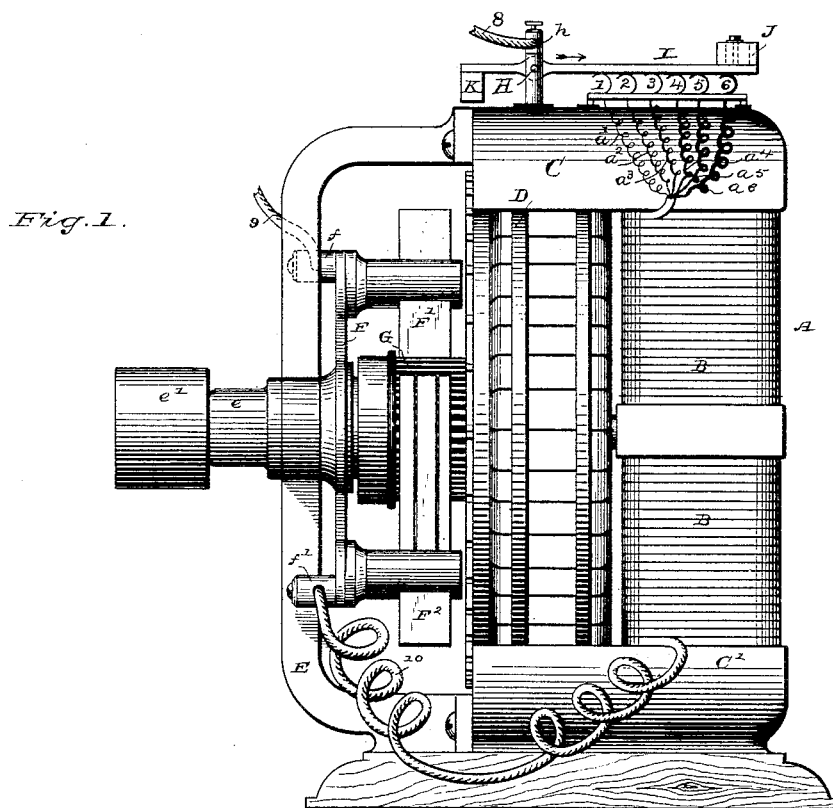
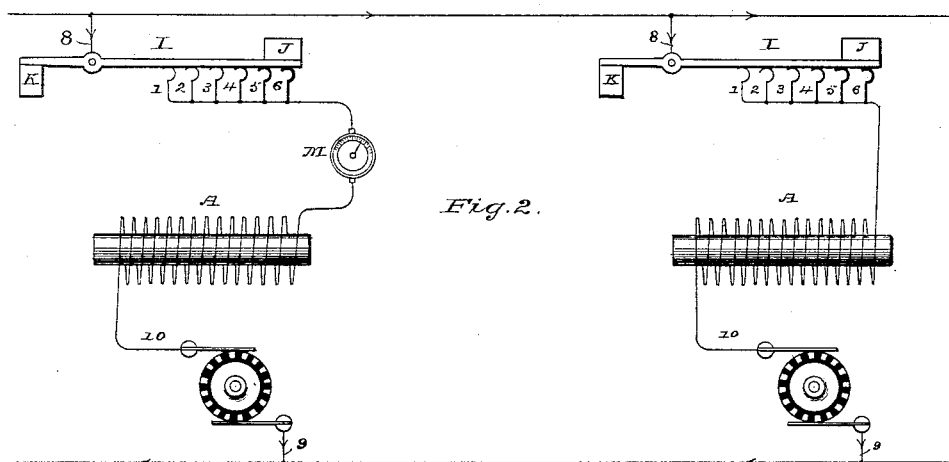


(No Model.)

C. J. VAN DEPOELE.
REGULATOR FOR ELECTRIC MOTORS.

No. 347,903.

Patented Aug. 24, 1886.



Witnesses

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REGULATOR FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 347,903, dated August 24, 1886.

Application filed February 20, 1886. Serial No. 192,678. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Automatic Current-Controllers for Electric Motors, of which the following is a description.

My present invention relates to an automatic current-controller for electric motors; and it consists, generally, in such an arrangement of the resistances used in connection with motors operated in multiple arc for the purpose of preventing too great a flow of current through their coils at starting that the said resistances will be placed in the motor-circuit as soon as it is closed, and then gradually and automatically withdrawn in accordance with the rise of counter electro-motive force; and it consists in replacing the rheostat heretofore used by additional coils of greater or less resistance wound upon the field-magnet of the motor, the supplementary coil or coils being in the same direction as and connected in series with the main field-magnet conductor, the current thus while passing through a necessary resistance strengthening the magnetic field of the motor, instead of being absorbed by the rheostat exterior thereto. As the motor acquires speed the counter electro-motive force will take the place of the resistance, which is then automatically withdrawn.

In the accompanying drawings, Figure 1 is a view in elevation of an electric motor embodying my invention. Fig. 2 is a theoretical diagram of the motor shown in Fig. 1.

Similar letters denote like parts throughout.

A is the field-magnet, and B is the conductor wound thereon.

CC' are the polar extensions between which the armature D rotates.

E is a yoke of diamagnetic metal, which extends from the upper to the lower pole-piece, and is provided with a suitable journal, *e*, for supporting the armature-shaft, which is provided at its outer end with a pulley, *e'*.

F is a yoke mounted upon the journal of the armature-shaft and carrying the commutator-

brushes F' F², and it is also provided with binding-posts *f f'*, which are secured to the extremities of the yoke F, and are in electrical connection with the commutator-brushes.

G is the commutator.

The field-magnet is wound in the usual manner and with a conductor of the usual size, on top or below which, or between the layers of which, is wound an additional conductor of higher resistance. There may be more than one additional conductor, and these may be of different sizes; but it will be readily understood that a single additional wire of sufficient length wound upon the cores of the field-magnet above or below the main field-magnet conductor and connected thereto in series would have the desired effect, the coils of said conductor being provided with loops connected thereto at different points along its length. *a' a² a³ a⁴ a⁵ a⁶* are such loops, and for the sake of illustration they are made to indicate by their varying size the comparative resistance of the different portions of the field-magnet coils that they represent, *a'* representing the longest of the supplementary coils, or the longest portion of the supplementary coil, in addition to the main field-magnet coil, *a²* represents, as before, the entire main field-magnet coil and a smaller additional resistance, the additional resistance becoming less as the number increases, the last one, *a⁶*, representing simply the main field-magnet conductor. The loops *a'* and *a⁶* are connected to suitable terminals, 1 to 6, to be described. With this arrangement it will readily be understood that any desired resistance can be at once thrown into the circuit of any motor for the purpose of preventing injury to its own coils, as well as practical short-circuiting of the generators.

Within a suitable insulated post, H, secured to the top of the pole-piece C, is pivoted a contact-bar, I, extending over the terminals of the field-magnet conductor, which latter are securely mounted and insulated in any suitable manner on top of the pole-piece. This bar is provided with an adjustable weight or spring, J, tending to press it down upon all the terminals 1 2 3 4 5 6. The opposite end of

the bar I is provided with an iron armature, K, located in proximity to the surface of the pole-piece C, and adapted when attracted by the magnetized condition of said pole-piece to be drawn downward and raise or tend to raise the bar I in opposition to the weight or spring J. The bar I can of course be operated by an electro-magnet included in the field-magnet conductor.

h is a binding-post, to which the conductor 8, leading from the external circuit, is attached, the other conductor, 9, being secured to the binding-post f, said conductors 8 and 9 being permanently connected to the working-conductors of the external circuit, so as to place all the motors in multiple arc. A conductor, 10, connects the field-magnet conductor to the other binding-post, f'.

The circuit through the motor starts at binding-post H, and passes thence to the bar I, contacts 1 2 3 4 5 6, thence through such portions of the supplementary coils as may be in circuit, thence through conductor B of the field-magnet, from there through conductor 10, binding-post f', commutator-brush F², into and through the armature, from which it issues by way of brush F', passing thence to binding-post f and to the other line-wire, 9.

In the diagram Fig. 2, L is a resistance representing the armature and field-coils of a motor connected in series. M is a current-indicator included in the motor-circuit.

In operation the action of the parts is as follows: The current from one of the working-conductors, entering at 8, finds the contact-bar down upon all its contacts, and encountering the minimum resistance passes freely through the coils of the field-magnet and armature of the motor, instantly magnetizes the pole-piece C, and the bar is raised from a portion of its contact by the downward pull of the armature K. As the bar I rises the loops representing that portion of the field-magnet conductor having the lowest resistance, and therefore affording the easiest passage to the largest quantity of current, are cut out, leaving only such loops in circuit as compel the current to pass through the desired resistance. This regulating and controlling action occurs to its greatest extent when the motor is being started, and there is no counter electro-motive force in the armature to hinder the passage of current. As soon, however, as the armature-speed increases to such an extent as to develop an appreciable counter electro-motive force, the resistance is gradually withdrawn by the increased resistance of the motor itself, causing the magnetism of the pole-pieces to be diminished, when the bar I gradually drops and brings more of the loops into circuit, thus decreasing the resistance until the full amount of current the machine is capable of utilizing is passing through the bar, the contacts, and the field-magnet coils.

In the foregoing I have shown and described a system in which the intensity of current is

kept nearly constant, and this will be necessary with a constant load and a constant speed; but it will be understood that instead of working the resistances by an automatic regulator said resistances, either in or outside of the machine, can be worked by hand, as will be necessary in propelling cars, and in other instances where a variable speed and a variable load come in as features, so that on starting the current would enter the point of highest resistance, which is then gradually cut out by hand as the speed of the motor increases.

The automatic arrangement will be found useful to prevent operators from throwing on the current too suddenly, thus saving a great deal of unnecessary work in the generators.

Since filing this application I have, on the 15th of March, 1886, filed another one, Serial No. 195,212, relating to the same subject.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a system of operating electric motors, the combination of main conductors, motors connected between said conductors in multiple arc, the field-magnet of said motors being provided with a supplementary coil or coils connected in series with the coils thereof, and means for automatically throwing a greater or less amount of the supplementary field-magnet conductor into circuit on starting a motor and gradually withdrawing the same on the rise of the counter electro-motive force, as set

2. In a system of operating electric motors, the combination, with main conductors, of two or more motors connected between the said conductors and in multiple arc, said motors being provided with a divisible field-magnet conductor composed of portions having different resistances, and means operated by the varying magnetism of said field-magnet to connect more or fewer of the portions of said conductor in series, as set forth.

3. In a system of operating electric motors, the combination, with two or more motors connected in multiple arc between the main conductors, of field-magnet conductors therefor provided with additional winding in series therewith, and of higher resistance than normally used to energize said field-magnet, terminals representing different portions of the field-magnet conductor, a moving contact for connecting more or fewer of said terminals, and an armature moving in accordance with the varying resistance of the motor-armature for operating said contact and regulating the internal resistance of the field-magnet, substantially as set forth.

4. In an electric motor, the combination, with a field-magnet having a divisible conductor consisting of portions of different resistances, of loops connected to said portions and to a series of contacts representing said resistances, a pivoted contact-lever arranged

to make contact with any or all of said con-
tacts simultaneously, and thereby connect any
desired proportions of the field-magnet con-
ductor in series, and an armature connected
5 to said bar and adapted to raise or lower said
contact-controlling portion thereof in accord-
ance with the magnetic condition of the field-
magnet, as set forth.

In testimony whereof I hereto affix my sig-
nature in presence of two witnesses.

CHARLES J. VAN DEPOELE.

Witnesses:

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