(No Model.)

E. A. SPERRY.

ARMATURE FOR DYNAMO ELECTRIC MACHINES.

No. 261,965. Patented Aug. 1, 1882.

Fig. 1.

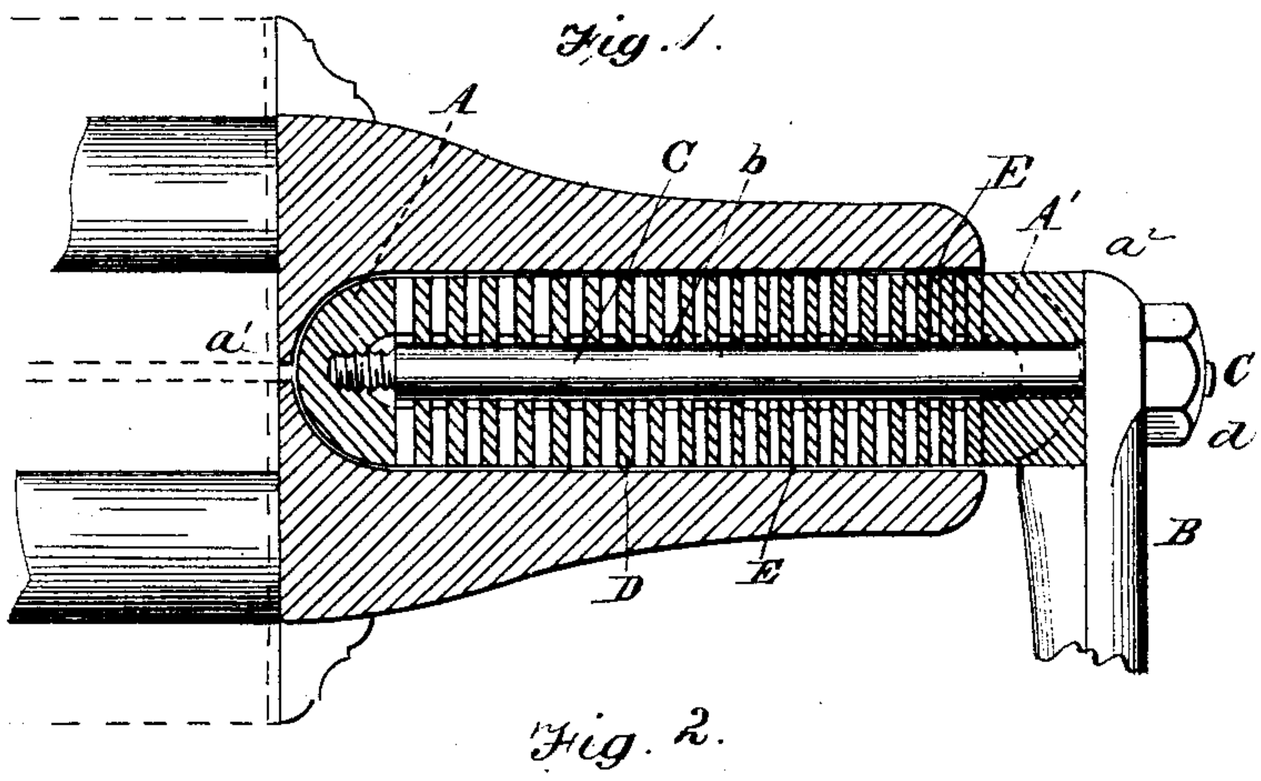


Fig. 2.

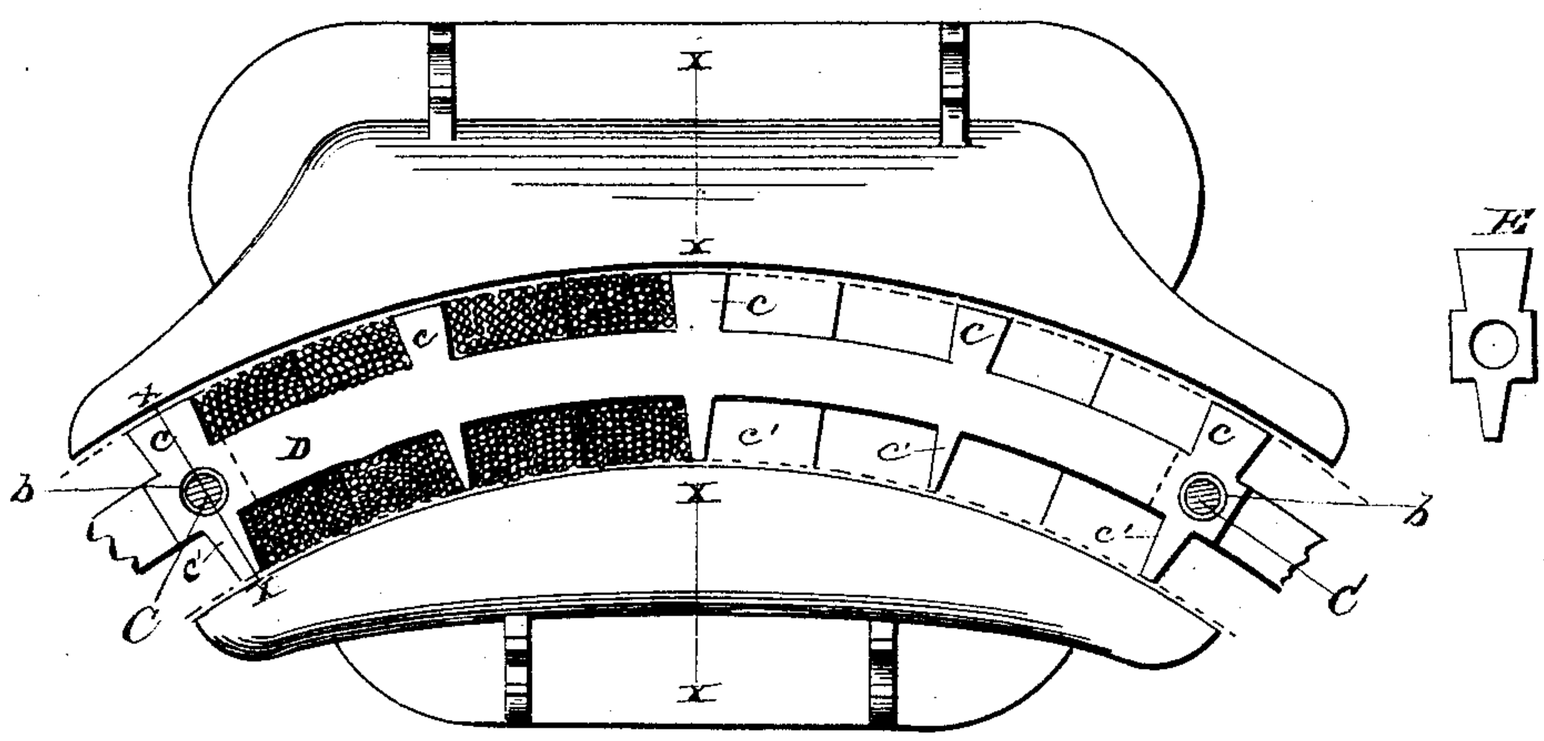
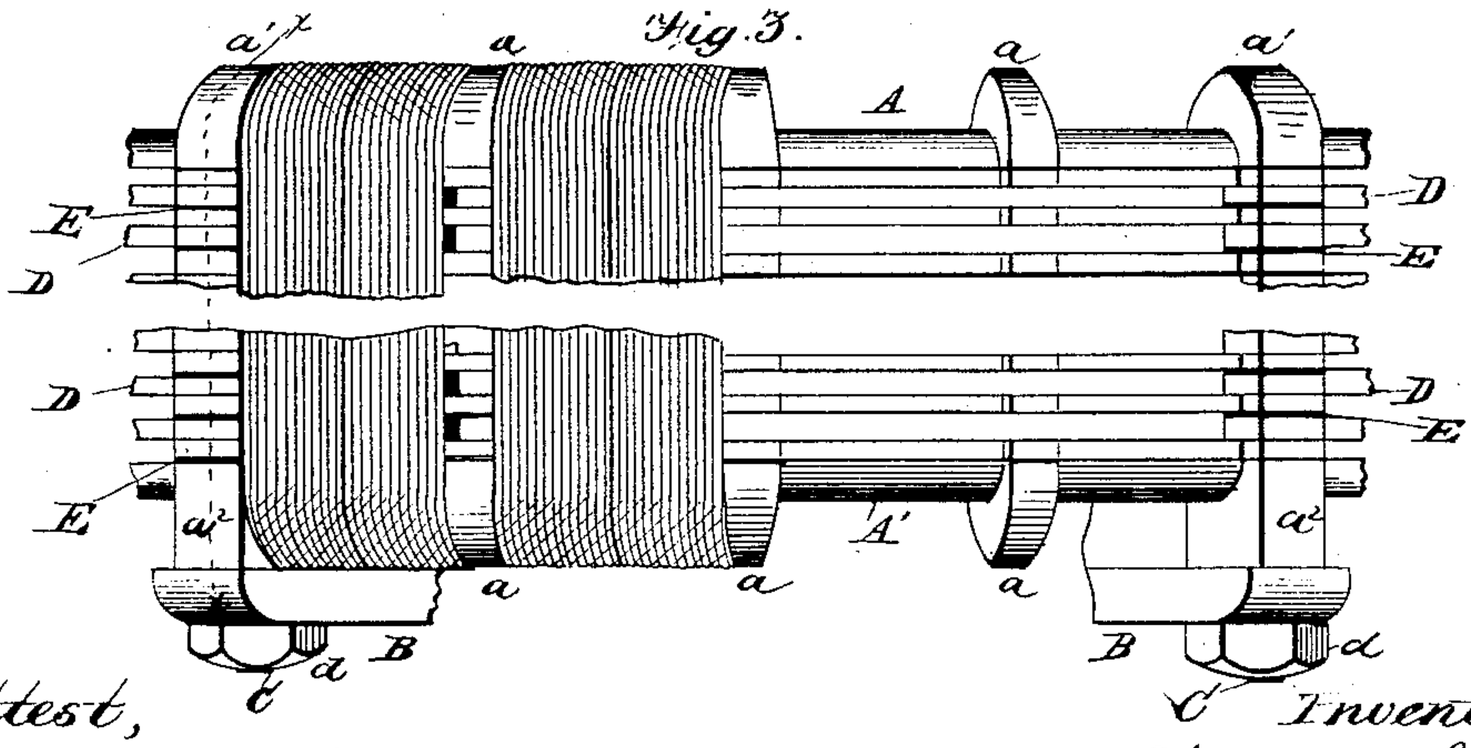


Fig. 3.



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ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 261,965, dated August 1, 1882.

Application filed October 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Cortland, in the county of Cortland and State of New York, have invented certain new and useful Improvements in Armatures for Electric Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to that class of electric machines in which the Pacinotti or ring armature is used, and particularly to the armature of such machines; and it consists, first, in so constructing the armature, which has its greatest dimension of cross-section parallel with its axis, as to present its interior and exterior surfaces, together with one extremity, to the pole-pieces of the field-magnets, the other extremity being used for attachment to the shaft; second, in an arrangement of such armature which provides equal parallelogrammatic or rectangular spaces for the reception of the wire, both interior and exterior to the core; and, third, in constructing said armature of segments of thin sheet metal bearing projections, and mounted on insulated rods which are used to secure the armature to the shaft, said segments being insulated from each other in a novel manner hereinafter to be described.

In the drawings, Figure 1 represents a transverse section of a portion of the armature and pole-pieces of the field-magnets. Fig. 2 is a longitudinal section through a portion of the armature, partially wound, showing form of the sheet-metal segments of which it is composed, and also showing a portion of the field-magnets. Fig. 3 is a lateral perspective view of a portion of the armature, also partially wound, like parts being indicated by similar letters.

In employing the common form of annular armature in a machine in which the pole-pieces of the field-magnets are presented both interior and exterior and to the free extremity of the armature I have encountered certain difficulties. The wire which is wound on the core, covering a given angle on its exterior, is compelled to occupy the same angle along its lesser internal surface, which causes it to "pile up," giving a greater depth of coil interior than exterior. This compels the internal pole-piece to be separated from the armature-core by much greater distance than the one external, with correspondingly-diminished effects. This defect I remedy by constructing the armature with rectangular recesses for the reception of the wire, which are equal on opposite sides of the core. These are formed by providing the the latter with projections interior and exterior, whose sides are parallel with a radius of the armature drawn from the central point of the coil, as shown in the figures. (See Fig. 2.)

The armature is constructed substantially as shown in the drawings.

A A′ are rings, preferably of soft cast-iron, cast originally together, for convenience, in sections of oblate or approximately-circular cross-sections; but after the sections are split each half has the cross-section of a true semicircle with twenty-four equidistant semicircular projections or flanges, *a a*, every fourth one being larger, *a′ a′*, and these on the front casting, A′, are left with a square face, a^2 a^2, for the contact of the supporting-arms B.

Transversely through the rings A and A′, and extending through the six larger projections or flanges, are formed apertures to receive the metal rods C, as shown in Fig. 1. In building up the core of the armature the rods C have one end secured firmly in the ring A, and they are then surrounded with mica or other good insulating material, as shown at *b b*, and are then ready for the reception of the segments D. These segments are composed preferably of thin sheet-iron well annealed, and each has on its convex edge five projections, *c c c c c*, which increase in width outwardly, and on its concave edge five projections, *c′ c′ c′ c′ c′*, decreasing in width toward their extremities, and having their side edges in line with the side edges of the outer projections, so that the edges of each projection are parallel with those of the projections on each side of it. Each segment is perforated near its extremities to receive the rods C, which project from the ring A. Three of these segments are first placed upon the rods—that is, each upon a separate pair of rods—with their ends

separated by equal spaces, each space being a little less than sixty degrees of the circle. Then three other segments are placed upon the rods to bridge these spaces—that is, the opposite ends of each are placed upon two rods, which support the adjacent ends of two of the first three segments and overlap the ends of said segments, as shown in Fig. 2, in metallic contact, so that a complete metallic circle is thus formed. Before any more segments are placed in position a piece of insulating material, E, preferably mica, the shape of which can be seen in the figure, is slipped on each rod and six other segments placed in position, overlapping each other in metallic contact, as described. Other insulating pieces E are then slipped over the rods and the operation repeated until the required depth of armature is secured, when the ring A′ is placed in position as shown, and all are held firmly in place by means of pressure exerted by nuts *d d*. The walls and floor of the rectangular spaces are then fitted with mica or other good non-conducting material, and the armature is ready for winding.

The advantages of an armature constructed as described are obvious. The mass of the core being finely divided, it is capable of receiving and parting with a heavy charge from the field-magnets more instantaneously, which reduces the "magnetic inertia" of the armature to a minimum; also, the segments being in metallic contact with each other circumferentially and isolated laterally, the induction of currents in the mass of metal forming the core is entirely prevented, thus eliminating the principal source of heat and waste of power in such armatures. Moreover, the lapping of the ends, together with the insulating-pieces E, form spaces between the segments laterally, which increases the heat-radiating surface of the armature and favors the dissipation of such heat as is acquired by the rapidly-changing magnetism and resistance of the coils while in service.

I do not limit myself to the method of insulating the segments in pairs, as described. Two or more rings can be formed of the segments and insulated in groups; but in every case the segments, by metallic contact, must form an endless circuit in line of circumference and be thoroughly insulated laterally. Non-magnetic rods can be used in place of the insulated rods C; but the latter are preferred. In some cases it is preferable to make the ring A′ of non-magnetic material, as its mass, when of metal, increases the magnetic inertia of the armature as a whole more than is warranted by the efficiency gained. Segments are much superior to a continuous ring in point of losing magnetism more quickly, absence of contortion while annealing, and great difference in actual cost.

The armature shown supports forty-eight coils, two in each rectangular recess, as shown, and the field-magnets are presented preferably at four equidistant points both interior and exterior, and to the free extremity of the armature. This latter arrangement, which is more fully described in a previous application, is one of great importance, as it more than doubles the efficiency of its wire as compared with that of the usual form of Pacinotti machines. In the former something like eighty-six per cent. of the wire is efficient as compared with thirty-six per cent. and less in machines presenting pole-pieces exterior only.

I am aware that it is not new to construct an annular armature of segments or to provide depressions for the reception of the wire; but the distinction between this invention and any other prior to it of which I am aware consists in part in so disposing the segments as to make endless circuits circumferentially, which are thoroughly insulated from each other laterally, and in forming parallelogrammatic or rectangular depressions for the reception of the wire on the internal which are identical with those on the external surface.

What I claim is—

1. An annular armature constructed of segments of thin sheet metal, overlapping at their extremities and supported by rods secured to outer continuous rings, said segments being connected by metallic contact in continuous circuits in line of magnetic axis or circumference and insulated in groups from each other laterally or at right angles to said magnetic axis, substantially as and for the purpose set forth.

2. An annular armature for an electric machine, constructed of segments of thin sheet metal, overlapping at their extremities in metallic contact, disposed between continuous rings on either lateral edge, said segments bearing projections on their internal and external edges of equal radial length, which are of such form as to leave rectangular depressions on opposite sides of the core which are equal in shape and capacity, substantially as and for the purpose shown.

3. The combination, with the projections or arms of the armature-shaft and the armature having the core composed of the segments and the rings A A′, of the insulated rods C, fixed in the first-named rings, passing through the latter, and having one end only fixed to the projections of the shaft, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ELMER A. SPERRY.

Witnesses:
JOHN W. SUGGETT,
M. STANLEY BIERCE.