

(No Model.)

D. HIGHAM.

PREVENTION OF SPARKING IN ELECTRIC GENERATORS AND MOTORS.

No. 399,402.

Patented Mar. 12, 1889.

Fig. 1.

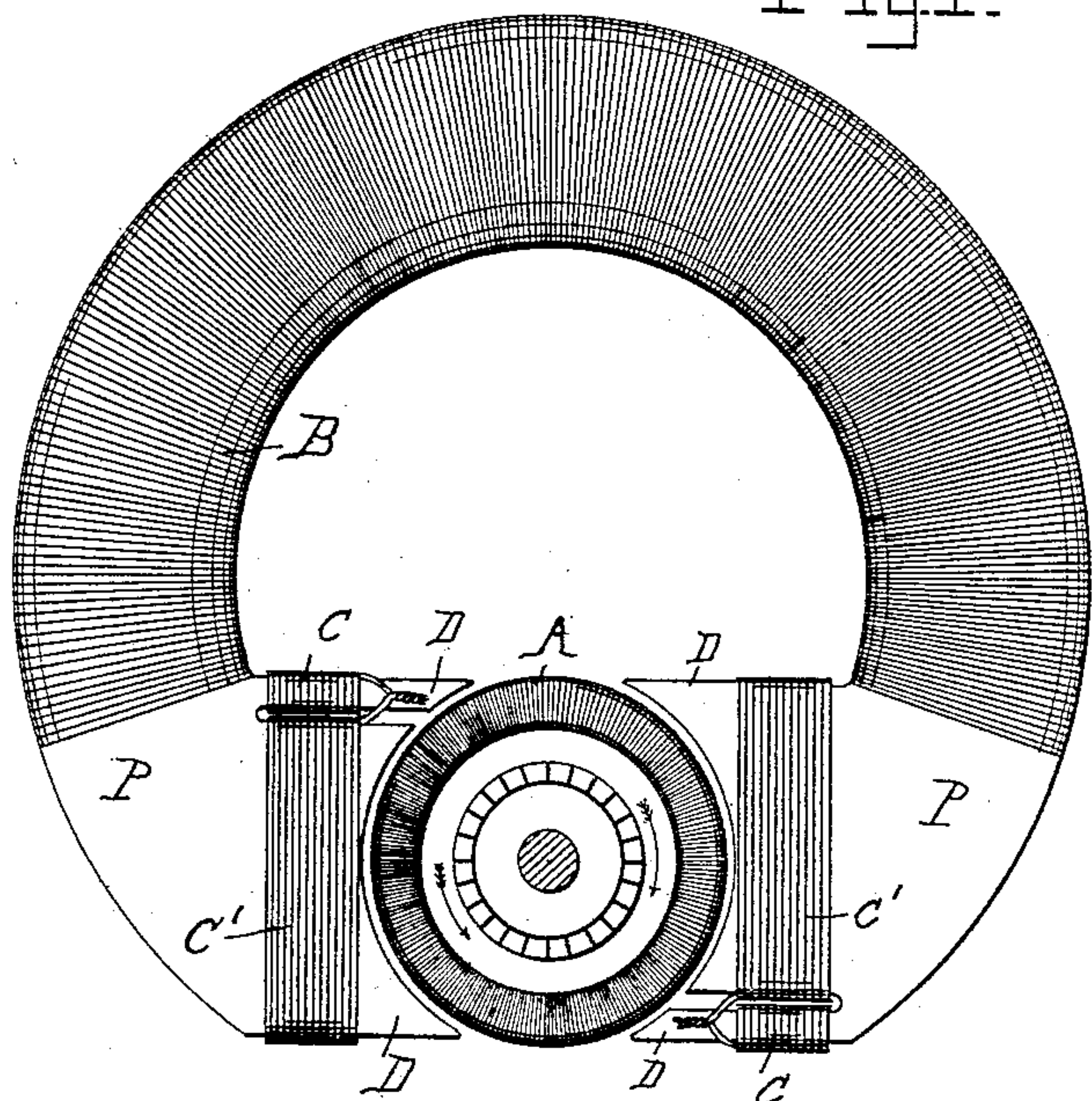


Fig. 2.

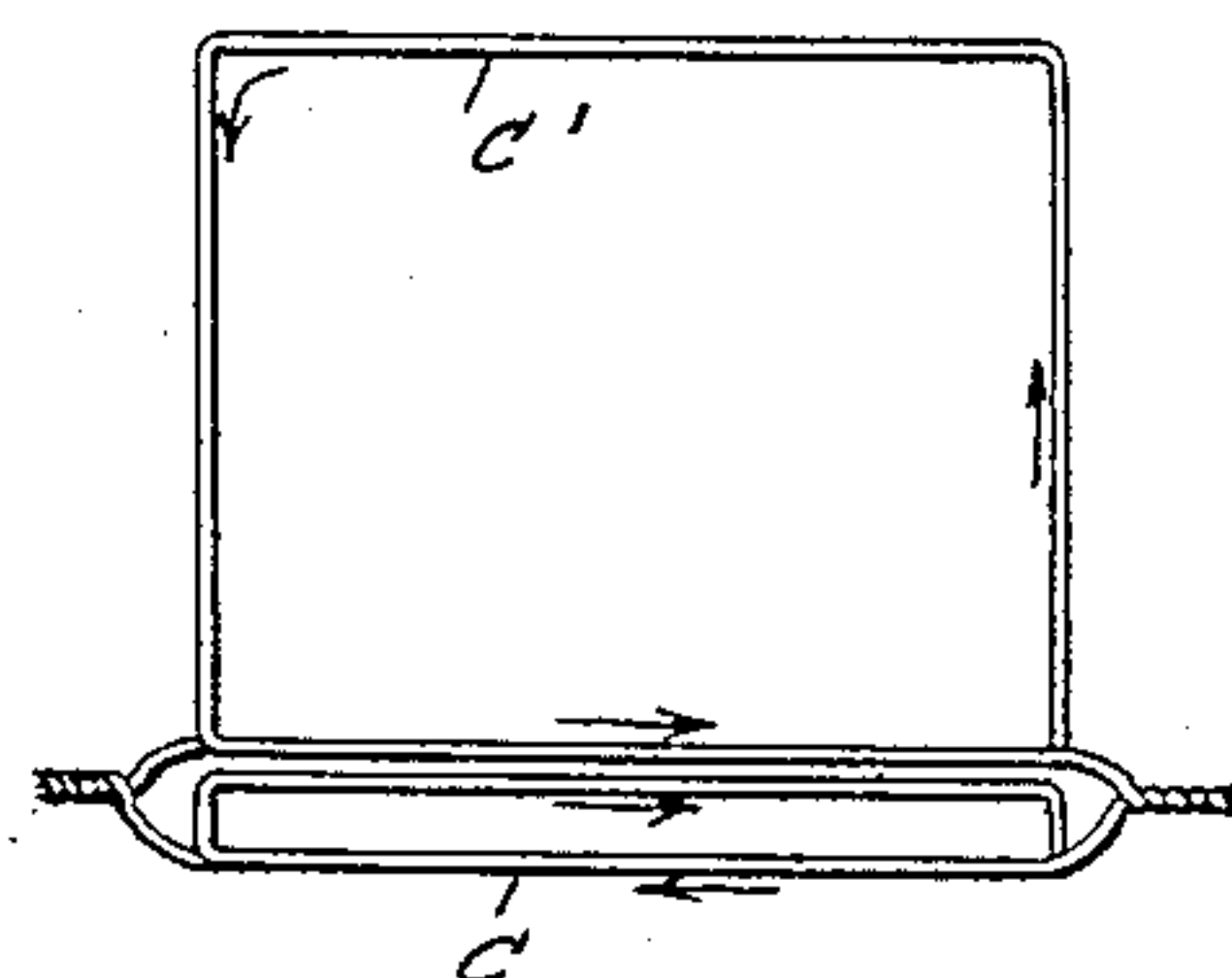
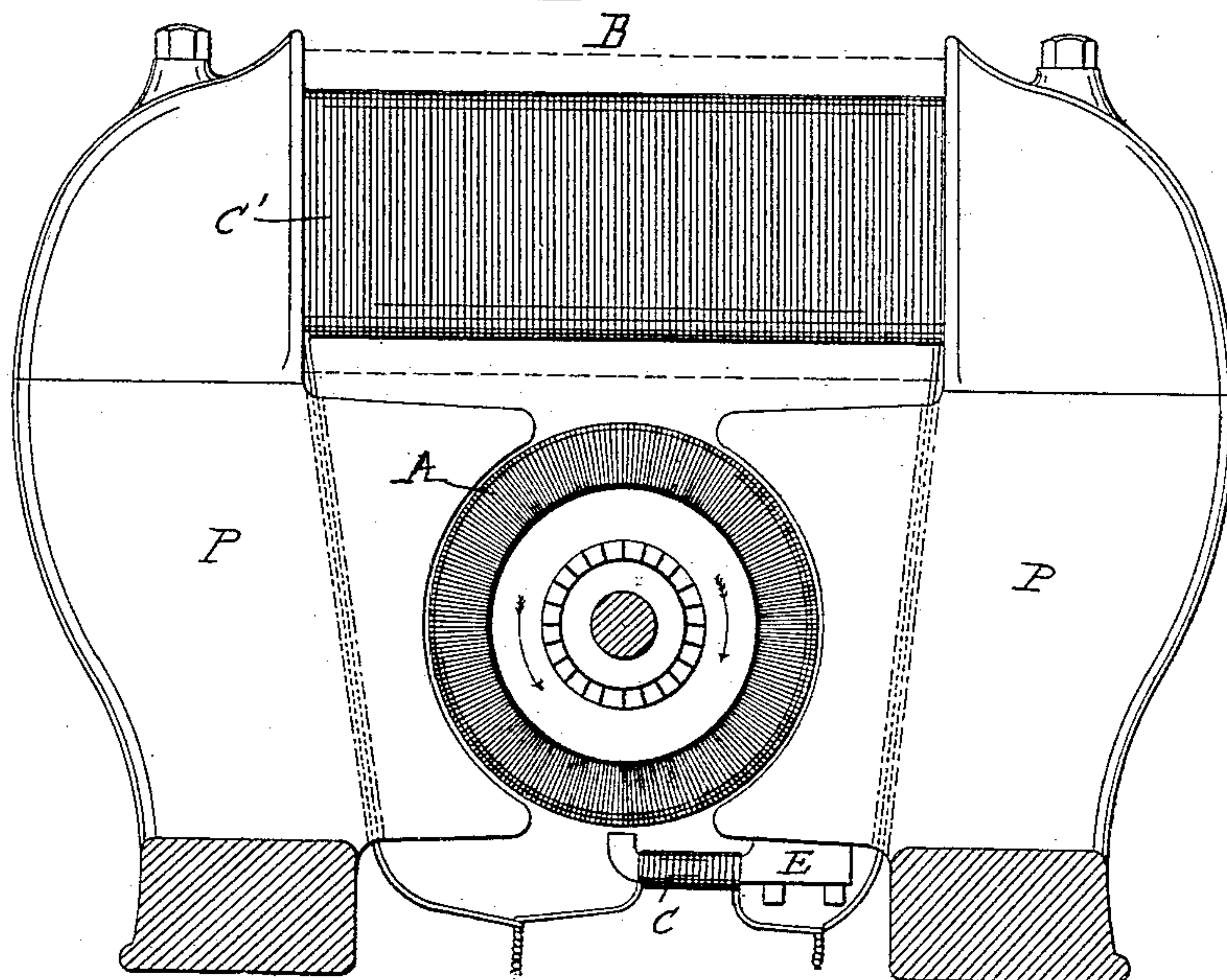


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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PREVENTION OF SPARKING IN ELECTRIC GENERATORS AND MOTORS.

SPECIFICATION forming part of Letters Patent No. 399,402, dated March 12, 1889.

Application filed June 7, 1888. Serial No. 276,344. (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 Dynamo-Electric Machines and Electric Motors, of which the following is a specification.

My invention relates to that class of dynamo-electric machines and electric motors in which the line of neutrality in the magnetic field is not appreciably shifted by the regulating means employed.

The object of my invention is to provide means for producing the conditions of non-sparking at the commutator-brushes.

My invention is particularly applicable to series-wound machines, and is especially adapted for use upon constant-current dynamos in which the armature-speed is varied for the purpose of regulation by means of a regulating device at the driving-engine, such as described in the Letters Patent granted to myself and E. T. Higham May 10, 1887, No. 362,510. My invention may also be used in connection with series-wound motors, such as those which are employed on street-cars, where the entire current supplied to the motor is varied according to the work to be done.

In an application for a patent filed by me of even date herewith, Serial No. 276,343, I have shown and described a magnetic conducting-bar not in magnetic contact with the field-magnet pole-piece, but adjacent thereto, and provided with means whereby the magnetic lines passing through the said conducting-bar may be regulated or adjusted in intensity, and such a construction may be employed in connection with my present invention. In the accompanying drawings, however, I have illustrated the magnetic conducting-bar as being simply connected to or forming part of one of the pole-pieces of the field-magnet.

Figure 1 is a view in the nature of a diagram to illustrate the principle of my invention. Fig. 2 is a diagram of the arrangement of the induction-coil in the machine, Fig. 1; and Fig. 3 illustrates the form in which I prefer to carry my invention into effect.

A is the armature of the machine, which may be of any suitable construction, and B is the field-magnet, between whose pole-pieces P P the armature revolves.

D is the magnetic conducting-bar, which acts upon the short-circuited coils of the armature to prevent sparking, as more fully described in my other applications for patent. In Fig. 1 I have shown two of these magnetic conducting-bars, each formed upon or as part of one of the field-magnet pole-pieces.

The principle of my present invention is as follows: When the current of a machine of the class to which my invention is intended to be applied is suddenly changed—as, for instance, if suddenly increased—the magnetism of the field-magnet will increase slowly, on account of the extra current set up in the field-magnet core, while it is essential that the magnetic conducting-bars, which act on the coils of the armature to prevent sparking, should increase in magnetism as quickly and to the same degree as the armature-current increases. I therefore employ in connection with each of these magnetic conducting-bars a coil or helix, C, which I wind upon said bar, and which is, however, not connected up with the armature or field-magnet coils, but is connected to coils C', which are not in the working-circuit or the field-magnet circuit, but are wound upon some suitable part of the field-magnet. In Fig. 1 I have shown each of these coils C' as wound upon a pole-piece of the field-magnet and connected in a closed circuit with the coil upon the adjacent magnetic conducting-bar. Currents generated by induction will be momentarily set up in these coils C' in the same manner and by the same force as the above-mentioned extra currents are set up. There will of course be a tendency to set up a current in the helices or coils C in the same direction as in the coils C', or, in other words, in the same direction as the said extra currents. I however cause a current to flow through the helices or coils C' in a contrary direction to that of the extra currents. This is accomplished by connecting up the coils C and C', as shown in Fig. 2—that is, so that the direction of the windings of the two coils shall be contrary to each other. Under these

conditions, if there should be an increase of current in the working-circuit, a current will be induced momentarily in the coils C', and as these coils C' surround a greater number
 5 of magnetic lines than do the helices or coils C a current will be forced through the helices or coils C in a contrary direction to the induced extra current, with the result that the magnetic lines passing through the magnetic
 10 conducting-bars D will be, when the windings are properly proportioned, increased to equal the increased intensity of the armature-current, and prevent sparking or the complete arcing of the commutator-cylinder if a small
 15 number of segments are employed. When the magnetism of the field-magnet has, however, come up equal to the armature-current—that is to say, when the induced extra currents will have died out, the current flowing
 20 through the induction-coils C and coils C' will also have died out exactly at the same time, leaving the said coils nothing more than dead wires until another change of current occurs.

25 The above description will apply also to the construction shown in Fig. 3, except that in Fig. 3 the induction-coils C' are shown as wound upon the core of the field-magnet, and the terminals of these coils are connected up
 30 to a helix, C, upon a single magnetic conducting-bar, E.

It should be understood that although the

magnetic conducting-bar is provided with a helix or coil it is not an electro-magnet in the sense meant in connection with my appli- 35
 cation filed October 3, 1887, Serial No. 251,339. The helix upon the magnetic conducting-bar only comes into action momentarily to compensate for the extra induced currents in the field-magnet core and pole-pieces, and is in- 40
 capable of setting up any magnetic lines of itself, and is therefore not a magnet.

I claim as my invention—

1. A dynamo-electric machine or electric motor having a magnetic conducting-bar act- 45
 ing upon the short-circuited armature-coils, a helix upon the said bar, and coils upon the field-magnet connected to the said helix, but not connected with the field-magnet coils or working-circuit. 50

2. A dynamo-electric machine or electric motor having a magnetic conducting-bar act-
 ing upon the short-circuited armature-coils, a helix upon the said bar, and coils C' upon the field-magnet connected to the helix C, which 55
 is wound contrary to the coils C'.

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

DANIEL HIGHAM.

Witnesses:

HARRY SMITH,
 HENRY HOWSON.