(No Model.) 2 Sheets—Sheet 1.

P. WRIGHT & J. W. KINSEY.

SWITCHING APPARATUS FOR ELECTRIC MOTORS.

No. 509,505. Patented Nov. 28, 1893.

Fig. 3,

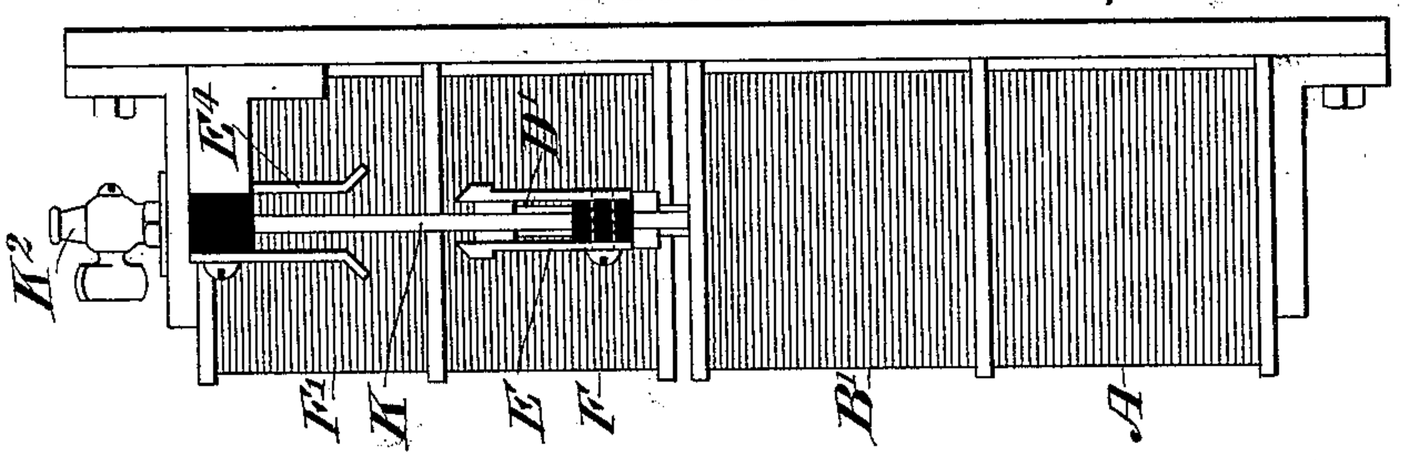

Fig. 2,

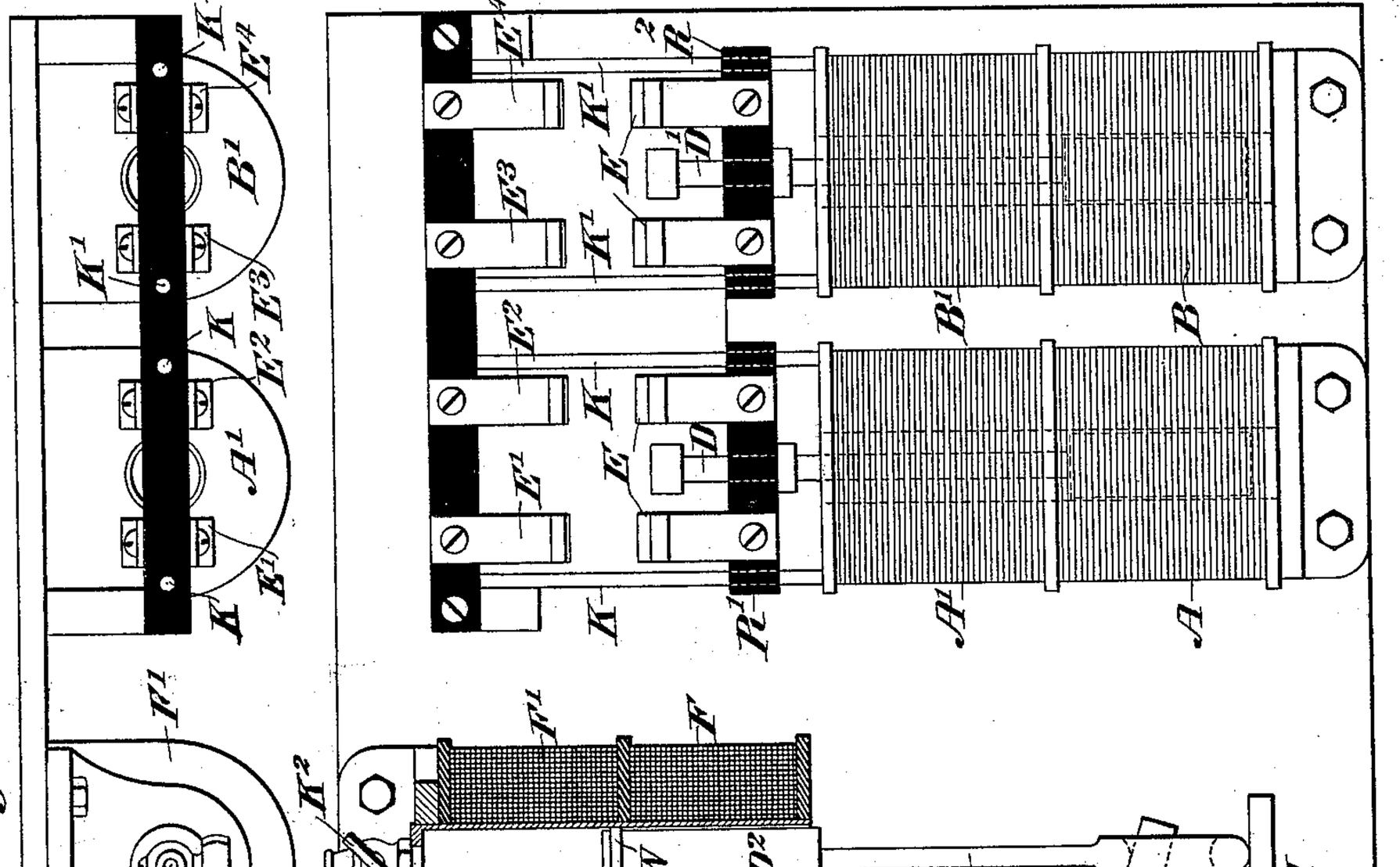

Fig. 1,

Witnesses

C. E. Ashley

H. W. Lloyd.

Inventors

Parvin Wright

Joseph W. Kinsey

By Attorney

Chas. J. Kintner

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

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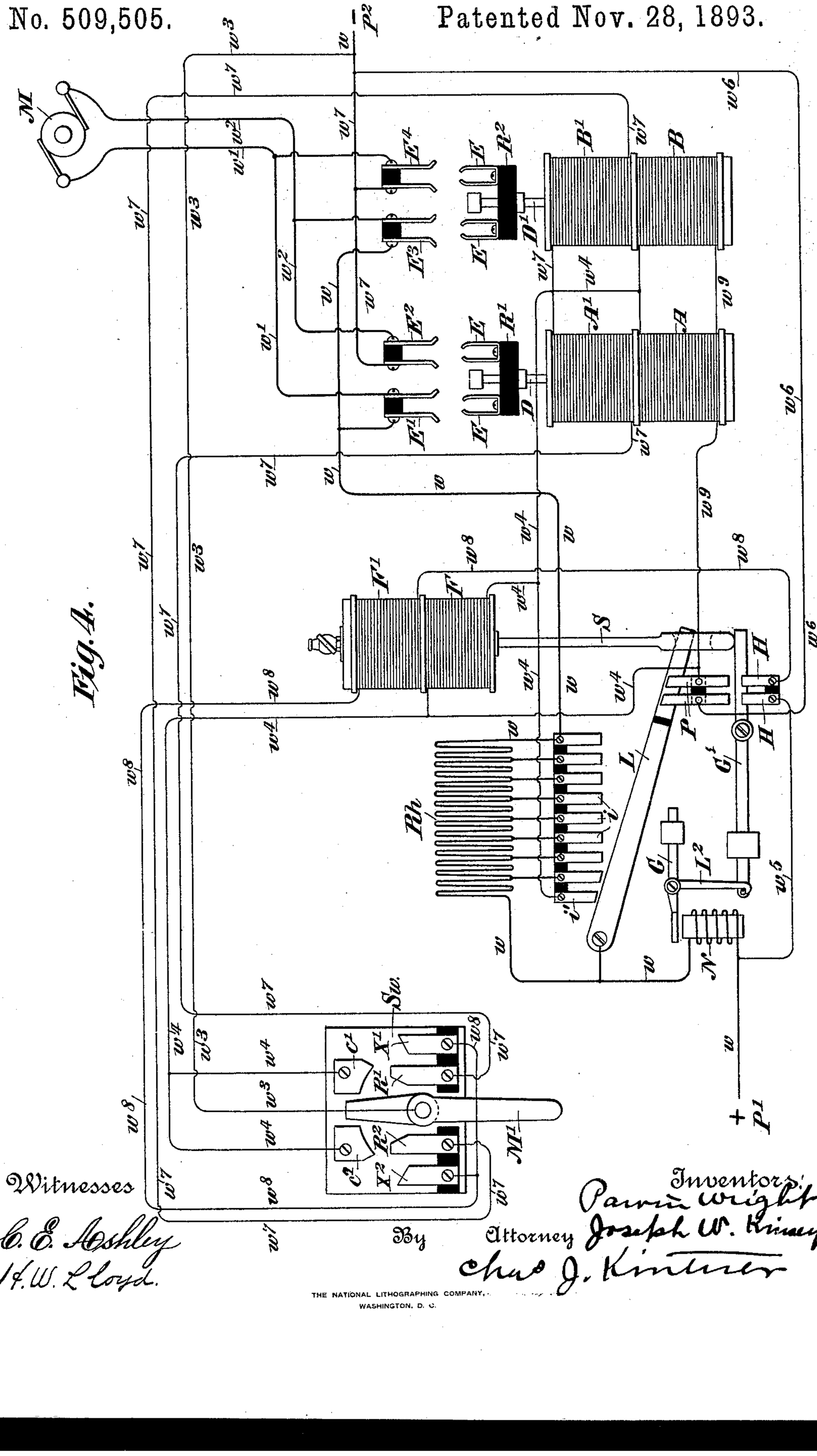

Fig. 4.

Witnesses
C. E. Ashley
H. W. Lloyd.

Inventors:
Parris Wright
Joseph W. Kinsey
Chas J. Kintner
By Attorney

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PARVIN WRIGHT AND JOSEPH W. KINSEY, OF DENVER, COLORADO.

SWITCHING APPARATUS FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 509,505, dated November 28, 1893.

Application filed November 15, 1892. Serial No. 452,037. (No model.)

To all whom it may concern:

Be it known that we, PARVIN WRIGHT and JOSEPH W. KINSEY, both residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Switching Apparatus for Electric Motors, of which the following is a specification.

Our invention is directed particularly to a novel form of switching apparatus adapted to so control the direction of the current through the operative parts of an electric motor that is armature will run in either direction and may be started or stopped at will.

Our invention has for its objects, first, the placing of the control of an electric motor under a simple actuating or operating handle, in such manner that it may be started or stopped and the direction of the armature's rotation reversed at will; second, the adaptation of safety appliances with such a switch and in such manner that there is little danger of burning out the motor. We accomplish these objects by the use of the apparatus hereinafter described, the essentially novel features of which are particularly pointed out in the claims at the end of this specification.

Our invention may be fully understood by referring to the accompanying drawings, in which—

Figure 1 is a plan view of the automatic circuit-controlling apparatus of the switch, and Fig. 2 a side elevation thereof, Fig. 3 being an end elevation view, and Fig. 4 a diagrammatic view fully disclosing all of the circuit connections.

Referring now to the drawings in detail in all of which like letters of reference represent like parts wherever used, A A′, B B′ are switching solenoids or electro-magnets provided with cores D D′ carrying insulating switch heads R′ R^2 on their upper ends, provided with pairs of conducting contact springs E E, E E, which contact springs are adapted to contact in pairs with corresponding fixed pairs of contact springs E′, E^2, E^3, E^4. The switch heads R′ R^2 have slight vertical movement on the ends of the cores D and are carried or guided in their movement by side rods K K, K′ K′. See Fig. 1.

F F′ is a starting or stopping solenoid having a core D^2, the lower end of which is attached to a rod S adapted to operate a pivoted lever L, the conducting portion of which is designed to come into contact with conducting springs *i i* connected with independent sections of a rheostat R^h. The outer end of the lever L is insulated from the body thereof and adapted to contact with conducting springs P, it having a certain amount of play in a slot or opening in the lower end of the rod S which in turn rests upon the free end of a pivoted weighted lever G′ making contact with two conducting springs H H.

N is a safety electro-magnet having an armature lever G provided with a hooked extension L^2 adapted to sustain the weighted lever G′.

S^w is the switch proper located at any desired point, usually in an elevator car, which the motor M is designed to operate.

M′ is the switch handle, and C′ C^2, X′ X^2, R′ R^2 are insulated conducting contacts adapted to contact with the conducting portion of the switch handle, said contacts and handle being electrically connected to the operative portions of the apparatus by conductors w^3, w^4, w^6, w^7 and w^8.

K^2 is a stop cock in the upper end of the hollow or tubular portion of the solenoid F F′ and W is a leather or other yielding washer fitting snugly in said casing, the casing and washer with the solenoid core D^2 acting as a dash pot which is regulated by the stop cock K^2.

The operation of the apparatus is as follows: Suppose the lower end of the switch handle M to be turned to the right until the conducting portion thereof makes contact with the two contacts X^2 and R^2 and that a dynamo electric machine or other generator of electricity, not shown, be connected to the conductor *w* at the points P′ and P^2 a current is set up as follows: starting from P′ by conductor *w*, thence through conductor w^5 to the contact strips H H, thence by conductor w^8 through the upper solenoid F′, thence by conductor w^8 through contact x^2, switch M′, conductor w^3 to the other pole of the generator. This causes the solenoid core D^2 to gradually lift the rod S thereby placing the lever L in

contact with the first contact plate *i* on the left and immediately a new or derived circuit is set up by conductor *w* through the safety magnet N through lever L, contact strip *i'*, conductor w^4, conductor w^7, upper right hand portion of solenoid B', conductor w^7 to the contact springs R^2 and of switch S^w, switch lever M', conductor w^3 out to the other pole of the generator. Immediately therefor the solenoid core D' is drawn into its upper position and the contact springs E E caused to make electrical contact with the upper or stationary contact springs E^3, E^4; consequently the motor circuit is now set up as follows: from P' by conductor *w*, safety magnet N, conductor *w*, lever L the first contact spring *i* of the rheostat R^h through the entire rheostat by conductor *w* to the contact springs E^3 through the contact spring E by conductor w^2 to the armature of the motor M through the motor to the conductor *w'* to contact springs E^4 E out through conductor *w* to the generator. As the solenoid F' continues to draw the solenoid cord D^2 upward, successive sections of the rheostat R^h are cut out and finally the entire rheostat is cut out of circuit and the current caused to pass directly through the lever L by conductor *w* to the motor and it therefore runs at full speed.

Suppose now it is desired to stop the motor, the lower end of the switch handle M' is turned slowly to the left and the contact first broken with the contact plate x^2, thereby demagnetizing the upper portion of the solenoid F' and finally contact is made with the contact plate C^2 at the upper side of the switch S^w thereby establishing a circuit as follows: from P' by conductor *w*, safety magnet N, lever L, left hand contact spring *i'*, conductor w^4, lower half of solenoid F, conductor w^4, contact plate C^2 on switch, switch lever, conductor w^3 out to generator at P^2. This energizes the solenoid F and causes the core D^2 to be drawn downward, ultimately breaking the circuit between the lever L and the left hand contact spring *i'*. At the same time that the circuit was established through the solenoid F as just described a branch circuit was established through the lower solenoid B on the right as follows: passing from P' by conductor *w*, safety magnet N, conductor *w*, lever L, contact strip *i'*, conductor w^4, solenoid B, conductor w^9, contact plate C^2, switch lever M', conductor w^3 out to generator as before. This energizes the solenoid B and causes the core D' to be drawn down into the position shown in Fig. 4. Finally these circuits are both ruptured between the lever L and the contact springs *i* and no current passes over the line. For reversing the motor the lower end of the switch handle M' is turned to the extreme left, when in the same manner as before described the solenoids F' and A' are energized, and the contact springs E E, E' E^2 caused to contact with each other and in the same manner the motor may be stopped as before described. Should an abnormal amount of current flow over the circuit when the motor is running the safety magnet N will be actuated, thereby causing the hook lever L^2 to release the weighted lever G' and make contact through the contact plates P, at the same time breaking contact with the contact plates H and demagnetizing the solenoid core F'; consequently a new circuit is made as follows: passing from P' by conductor *w* through the safety magnet N, conductor *w*, lever L, contact plate *i*, conductor w^4, lower solenoids B and A, conductor w^9, weighted lever G', contact springs P, conductor w^6 out to generator at P^2. Therefore both solenoids A and B being energized the switch heads R' and R^2 will be drawn down and the motor absolutely cut out of circuit. As the solenoid core D^2 and the rod S descend they will ultimately cause the lever L to break the circuit at the contact spring *i* on the left and replace the weighted lever G' in its former position breaking circuit at the contact springs P and reestablishing circuit at the contact springs H and simultaneously allowing the hook lever L^2 to hold it in its locked position.

We do not limit ourselves to the special form of mechanism herein shown and described for controlling the direction of rotation of the armature of an electric motor and automatically cutting the motor out of circuit for abnormal currents, as many of the details of construction may be materially departed from and still come within the scope of our claims hereinafter made.

In some instances the solenoids A B may be dispensed with, and the cores D and D' permitted to drop down and break the circuit by gravity.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. A switch for electric motors having a double starting solenoid or electro-magnet operatively connected to a variable rheostat in combination with two switch controlling solenoids having mechanical and electrical connections, whereby the current supply may be varied, broken or reversed at will, substantially as described.

2. A switch having a double starting electro-magnet or solenoid operatively connected to a current varying device as a rheostat and a pair of double solenoids provided with mechanical and electrical connections for reversing the direction of the current through a translating device, substantially as described.

3. A switch having a starting electro-magnet or solenoid provided with retarding mechanism and operatively connected to a variable resistance in combination with two pairs of switching electro-magnets having mechanical and electrical connections for controlling the current supply and direction to a translating device, substantially as described.

4. In a switch the combination of a starting electro-magnet or solenoid operatively

connected to a variable resistance or rheostat; a pair of double solenoid coils having switch connections for reversing the direction of the current through a translating device and a safety cut out electro-magnet adapted to act for abnormal current, substantially as described.

5. A switch having two double switching solenoid coils, the cores of which are connected to circuit reversing contacts in combination with a starting coil, the core of which is operatively connected with a current varying device and circuit connections running to a switch handle and the aforesaid coils, substantially as described.

6. A switch having an operating handle operatively connected through circuit connections with a starting solenoid coil and two switching solenoid coils and mechanical and electrical connections, substantially as described.

7. A switch having an operating handle electrically connected through branch conductors with a starting solenoid coil and a pair of switching coils in combination with a variable resistance and electrical and mechanical connections, whereby the current is first caused to pass through the starting coil then through one of the switching coils and allowed to increase in volume until the maximum flow occurs, substantially as described.

8. A switch having a starting solenoid or electro-magnet operatively connected with a variable resistance or rheostat and a retarding device for causing the core or armature thereof to move gradually; a pair of switching solenoids or electro-magnets having circuit changing contacts secured to the cores or armatures thereof and intermediate circuit connections, whereby the current is turned on gradually and reversed at will, substantially as described.

PARVIN WRIGHT.
JOSEPH W. KINSEY.

Witnesses:
F. A. GILLESPIE,
J. B. CHAMBERLIN.