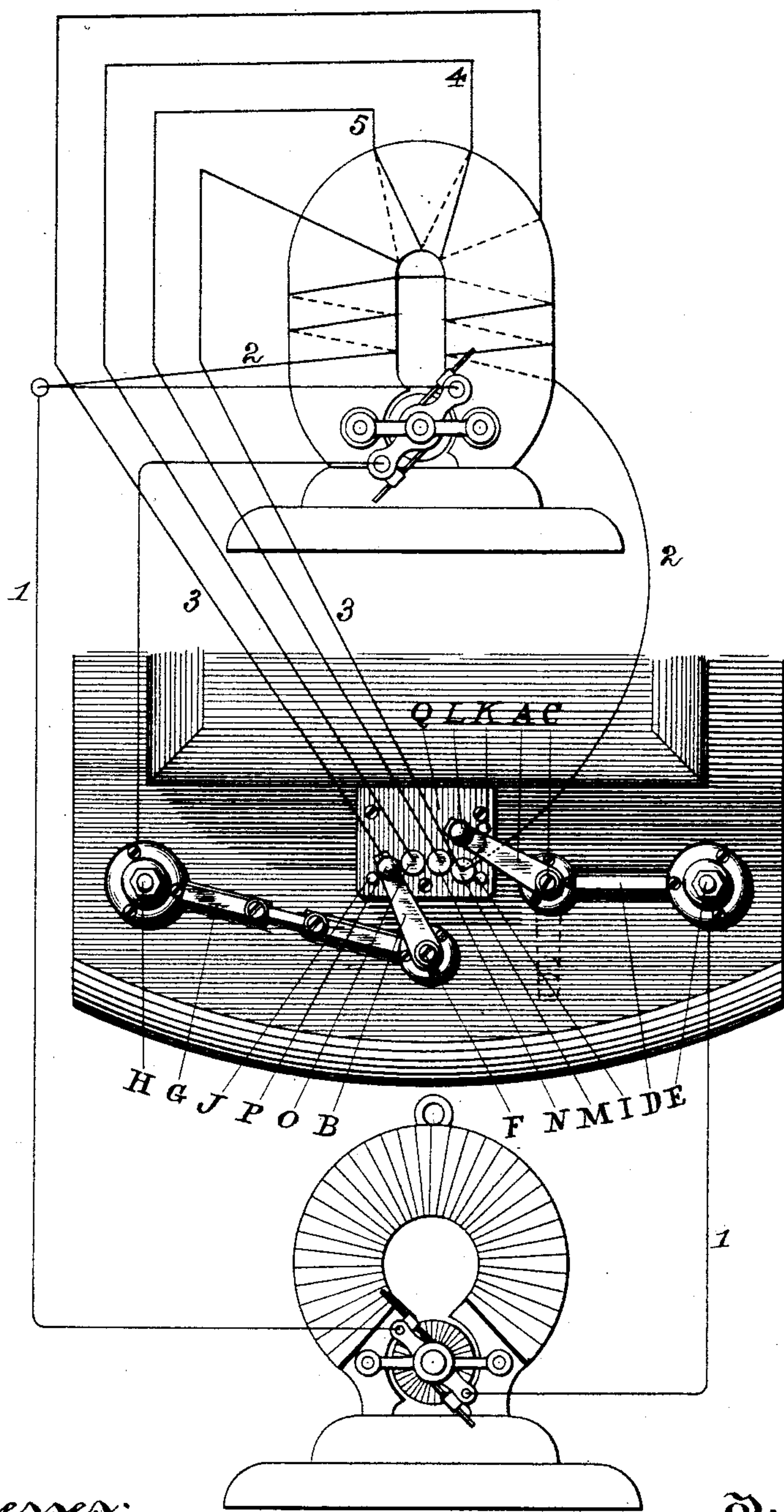


(No Model.)

W. A. ANTHONY.
ELECTRIC MOTOR.

No. 444,416.

Patented Jan. 13, 1891.



Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM A. ANTHONY, OF MANCHESTER, CONNECTICUT.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 444,416, dated January 13, 1891.

Application filed May 14, 1890. Serial No. 351,743. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. ANTHONY, of Manchester, Connecticut, have invented a new and useful Improvement in Electric Motors, of which the following description and claims constitute the specification, and which is illustrated by the accompanying drawing.

This invention relates to the windings of the field-magnets of electric motors; and it consists in winding such a magnet with a regular shunt-wire for its magnetization at all times when the motor is running, and in also winding the same magnet with a separate wire, the function of which is to interpose a large but gradually decreasing resistance between the main-line conductor and the armature of the motor when the current is first turned onto the armature, and also to supplement the magnetic effect of the shunt-wire when the motor is started, and until that resistance-wire is cut out of the circuit, when the armature of the motor has attained its full speed.

In the accompanying drawing, the lower part is a front elevation of a dynamo, and the middle part is a plan view of that part of the base of the motor which is provided with such a starting-switch as that shown, described, and claimed in my Letters Patent No. 421,090, of February 11, 1890, and the upper part is a front elevation of a motor, including such a base.

The numeral 1 indicates the main-line conductor, and 2 indicates the shunt-wire, which is connected with the main-line conductor on opposite sides of the motor, and is wound around the field-magnet thereof, while 3 indicates the resistance-wire, which is separately wound around the field-magnet of the motor, and the ends of which are electrically connected with the contact-points M and P, respectively, of the starting-switch, while 4 and 5 indicate wires which respectively connect the contact-points N and O with the resistance-wire 3 at opposite sides of its middle part, about one-third of the way from that middle part to its ends, respectively.

The letters A and B indicate swinging arms which constitute the moving parts of the starting-switch. The arm A is electrically connected through the pivot C, the conductor D, and the binding-post E with one branch

of the main line, and the arm B is electrically connected through the pivot F, the conductor G, and the binding-post H to one of the brushes of the armature of the motor. The other branch of the main line is connected to a binding-post on the opposite side of the machine, and that binding-post is connected to the other armature-brush of the motor and to one end of the shunt-wire 2. The upward and inward swing of the arm A is limited by the stop K, but that arm is not limited in its downward swing. The swing of the arm B is limited in one direction by the stop J, and is limited in the other direction by the stop I.

The letter K indicates the only contact-point with which the arm A makes connection, while M, N, O, and P indicate four contact-points with which the arm B makes connection, respectively, at different times, and the upper surfaces of which are all on the same plane and on a lower plane than the upper surface of the contact-point L. The contact-point K is electrically and directly connected with the contact-point M by a conductor which passes from the lower end of one to the lower end of the other under the plate Q, as indicated by the dotted line which extends in the drawing from the contact-point K to the contact-point M. The contact-point M is also connected to the other end of the shunt-wire 2, and it is through that contact-point and through the contact-point K that that end of the shunt-wire 2 is connected with the main-line conductor.

The mode of operation is as follows: When the motor is to be started, the arm A is turned from its dotted position over the contact-points M and N without touching them and upon the contact-point L. Thereupon a shunt-current is established through the wire 2, and that part of the main current which when the armature is in full motion is designed to pass directly from the contact-point M to the arm B and thence into the armature must pass through the whole of the resistance-wire 3 before it can reach the arm B, and is diminished in volume by that resistance-wire. That diminished volume of current is sufficient to gradually start the armature, and as the armature increases in its speed it acts as a generator to develop a counter-current, and thus diminishes the amount of current flowing

through it. Thereupon the arm B may be safely turned from the contact-point P to the contact-point O and then to the contact-point N, and finally to the contact-point M, so as to successively cut out from the armature-circuit all of the three substantially equal parts into which the resistance-circuit 3 is divided by the wires 4 and 5.

The distinguishing characteristic of this invention, as compared with the arrangement shown in said Letters Patent No. 421,090, resides in the fact that in the arrangement shown in that patent portions of the regular shunt-wire are used to furnish the extra resistance which is required between the main line and the armature when the motor is started; whereas in the present arrangement no portion of the regular shunt-wire is used for that purpose, but a new and separate resistance-wire is wound around the field-magnet and is tapped at intervals between its ends by one or more wires, so that more or less of that separate resistance-wire may be interposed in the armature-circuit, as occasion requires.

The merits of the present arrangement, as compared with those of the arrangement shown in said Letters Patent No. 421,090, consist in the fact that the aggregate magnetizing-power of the currents in the shunt-wire 2 and the resistance-wire 3 in the present arrangement is much greater when the motor is started than is the magnetizing power of the shunt-wire in the arrangement shown in said Letters Patent, and in the fact that this superior magnetizing power can be increased or adjusted to any desired degree by making the resistance-wire larger in cross-section than the regular shunt-wire, and thereby increasing the number of ampère turns thereof. Thus at the moment of starting the number of ampère turns on the field of the motor may be more than double the number of ampère turns given by the shunt-winding alone, and the power of the field-magnet may thus be made much greater at the moment of starting than it is after the armature has reached its full speed, whereas in the arrangement shown in said Letters Patent No. 421,090 the

power of the field-magnet is necessarily less at the moment of starting than it afterward becomes, and much less than it ought to be at that moment.

Where it is admissible to cut out from the main circuit all parts of the resistance-wire 3, at the same time the wires 4 and 5 and their contact-points may be omitted, and those wires and contact-points may be less or more numerous than two where the cutting out from the main circuit of the resistance-wire 3 is desired to be less or more gradual than it will be where two such wires are used.

I claim as my invention—

1. An electric motor the field-magnet of which is wound with a shunt-wire, the ends of which are connected with the main conductor at points on opposite sides of the motor, and is also wound with a resistance-wire separate from the shunt-wire and separate from the main conductor, but the ends of which are connected with the main conductor between the armature and one of the ends of the shunt-wire by means of an electric switch, all substantially as described.

2. An electric motor the field-magnet of which is wound with a shunt-wire, the ends of which are connected with the main conductor at points on opposite sides of the motor, and is also wound with resistance-wire separate from the shunt-wire and separate from the main conductor, but the ends of which are connected with the main conductor between the armature and one of the ends of the shunt-wire by means of an electric switch, and which motor is also provided with one or more additional wires connecting that resistance-wire at a point or points between its ends with a contact point or points in that electric switch between the contact-points to which the ends of that resistance-wire are connected, all substantially as described.

Hartford, May 13, 1890.

WILLIAM A. ANTHONY.

Witnesses:

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PHOEBE A. PHELPS.