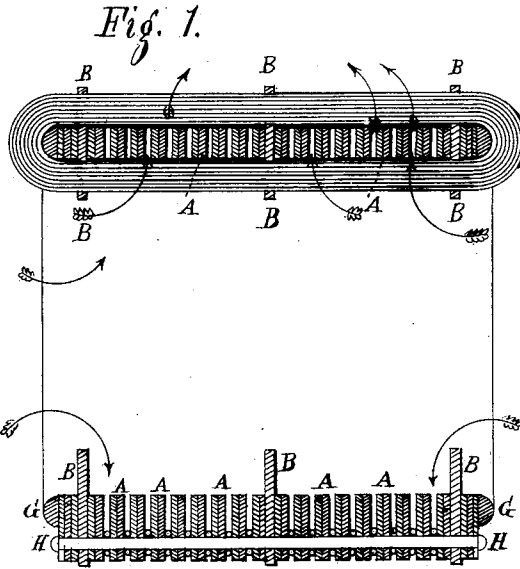
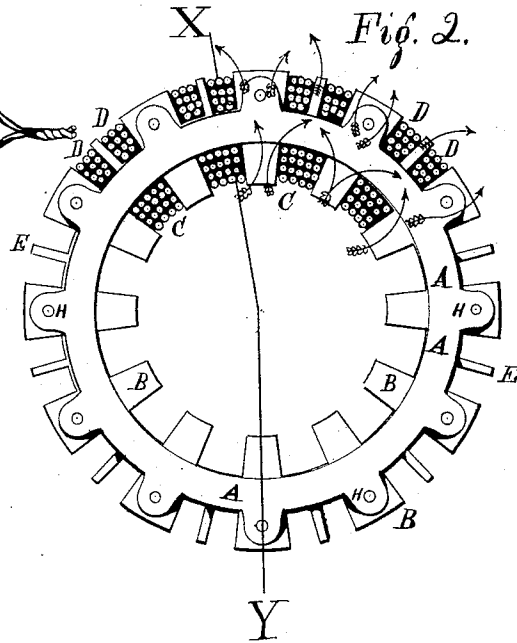
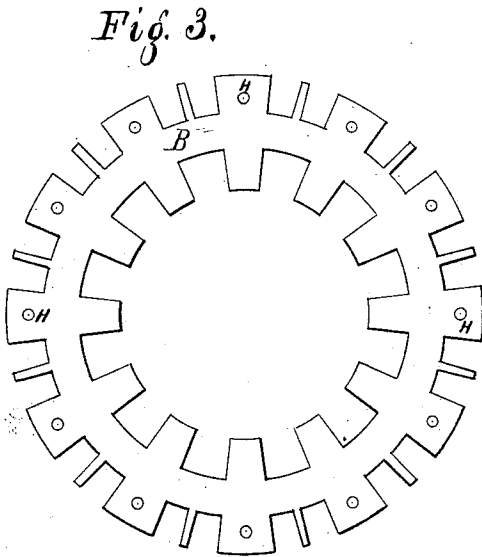
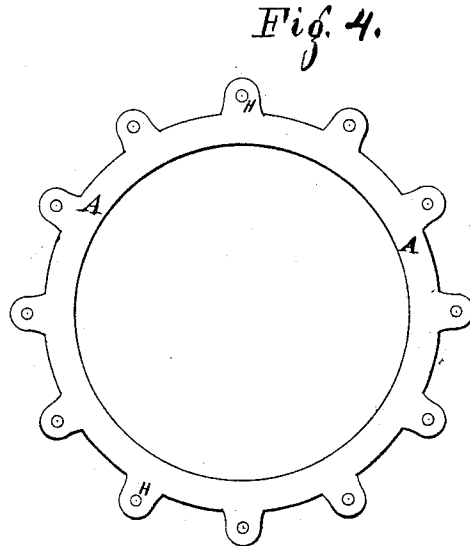


H. S. MAXIM.
Dynamó-Electric Machine.

No. 228,544.

Patented June 8, 1880.



Witnesses;
John Ferguson.
Samuel Maxim

Inventor;
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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 228,544, dated June 8, 1880.

Application filed May 7, 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 useful Improvements in Armatures for Dynamo-Magneto-Electric Machines, of which the following is a specification, reference being had to the accompanying drawings, which form a part thereof.

10 My invention relates to the revolving armature or bobbin of a magneto-electric machine; and it consists in forming such armature of a series of peculiarly-shaped plates or rings fastened together by pins and washers
15 in such a way that all parts of the armature and coils are open to a free circulation of air.

Armatures as heretofore constructed are liable to become very highly heated from the rapid changes of polarity of the parts and from
20 the resistance of the coils, and such heating is very injurious to the machine, as it destroys the insulation of the wire.

My improvement is designed to obviate this difficulty by exposing the different parts of
25 the armature and the coils on all sides to a rapid circulation of air, so that the heat generated may at once pass off. Attempts have hitherto been made to accomplish this result by boring holes in the armature, by making
30 the shaft of the machine hollow, with a draft of air through it, and by fans and other devices; but all have worked imperfectly. The holes destroy the continuity of the ring, and do not expose surface enough, and the hollow shaft
35 does not give room enough for sufficient volume of air, while the fans, acting by centrifugal force, throw out the cold air and retain the hot on account of the difference in weight.

In my improved armature the parts are so
40 divided and arranged that there is no considerable volume of iron or wire at any place without a passage-way for air about or through it.

In the drawings, Figure 1 is a longitudinal section of an armature constructed in accordance with my improvement, taken through the
45 same at the line X Y. Fig. 2 is a transverse section of the same perpendicular to the axis. Fig. 3 is a ring or plate of the armature of the larger form used; and Fig. 4 is a ring or plate
50 of the smaller form, as hereinafter described.

I usually construct the body of the armature of thin plates of iron, of the form shown in Fig. 4 and at A in Fig. 2. These plates should be of the best annealed iron, and are provided with a series of lodial projections, 55 which serve as pole-extensions. Part of the plates of the armature are made of the form shown in Fig. 3 and at B in Fig. 2. These are provided with longer projections, corresponding to the lodial projections of the other 60 plates, and also with additional projections, both on the outside and on the inside, for the purpose of holding the wire of the coils in position. An armature is constructed by placing a sufficient number of plates alongside of each 65 other and fastening them together by means of pins or rods H H, made of some diamagnetic material, passing through all the plates, as shown in Fig. 1. The plates, however, are not placed directly in contact with each other, 70 but are separated by washers upon the rods H H, of about the thickness of the plates, and interposed between them or between pairs of them, as shown in the lower part of Fig. 1.

Where the tension of the current is very 75 great, as in machines for supplying electric lamps, I prefer to make the larger plates of some strong insulating material and to use a few of them—say one at each end and one in the middle—and they may be made to project 80 so as to keep the wire at some little distance from the iron and prevent all danger of a short circuit. Where a current of low tension is required I prefer to make all the rings of iron, and it is advantageous under some circumstances to use more of the larger rings, or even 85 to construct the whole armature of them.

The manner of winding the coils is shown in Figs. 1 and 2, where C represents the part of the coil inside of the armature, and D the 90 part outside, held in position by the projections on the large plates B.

The armature is attached to its shaft by means of a hub, with spokes fitting into recesses in the rings, or by any other suitable 95 device.

It is important, however, that the space between the armature and its shaft should be left substantially open, so as to permit the free ingress of air, and a sufficient number of 100

the plates shown at B, having the larger exterior and interior projections, should be used to keep the coils separated throughout their entire course, so as to leave an open passage for air between them.

In order to secure the greatest advantages from this construction, the plates composing the armature should be made thin and a considerable number of them used.

To obviate a sharp bend at the end of the coil, and the consequent injury to the insulation and increase of resistance, I construct the end rings of the cylinder of half-round iron, as shown at G in Fig. 1. This presents an easy curve for the wire at all points.

In other respects than those mentioned my armature is similar in construction and operation to those which are now well known and in common use.

Its particular mode of operation as regards the prevention of heating is as follows: Upon rapid rotation of the armature the air contained in the interstices of the armature and coils is rapidly thrown out by its centrifugal force, and fresh cool air constantly flows in at the open ends of the cylinder, as shown by the arrows in Fig. 1, to take its place. The air not only moves radially through the armature, but is made to move around the circle and impinge upon all sides of the different parts and carry away their heat.

I am aware that solid armatures have been heretofore constructed with the coils wound in grooves or recesses cut in the metal, as shown in Letters Patent No. 189,997, granted to Charles F. Brush, April 24, 1877, and that grooves and perforations of various forms have been made in armatures, both to break up the induced currents and to provide a longer surface for the radiation of heat, as shown in Letters Patent No. 203,413, granted to said Brush, May 7, 1878; and that armatures have also been constructed of a series of disks hung parallel to each other upon a central hollow shaft, and separated from each other by collars, and having air-spaces between them, into which air may be introduced through the hollow shaft, as shown in Letters Patent No. 209,532, granted to Edward Weston, October 29, 1878. I am also aware that solid cores for armatures have been heretofore constructed with rounded ends, as shown in Letters Patent No. 120,057, granted to Gramme and D'Ivernois, October 17, 1871, and that a hollow cylinder or annulus composed of paper or other non-conducting substance has been used as a carrier for the coils of an armature, in connection with an interior electro-magnet, as shown in Let-

ters Patent No. 209,094, granted to Edward Weston, October 15, 1878; and I do not claim to have invented any of such constructions or combinations of the parts of an armature.

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

1. An armature for a dynamo-magneto-electric machine, composed of a series of annular plates separated by air-passages from each other and from the armature-shaft, the said plates having outer and inner projections, so constructed as to keep the coils separated from each other and leave air-passages between them, substantially as described.

2. An armature for a dynamo-magneto-electric machine, composed of a series of thin annular plates separated by air-passages from each other and from the armature-shaft, a part of said plates being of the form shown at A, and the remainder being of the form shown at B, substantially as described.

3. In an armature for a dynamo-magneto-electric machine, composed of annular plates with air-passages between them, projections upon both the outer and inner circumferences of such plates, so constructed as to keep the coils separated from each other and leave air-passages between them, substantially as described.

4. The combination, in a dynamo-magneto-electric machine, of one or more of the coils C with an armature composed of a series of annular plates separated by air-passages from each other and from the armature-shaft, the said plates or a part of them having outer and inner projections, so constructed as to keep the said coils separated from each other and leave air-passages between them, substantially as described.

5. In an armature composed of disks or annular plates, the combination, with such plates, of two or more similarly-shaped plates of insulating material, so constructed as to project slightly beyond said metallic parts and support the coils free from contact therewith, substantially as described.

6. The combination, in an armature, of two or more annular plates, open about the armature-shaft and having inner and outer projections to keep the coils separated from each other, with the rods H H and washers on said rods, interposed between the plates, substantially as described.

HIRAM S. MAXIM.

Witnesses:

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