

(No Model.)

H. F. T. ERBEN.

ARMATURE FOR DYNAMO ELECTRIC MACHINES.

No. 520,773.

Patented June 5, 1894.

FIG. 1.

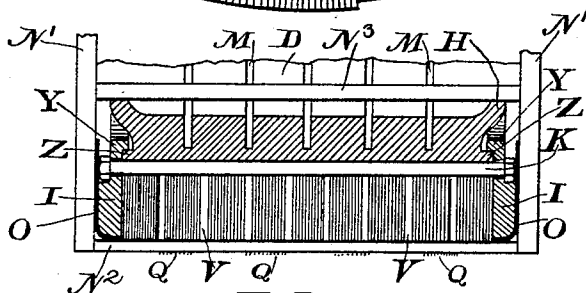
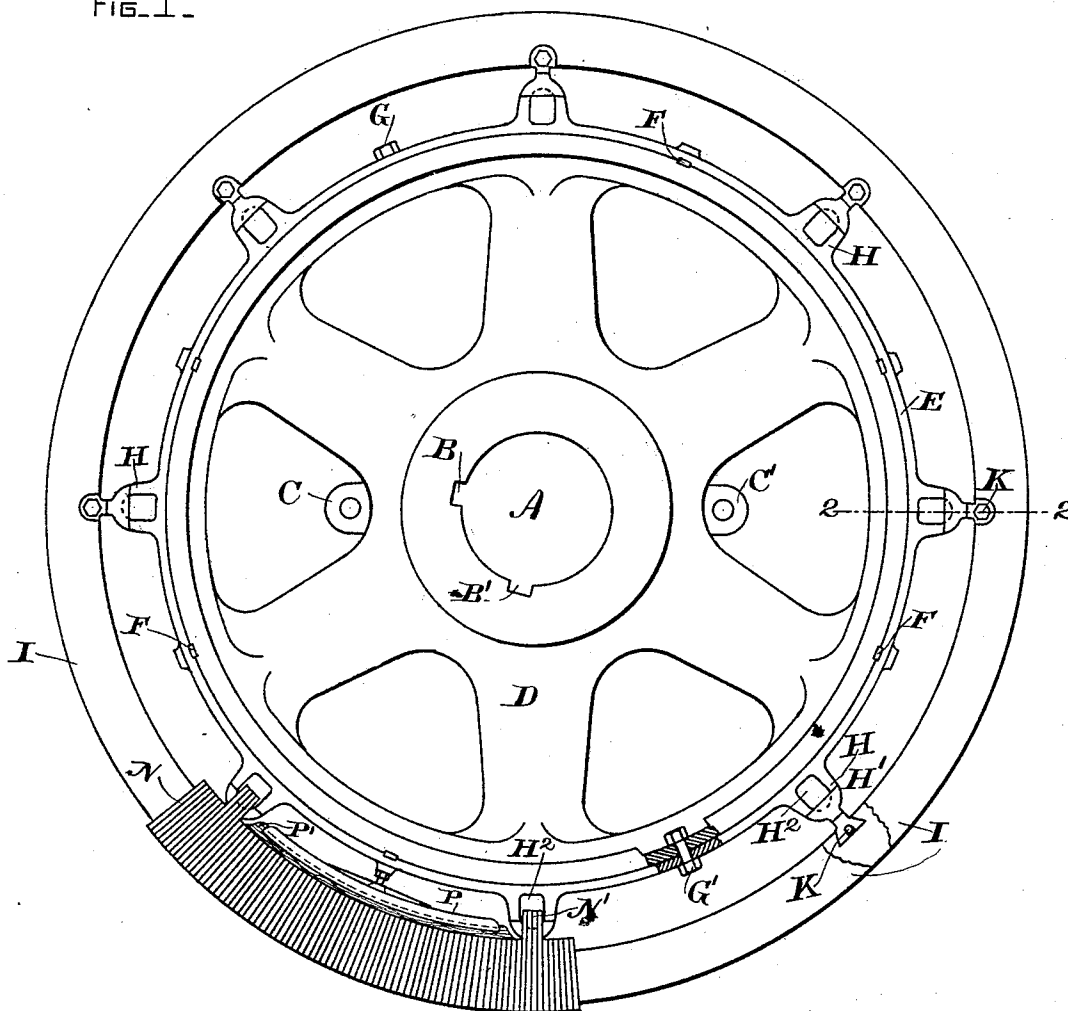


FIG. 2.

WITNESSES.

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INVENTOR-

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UNITED STATES PATENT OFFICE.

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ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 520,773, dated June 5, 1894.

Application filed February 9, 1894. Serial No. 499,607. (No model.)

To all whom it may concern:

Be it known that I, HERMANN F. T. ERBEN, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Armatures for Dynamo-Electric Machines, of which the following is a specification.

My invention relates to armatures for dynamo-electric machines, and particularly to those designed for the generation of large currents in a modern direct-driven, multipolar generator; and has for its object to provide efficient ventilation, a strong mechanical construction, a means of leading the large conductors used in such armatures around the spider arms without the complication which has hitherto been found necessary to preserve the strength of the spider, and efficient means of clamping the laminations of the core in place, which make the whole structure firm and solid and adapted for rotation at high speed without danger to the machine.

The improvements which I have devised have particular reference to armatures having side-bearing commutators, in which the conductors of the armature form the segments of the commutator; but I do not mean to limit myself in this particular, inasmuch as the brushes may be located between the projecting pole pieces and have a bearing upon the cylindrical face of the armature, if this be desired by the constructor, or the armature-coils may be connected to a separate commutator or otherwise arranged in any preferred manner. I have however found the constructions described and claimed herein particularly desirable in armatures having commutators of the type indicated.

In armatures as heretofore constructed, the core-disks have been secured in place by means of bolts passing directly through and insulated from them. The construction has been found objectionable because if the bolts become uninsulated in any way they form current paths, as they pass directly through the field, and become heated; they are also liable to become thus uninsulated because by reason of their length they are apt to spring when the armature is rotated, thus allowing the core-disks to work back and forth and

affect the insulation. To obviate this I have adopted the improved construction herein illustrated. A further fault with the armatures heretofore constructed has been the lack of ventilation, and this I obviate by separating the laminations of the core into groups with ventilating spaces between them. The spider also has been a source of heating by reason of eddy currents formed in it, and this is obviated in my improved construction by splitting the spider-arms into a number of parts by cores placed in the mold when casting. To attain the ends pointed out, the spider-arms are formed with a dove-tail upon their ends, and a similar slot is cut in the laminations of the core, these laminations being then slipped on the dove-tailed spider; when a few of these have been put in place, a sheet having a separator upon it is adjusted in place and the next group of laminations is formed, the groups being separated by such a distance as the engineer may select as sufficient for the purposes of ventilation. End-rings are then put upon the spider, the ring having fingers engaging with the arms of the spider, and bolts are passed through the end rings, and through the channel formed in the dove-tailed part of the spider-arm, which when secured in place securely lock the core and end rings together, forming a rigid structure not liable to be distorted by centrifugal action. The bolts are of course insulated so as to prevent heating.

In the accompanying drawings hereby referred to and made part of this specification, like letters denote the same part throughout; and therein Figure 1 is a side elevation and Fig. 2 a section upon the line 2—2 of Fig. 1 of an armature constructed according to my invention. D is the pulley upon which the armature is carried; A is the shaft hole; B, B' are the key ways securing the pulley to the shaft; C, C' are lugs or ears by which the pulley is conveniently handled; this pulley may be, if preferred, constructed in sections which are secured together either before or after placing them upon the shaft, as commonly practiced in large wheels, or it may be formed in a single casting, the particular construction being immaterial.

E is the improved spider which I have de-

vised, consisting of a cylinder of some diamagnetic metal, preferably such as is well known to be proper for an armature spider by those acquainted with the art. To assemble these parts the pulley face is turned true and the cylindrical spider is shrunk upon the face of the pulley, the key-ways being machined in the face of the pulley to fit the keys F, F; the bolts G, G' prevent longitudinal creeping of the armature upon the pulley face, one of them being shown best at G' where the pulley and the edge of the spider are broken away.

H, H, &c., are the projecting arms of the cylindrical spider, which engage, as already described, with end-rings, I, I. At H' a portion of the end-ring I is broken away and the head of the bolt K removed in order to show its arrangement within the dove-tailed end of the projecting arm H.

At N are shown the armature conductors which form the commutator face, while at N' are shown the conductors or segments of greater length than those at N, which serve to engage with the back part of the coil or armature conductor passing through a perforation H² of the spider arm. The arrangement of these conductors will be more clearly understood from Fig. 2, wherein N', N' are the longer commutator segments just described, while N² shows the armature bars upon the face of the armature, and N³ shows the back portion of the armature coil.

M, M are the spaces formed in the spider arm serving to break up the eddy currents, as already described, while V, V are the ventilating spaces formed by the separators between the core disks.

At O, O insulation necessary to separate the armature conductors and other parts from the core disks is indicated, as commonly practiced.

In order to preserve in place the inner conductors of the armature passing between the spider and the core disks, I provide at P, P' a clamping device such as that described in the patent to E. W. Rice, Jr., No. 455,887, consisting of an iron shoe having an adjusting screw with lock-nuts bearing upon one face of the shoe and upon the pulley-face or spider; between the shoe and the armature conductors I insert a block of wood P' serving to prevent abrasion of the insulation.

The armature as thus constructed I prefer to wind with a compound multiple winding, such as is described in the application of Henry G. Reist, Serial No. 485,596, filed September 16, 1893; by the use of the winding therein described I am able to enlarge the ventilating spaces in the back of the armature and in its face so that it is possible to keep it thoroughly cool while running. For this purpose I may insert between the armature conductors upon the face of the armature and upon its back small wedges or blocks serving to separate the conductors; such wedges are placed where they will not ob-

struct the circulation of air through the ducts V, V between the laminations of the core, and they are held in place upon the outer face of the armature by the binding wires Q, Q, and upon its inner part by the shoe just described.

Referring again to Fig. 2, I show how the end-rings I, I engage with the spider arms H, they being formed with fingers Y, Y engaging with notches or lugs Z, Z, upon the spider arm.

By the construction illustrated and described I obviate some of the difficulties attendant upon the construction of large armatures and avoid the complicated arrangements, such as those illustrated in the patent to Emil Kolben, No. 491,568, employed to get the armature conductors around the spider without weakening the arm so that it cannot safely carry the weight of the armature, at the same time so simplifying the construction that I may wind the armature in any preferred manner.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an armature for a dynamo-electric machine, a spider having arms extending therefrom adapted to engage the core-disks, such arms provided with an opening, in combination with conductors passing through such opening, and commutator segments connected to such conductors.

2. In an armature for a dynamo-electric machine wherein the armature conductors form the segments of the commutator, a spider having perforated arms through which such armature conductors may extend, and commutator segments formed of the armature conductors, as described, such segments being of various lengths, and adapted to engage both with the conductors passing through the perforations in the spider-arms and with the other conductors of the armature passing between the spider and the core-disks.

3. In an armature for a dynamo-electric machine wherein the armature conductors form the segments of the commutator, a spider having perforated arms, such arms having dove-tailed ends, core-disks engaging with the dove-tailed ends of the arms, end-plates also engaged by the spider-arms, and insulated bolts securing the end-plates and the spider arms together and arranged to compress the core-disks in place.

4. In an armature for a dynamo-electric machine, a spider having perforated arms, such arms being formed with a dove-tailed end, core-disks having ventilating spaces between them, end-plates adapted to engage with the spider-arms, and an insulated bolt in a channel cut in the end of the spider-arm; all arranged and adapted as herein described, to compress the core-disks and end-plates securely in place.

5. In an armature for a dynamo-electric machine, a spider having perforated arms, the ends of the arms being dove-tailed in shape, core-disks having ventilating spaces between them, end-rings arranged to engage

with the spider-arms, bolts insulated from the spider-arms arranged in a groove in their dove-tailed ends and adapted to compress the end-plates and the laminations of the core, armature conductors passing respectively between the spider and the core-disks and through the perforations in the spider-arms, and commutator segments of different lengths adapted to engage with the armature conduc-

tors passing respectively through the perforated arms of the spider and between the spider and the core-disks.

In witness whereof I have hereunto set my hand this 6th day of February, 1894.

HERMANN F. T. ERBEN.

Witnesses:

O. R. CLARK,

ARTHUR CHURCHILL.