

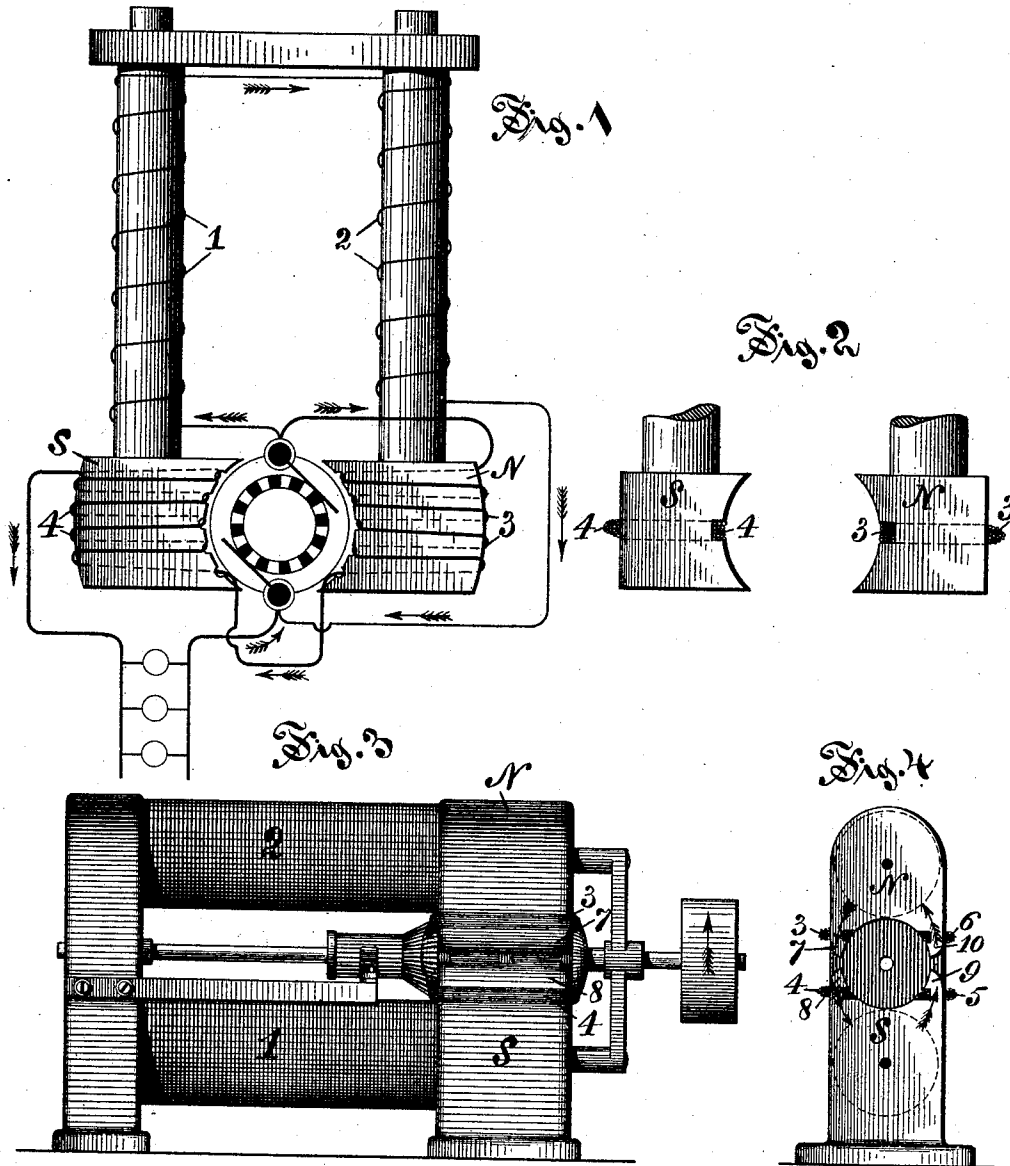
(No Model.)

R. H. MATHER.

DYNAMO ELECTRIC MACHINE.

No. 381,398.

Patented Apr. 17, 1888.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

RICHARD H. MATHER, OF WINDSOR, CONNECTICUT.

## DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 381,398, dated April 17, 1888.

Application filed March 3, 1887. Serial No. 229,537. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD H. MATHER, of Windsor, in Hartford county, Connecticut, have invented certain new and useful Improvements in Dynamo-Electric Machines, which are described in the following specification, and illustrated by the accompanying drawings.

This invention relates to dynamo-electric machines in a broad sense, including both dynamo-electric generators and motors.

The object of the invention is to locate the brushes in constant positions about the commutators of such machines, and at the same time to prevent sparking. In other words, the object of the invention is to counteract the distortion of the magnetic field, which results from variations in the armature-current, by means of an opposing distortion, which results from the same variations, so that the magnetic resultant, which is due to the armature and field-magnet, shall remain unchanged, and the non-sparking points of the commutator shall consequently be maintained in constant positions. This object I accomplish by winding the pole-pieces of the field-magnet in series with the armature.

The best manner in which I have contemplated applying the principle of the invention is shown in said drawings, in which—

Figure 1 is a diagrammatic representation of a shunt-wound dynamo-electric generator constructed upon that principle. Fig. 2 is a side view of a pair of pole-pieces wound in a modified manner. Fig. 3 is a side view of a reversible shunt-wound dynamo-electric generator or motor constructed upon the same principle; and Fig. 4 is a front end view of Fig. 3, parts being removed.

The machine which is shown in Fig. 1 is a typical shunt-wound self-regulating generator, which produces a constant electro-motive force and is connected with a number of incandescent-lamps or other translating devices arranged in multiple arc. The limbs of the field-magnet are wound in the usual manner with helices 1 and 2, and the machine is constructed in the usual manner in all other particulars, except as hereinafter specified. The north and south pole-pieces of this machine are lettered N and S, respectively, and are wound as elec-

tro-magnets with helices 3 and 4, respectively. These helices, which are connected in series in the main circuit of the machine, are wound or excited in one and the same direction. The several coils of helices 3 and 4 are dispersed upon pole-pieces N and S, as shown in Fig. 1, or are assembled compactly together thereon, as indicated in Fig. 2, and in either case are let into the faces of said pole-pieces, as shown in said figures, so as to be out of the way of the armature. The arrows in Fig. 1 indicate the direction of current.

In the machine which is shown in Figs. 3 and 4 the corresponding field-magnet helices and pole-pieces are indicated by the same numerals 1 and 2 and the same letters N and S. The four horns 7, 8, 9, and 10 of the last-mentioned pole-pieces are wound with the four helices 3, 4, 5, and 6, respectively, which are connected in series with each other and with the armature of the machine, and are severally let into the faces of said pole-pieces, as shown in Fig. 4. Said helices 3 and 5 are wound or connected in one and the same direction. So also are said helices 4 and 6; but said helices 3 and 6 are wound or connected in opposite directions, and so also are said helices 4 and 5. The direction of current through this machine, regarded as a generator, is such that the rotation of the armature in the direction indicated by the arrow upon the pulley produces that polarity of said pole-pieces which is indicated by said letters N and S, respectively, as applied.

As it is unnecessary, in view of the mode of operation of this invention, to set the brushes forward in generators or backward in motors in the manner which has been practiced heretofore, the brushes of said machines are permanently fixed in such a position as to make contacts with the commutator in an unchanging line through the neutral points of the armature. The remaining features of construction and the appropriate connections of the several parts of said machine will sufficiently appear from the drawings and from the mode of operation, which is now to be explained.

When the generator which is shown in Fig. 1 is in operation, the electric current passes through the armature and through the main and shunt circuits in the courses and directions

which are indicated in that figure. The electro-magnetic efficiency of helix 3 is then exerted in opposition to that of helix 2, to produce a south polarity in the lower part of pole-piece N and to drive the magnetism which is produced in that pole-piece by helix 2 from said lower to the upper part of pole-piece N, and to concentrate said magnetism in or about the upper horn of that pole-piece, and in like manner the electro-magnetic efficiency of helix 4, being exerted in conjunction with that of helix 1, tends to produce a south polarity in the lower part of pole-piece S and to drive the magnetism which is produced in that pole-piece from the upper to the lower part of the same, and to concentrate said magnetism in or about the lower horn of that pole-piece. The aggregate effect of the action of both said helices 3 and 4, therefore, is to distort the magnetic field in a direction the reverse of that in which the magnetization of the armature tends to distort the same, and these effects of distortion and counter-distortion vary as the current which passes through the armature; hence an equilibrium of effects is maintained, the magnetic field in which the armature revolves suffers no distortion, and the line of parallel cutting of the lines of force is maintained in a constant position.

The mode of operation of the machine which is shown in Figs. 3 and 4 is similar to that already described. Helices 3 and 6 in Fig. 4 tend to distort the magnetization of pole-piece N by pressing the magnetism back from horn 10 and by drawing that magnetism down toward and into horn 7. In like manner helices 4 and 5 tend to distort the magnetization of pole-piece S by pressing magnetism down from horn 8 and by drawing magnetism up toward and

into horn 9. The aggregate effect of these distorting tendencies counterbalances the distorting tendency which is due to the magnetization of the armature, and varies with that tendency for the reason before stated—namely, the inclusion of the pole-piece helices in the armature-circuit. The several described effects of counter-distortion which are produced in pole-pieces N and S by helices 3, 4, 5, and 6 in Fig. 4 are exerted in the several directions, which are indicated approximately by the arrows in that figure.

By means of this invention any current which the armature is capable of carrying can be taken from the commutator by stationary brushes without sparking.

I claim as my invention and desire to secure by Letters Patent—

1. In a dynamo-electric machine, a helix which is wound upon a pole-piece of the field-magnet and is let into the face of said pole-piece, substantially as and for the purpose specified.

2. Upon the pole-pieces of a field-magnet, a number of helices which are wound around the horns of said pole-pieces, substantially as and for the purpose specified.

3. In a shunt-wound dynamo-electric machine, two pole-piece helices, one of which is wound in the same direction as the field-magnet and the other of which is wound in the opposite direction, substantially as and for the purpose specified.

In testimony whereof I hereunto set my name in the presence of two witnesses.

RICHARD H. MATHER.

Witnesses:

W. M. DYORKMAN,  
WILLARD EDDY.