

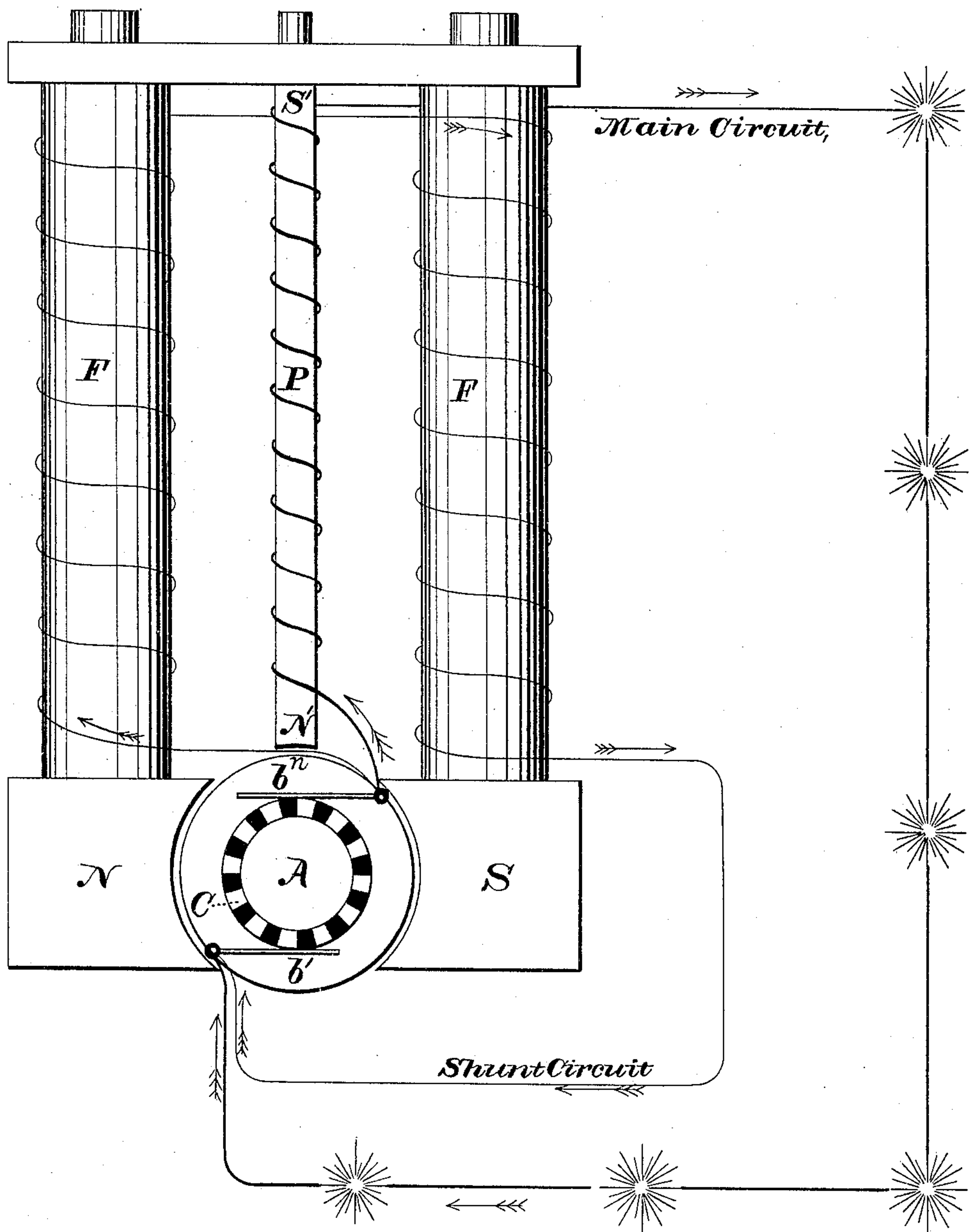
(No Model.)

R. H. MATHER.

DEVICE FOR PREVENTING SPARKING IN DYNAMO ELECTRIC MACHINES.

No. 321,990.

Patented July 14, 1885.



Witnesses:

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RICHARD H. MATHER, OF WINDSOR, CONNECTICUT.

DEVICE FOR PREVENTING SPARKING IN DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 321,990, dated July 14, 1885.

Application filed July 1, 1884. (No model.)

To all whom it may concern:

Be it known that I, RICHARD H. MATHER, a citizen of the United States, residing at Windsor, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Devices for Preventing Sparking in Dynamo-Electric Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to dynamo-electric machines in a broad sense, including not only all machines for converting energy in the form of dynamical power into energy in the form of electric currents by the rotation of conductors in a magnetic field; but also those electrical machines which, having a similar construction but operating in the reverse manner, are known as "electric motors."

The object of my invention is to provide a simple, effective, and inexpensive means of preventing the occurrence in such machines of the phenomenon known as "sparking;" and my device for the accomplishment of this object consists of a magnet or a number of magnets, as the case may be, in addition to or in extension of the field-magnet of such a machine, which device may appropriately be termed a "neutralizing-magnet," from the circumstance that in the operation of my invention this magnet has an inductive effect upon the armature-core the reverse of that of the armature-current. This magnet neither increases nor diminishes the useful external current of the machine, but has for its sole purpose the production of a current in those coils of the armature which are for the time being short-circuited by the brush or brushes of the commutator. I proceed to point out the best mode of applying my invention.

The accompanying drawing is a diagrammatic representation of a dynamo-electric machine embodying my invention. For the mere purpose of illustration and explanation, I

have chosen for the drawing a "shunt-dynamo," so-called, having a drum-armature.

In the drawing, F is the field-magnet, the particular form of which is unimportant in this connection. The north and south poles of the field-magnet are lettered, respectively, N and S.

A is the revolving armature, provided with commutator C and brushes *b* and *b'*, as shown, while *n* is the north pole of the armature or armature core as magnetized by the armature current.

P is the neutralizing-magnet, which is the principal feature of my invention, and consists of a core of soft iron wound as an electro-magnet, having north and south poles lettered, respectively, N' and S'. This core should, preferably, be in the form of a thin and narrow plate, an edge view of which is seen in the drawing, and may be suspended perpendicularly between the arms of the field-magnet. The same should be placed in a fixed position, such that its north pole, N', shall be close to the armature at or near the middle point between the poles N and S of the field-magnet; or, which is the same thing, should be fixed opposite and near the theoretical neutral point of the armature A. The best attachment of the neutralizing-magnet is by bolting the same to the field-magnet in the position mentioned, as shown in the drawing. The neutralizing-magnet P is of sufficient size and is wound to a sufficient degree of electro-magnetic efficiency to insure the control of the armature thereby in the manner hereinafter described—that is to say, the neutralizing-magnet is constructed to have a considerably higher magnetic efficiency than the armature A.

The coil of the neutralizing-magnet is by preference to be placed in the armature-circuit, as distinguished from the field-magnet circuit, in order that the magnetization of the neutralizing-magnet may vary with the current in the former circuit and not with the current in the latter circuit in the manner hereinafter explained.

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 heretofore been prac-

ticed for the purpose of preventing sparking, the brushes *b* and *b'* are placed in such positions as to make contacts with the commutator in a perpendicular line through the neutral points of the armature.

The remaining features of construction and the appropriate connection of the several parts of the dynamo embodying my invention will sufficiently appear from the drawing, and from the mode of operation as hereinafter explained.

It is a well-known fact that in dynamo-electric generators heretofore constructed, and having the Pacinotti or Siemens system of armature-coil connections, it has been necessary to set the brushes forward, and in dynamo-electric motors of like construction to set the brushes backward upon the commutator, in order to prevent sparking, which adjustment of the brushes, whether manual or automatic, has nevertheless been not entirely efficacious to produce that result. Also, it has been necessary that the adjustment of the brushes should be variable, on account of the variations in the absolute strength of the field magnet, or in the relative strength of the field-magnet as compared with the armature due to variations in the electro-motive force or current of the machine; for, by reason of such variations, the neutral point or points in the armature have been movable and incapable of being fixed by the brushes.

The mode of operation of my invention is as follows: When the machine is in operation the electric current passes through the armature and through the main and shunt circuits in the courses and directions indicated in the drawings, whereby the neutralizing-magnet *P* is energized as an electro-magnet in a degree dependent upon and varying with the strength of the current through the armature, which dependence and variation follow from the above-described location of the neutralizing-magnet coil in the main circuit. During the operation of the machine, therefore, the neutralizing-magnet, whose north pole is by said construction near and opposite the theoretical neutral point of the armature, causes or tends to cause a reversal in the direction of the current traversing those coils of the armature which are for the time being passing directly under that magnet; and this magnetic influence or tendency to cause reversal automatically varies in strength according to the varying strength of the current so to be reversed for the reason before stated—namely, the inclusion of the neutralizing-magnet coil in the armature-circuit. A like result has hitherto been accomplished by throwing the brushes over into such a position that those coils of the armature which would otherwise produce sparking are brought under the direct magnetic influence of the field-magnet.

In the case of a dynamo having a ring-armature the neutralizing-magnet will affect in the manner described those armature-coils only which are directly opposite and adjacent thereto; hence it is necessary in dynamos of that class to place a second neutralizing magnet upon the opposite side of the armature; and in the case of dynamos having multiple poles additional neutralizing-magnets are necessary; also, I do not confine my invention to a dynamo-electric machine having a neutralizing-magnet in the main circuit with the armature; for the neutralizing-magnet may be placed in a shunt, or in an independent circuit, or may even be a strong permanent magnet.

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

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

1. A dynamo-electric machine provided with a magnet whose north or south pole is adjacent to the like pole of the armature, substantially as and for the purpose specified.

2. In a dynamo-electric machine, a spark-preventing device consisting of an electro-magnet whose helix is located in the main circuit of the machine, and one of whose poles is adjacent to the like pole of the armature, substantially as set forth.

3. In a dynamo-electric machine, a spark-preventing device consisting of an electro-magnet which is attached to the field-magnet, is located in the main circuit, and has one of its poles adjacent to the like pole of the armature, substantially in the manner and for the purpose specified.

4. In a dynamo-electric machine, an electro-magnet in circuit with the armature and having one of its poles adjacent to the like pole of such armature, substantially in the manner and for the purpose specified.

5. In a dynamo-electric machine, a device to prevent sparking, consisting of one or more magnets so placed that the neutral point or points of the armature of such machine shall be within the magnetic field thereof, substantially as and for the purpose specified.

6. In a dynamo-electric machine, a device to prevent sparking, consisting of an electro-magnet in circuit with the armature and so placed relatively to the armature that one of the poles of such magnet and the like pole of the armature shall be next to each other, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

RICHARD H. MATHER.

Witnesses:

WILLARD EDDY,
RALPH H. PARK.