(No Model.)

C. J. VAN DEPOELE.

ELECTRO DYNAMIC MOTOR.

No. 347,902. Patented Aug. 24, 1886.

Fig. 1.

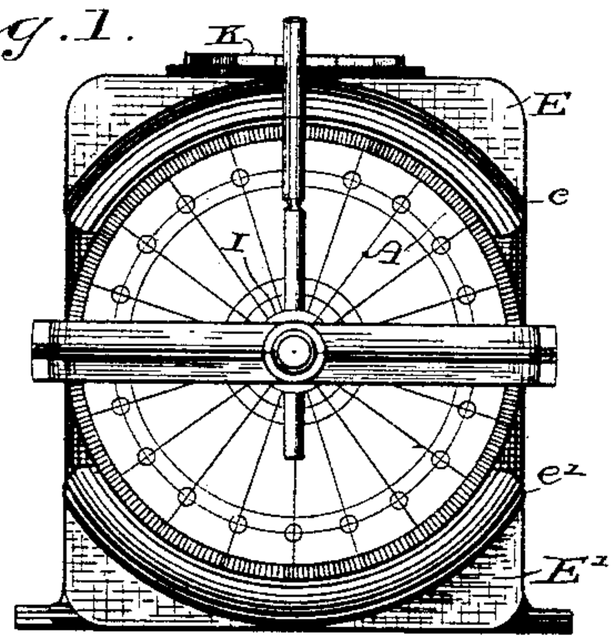


Fig. 2.

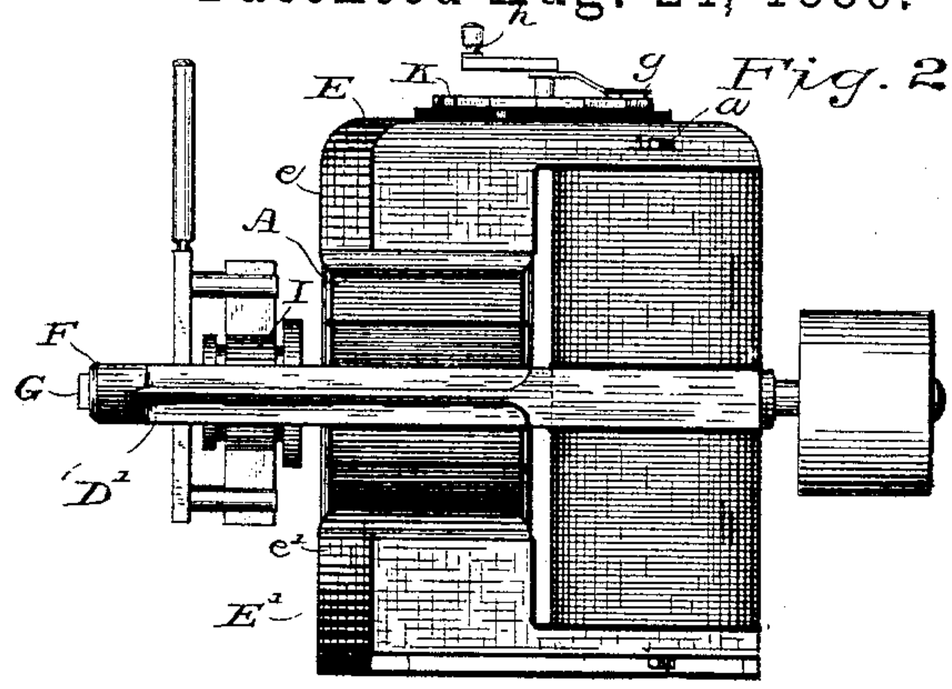


Fig. 3.

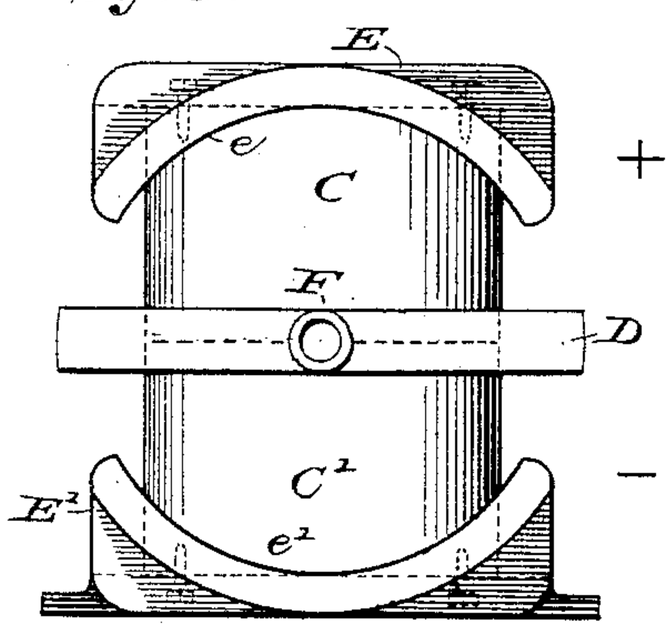


Fig. 4.

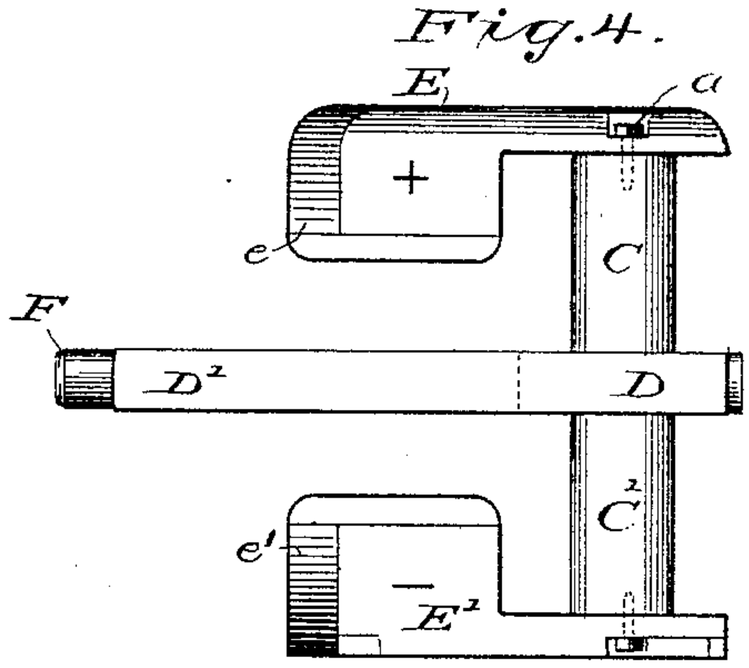


Fig. 5.

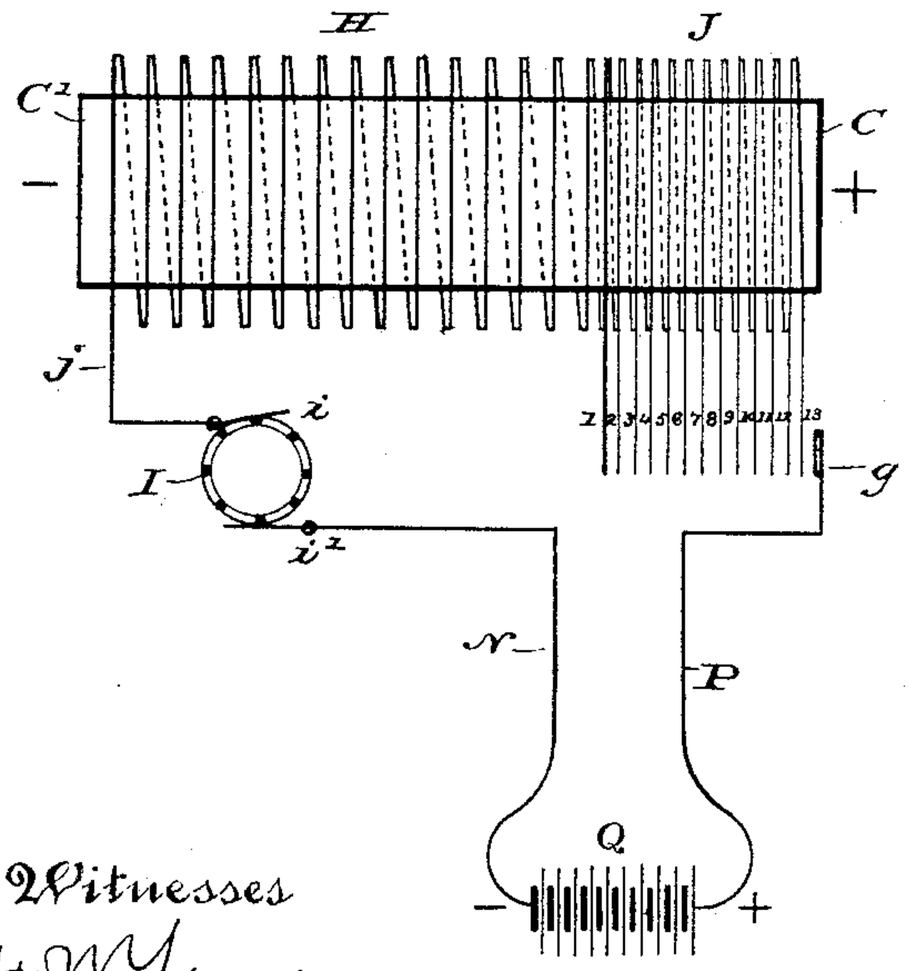
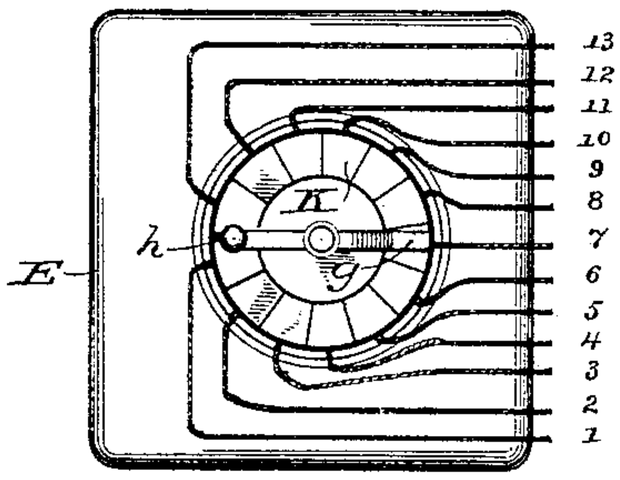


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES J. VAN DEPOELE, OF CHICAGO, ILLINOIS.

ELECTRO-DYNAMIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 347,902, dated August 24, 1886,

Application filed March 15, 1886. Serial No. 195,212. (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 Electro-Dynamic Motors, of which the following is a description.

My invention relates to improvements in the construction of the magnetic frame and in the winding of electro-dynamic motors; and it consists in certain modifications in the magnetic frame, which, while greatly simplifying its manufacture, produce a machine of great efficiency at a low cost both for original production and subsequent maintenance and repair; and, further, in an improved method of winding the field-magnet coils, whereby the motor is rendered entirely self-contained, and no exterior artificial resistances are required with which to regulate its speed, power, and current consumption.

The following is a description of my improvements, reference being had to the annexed drawings, which form a part of this specification, and in which—

Figure 1 is a front elevation of a dynamo-electric motor embodying my improvements. Fig. 2 is a side elevation thereof. Fig. 3 is a front elevation of the magnetic frame, the armature and field-magnet coils being removed. Fig. 4 is a side elevation of the frame shown in Fig. 3. Fig. 5 is a diagram showing the method of winding and connecting the field-magnet helices. Fig. 6 is a top plan view of the motor, showing the manner of connecting the terminals of the field-magnet helices to the regulator.

Similar letters denote like parts throughout.

The magnetic frame of my improved motor is divisible and contains the usual parts, which are constructed and arranged as follows: The cores C C′ are composed of wrought-iron and preferably in a single piece, around the central portion of which is cast a body of iron, D. They may also, when more convenient, be formed of two pieces and united by the body of cast or wrought iron D, which extends around and connects them at their inner ends, forming the neutral point in the magnetic circle under either form of construction. From the outer ends of the united cores C C′ extend pole-pieces E E′, which project at right angles therefrom and are formed with curved and somewhat enlarged extremities *e e′*, between which the armature A is mounted. The pole-pieces above referred to are also formed of wrought-iron and are secured in position by suitable bolts, *a*, extending therethrough and into the ends of the cores C C′.

D′ is a yoke, which may be of cast-iron, and is formed to extend from the field-magnet around the sides of the armature and across the front of it, its ends being securely connected to the center piece, D, and its front central portion provided with a bearing, F.

G is the armature-shaft, which is journaled in the bearing F at one end and passes into or through the block D, where its other extremity is suitably supported.

I represents the commutator, which is mounted upon the armature-shaft.

The construction of the magnetic frame here shown is brought down to the utmost simplicity, and at the same time the disposition gives a powerful electro-magnet, the poles of which are non-consequent. The helices extending between the cross-piece D and the positive and negative pole-pieces E E′ give a powerful magnetization to the extending poles *e e′*, which, as will be seen, envelop two-thirds of the circumference of the armature, one-sixth thereof being left exposed on each side. The armature is preferably of the well-known Gramme type.

In order to increase the efficience of my motor, and also to render it entirely self-contained, I add to the ordinary field-magnet coils H other and additional ones, J, which latter are successively connected to each other in series, and are also in series with or form one continuous addition to the main coils H. The supplemental coils J are provided at suitable points with terminals extending therefrom, as indicated in Fig. 5, and numbered, respectively, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13, and these terminals are connected in any suitable manner with the stationary commutator K, located on the top of the pole-piece E. A contact device or brush, *g*, is secured to a suitably-pivoted hand-lever, *h*, so that by turning the handle any portion of the additional coils represented by the numbered

terminals may be thrown into the main field-magnet circuit and the resistance thereof increased or decreased, as desired.

In the diagram, Fig. 5, *i* represents one of the commutator-brushes in position. *j* is the conductor leading therefrom to the field-magnets C′ and C, upon which are wound the main coils H and the supplemental coils J.

The numbers 1 to 13 represent independent terminals extending from the supplemental coils, which said terminals are all in the path of the contact-brush *g*, which is connected directly to one of the conductors P of the working-circuit, and which, through the source of electricity Q, is connected to the other main conductor, N, and thence to the other commutator-brush, *i*′. The wire of the main field-magnet helices H should be of such size and relation to the helices on the armature as to work in perfect accord therewith when doing normal work, so as to form a complete machine in itself, all other coils being simply supplementary thereto, and in place of the resistance usually put in circuit with the motor and outside of it. The auxiliary or additional helices J can be of the same size as the main wire helices whenever the motor is intended to run for a considerable length of time with a given speed and with the additional coils in; but in the event that the additional coils are only intended to be placed in circuit at the moment of starting, and then gradually cut out, then the additional coils may gradually decrease in size, and in this case said additional coils will not take up as much room as the coils of same size of wire as the main helices would. The size of the additional wire will have to be such as to be suitable to the work the motor has to do. The main and additional coils may be wound upon the core in any convenient or desirable manner, so that they all may form one continuous circuit. The main helices can be wound on first and cover the whole length of the core, and then the additional helices wound over the main. Any other method producing similar results may be adopted without departing from the spirit of my invention. It will be obvious that the helices could also be wound upon double instead of single magnet-cores.

We will now suppose the motors to be used for railway or other purposes where frequent stops and starts are made and where the speed and power required will vary considerably and the current supplying the motors to be of constant or nearly constant potential and the motors to be connected in multiple arc. It will be understood that whenever the motor-circuit is closed while the motor is at rest more current will flow through the motor than when the armature is revolving, on account of the absence of the counter electro-motive force of the armature produced while revolving. Where a large number of motors are used, it may happen that several start at the same instant, and without some check this would have the effect of taking from the generator or generators more current than is proper to the efficient working of the system, heating the coils of both motors and generators, and at the same time consuming more of the prime power than is useful. All this I obviate in the mode of winding and connecting, as above described. One other advantage that I gain by this system is that the current, instead of being passed through an outside resistance and lost when the motor is to be started with its load, is passed around the core of the field-magnet, thus increasing the power of the motor when most needed and doing away with the loss inherent to the use of the rheostat. In case the current is passed through the whole length of the main and supplementary coils of the field-magnet as well as those of the armature, it will be impossible for the motor to obtain its maximum speed. This is due to the fact that the field-magnets, being magnetized to a higher degree than usual, will have the effect of creating a counter electro-motive force in the armature with a lower speed than in the case where the current passes through a shorter length of the helices and when the magnetism is lower in the field of force. Another cause of the lower speed is the resistance of the supplemental field-magnet coils, which factor must be added to the counter electro-motive force of the armature. It will be clearly seen now that by varying the strength of the magnetic field of force and by varying the resistance of the field-helices I obtain a simple and perfect regulation with and minimum expenditure of current. At starting the current is admitted, first, to the longest extremity of the combined field-helices. It can then be gradually made to enter one or other of the terminals 12, 11, 10, &c.—that is at points closer and closer to the main or real helices H, which are so proportioned as to give the best effect of power and speed to the motor. By allowing the current to enter a larger or smaller number of the supplementary coils the speed and power are perfectly regulated to any desired point.

Having on the 20th day of February, 1886, filed an application, Serial No. 192,678, showing and describing some of the subject-matter hereinbefore set forth, I do not in the present instance claim anything covered by the claims in the above-mentioned application.

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

1. In an electric motor, a field-magnet consisting of a single iron core having a projecting body of iron extending around its central portion, a yoke secured to said projection and supporting the armature-shaft at one end, the other end being supported by a journal in the center of the single core, substantially as set forth and described.

2. In an electric motor, a field-magnet consisting of one single core of iron, said core being provided with detachable pole-pieces extending from the ends thereof and at right

angles thereto on one side of the motor and toward each other, and an armature arranged to revolve between said poles, substantially as described.

3. In an electric motor, a field-magnet consisting of an iron core formed of two pieces of wrought-iron united by a raise or body of iron in the middle of said core and projecting at right angles therefrom, and helices wound upon the iron core between the central projection and the opposite pole-pieces, substantially as shown and described.

4. In an electric motor, a field-magnet consisting of a single iron core, said core being composed of one or more pieces of iron united or surrounded at their central portion by a projecting body of iron, and having detachable pole-pieces extending from the ends of the core so formed, substantially as shown and described.

5. In an electric motor, a field-magnet wound with main and supplementary helices, all in series with each other, and suitable connections between the successive coils of the supplementary helices, by means of which the current can be made to flow through a greater or smaller number of the supplementary coils, in addition to the main field-magnet coils, and thereby to vary the resistance of the field-magnet conductor for the purpose of regulating the power and speed of the motor.

6. In an electric motor, and in combination with its main field-magnet coils, supplementary coils placed in series with the armature and the main field-coils, said supplementary field coils or helices taking the place of the ordinary rheostat commonly placed outside of the motor and in series therewith, and means for gradually placing the rheostatic field-coils either in or out of circuit, substantially as described.

In testimony whereof I hereto affix my signature in presence of two witnesses.

CHARLES J. VAN DEPOELE.

Witnesses:
WILLIAM A. STILES,
JOHN EASON.