(No Model.) 2 Sheets—Sheet 1.

E. WESTON.

ELECTRO MAGNETIC MOTOR.

No. 264,982. Patented Sept. 26, 1882.

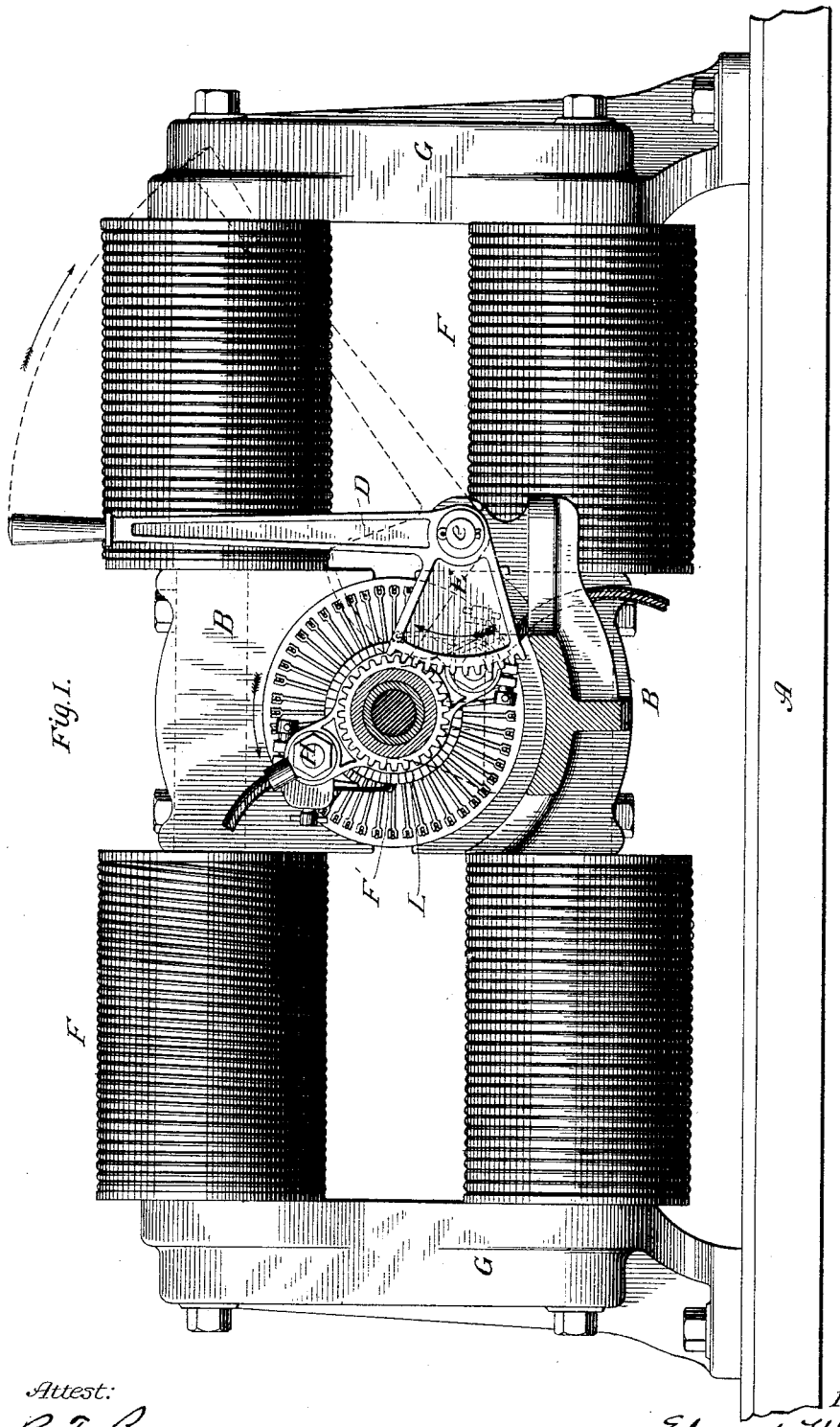

Fig. 1.

Attest:
R. F. Barnes
Henry Orth

Inventor:
Edward Weston
By Parker W Page
atty.

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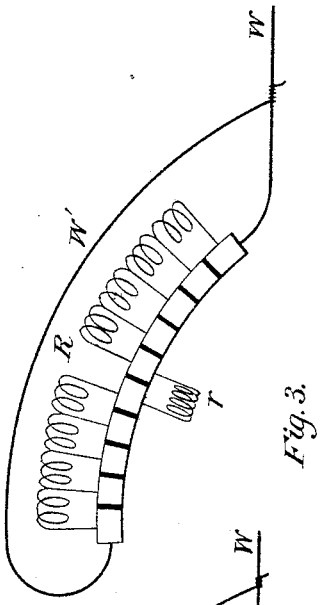

Fig. 3.

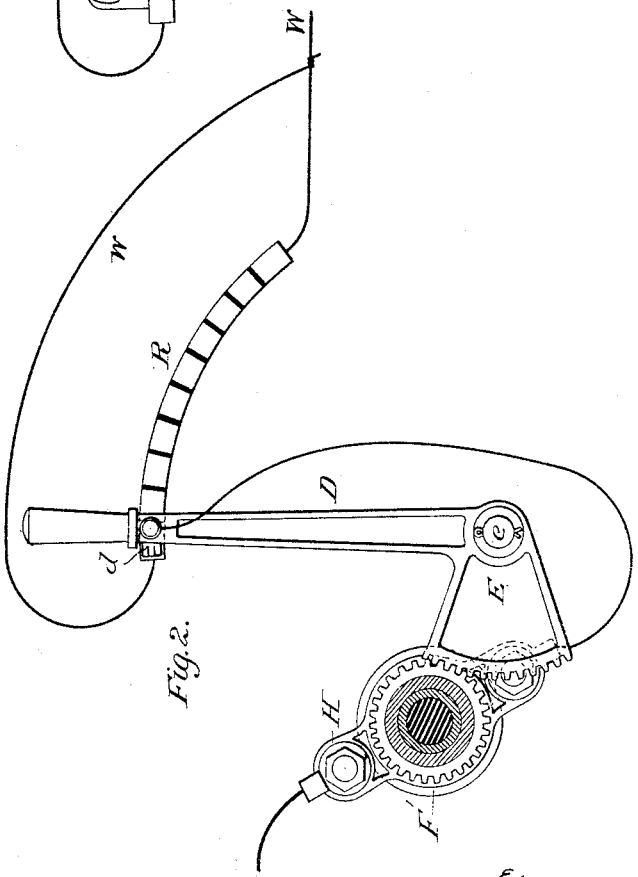

Fig. 2.

Attest:

Raymond G. Barnes.

N. Finley

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UNITED STATES PATENT OFFICE.

EDWARD WESTON, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE UNITED STATES ELECTRIC LIGHTING COMPANY, OF NEW YORK, N. Y.

ELECTRO-MAGNETIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 264,932, dated September 26, 1882.

Application filed May 8, 1882. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WESTON, a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electro-Magnetic Motors, of which the following is a specification.

My invention consists in a device for readily and easily reversing the direction of rotation of the armature of an electro-magnetic motor without breaking or reversing the circuit with which it is connected.

It is well known that the direction of rotation of a motor, the polarity of the field-magnets remaining the same, depends upon the direction in which the current enters and leaves the coils of the armature. If, therefore, the position of the brushes which pass the current through the motor be shifted one hundred and eighty degrees with reference to the commutator, it is evident that a change in direction of rotation will follow, since the current is carried through the armature in a contrary direction, while its direction through the field is the same. To shift the position of the brushes by hand is often a difficult and sometimes dangerous operation, the latter from the liability of receiving shocks and from the danger of heating or burning the coils by not effecting the change with sufficient rapidity. I have therefore devised a mechanical means of reversing the direction of rotation by shifting the brushes, the nature and principle of action of which will be explained by reference to the accompanying drawings.

Figure 1 is a side view, in elevation, of a motor with my improved shifting mechanism combined therewith. Fig. 2 is an illustration partly in diagram of a resistance or rheostat used in conjunction with the parts shown in Fig. 1. Fig. 3 is a view in detail of the rheostat.

The invention may be applied to any ordinary form of motor. That shown is the type adopted by me as the best suited for general purposes; and it consists of a double system of field-magnets, F F, fixed to standards G G and mounted on a base, A. Between consequent pole-pieces B B a cylindrical armature is mounted, the plan of construction of which is that described in numerous patents granted to me and in applications by me made. At one end of said armature is the commutator L, the brushes for which are carried by an adjustable holder, H. The holder is fixed to a sleeve of insulating material, through which passes the shaft. A cog-wheel, F′, is also fixed to said sleeve.

Upon an extension from one of the pole-pieces B is pivoted at *e*, in a suitable standard, a lever, D, the short arm E of which is formed as a toothed sector and caused to engage with the cog F′. The relative proportions of the sector E and cog F′ are such that by moving the lever through an arc, say, of forty-five degrees, the cog will be turned one hundred and eighty degrees, thereby shifting the brushes to diametrically-opposite positions on the commutator.

In the practical application of this invention to motors the direction of rotation of which it is frequently necessary to reverse—as, for instance, with motors used for hoisting and the like—I design using, in conjunction with the above-described apparatus, a rheostat to interpose a resistance in the circuit at the moment when the shifting of the brushes takes place. When the position of the brushes is shifted there will be an interval during which the attraction between the field and armature is balanced, so that the latter remains still. During this interval the current passes freely through the coils of the motor and heats them, for the reason that the counter electro-motive force produced by the motor in action is withdrawn. The object of the shifting mechanism above described is mainly to reduce this interval, so that no injury by heating will occur. To avoid jarring and shocks, however, it will be found advisable to interpose a resistance in the motor-circuit corresponding to the counter electro-motive force withdrawn, and for this purpose I employ the device illustrated in Figs. 2 and 3. The lever D is included in the circuit; or the wire from one of the brushes is secured to it and kept in contact with a brush, *d*. In the path of movement of this brush *d* are arranged a number of contact-plates and resistance-coils, the whole forming a double rheostat, R. The line-wire is connected to

plates at opposite ends by branches W W′. The plates are divided into two sets, the connection between the two being made by a coil of very high resistance, *r*. Instead of being so connected, they may be so arranged that the brush *d*, before leaving one set, makes contact with the first plate of the other, though the former arrangement is preferable.

Suppose this motor to be running. The resistance in the circuit, in addition to that of the conductors, is caused by the counter electro-motive force of the motor. If the lever D be moved, the speed of the motor is reduced and the counter electro-motive force also. At the same time an increasing resistance is interposed in the circuit by the movement of the brush *d* over the plates of the rheostat. When the counter electro-motive force has been reduced to a minimum the amount of interposed resistance is the greatest, and from this point on until the position of the brushes has been completely reversed the resistance is decreased.

Instead of operating the rheostat by means of the lever D, any moving part of the shifting mechanism could be employed. It may be stated that the combination of devices just described serves not only as a shifting device, but as a convenient means of effecting the regulation of the speed of the motor by shifting the position of the brushes and at the same time interposing resistance as the counter electro-motive force is reduced.

Having now described my invention and the best manner of which I am at present aware of carrying the same into effect, what I claim is—

1. The combination, in an electro-magnetic motor, with a brush-holder and brushes carried thereby, of a shifting mechanism for turning said brushes, and a resistance coil or coils arranged to be thrown in and out of circuit with the brushes by the movement of the shifting mechanism, as and for the purpose set forth.

2. The combination, with brush-holder H, brushes carried thereby, and cog-wheel F′, of the toothed segment E and lever D, these parts being constructed and combined in substantially the manner set forth.

3. The combination of brush-holder H, brushes carried thereby, cog-wheel F′, toothed segment E, lever D, and resistance-coils R, said coils being placed as described, and arranged to be thrown in and out of circuit with the brushes by the movement across them of the lever D, as described.

In testimony whereof I have hereunto set my hand this 3d day of May, 1882.

EDWARD WESTON.

Witnesses:
HENRY A. BECKMEYER,
JOHN F. KELLY.