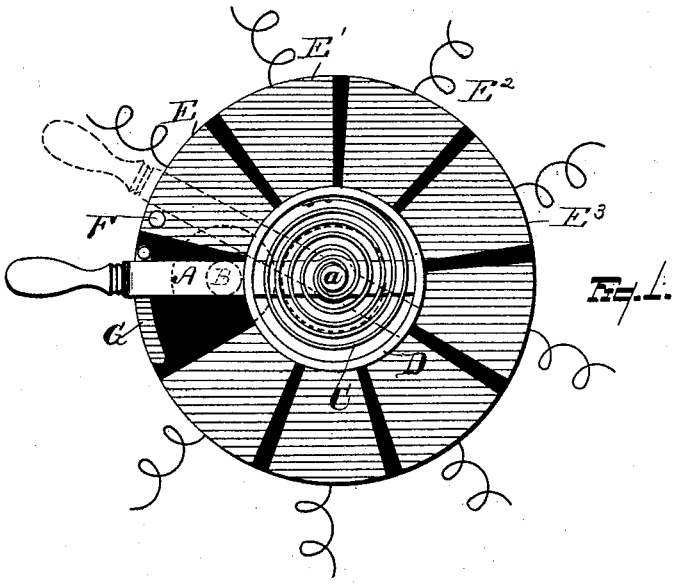

Fig. 1.

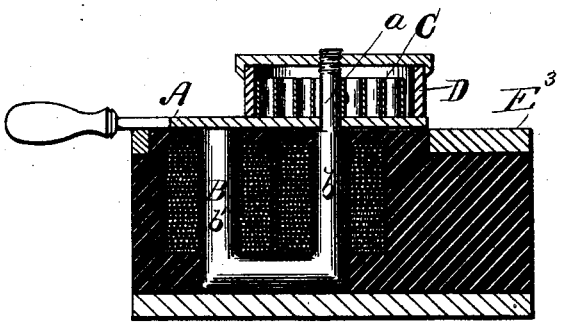

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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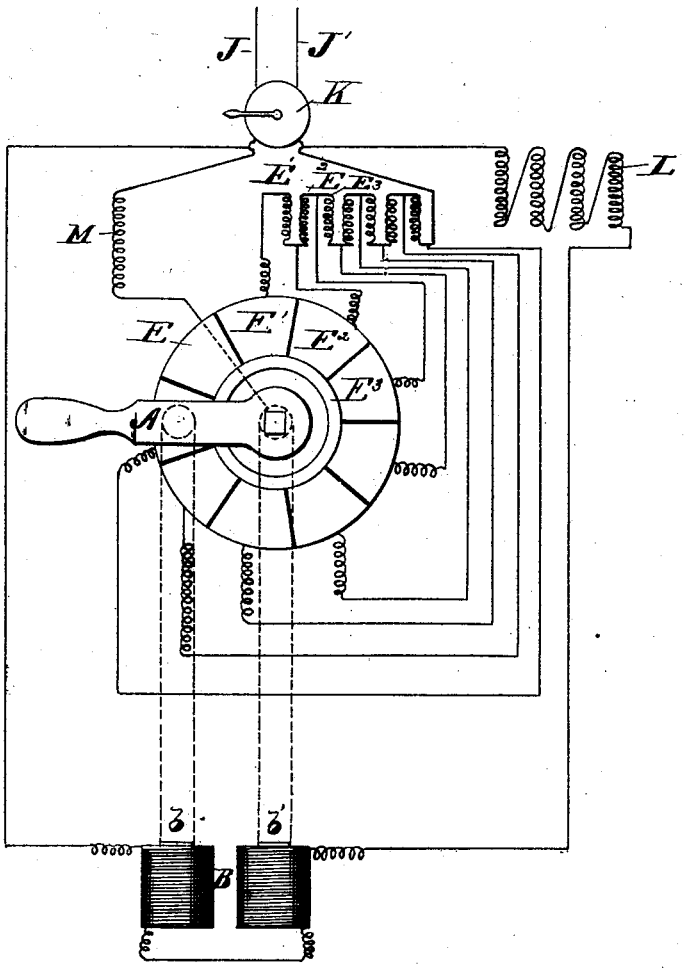

Fig. 3.

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UNITED STATES PATENT OFFICE.

HARRY H. BLADES, OF DETROIT, MICHIGAN, ASSIGNOR TO THE DETROIT MOTOR COMPANY, OF SAME PLACE.

ELECTRIC SWITCH FOR MOTORS.

SPECIFICATION forming part of Letters Patent No. 418,678, dated January 7, 1890.

Application filed November 30, 1888. Serial No. 292,290. (No model.)

To all whom it may concern:

Be it known that I, HARRY H. BLADES, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Electrical Switches for Motors, &c.; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

It is the object of my invention to provide a switch for electric motors on constant potential circuits, such that when there is a cessation of the current it will automatically break the armature-circuit and assume its initial position, ready at will to gradually turn the current on the armature in starting.

In starting shunt-motors on constant potential circuits the field-circuit is first made, and then the current is thrown gradually on the armature. This leaves the switch-lever for starting the armature in its final position.

In stopping, the operator first breaks the main circuit, including the field-circuit, and then after the motor stops turns the switch-lever for starting the armature from its final position back to its initial. Very often, however, the operator forgets to turn this armature-lever back, and when the time comes to start the motor turns on the main switch, and thus throws the full current into the armature before it has time to generate its counter-electro-motive force, and thus reduce the current flowing through it. The result of this is that either the armature is burned out or the fusible plugs put in for its protection are blown; also, the circuit is sometimes broken for a short time by the stopping of the dynamo, a short circuit at the central station, or for some other cause. In this event the ordinary armature-lever would of course stay in its final position, and when the current is re-established either the armature or the plugs would burn out.

It is the object of my invention to obviate these difficulties by a device such that when the circuit is broken, whether intentionally or not, the armature will be thrown out of circuit. This I accomplish by a combination of devices hereinafter more fully shown and described.

In the drawings, Figure 1 is a plan view of my improved switch, and Fig. 2 is a cross-section of the same. Fig. 3 is a diagrammatic view showing the circuits.

In the above drawings, J J′ are the main-line wires.

K is the main switch controlling the current.

L represents the fields of the motor, and M is the armature of the motor.

A represents the switch-lever. This lever is the armature of the magnet B, which I prefer shall be a horseshoe electro-magnet, although it may be any electro-magnet, the same being preferably in the field-circuit. If the electro-magnet is a horseshoe electro-magnet, as shown, the lever A is preferably pivoted at *a*, as shown, to one pole *b* of the magnet B.

C is a spring engaged at one end to the extension of the pole *b* and at the other to the cap or drum D, which is revolved on the pivot *a* by the movement of the lever, and so increases the tension of the spring.

E is a blank segmental terminal, and the spiral shown in Fig. 1 as projecting from it is insulated from it and connects the pivot of the lever with one of the terminals of the armature.

E′ E^2 E^3, &c., are segmental terminals connected with a number of resistance-coils joined in series, whereby a varying amount of resistance may be thrown into the armature-circuit in starting, the said resistance E′ being the greatest, and each successive segment governing a smaller resistance, until finally the armature is without any external coils in series with it. In this particular case the electro-magnet B is in series with the field-magnets of the motor, and of course the changes in the armature-circuit produce no change in the coils of the magnet B.

The operation of the switch will now be understood. The main circuit, including the field-circuit, is now closed with the usual double pole or other switch K. The lever A, at rest in its initial position on the blank terminal E, is moved to the segment E′. The armature-circuit is now closed with the whole

resistance in series with the armature. The armature starts slowly, and as the speed increases the lever is moved from one segment to the next, thus reducing the resistance until finally on the last segment the armature runs without any resistance whatever. As the lever reaches the last segment, the armature of the electro-magnet rests upon the other pole *b'* of the magnet, and is thus held by this magnet against the action of the spring, which tends to bring the lever back. The coils of the electro-magnet being in series with the field, the lever will remain in its final position as long as the field-circuit and main circuit are not broken. When the main circuit is broken, whether accidentally or, as usual, by the operation of the main switch, the motor will gradually slow down, and when it has nearly stopped the lever A will fly back to its original position by the action of the spring. The lever will not fly back until the motor has nearly stopped, since the magnet which holds it is in series with the fields, which are still excited to an extent by the motor acting as generator in slowing down, the fields being in shunt around the armature. Thus when the lever has gone back to its original position the armature-circuit is broken, and the motor is now ready to start without the liability of either burning out the armature or blowing the fusible strips or plugs.

F are stops against which the lever may strike, and G is a wearing-plate on which the lever may bear.

It will of course be understood that this magnet may be any electro-magnet, and the general construction may be varied widely without departing from my invention, which contemplates, broadly, any gradual resistance-switch for starting an armature, in which switch an electro-magnet operates by the magnetism to hold the switch-lever in its proper position when the current is on, and mechanism for automatically returning the switch to its initial position when released by the demagnetization of the said magnet.

What I claim is—

1. In a shunt-wound electric motor, the combination, with the field-circuit, of a magnet in the said circuit, a hand-switch adapted to open and close the armature-circuit, said switch arranged to be held in its closed position by the magnetism of the said magnet, and means for automatically retracting the said switch to its initial position when the magnet is de-energized by the cessation of the current through the field-circuit, substantially as described.

2. In a shunt-wound electric motor, the combination, with the field-circuit, of a horse-shoe-magnet in the said circuit, a hand-switch pivoted to one pole of the magnet and adapted to open and close the armature-circuit, said switch arranged to be held in its closed position by the magnetism of one pole of the magnet, and means for automatically retracting the said switch to its initial position when the magnet is de-energized by the cessation of the current through the field-circuit, substantially as described.

3. In a shunt-wound electric motor, the combination, with the field-circuit, of a magnet in said circuit, a hand-switch pivoted to one pole of the magnet and adapted to open and close the armature-circuit, a series of terminals in contact with which said hand-switch is adapted to sweep, said terminals governing a series of resistances, whereby the armature-current is admitted gradually past the switch, said switch arranged to be held in its closed position by the magnetism of the said magnet, and means for automatically retracting the said switch to its initial position when the magnet is de-energized by the cessation of the current through the field-circuit, substantially as described.

4. In a shunt-wound electric motor, the combination, with the field-circuit, of a magnet in said circuit, a hand-switch adapted to open and close the armature-circuit, said switch arranged to be held in its closed position by the magnetism of the said magnet, and a spring for automatically retracting the said switch to its initial position when the magnet is de-energized by the cessation of the current through the field-circuit, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

HARRY H. BLADES.

Witnesses:
W. H. CHAMBERLIN,
E. WELTON.