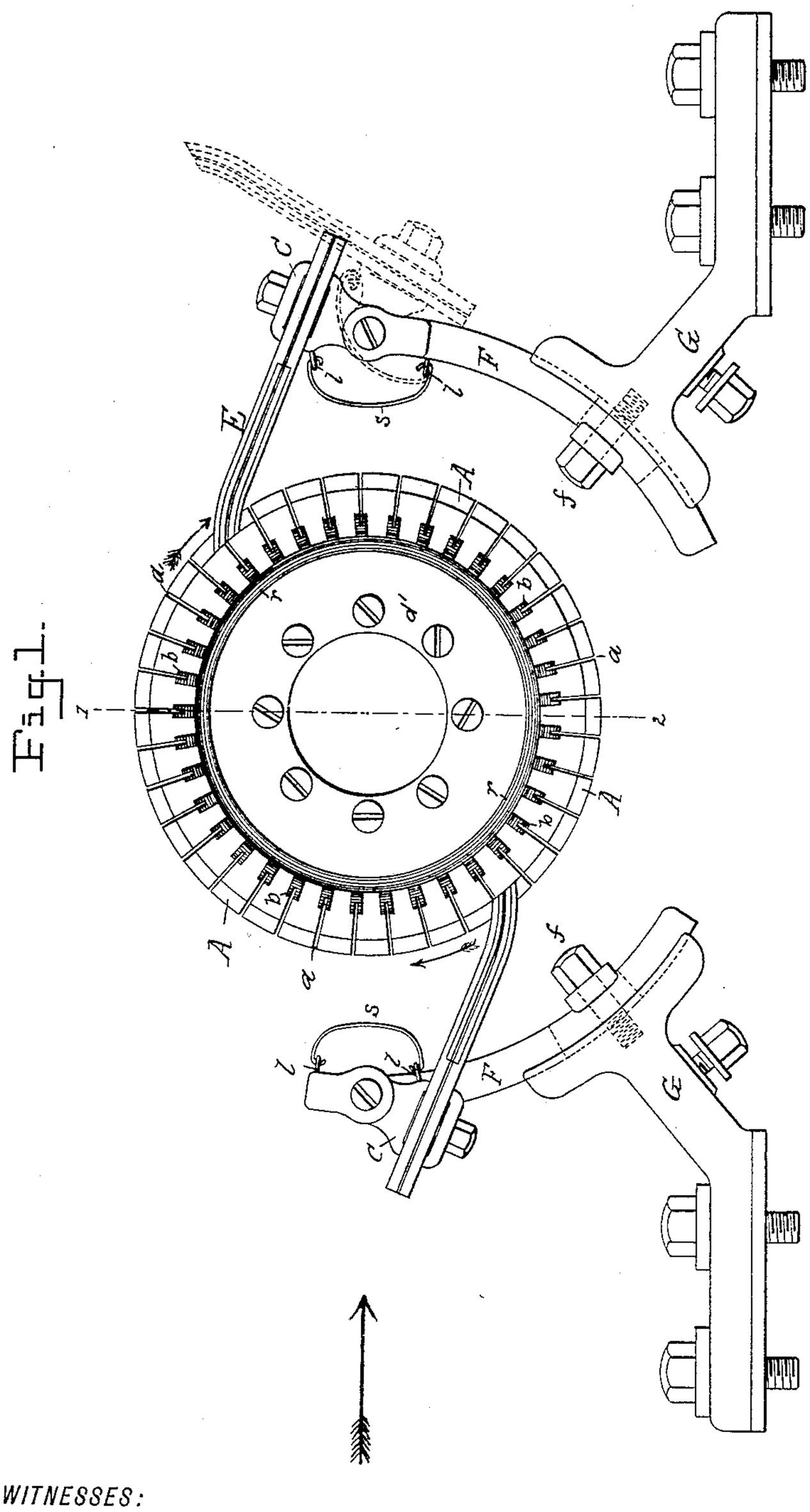
(No Model.) 2 Sheets—Sheet 1.

D. HIGHAM.

DYNAMO ELECTRIC MACHINE.

No. 399,404. Patented Mar. 12, 1889.

Fig. 1.



WITNESSES:

E. J. Griswold.

John Revell.

INVENTOR,

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his ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

D. HIGHAM.

DYNAMO ELECTRIC MACHINE.

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Fig. 2.

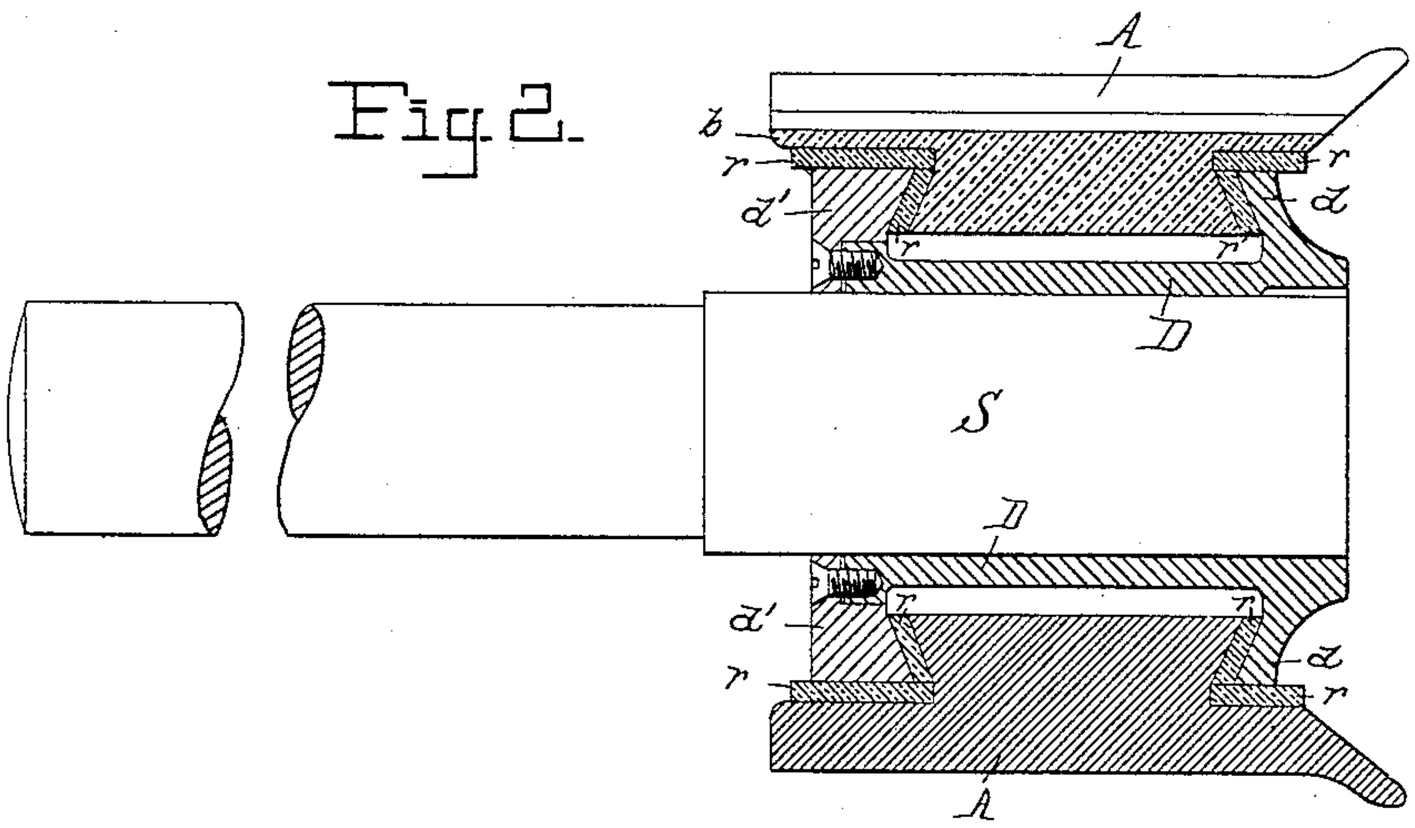


Fig. 4.

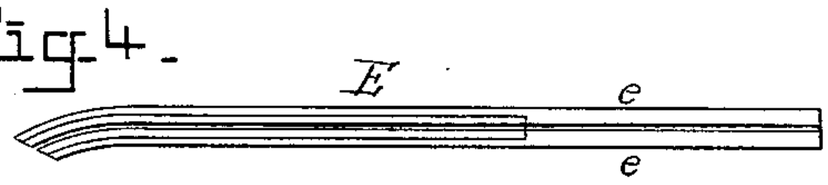
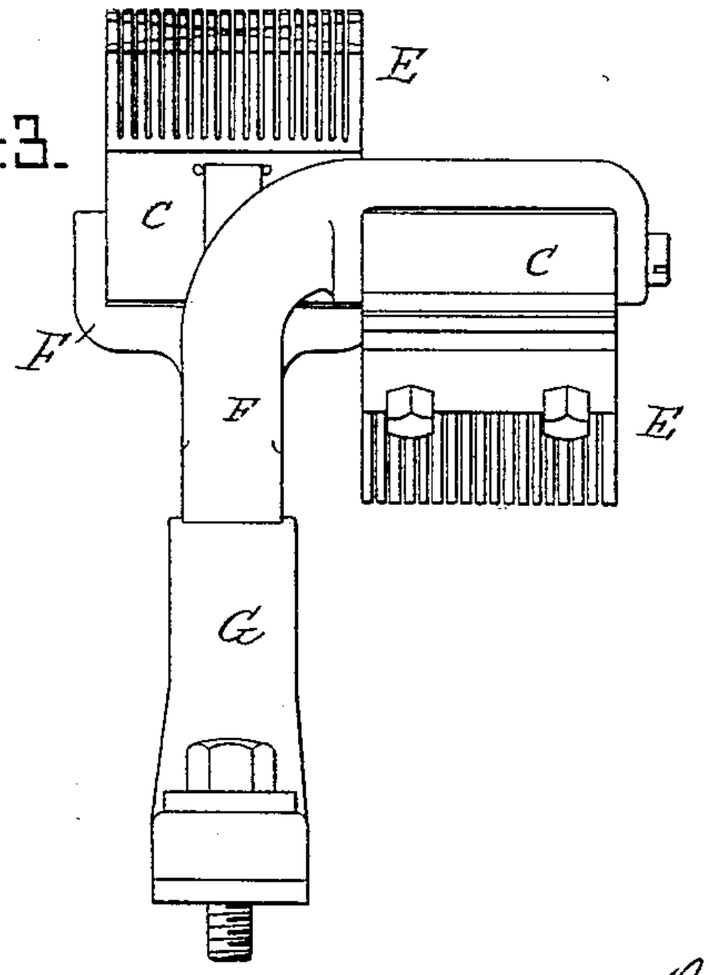


Fig. 3.



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INVENTOR,

Daniel Higham,

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UNITED STATES PATENT OFFICE.

DANIEL HIGHAM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE HIGHAM ELECTRIC LIGHT COMPANY, OF ROCKLAND, MAINE.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 399,404, dated March 12, 1889.

Application filed July 7, 1888. Serial No. 279,315. (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 Commutating Devices for Dynamo-Electric Machines, of which the following is a specification.

My invention relates to the commutating devices for dynamo-electric machines and electric motors, my invention consisting of certain improvements in the construction of the commutator, the brushes, and the brush-holding devices, as hereinafter described.

In the accompanying drawings, Figure 1 is a side view showing the commutator, the brushes, and the holders for the latter. Fig. 2 is a longitudinal section through the commutator on the line 1 2, Fig. 1. Fig. 3 is an end view of the commutator holders and brushes looking in the direction of the arrow, Fig. 1; and Fig. 4 is a side view of one of the commutator-brushes detached.

The commutator is made up of a number of metallic segments, A, as usual, which are separated from each other at their bases by insulating-blocks *b*, and toward the periphery of the commutator by air spaces or slits *a*. The segments and intermediate insulating-blocks are clamped between a ring, *d*, formed by a flange on the sleeve D, and a ring, *d'*, secured to the sleeve at the opposite end, this sleeve being keyed or otherwise secured to the shaft S of the armature in the usual way. Rings or washers *r* of insulating material are placed between the segments and the clamping-rings, by which they are held, as shown in Fig. 2.

As usually constructed, the clamping-rings for the segments are nearly equal in diameter to the commutator and close up or partially close up the ends of the air-spaces, so that it is very difficult, if not impossible, to clean out these spaces after the commutator has been turned up in the lathe. I overcome this objection by making the clamping-rings so much less in diameter than the commutator that they do not extend to the bottoms of the air-spaces, so that dirt and fine pieces of metal, which are apt to get into the slits, can be readily swept out by a suitable tool. Furthermore, I extend the slits *a* down into the insulating-blocks *b*, as shown in Fig. 1, so that even if fine particles of metal be accidentally left in the bottoms of the slits they can do no harm.

The commutator-brushes E are held in clamps C, pivoted to curved adjustable holders F, which are secured to arms G on the base of the machine. The adjustable holders F are curved on a radius drawn from the center of the armature-shaft, and the bearing-faces of the arms G are similarly curved on similar lines. The curved holders F are held to the curved bearing-faces of the arms G by means of headed bolts *f*, passing through slots (indicated by dotted lines in Fig. 1) in the curved holders F, so that by loosening these bolts the holders and brushes can be adjusted readily to any desired position, and as the ends of the commutator-brushes wear away their point of contact on the commutator can always be maintained by the described adjustment.

The ends of the commutator-brushes are curved, as shown in Fig. 1, so as to maintain a proper bearing upon the segments.

Each brush E is made of two strips, *e*, and slitted, as shown in Fig. 3. The bearing ends of the brushes are beveled, as shown in Figs. 3 and 4, on their adjacent inner faces, so that the bearing-faces of the individual members or points of each brush are of different thicknesses. By preference the greatest thickness is at the center, while the outer edges of the brushes are thinnest. The object of this is to lessen the sparking, which is caused by the jumping of the brushes when the machine is in operation.

By making the laminæ or individual points of each brush of different thicknesses a different wearing effect upon the different parts of the edges of the commutator-segments is obtained, and in consequence, although the members of each brush leave one segment all at the same time, and also pass onto the next segment all at the same time, (owing to the straight front and back edges of the brush,) yet the bouncing up of the points from the face of the commutator, which is more apt to occur on a sudden increase of speed, will

take place, as to the different points, at different times. As the points of a brush are thus never all bounced up at once, there is little or no sparking from this cause.

The beveling off of the brushes, as described, causes the individual members of each brush to jump at different times, instead of at the same time, as would be the case if they were all of the same width, and in this way the tendency to sparking is lessened.

The brushes are caused to bear upon the commutator-surface by means of curved springs *s*, hooked at the ends into loops *l*, one in each case upon the clamp and the other upon the adjustable holder. This construction of spring permits the brush to be thrown back to the position indicated by dotted lines in Fig. 1, so that when it is turned back to that position it will stay there until it is intentionally returned to bear upon the segments.

As shown in Figs. 2 and 3, the two brushes are held by their holders out of line or in different planes, so that the two brushes bear upon independent portions of the periphery of the commutator, and the life of the latter is thus greatly prolonged.

I claim as my invention—

1. A commutator having segments and intermediate insulating-blocks with air spaces or slits extending down into the intermediate insulating-blocks, and clamping-rings not covering the ends of the slits, as and for the purpose set forth.

2. A commutator having segments with insulating-blocks and air-spaces, and clamping-rings not covering the ends of the air-spaces, as and for the purpose described.

3. A commutator-brush composed of two strips having the bearing ends of the individual members or points of different widths, as and for the purpose set forth.

4. The combination of a commutator, with a pair of commutator-brushes set out of line for bearing upon independent portions of the commutator, substantially as set forth.

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

DANIEL HIGHAM.

Witnesses:
HUBERT HOWSON,
HARRY SMITH.