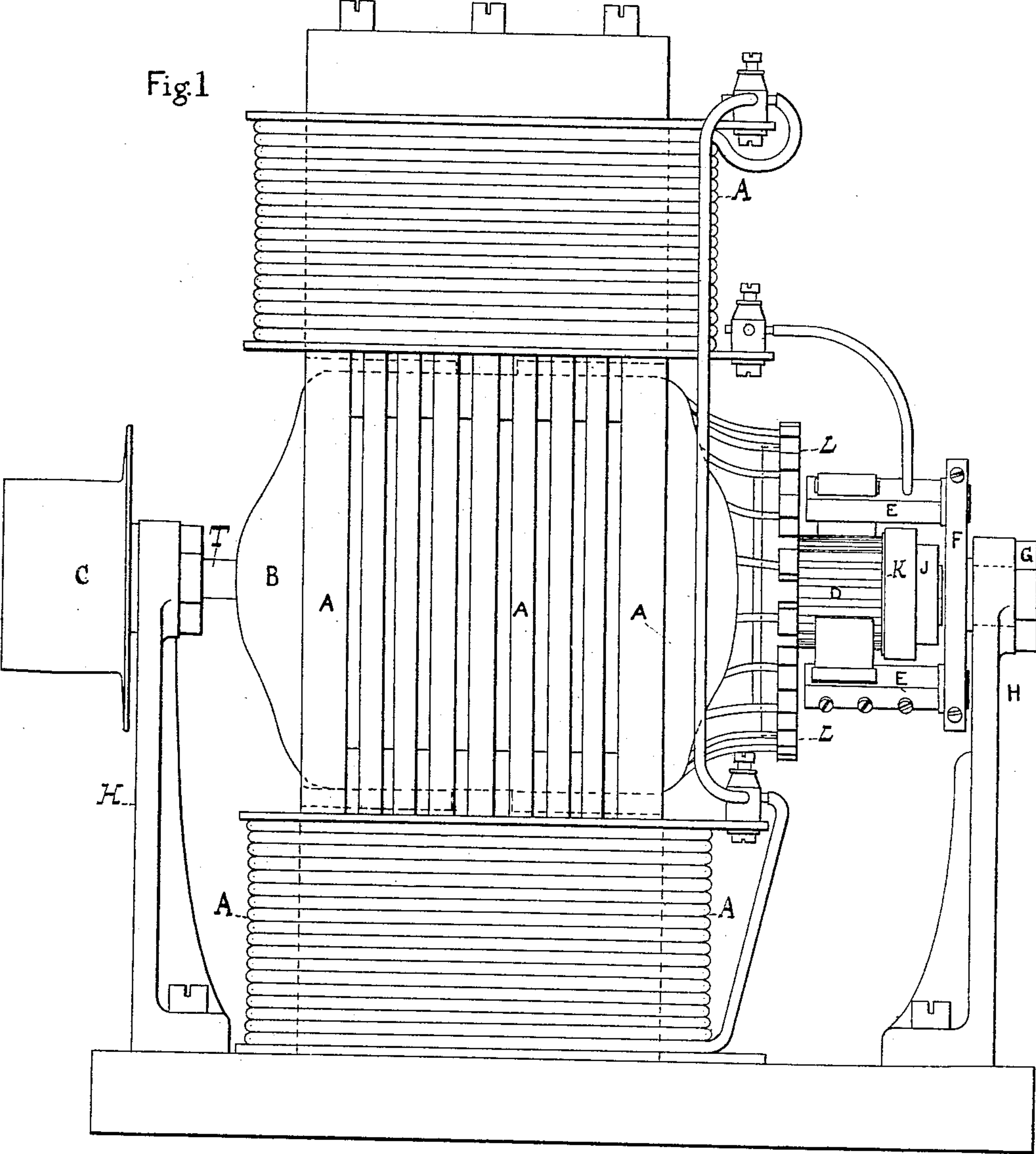


H. S. MAXIM.
Dynamo Electric Machine.

No. 233,942.

Patented Nov. 2, 1880.



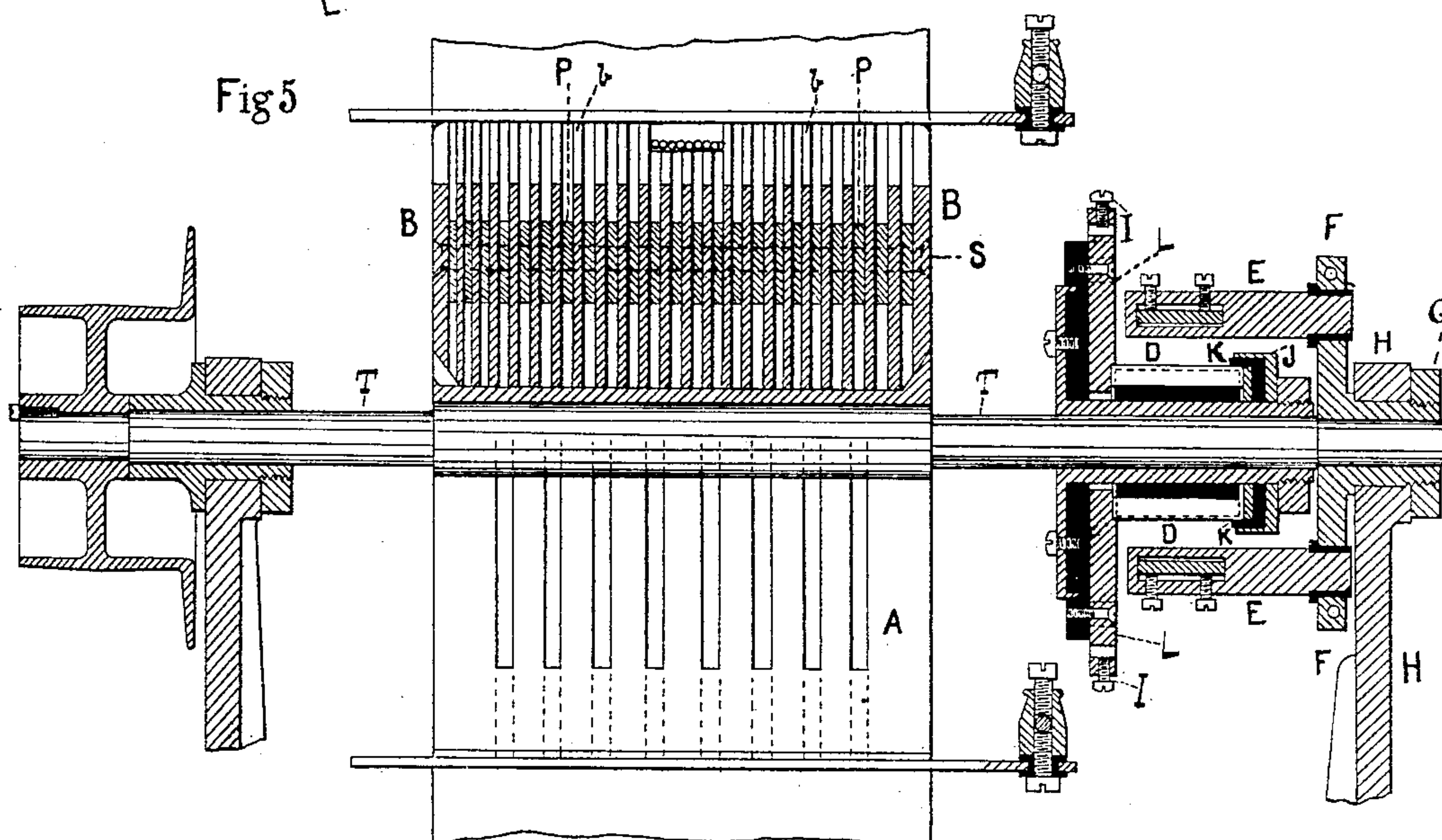
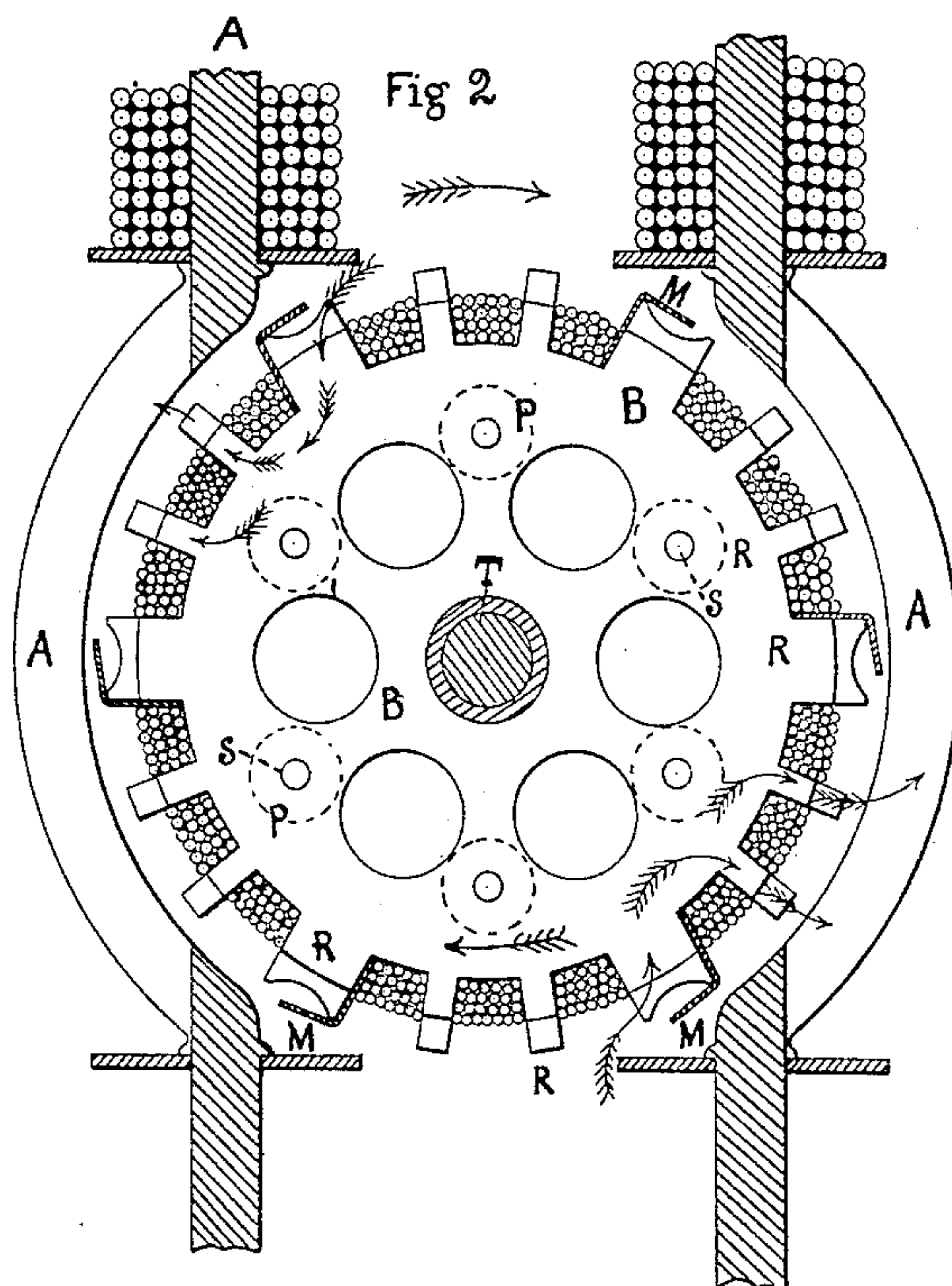
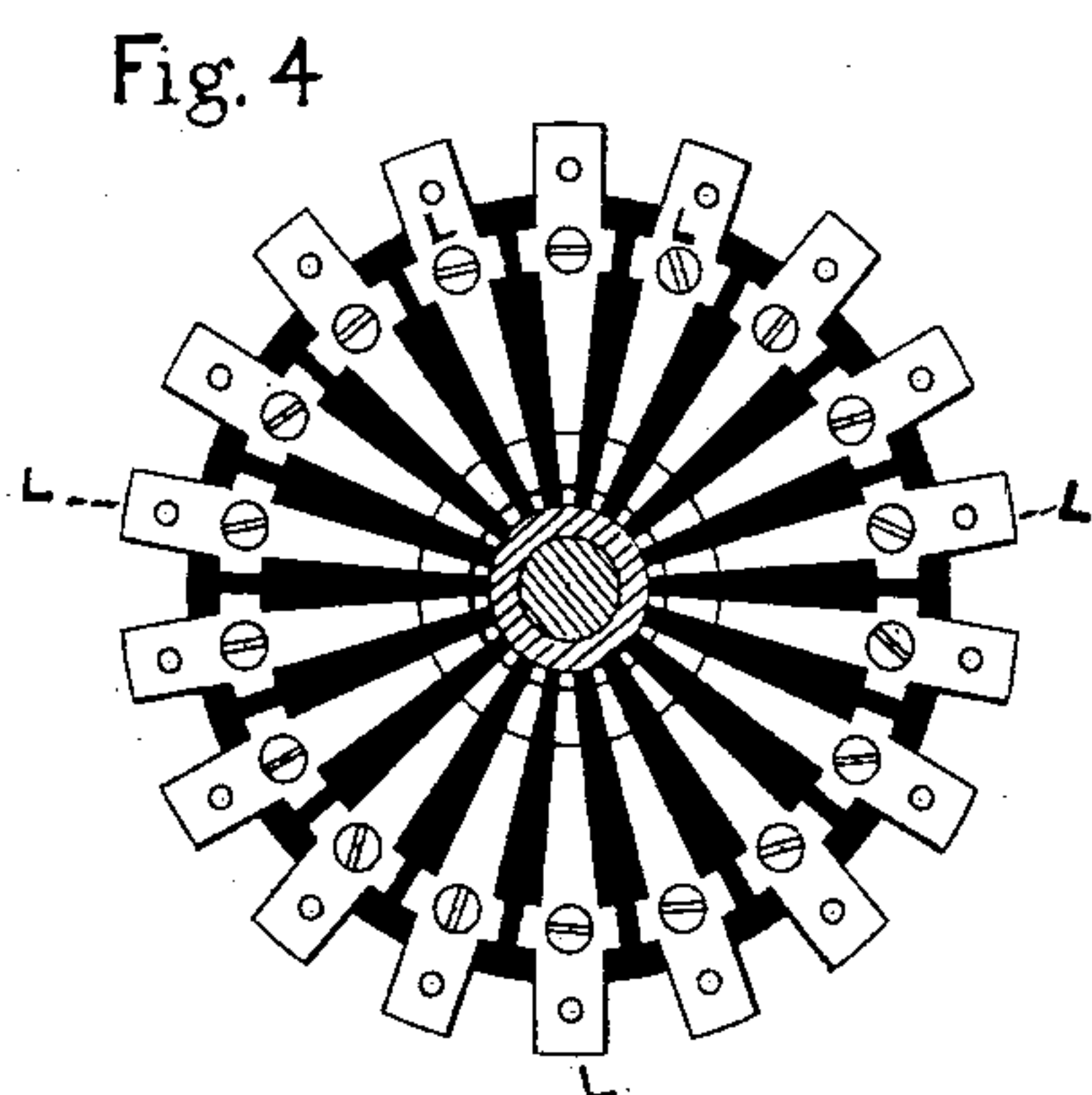
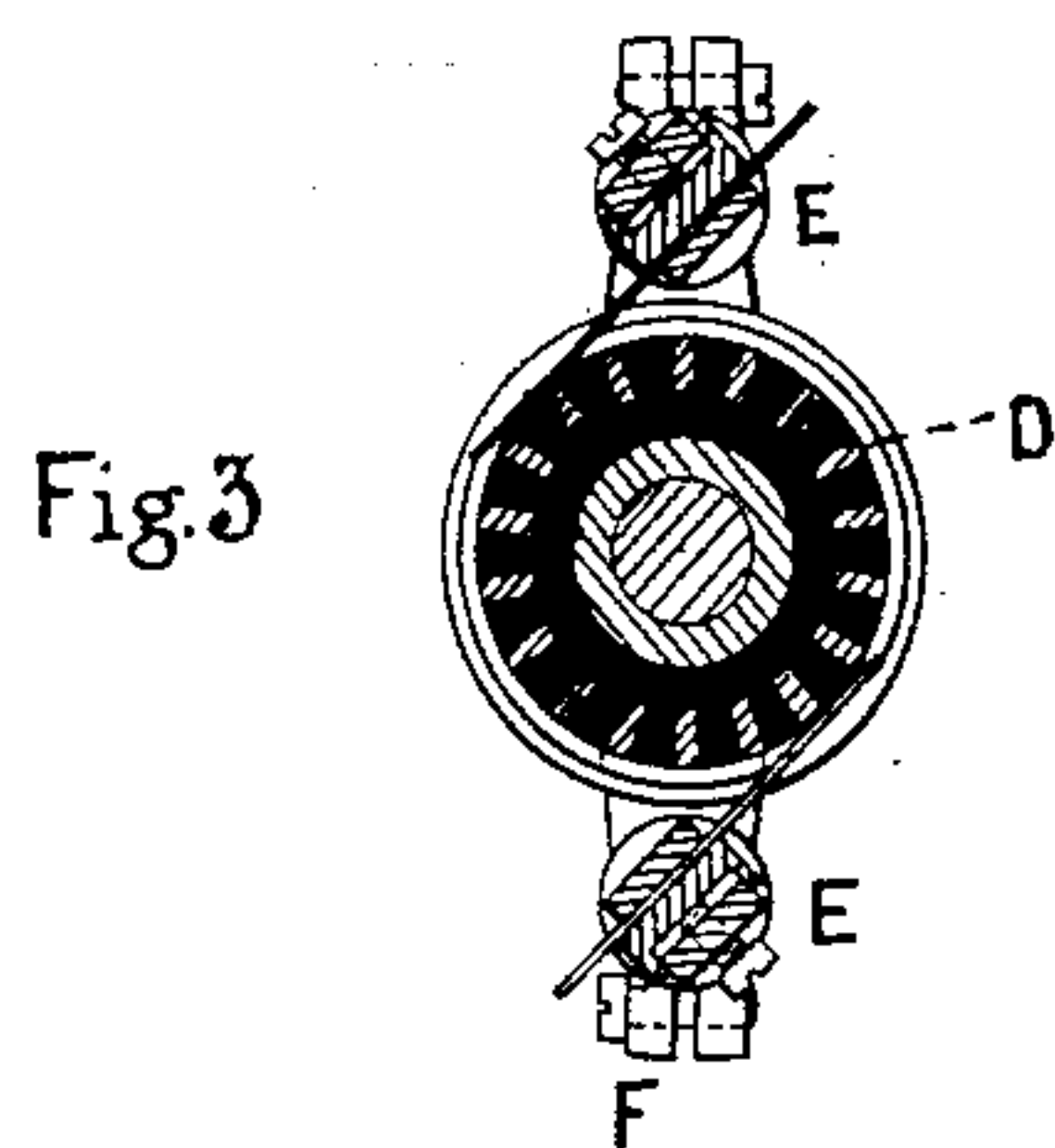
WITNESSES;—
L. Schuyler
James P. F. Kelly

INVENTOR;—
Henry S. Maxim

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INVENTOR:—

William S. Maxim.

UNITED STATES PATENT OFFICE.

HIRAM S. MAXIM, OF BROOKLYN, ASSIGNOR TO SPENCER D. SCHUYLER, OF
NEW YORK, N. Y.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 233,942, dated November 2, 1880.

Application filed February 25, 1879.

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and
5 useful Improvements in Dynamo-Electric Machines, of which the following is a specification, reference being had to the accompanying drawings, which form a part hereof.

My invention relates more particularly to
10 the parts of the machine known as the "armature" and the "commutator," and is intended to obviate two classes of difficulties which have heretofore attended the use of such machines. These difficulties are, first, the heating of the
15 armature arising from the resistance of the coils, the circulation of induced currents in the core, and its rapid changes of polarity; and, secondly, the trouble and expense of renewing the commutator when worn out.

20 I obviate the injurious heating of the armature by so constructing and arranging the parts that while the machine is in operation there is a rapid and constant circulation of air around or through all the parts liable to become heated; and I construct the commu-
25 tator in such a manner that all the parts liable to wear are easily removable and may be replaced with little trouble or expense.

In the drawings, Figure 1 is a side elevation of my improved machine. Fig. 2 is a
30 transverse vertical section. Fig. 3 is a section of the commutator. Fig. 4 is a face view of the commutator-disk; and Fig. 5 is a view, partly in elevation and partly in section, showing a
35 longitudinal section of the armature and commutator.

A A are the field-of-force electro-magnets, constructed and arranged in the usual way. B is the armature, mounted upon the shaft T.
40 Its construction is best shown in Fig. 2 and in the upper part of Fig. 5, where *b b* are iron disks or plates of the form shown in Fig. 2, placed upon the shaft parallel to each other.

S S are pins or rods passing through the
45 disks and holding them together, and P P are collars interposed between the plates so as to leave air-passages between them. The collars are made of about the same thickness as the plates, and are placed upon the pins S S, as
50 shown in the drawings. Each plate is fur-

nished with radial projections R R, and the coils are wound in the depressions or grooves between these projections in such a manner that each coil occupies the two diametrically-
55 opposite depressions, and the adjacent coils are separated from each other by the projections.

In order to produce a rapid and constant circulation of air within the armature so constructed I apply wings or fausts to it so shaped
60 and arranged as to catch the air and force it into the recesses between the plates. In the drawings I have shown such wings in the form of plates of sheet metal M M, applied to a part of the radial projections and bent over
65 in the direction of revolution of the armature. With this arrangement it is obvious that when the armature is rotated rapidly the wings M M will force a strong current of air into the
70 interior of the core through the spaces between the projections to which they are applied, and that the air will find its way out again between the projections not furnished with fans, as indicated by the curved arrows
75 in Fig. 2. Instead of this arrangement wings may be applied to all the lines of projections, and some other opening may be provided for the exit of the air, or openings for the admis-
80 sion of air may be made at or near the shaft, and wings or fans of proper shape may be applied to such openings for forcing air into the interior of the armature, which may be al-
85 lowed to escape at the periphery. In this way a powerful circulation of air is maintained within and through the armature, which effectually carries off its heat.

My improvement in the commutator consists in constructing the wearing parts of it in a separate piece, so arranged that it may be
90 readily removed and replaced without disturbing the connections with the coils.

Fig. 4 shows a plate of hard rubber or other suitable insulating material keyed to the shaft T and fitted with radial arms L L, of brass or other suitable conducting material. These
95 arms are completely insulated from each other, and are equal in number to the terminals of the coils. Each of them has a terminal of one of the coils firmly secured to its outer end by means of a set-screw, as shown at I in Fig. 5, 100

and the terminals of each coil are joined to diametrically-opposite arms, as in the ordinary arrangement.

The wearing part of the commutator is constructed in the form of a hub, D, attached to this plate, and it consists of a cylinder of hard rubber or other insulating material, carrying strips or bars of brass or other conducting material loosely embedded in longitudinal grooves cut in its periphery. These strips are equal in number to the radial arms, and correspond exactly in position with their inner ends, so that each of the bars forms a contact with one of the arms when the parts are in position, but is entirely insulated from all other parts of the machine. The hub is slipped onto the shaft and held in place by means of the nut and washer J, Fig. 5. The soft-rubber washer K, interposed between J and the hub, insures a perfect contact between the commutator-bars and the corresponding radial arms.

The current is taken off from the commutator by means of brushes E E, Fig. 3, of the usual form. The frame F F, which carries the brushes, is made in the form of a box or bushing surrounding the shaft, and it may be turned around to any desired position and secured by means of the nut G.

C is the driving-pulley, and H H are the supports of the boxes in which the armature-shaft revolves.

It is evident that the hub of the commutator and the brushes are the only parts subject to much wear, and they may, when constructed in the manner above described, be readily removed and replaced at trifling expense, as the terminals of the coils are permanently connected with the radial arms, and are not disturbed when the hub is removed, so that they

require no readjustment when a new hub is put on.

I am aware that armatures have hitherto been constructed with air-passages through them, and that attempts have been made to keep such armatures cool by introducing air into them through a hollow shaft, and in other ways, and I do not claim the circulation of currents of air in such armatures, independently of the use of wings or fans, to produce or accelerate it; but,

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a dynamo-electric machine, of an armature with one or more wings or fans for drawing air into it, when constructed and operating substantially in the manner set forth.

2. The combination of the wings or fans M M with an armature provided with air-passages and having radial extensions between the coils, substantially as described.

3. The combination of the radial-armed plate L L with the removable hub D and its commutator-bars, substantially as described.

4. The combination of the radial arms L L with the commutator-bars carried by the hub D, and the washer K and nut J, when constructed substantially as described.

5. The combination of the brush-holders E E with the arms F F and boxing, substantially as described.

6. The combination of the radial arms L L with the removable hub D and the brushes E E, substantially as described.

Witnesses: HIRAM S. MAXIM.

S. D. SCHUYLER,
JAMES R. F. KELLY.