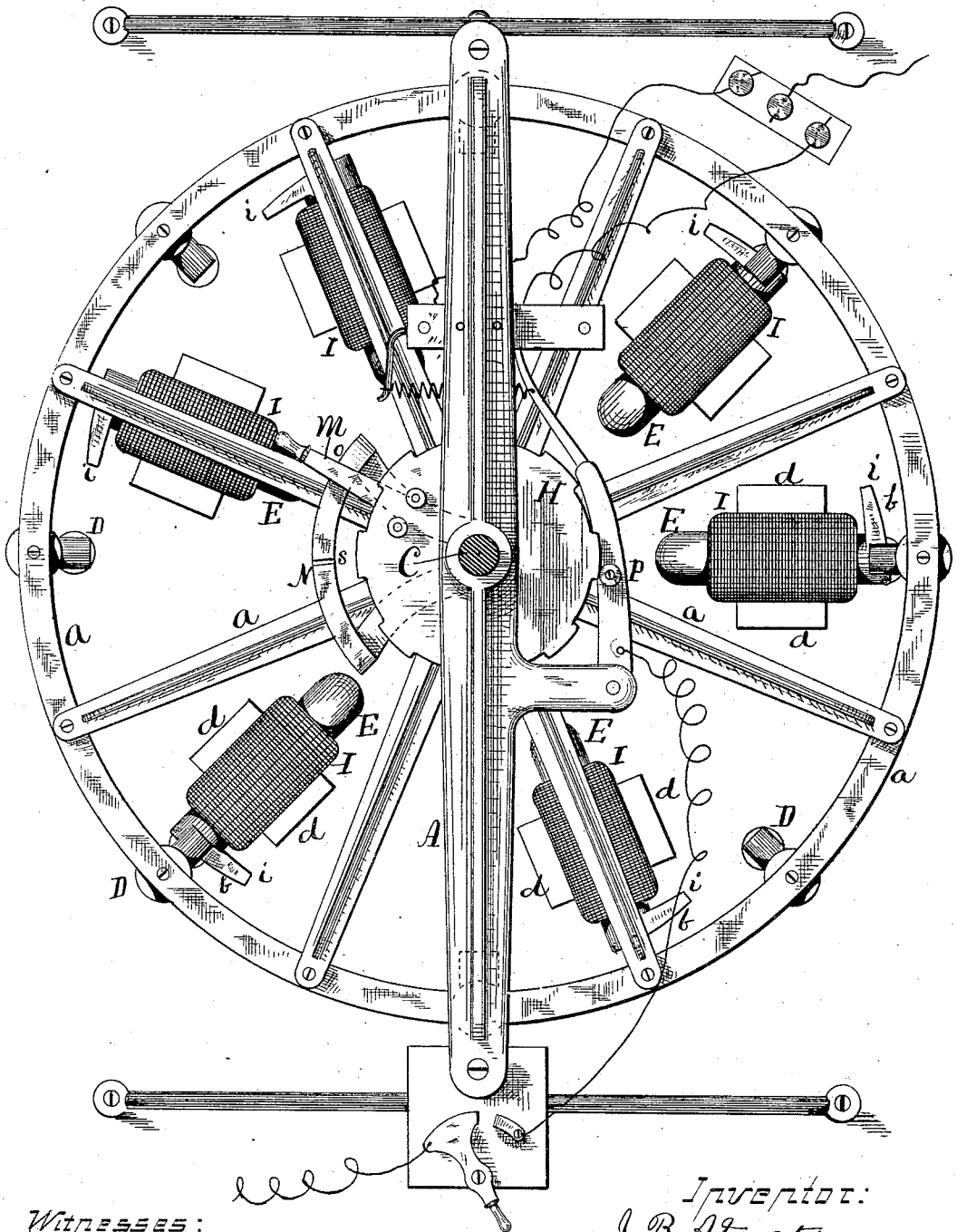
(No Model.) 2 Sheets—Sheet 1.

J. B. ATWATER.

ELECTRIC MOTOR.

No. 306,805. Patented Oct. 21, 1884.

Fig. 1.



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Per

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(No Model.) 2 Sheets—Sheet 2.

J. B. ATWATER.

ELECTRIC MOTOR.

No. 306,805. Patented Oct. 21, 1884.

Fig. 2.

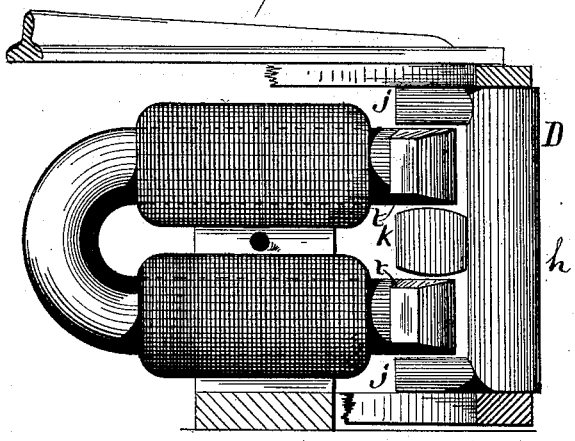


Fig. 3.

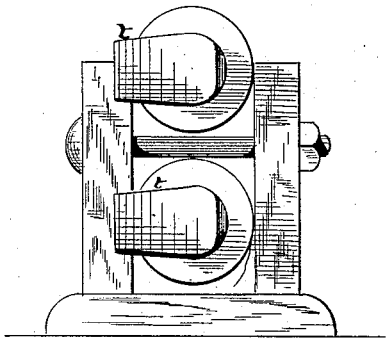


Fig. 4.

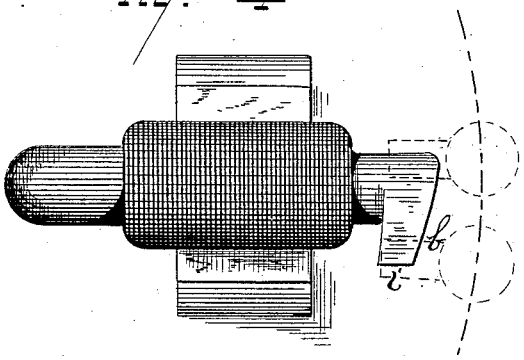


Fig. 5.

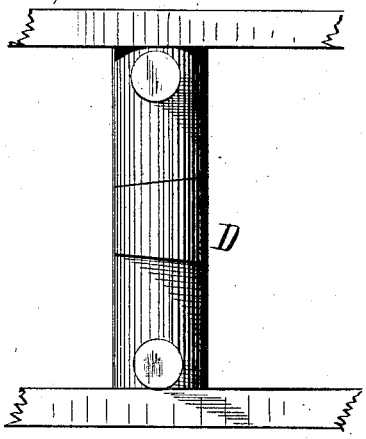
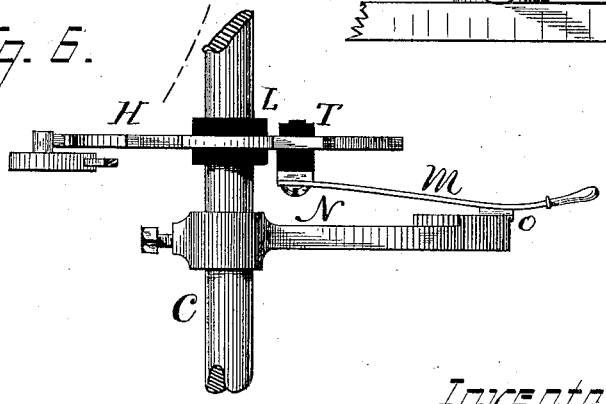


Fig. 6.



Witnesses:
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his Attorney.

UNITED STATES PATENT OFFICE.

JOHN B. ATWATER, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF PART TO JOSEPH B. LONG AND ABRAM M. PENCE, BOTH OF SAME PLACE.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 306,805, dated October 21, 1884.

Application filed January 3, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. ATWATER, a citizen of the United States, residing at the city of Chicago, in the State of Illinois, have invented a new and useful Improvement in Electric Motors, of which the following is a specification.

The nature and object of this invention is to make one or more magnets that will have increased magnetic surface because of their peculiar formation, and armatures of peculiar formation to work in harmony with the magnets, the magnets being arranged in a stationary circular form, and the armatures being arranged in a circular form and revolving in front of the magnets, and also a device for reversing the motion of armatures, as will hereinafter appear. This is an improvement on rotary electro-magnetic motors for which Letters Patent No. 278,760 were issued to me, dated June 5, 1883.

Figure 1 is a plan view showing the magnets and armatures located in their respective circular forms. Fig. 2 is a detail side elevation of one magnet and armature. Fig. 3 is an end view of the magnet. Fig. 4 is a top view of magnet. Fig. 5 is a front view of armature. Fig. 6 is a detail of device for reversing motion of armature-wheel.

Similar letters of reference refer to similar parts in the different drawings.

Only such parts will be described as refer to my improvement.

A, Fig. 1, is a cross-bar of a suitable frame, which supports the various parts constituting my motor.

C is a central shaft, having its upper bearing in the boss located in cross-bar A, and its lower bearing in a suitable foot-block. To this central shaft, C, is fixedly attached the wheel *a a*, which carries a number of armatures, D D D D, circularly and equidistantly arranged, as shown.

Between the armatures D D, and fastened by suitable studs, *d d d d*, are a series of horse-shoe-magnets, E E E E, arranged in circular form, having coils I I I I, of ordinary insulated wire, and also provided with angular pole-extensions *i i i i*, and all are held in proper position opposite the traveling armatures. These angular pole-extensions *i i i i* are made tapering on three sides—that is, the top and bottom sides and the facing side. In the facing side the tapering is in circular form, making the toe of the pole-extension farther from the path of the armatures than the heels, and if the line of the facing *b* were produced it would form a tangent to the path of the armatures. The upper and lower sides of these angular pole-extensions are tapering in form, as shown at *t t t t*, Figs. 2 and 3, to give the same incline to approaching E-shaped armature that the facing or foot surface does. This form of the pole-extension makes the greatest attraction toward the heel. The angular pole-extensions of these magnets extend in the same direction, as shown in Fig. 1. The armature D is made in E shape—that is, it is composed of the vertical part *h*, the arms *j j*, extending from same line on vertical part *h*, at each end thereof, and the central extension, *k*, between the two arms *j j*. These two devices—the magnets E E E E and armatures D D D D—are so arranged with reference to each other that as the armature D passes by the magnet E the arms *j j* pass above and below the angular pole-extensions *i i i i*, respectively, while the central extension, *k*, passes between the two poles. In this construction of the magnet and armature, in addition to the usual end attraction, I secure three attractive surfaces on each pole, each of which extends the entire length of the angular pole-extension.

The various magnets are arranged to work in sets, one half of the number of magnets used being in one set, and the other half being in the other set, and each set is again divided, so that one-half of each set will be opposite each other—that is, if there are six magnets used, they will be divided into two sets of three each, and each set of three will be divided, two being on one side of wheel, and one opposite to them; and if any other number of magnets is used, so that a half of that number is an even number, then this half will have an equal number of magnets opposite each other in the same set.

In Fig. 6 is shown the device for reversing the motion of the armature-wheel. The com-

mutator H is loosely attached to the central post, C, by the insulating-bushing L. M is a lever attached to the commutator by the insulating-bushing T. N is a segmental bracket attached to central post, C, and revolving with it. In the edge of the bracket are two slots, *s* and *o*, in which fit the projections from lever M. This projection extends downwardly from lever M immediately over the segmental bracket N, to fit into the slots *o* and *s* in the segmental bracket, as shown in Fig. 5. The lever M is placed in notch *o*. This arranges the commutator H with respect to the switch P so that the armatures approach the toes of the magnets. When the lever M is placed in notch *s*, the commutator is arranged with respect to the switch so that the armatures approach the heels, and the motion of the armature-wheel is reversed, which is desirable under many circumstances. The commutator H is provided at its periphery with alternate cams equal in number to the number of armatures.

It will be observed that the operation of my motor is to place one set of magnets in the circuit, which magnets attract the armatures facing them toward the toes of the pole-extensions and along their facing sides until they approach the heel, when, by means of the switch P and commutator H, the circuit is changed to the other set, and in turn this set attracts the armatures facing its magnets in the same manner as the first set, and thus the revolution of the armature-wheel is completed. This arrangement of the magnets by dividing them into sets, as previously shown, gives a balancing-power on each side of central post, C, and as the electric power reaches out to attract the armatures facing the magnets, it has a tendency to equalize lateral pressure on the central post, C, and when the number of magnets are an equal number in each set, as herein described, the equalization of the lateral strain is nearly or quite complete. I have shown only six magnets in the drawings. I do not confine myself to this number, as I can use any number desired.

I claim—

1. As an article of manufacture, a horseshoe-magnet having angular pole-extensions *i*, and, in addition to the ordinary end attractive surface, having three attractive tapering surfaces on each pole, substantially as shown.

2. In an electric motor, the combination of the E-shaped armature and the horseshoe-magnet provided with angular pole-extensions, and said extensions also provided with three attractive surfaces in addition to the end surfaces, substantially as shown.

3. In an electric motor, the combination of the E-shaped armature and the horseshoe-magnet provided with angular pole-extensions, and three attractive surfaces in addition to the end surface, so that the upper and lower arms of E-shaped armature will pass above and below the angular pole-extensions, and the central extension of armature will pass between them, substantially as shown and described.

4. In an electric motor having magnets with angular polar extensions, and each polar extension having three attractive surfaces, the combination of the magnets arranged in two sets, one set opposite the other, and the central post, C, between them, whereby the electric force reaching out to attract the facing armatures is exerted at or near opposite points on the armature-wheel, and thus in a manner tending to relieve the central post of lateral strain, as and for the purpose shown.

JOHN B. ATWATER.

Witnesses:
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J. A. COWLES.