

(No Model.)

D. HIGHAM.

PREVENTION OF SPARKING IN ELECTRIC MOTORS AND GENERATORS.

No. 373,739.

Patented Nov. 22, 1887.

FIG. 1.

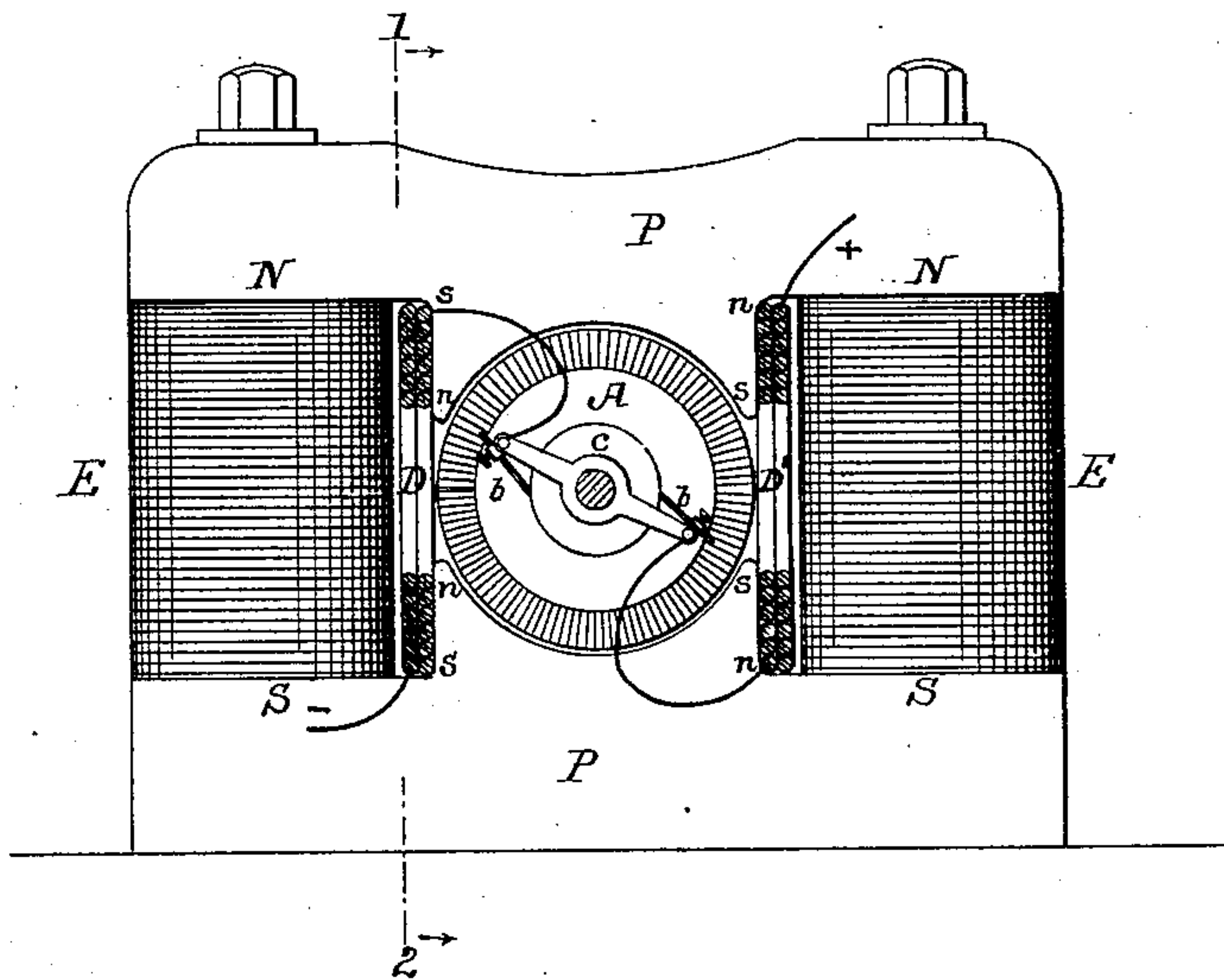


FIG. 2.

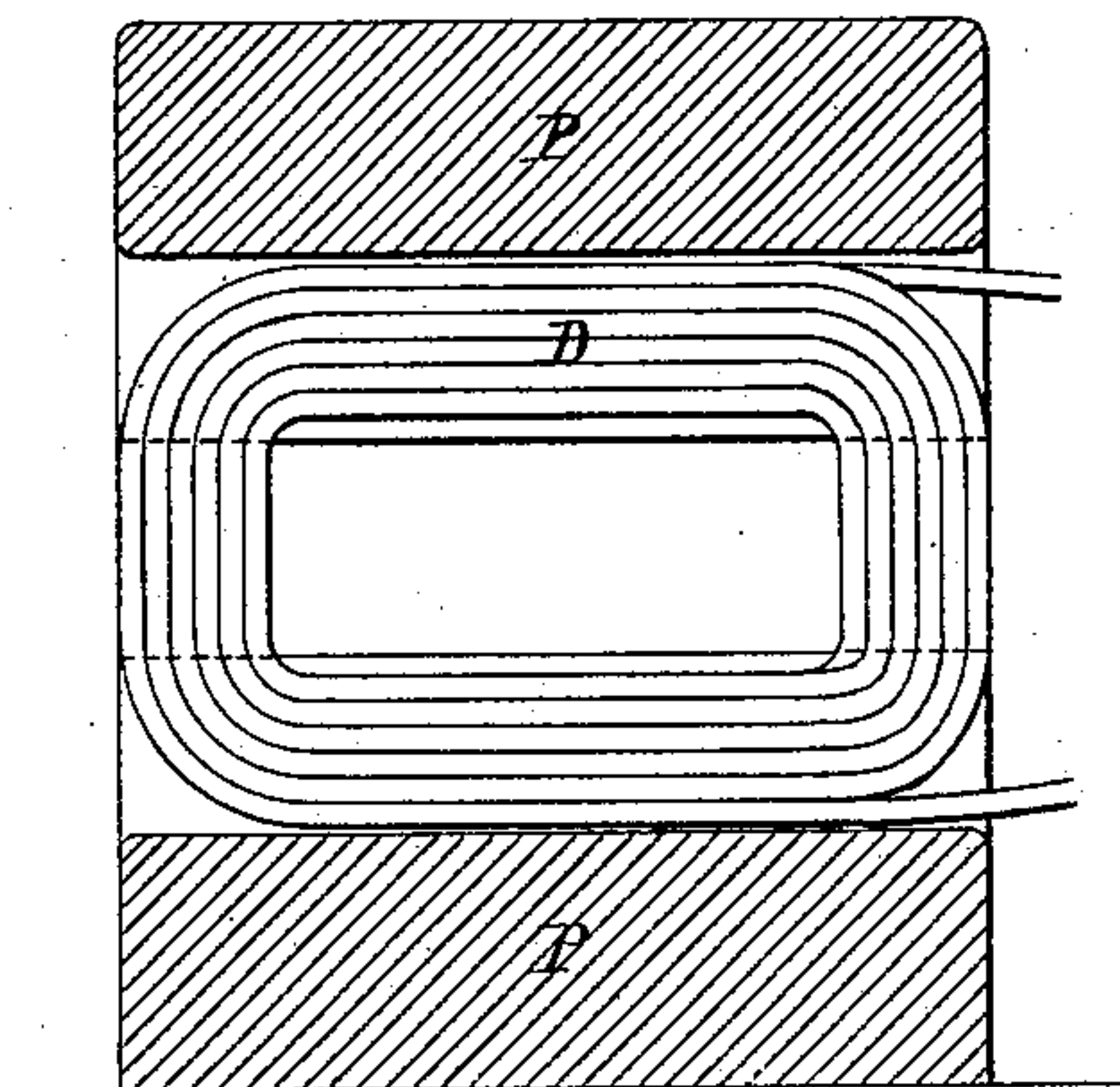


FIG. 3.

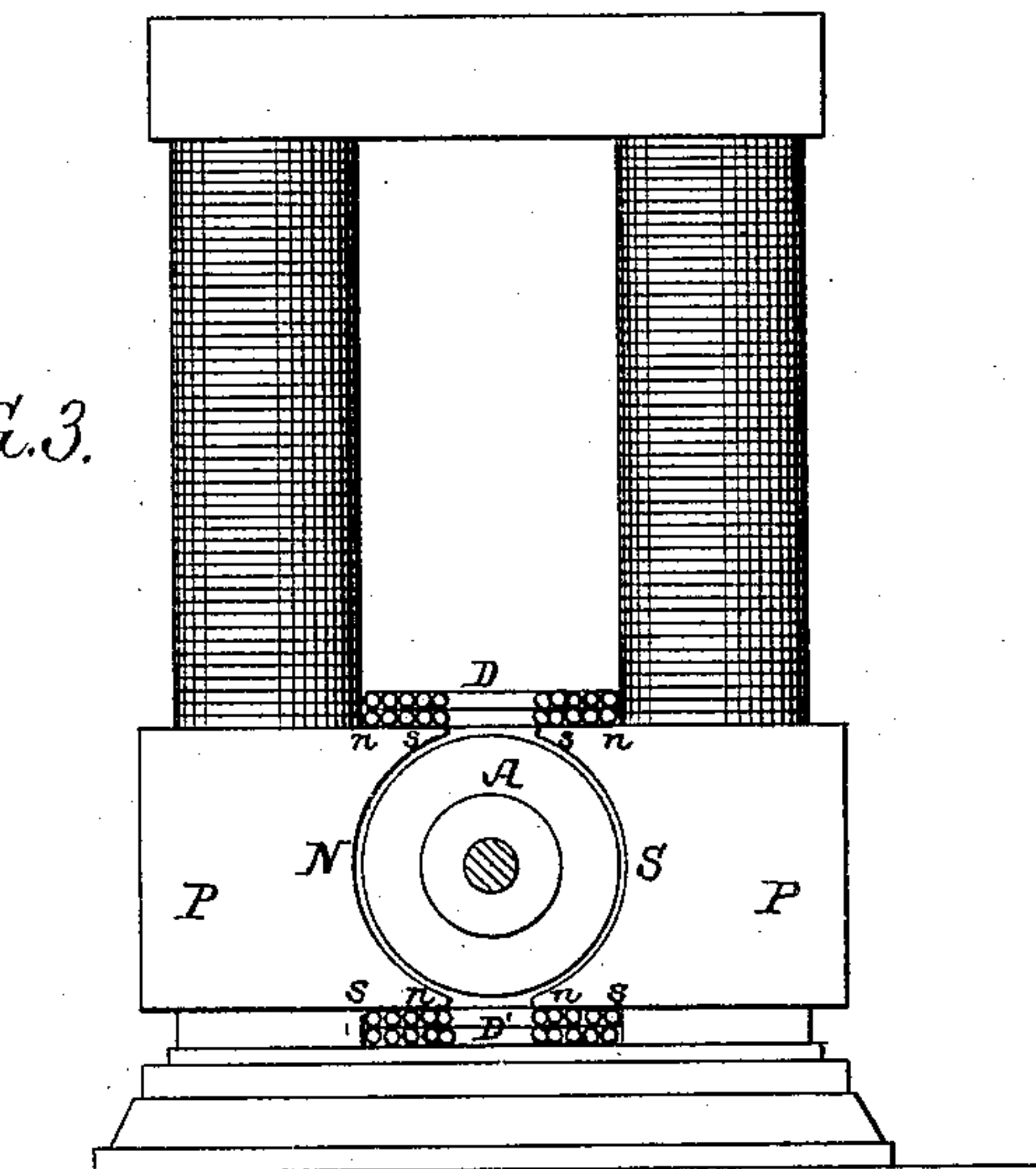
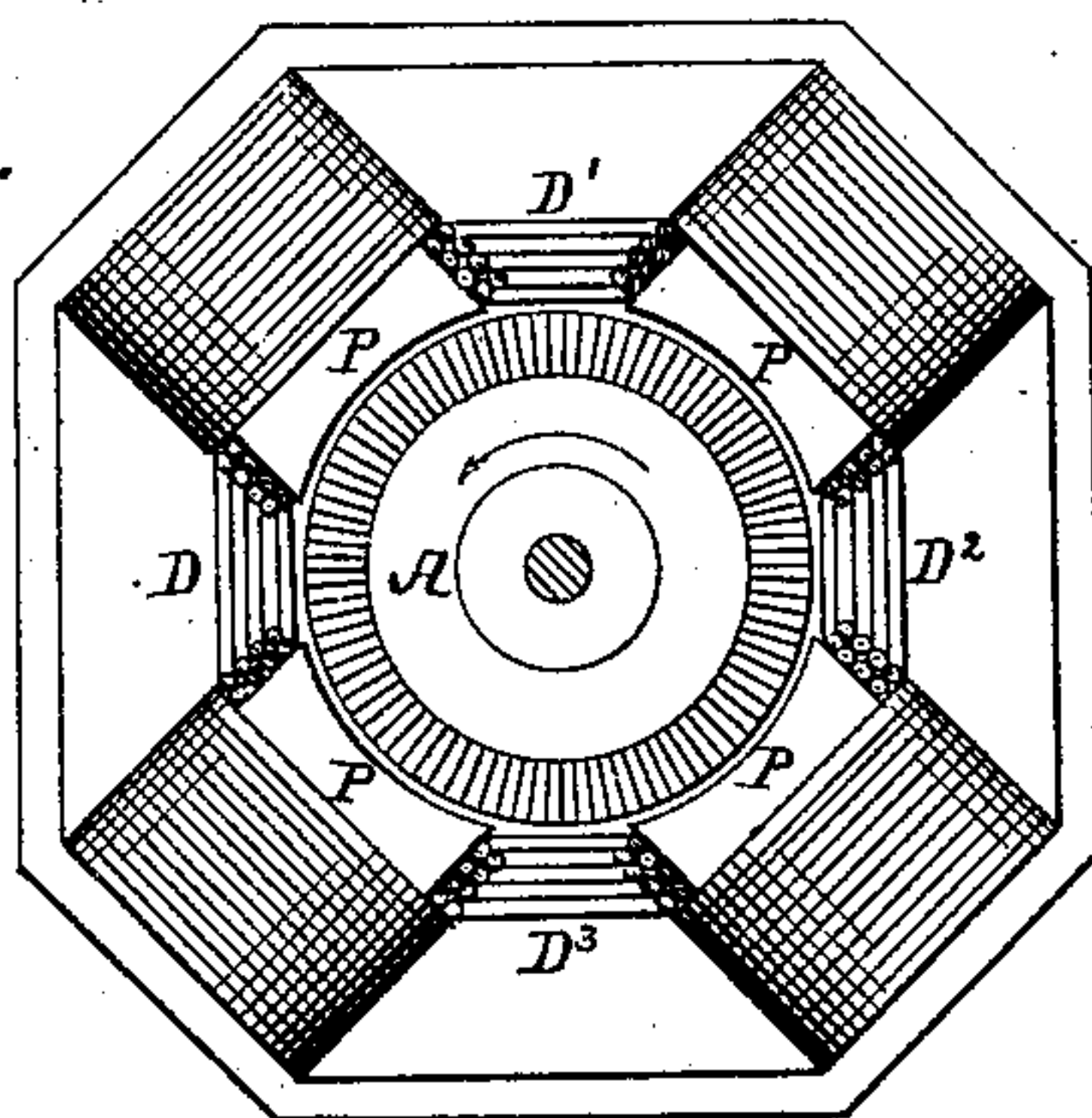


FIG. 4.



Witnesses  
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# UNITED STATES PATENT OFFICE.

DANIEL HIGHAM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE  
HIGHAM ELECTRIC MOTOR COMPANY, OF SAME PLACE.

PREVENTION OF SPARKING IN ELECTRIC MOTORS AND GENERATORS.

SPECIFICATION forming part of Letters Patent No. 373,739, dated November 22, 1887.

Application filed May 9, 1887. Serial No. 237,578. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL HIGHAM, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in the Prevention of Sparking in Electric Motors and Generators, of which the following is a specification.

The object of my invention is to so construct electric motors or generators that the non-sparking points of the commutator-cylinder of the armature can be automatically maintained without shifting the commutator-brushes. This object I attain by placing alongside the edges of the projecting pole-pieces coils on opposite sides of the armature, as more fully described hereinafter.

In the accompanying drawings, Figure 1 is a side view of a machine having its pole-pieces provided with coils in accordance with my invention. Fig. 2 is a sectional view on the line 1 2. Fig. 3 is a view of another form of machine provided with my improvements, and Fig. 4 is a view of another form of machine provided with my improvements.

Referring to Figs. 1 and 2, A is the armature, having a commutator, c, on which bear the brushes b b. These commutator-brushes may be carried by a fixed holder.

E E are the field-magnets, with pole-pieces P, whose curved faces are carried around the armature to such an extent that they form projecting parts n s, of a greater or less extent; or the pole-pieces themselves may be made to project to a greater or less extent from the bodies of the poles irrespective of the extent of their curved faces. I arrange alongside these projecting pole-pieces coils D D', each coil D or D' being wholly on one side of the armature and acting on poles of opposite sign, as illustrated in Fig. 2.

The N and S signs indicate the polarity induced by the field-magnet coils, while the signs n and s indicate the polarity induced in the projecting pole-pieces by the pole-piece coils D D'.

It will be seen that in those portions of the pole-pieces where the polarity of the pole-piece coils and the polarity of the field-magnet coils are of the same sign the magnetic field between the armature and such portions will be

greater than the magnetic field between the armature and those portions where the polarities of the different sets of coils are of different signs. The magnetic field will therefore be shifted toward those portions where the polarities are of the same sign.

In constant-potential machines the sparking is due to the varying armature-current. Therefore, if the pole-piece coils D D' are connected in series with the armature-coils, as shown in Fig. 1, for instance, the magnetic field will be shifted in proportion to the armature-current. The armature-coils, which are short-circuited by the commutator-brushes, are thus automatically made to so cut such magnetic lines as to counterbalance the self-induction of said armature-coils, and so prevent sparking.

In constant-current machines, where the regulation is accomplished by varying the magnetic intensity of the field-magnet, the sparking is similarly prevented; but in this case the pole-piece coils are supplied with a constant current, the magnetic field being shifted by varying the magnetic intensity of the field-magnet. For instance, when there is little or no current traversing the field-magnet coils, and when the pole-piece coils have their full current, the magnetic field set up will be the most distorted or shifted; but when an intense current is traversing the field-magnet coils (remembering the current of the pole-piece coils to be constant) the magnetic field will be very little distorted or shifted, on account of the magnetic action of the pole-piece coils becoming smaller in comparison with the increased magnetic action of the field-magnet coils. These coils can therefore be so proportioned by experiment that the magnetic field will always counteract the self-induction of the armature-coils and prevent sparking.

The described arrangement of coils alongside the pole-pieces and on opposite sides of the armature, each coil being wholly on one side of the armature, is not only very effective for the purpose, but the coils themselves are very conveniently and easily applied, and do not in any way interfere with the removal of the armature whenever desired.

The pole-piece coils are applicable to other forms of electric motors or generators than

that illustrated in Fig. 1. For instance, in Fig. 3 is shown an upright form of machine with pole-piece coils D D', while in Fig. 4 is shown a four-pole machine, to which coils D, D', D<sup>2</sup>, and D<sup>3</sup> are applied, as will be readily understood without further description.

I claim as my invention—

1. An electric motor or generator having projecting field-magnet pole-pieces and electro-magnetic coils alongside said projecting pole-pieces, each coil being wholly on one side of the armature and acting on poles of opposite sign, substantially as and for the purpose set forth.

15 2. An electric motor or generator having

projecting field-magnet pole-pieces and electro-magnetic coils alongside said projecting pole-pieces, each coil being wholly on one side of the armature and acting on poles of opposite sign, and being in series with the armature-coils, substantially as and for the purpose set forth. 20

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DANIEL HIGHAM.

Witnesses:

WILLIAM D. CONNER,  
HARRY SMITH.