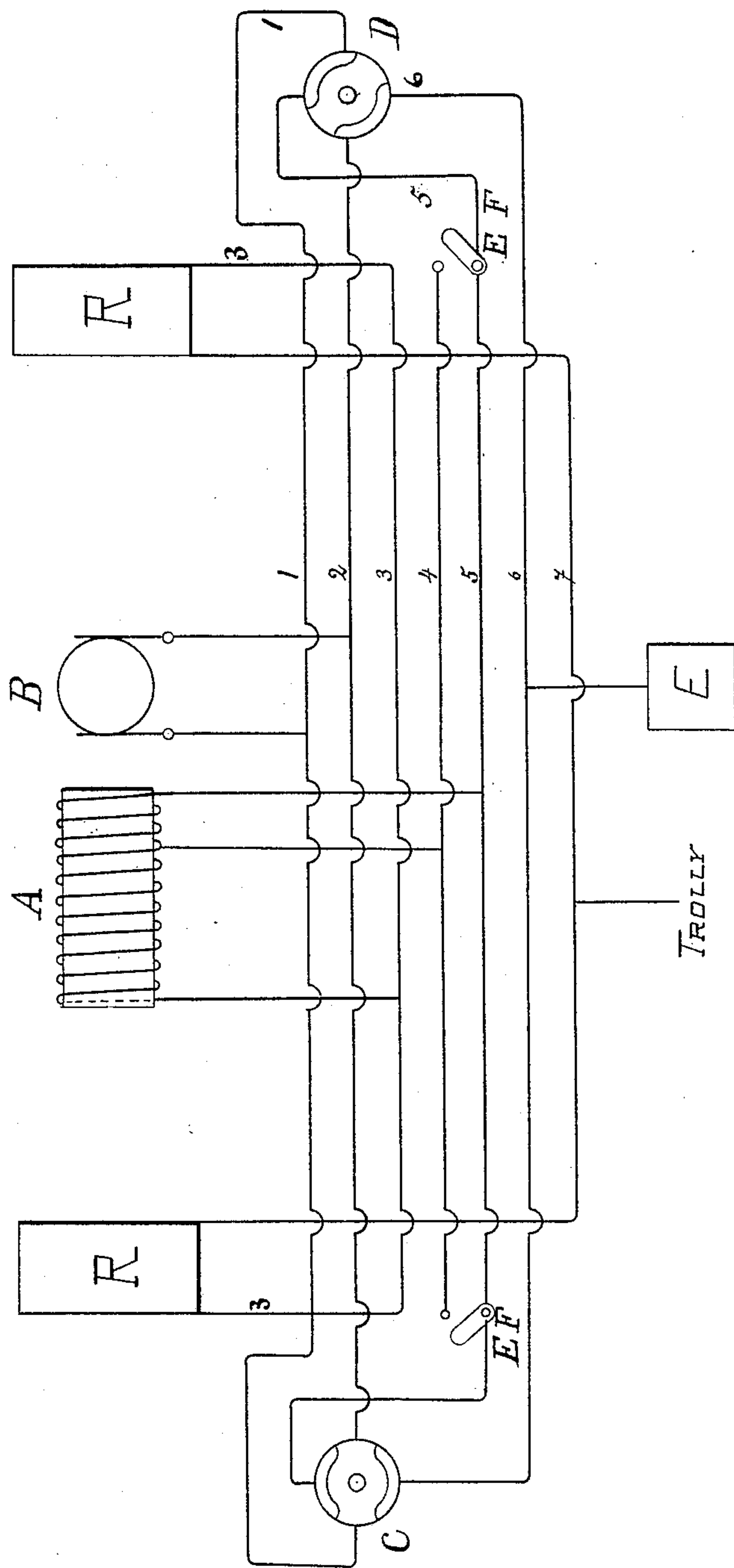


F. O. BLACKWELL.
CONTROLLING DEVICE FOR ELECTRIC MOTORS.

No. 452,422.

Patented May 19, 1891.

Fig. 1-



Witnesses

G. F. Renault.
Joseph E. Alue.

Inventor

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(No Model.)

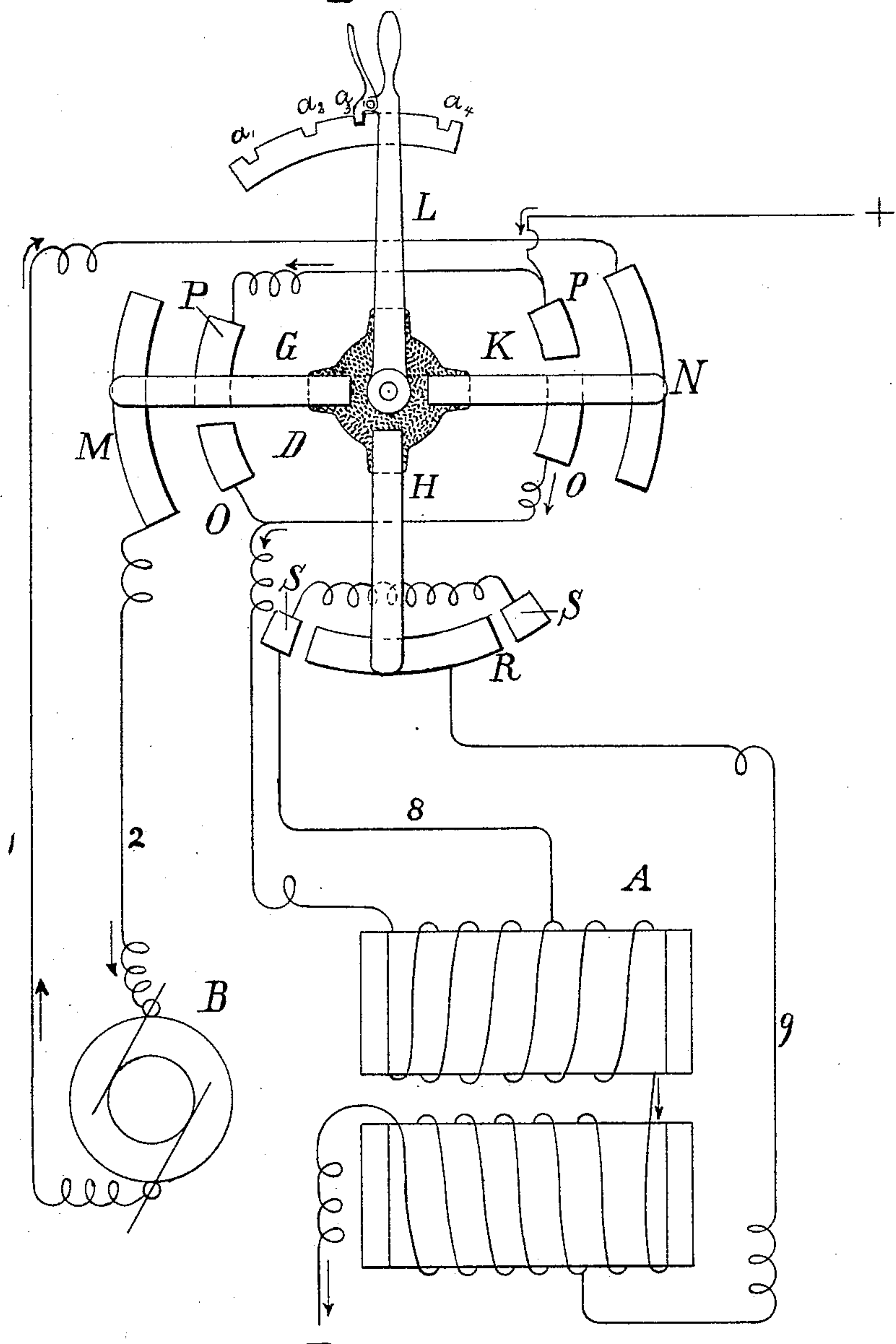
2 Sheets—Sheet 2.

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Fig. II.



WITNESSES

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INVENTOR

Francis O. Blackwell
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UNITED STATES PATENT OFFICE.

FRANCIS O. BLACKWELL, OF NEW YORK, N. Y., ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

CONTROLLING DEVICE FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 452,422, dated May 19, 1891.

Application filed July 13, 1889. Serial No. 317,375. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS O. BLACKWELL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Controlling Devices for Electric Motors, of which the following is a specification.

My invention relates to controlling devices for electric-railway motors. It has heretofore been customary in the regulation of motors of this type to introduce a variable artificial resistance to control the motor over a certain range and then to give an additional range of speed by cutting out a section of the field-magnet coil. This operation has usually been performed by a single switch; but as this introduces complications in the electrical connections I have provided both a resistance and a cut-out switch to be operated independently of the resistance. I have also combined the field-magnet cut-out switch with the reversing-switch of the motor, so that an extraordinary movement of the reverse switch will act to cut out a part of the field-magnet coils. I have also devised a convenient method for cutting out field-magnet coils when they are in series.

In the accompanying drawings, Figure 1 is a diagram showing the application of my independent cut-out to a car operated from both ends. Fig. 2 is a detail of the combined reverse and cut out switch.

In Fig. 1, A represents the field-magnet of the motor; B, the armature; R R, variable resistance of any well-known type. C and D are reverse-switches placed at opposite ends of the vehicle. As these reverse switches are duplicates of each other, a description of one with its connections applies equally to the other. Referring to switch D, it will be seen that two of its terminals are connected to wires 1 and 2, leading from armature B. The other two terminals are connected to wires 5 and 6, leading, respectively, to field-magnet A and to the ground-terminal E. The resistance-box R has one terminal connected to the trolley-wire 7 and the other to wire 3. A wire 4 is extended through the car and connected to a section of the field-magnet. At opposite ends of wire 4 is hand-switch F,

by which it may be connected at will to wire 5, thereby short-circuiting one section of field-magnet coil A. As shown in this figure, the circuit is as follows: trolley-wire 7 R 3 A 5 D 1 B 2 6 E. By turning reverse-switch D the direction of current in armature B will be altered. The same effect is produced when the car is operated from the other end, the circuit being broken at R, C, or D at one end when the car is operated at the other end.

In Fig. 2 the reverse-switch D is shown with the cut-out switch F combined with it. G H K are three insulated contact-arms movable about a common center by means of lever L. G and K are constantly in circuit with contact-pieces M and N, connected, respectively, to opposite terminals of armature B. O O' and P P' are two sets of contact-pieces, connected the former to one terminal of field-magnet A and the latter to the line-terminal.

In operation the contact-arms G and K alternately connect to contact-pieces M N, respectively, O' P' and O P. Contact-arm H, which is for operating the cut-out, bears normally on a contact-piece R. At either extremity of R is a supplementary contact-piece S, both of which are connected in series to a wire 8, leading from an intermediate point in one leg of field-magnet A. An intermediate point in the opposite leg of the field-magnet is connected by wire 9 to contact-piece R. Whenever the space between R and either one of the contact-pieces S is bridged by arm H, one section of each leg of the field-magnet is short-circuited and the power of the magnet thereby weakened. In the position shown lever L has its latch in the notch α^3 , the current then passing in one direction, as shown by the arrows, through the armature B and through the whole of field-magnet A. When L is moved until its latch comes into notch α^2 , the current will be reversed through the armature, but no change will be effected in the field-magnet. When, however, the latch reaches the notch α' or α^1 , the armature is not only correspondingly reversed but part of the field-magnet is short-circuited.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of an electric motor having a sectional field and a variable resistance, by both of which agencies the motor is regulated, and a switch independent of the resistance-controller for cutting out or short-circuiting a section of the field.

2. The combination, with an electric motor, of a controlling-resistance in circuit therewith, a reversing-switch, and a supplementary contact on the reversing-switch connected to the field-magnet for short-circuiting or cutting out a part thereof.

3. The combination of armature B, field-magnet A, a reversing-switch having its terminals connected to the armature to reverse the current therein, and a supplementary contact on said switch connected to field-magnet A for cutting out and short-circuiting a part thereof.

4. The combination, with an electric motor, of a reversing-switch therefor, and a supplementary contact connected therewith and leading to the field-magnet for cutting out or short-circuiting part thereof.

5. The combination, in an electric-railway vehicle, of a traveling motor having a sectional field, a controlling-resistance, and reversing-switch, with a supplementary switch

connected to the reversing-switch for cutting out or short-circuiting a part of the field, as described.

6. The combination, in an electric-railway vehicle, of a propelling-motor, a controlling-resistance, and reversing-switch upon each end of the vehicle, having duplicate connections with the field-magnet for cutting out or short-circuiting a part thereof.

7. The combination, in an electric-railway vehicle, of a propelling-motor and reversing-switches on opposite ends of the vehicle, having duplicate electrical connections with the motor and each provided with a supplementary contact leading to the field-magnet of the motor.

8. The combination of an electric motor having its armature and field-magnet in series, the latter consisting of two coils likewise in series with one another, with a cut-out switch consisting of contact-pieces connected to like points in both coils, and a contact-arm for connecting the said pieces and thereby cutting out like portions of each coil.

FRANCIS O. BLACKWELL.

Witnesses:

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G. RENAULT.