(No Model.)

R. J. SHEEHY.

ELECTRIC MOTOR.

No. 362,322. Patented May 3, 1887.

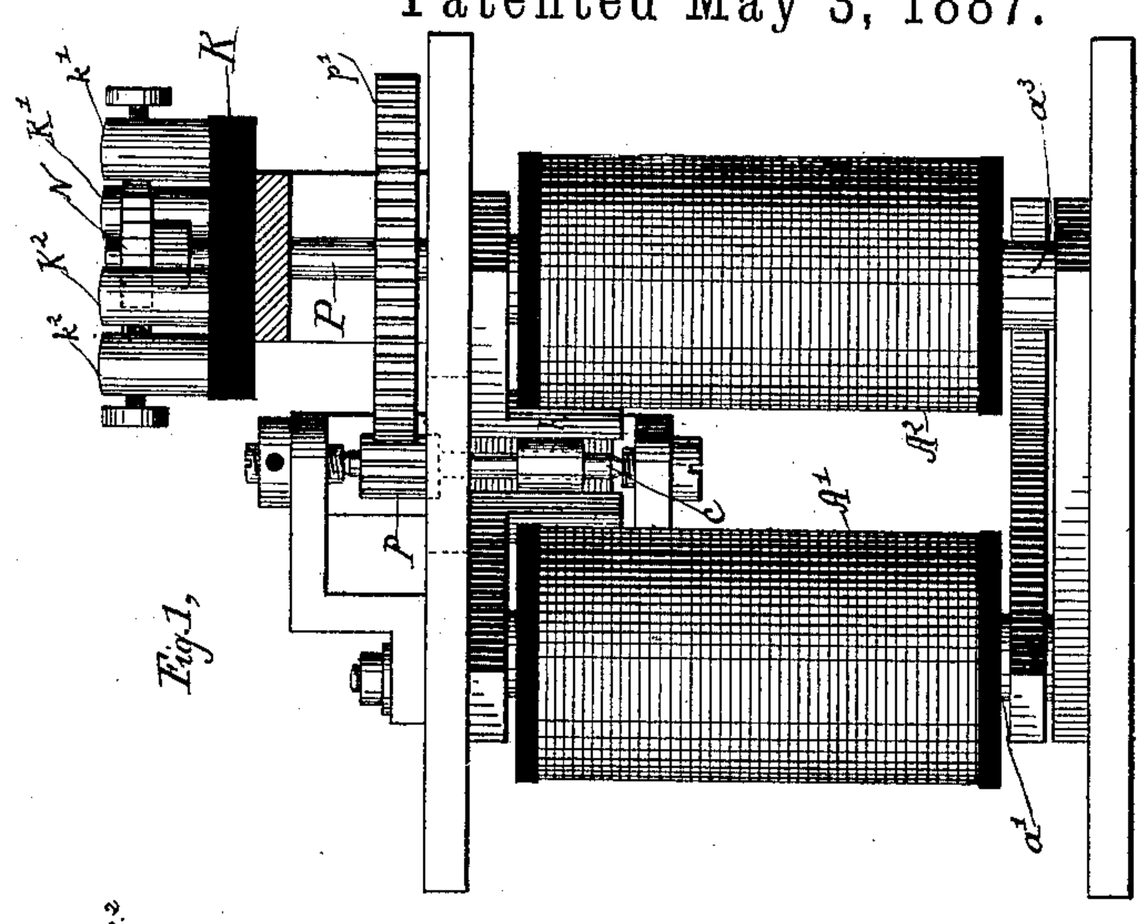

Fig. 1,

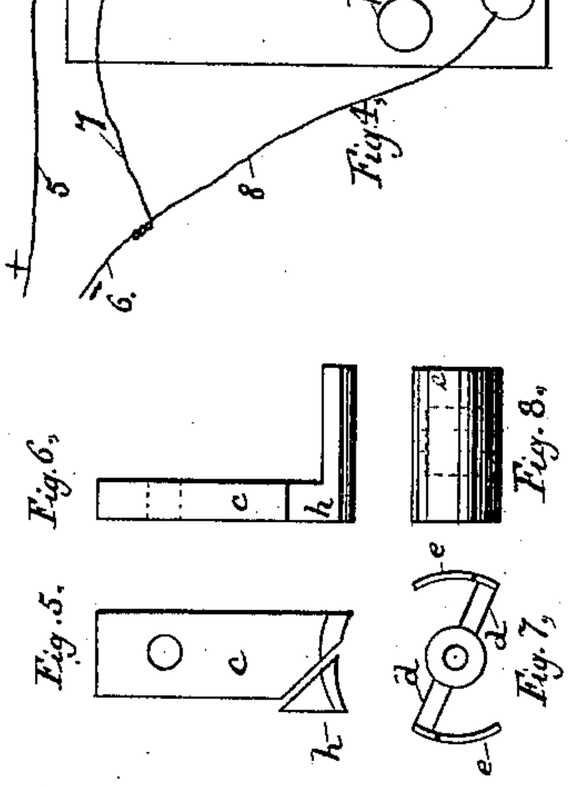

Fig. 4,

Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9,

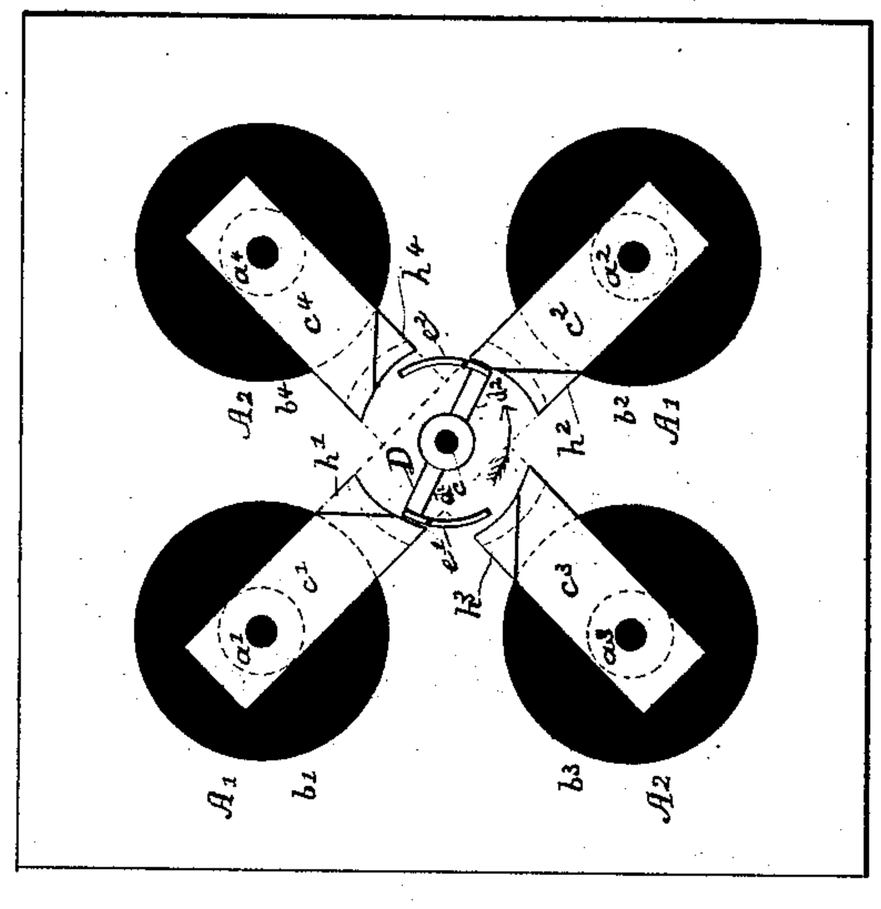

Fig. 3,

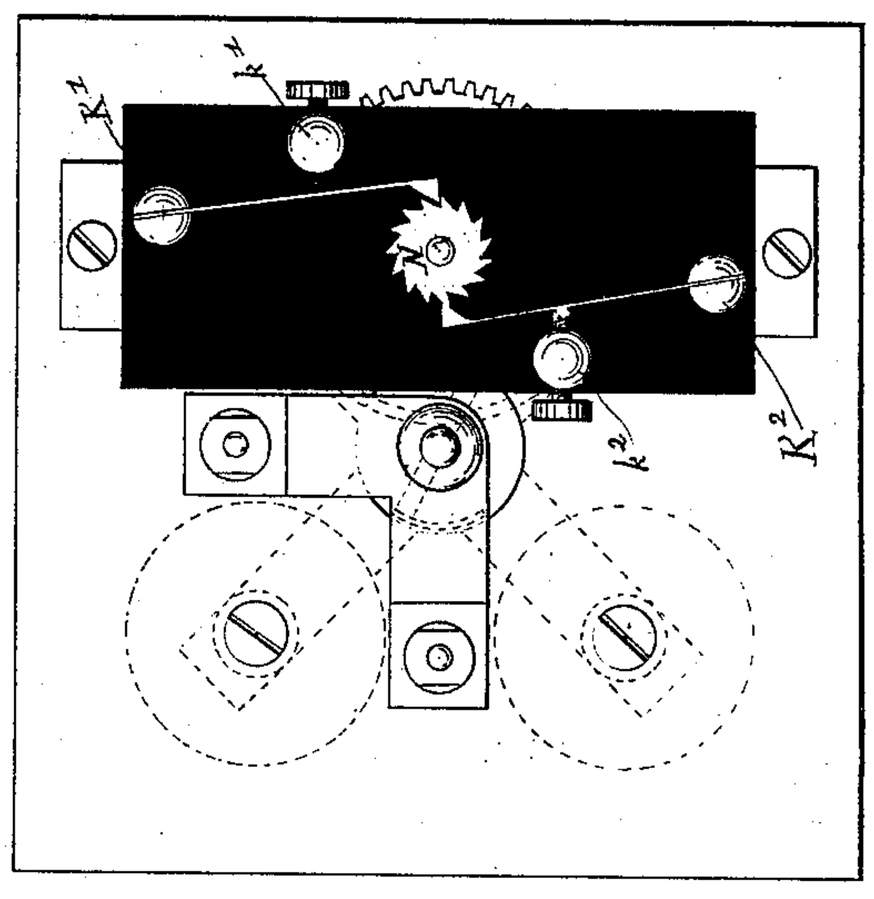

Fig. 2,

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UNITED STATES PATENT OFFICE.

ROBERT J. SHEEHY, OF NEW YORK, N. Y.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 362,322, dated May 3, 1887.

Application filed December 27, 1886. Serial No. 222,555. (No model.)

To all whom it may concern:

Be it known that I, ROBERT J. SHEEHY, a citizen of the United States, residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Electric Motors, of which the following is a specification.

The invention relates to the construction of electro-magnetic motors.

The object of the invention is to provide a motor which may be readily started and stopped, which shall have no dead-points, which will always revolve in the desired direction, and which shall, in general, be as efficient as possible.

The invention consists, in general terms, in creating a field by one or more magnets having their cores extending in parallel directions, and in mounting between the same an armature having arms projecting in opposite directions and curved to conform generally to a circular field formed by projections from the poles of the magnet or magnets. The alternate magnetization of the magnets, when two or more are used, causes the armature to advance step by step, producing practically a continuous revolution. By causing the circuit to remain completed through either one of the electro-magnets, the armature will be arrested, with its arms confronting the respective poles of that magnet. When a single electro-magnet is used, and it is desired to arrest the armature in determinate positions, alternating currents may be employed to produce a revolution.

The polar projections of the electro-magnets are preferably provided with sections magnetically separated from but under the inductive influence of the main portions, and likewise the arms of the armature are provided with extensions of magnetic material supported thereby, but separated by intervening non-magnetic material. This construction is of advantage in securing a forward movement, assisting in the starting of the instrument, and also in insuring a continuous pull upon the armature through a long arc. This construction is also of advantage when two or more motors are to be placed in series in a single circuit, as it insures that they will run synchronously with each other.

In an application for Letters Patent for printing-telegraphs, filed by me January 10, 1887, Serial No. 223,868, there is described a motor involving certain of the features herein set forth.

In the accompanying drawings, Figure 1 is an elevation of a motor embodying the features of the invention. Fig. 2 is a plan of the same. Fig. 3 is a section showing the construction of the armature and pole-pieces. Fig. 4 is a diagram illustrating the circuit-connections. Figs. 5 and 6 illustrate the construction of the pole-pieces; and Figs. 7, 8, and 9 illustrate the construction of the armature.

Referring to the figures, $A' A^2$ represent two electro-magnets, having cores a' a^2 and a^3 a^4, respectively. These cores are respectively wound with coils b', b^2, b^3, and b^4. The magnets are provided with polar extensions c', c^2, c^3, and c^4, respectively. These extend toward each other and form a circular or cylindrical field, in which there revolves an armature, D. This armature is mounted upon a shaft, c, supported in suitable brackets formed in the frame of the motor. The armature consists of two oppositely-projecting arms, d' d^2, which are provided with curved extensions e' e^2. The lengths of these extensions are preferably equal to or slightly less than one-quarter of the circumference of the annular field formed by the four pole-pieces. By reason of this construction a portion of the armature will at all times be within the field of each of the electro-magnets. The preponderance of the metal in the arms d' d^2 insures an advance movement of the motor in whatever position it may stand when the succeeding electro magnet is vitalized.

In certain other applications for Letters Patent filed by me, Serial No. 185,818, December 16, 1885, and Serial No. 194,768, filed March 11, 1886, and Serial Nos. 196,340 and 196,342, filed March 24, 1886, there are described forms of motors in some respects resembling that described herein. The present form involves certain features not shown in the cases cited, and an important feature consists in constructing both the armature projections and the pole-pieces with the magnetically-separated portions. Thus the arma-

ture is constructed with the curved extensions $c' e^2$, which are of magnetic material and are supported from the arms $d' d^2$ by being cut away and then soldered or otherwise securely fastened back in their former positions, the intervening solder, however, preventing magnetic contact. The proximity of the parts will render the extensions of the same polarity as the portions which support them.

The projections of the cores of the field-magnets are also constructed upon the same principle. Thus the corners h', h^2, h^3, and h^4 are cut away from their corresponding pole-pieces and are fastened by non-magnetic material, so that they are held in position or partake of their magnetism only by induction from the parts to which they are secured. By this construction the armature which advances in the direction of the arrow will first be attracted by reason of the attraction exerted by the extensions h^3 and h^4 (see Fig. 3) upon the extensions $e' e^2$. Then, as the armature advances, the main portions of the corresponding pole-pieces will act first upon the extensions $e' e^2$, while the sections h^3 h^4 attract the arms d' and d^2, and finally the arms d' and d^2 will be attracted directly by the main pole-pieces c^3 and c^4. In this manner there will be a gradually-increasing pull upon the armature during the time it is passing from the position shown in the drawings to a corresponding position with reference to the pole-pieces c^3 and c^4. Meanwhile the extensions $e' e^2$ will have been carried into the field of the magnet A', and when that magnet is vitalized the armature will be advanced another quarter of a revolution, in the manner already described.

For the purpose of still further adding to the continuous pull upon the armature, the pole-pieces are preferably cut away upon the sides which the armature approaches, as shown in Fig. 3—that is to say, the confronting surfaces are not concentric with the armature. Therefore as the armature advances the parts come into closer proximity.

It is not always necessary to employ pole-pieces upon the cores of the electro-magnets; but the cores may themselves act directly upon the armature. In such case sections of the cores may be magnetically separated from the main portions.

For the purpose of giving sufficient attractive surface, it is usually preferred to extend the polar projections inward, as shown in Fig. 6, and likewise the armature projections are made of such width as to correspond with the extensions of the pole-pieces, as shown in Fig. 8.

For the purpose of controlling the circuit-connections through the field-magnets of the motor, the device illustrated in Figs. 1 and 2 is employed. This consists of two contact-points, k' and k^2, mounted upon a suitable insulating-base, K, and respectively connected with the coils of the electro-magnets A' and A^2 by conductors 1 and 2. The conductors 3 and 4, leading from these magnets, are united in a conductor, 5, designed to be connected with one pole of a battery or other suitable source of electricity, and a conductor, 6, leading from the other pole of this source is connected by conductors 7 and 8 with the contact-springs K' and K^2, which are respectively applied to the points k' and k^2. These springs are provided with points resting against a ratchet-wheel, N, mounted upon a shaft, P, which is geared through a pinion, p, and a wheel, p', with the shaft c. When this wheel is revolved, it causes the springs to be alternately pushed back against their respective points, thus alternately completing the circuit-connections through the respective electro-magnets. The connections of the conductors 7 and 8, it is evident, may be made and interrupted in any desired manner for the purpose of controlling the operations of the motor.

When a single electro-magnet is used, the same general construction is adopted, but the current is sent in alternate directions through the coils.

It is not always necessary to construct both the armature and the pole-pieces with magnetically-separated sections, for very good results are obtained by separating sections of the pole-pieces alone.

I claim as my invention—

1. An electric motor consisting of one or more electro-magnets having polar extensions forming a cylindrical field, and an armature within such field consisting of two radial arms magnetically separated from each other, and a magnetic support for the same, substantially as described.

2. An electric motor consisting of one or more electro-magnets having polar projections extending toward each other, and an armature consisting of oppositely-projecting arms, each arm having a magnetically-separated extension, substantially as described.

3. An electric motor consisting of one or more electro-magnets having parallel cores, polar projections for the same, forming a cylindrical field for the armature, magnetic attachments to the individual pole-pieces magnetically separated therefrom, and an armature revolving within the field of the polar projections.

4. An electric motor consisting of parallel electro-magnets having polar extensions, each polar extension being constructed with a magnetic section magnetically separated therefrom, and an armature revolving in the field of the magnets and consisting of oppositely-projecting arms having extensions magnetically separated therefrom, substantially as described.

5. In an electric motor, field-magnets having non-magnetic sections in their cores or pole-pieces, and an armature constructed in sections magnetically separated.

6. In an electric motor, the combination of two electro-magnets having parallel cores, polar projections forming a cylindrical field, each polar projection being extended laterally with reference to the cores of the electro-

magnets, and an armature applied thereto, consisting of widened arms and curved projections carried by said arms, which projections are laterally extended and conform to the surfaces of the polar projections.

7. In an electric motor, the combination of two electro-magnets having their cores parallel, polar projections forming a cylindrical field, each polar projection being extended laterally with reference to the cores of the electro-magnets, an armature applied thereto, consisting of widening-arms and curved projections carried by said arms, which projections are laterally extended and conform to the surfaces of the polar projections, and a circuit-controller driven by the armature for controlling the circuit-connections through the electro-magnets, substantially as described.

8. In an electric motor having a rotating armature, a field-magnet having cores or pole-pieces having sections magnetically separated from each other.

In testimony whereof I have hereunto subscribed my name this 24th day of December, A. D. 1886.

ROBERT J. SHEEHY.

Witnesses:
CHARLES A. TERRY,
J. PEER ASHLEY.