(No Model.)

S. H. SHORT.

FIELD MAGNET FOR DYNAMO ELECTRIC MACHINES.

No. 587,869. Patented Aug. 10, 1897.

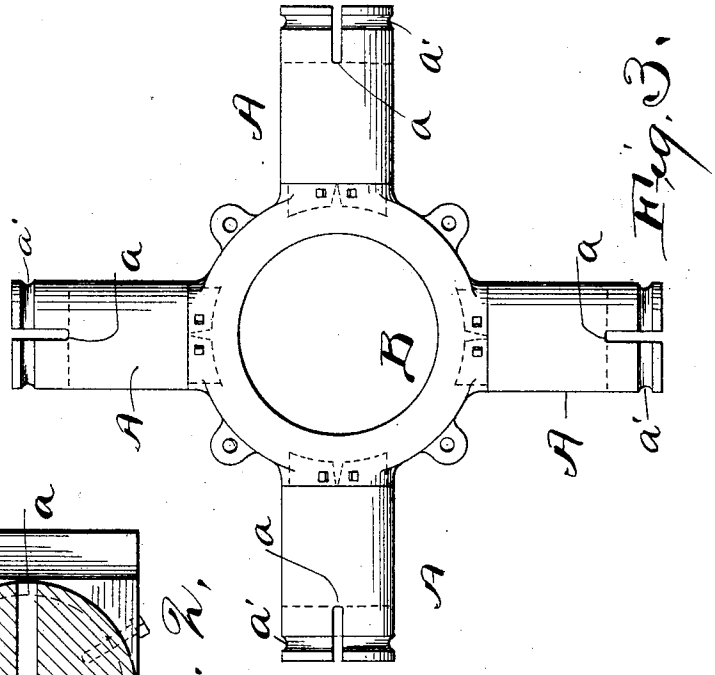


Fig. 3.

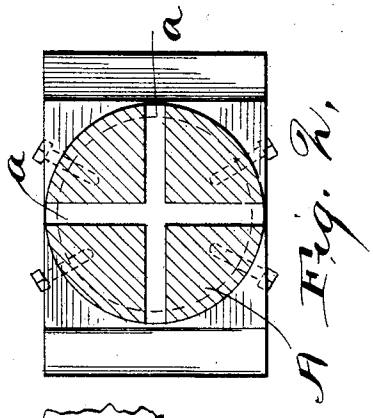


Fig. 2.

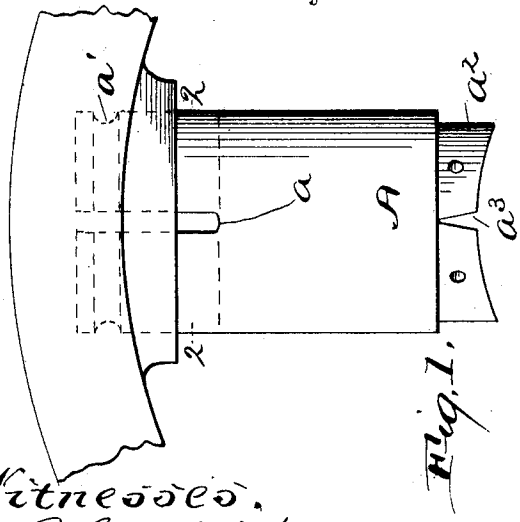


Fig. 1.

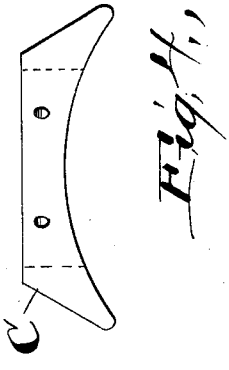


Fig. 4.

Witnesses.
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FIELD-MAGNET FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 587,869, dated August 10, 1897.

Application filed March 12, 1897. Serial No. 627,168. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY H. SHORT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Field-Magnets for Dynamo-Electric Machinery and the Process of Constructing the Same; 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.

My invention is for field-magnets for dynamo-electric machinery and for the process of constructing the same.

The invention is adapted especially to multipolar machines in which the magnet-cores project from a yoke. Its object is to provide means for securing solid cores to a cast-iron yoke which shall be economical and efficient—means which shall provide sufficient contact between a core and the yoke to prevent the lines of force being pinched at the junction.

The invention includes other advantages hereinafter set forth.

Heretofore it has been customary in this class of machines to cast the yoke and magnet-cores separately and finish the end of the core and the correlative face of the yoke and bolt the two together. This finishing and bolting has been expensive, and, moreover, if a cast-iron yoke was used it had to be so large to carry the requisite number of lines of force that a great deal of copper was necessarily used in winding it, while, on the other hand, if a steel core was used (which, being of lower reluctance, need be of only about half the section of an iron core) the lines of force were pinched at the junction with the cast-iron yoke, cast-iron being required for the yoke in order that it be at once rigid and economical. Thus in either case the efficiency was diminished. It has also been customary to punch out laminations of sheet-steel and build up the core with a large number of them. The core thus built up has been placed in a mold and the yoke cast about the end of the core, the laminations yielding sufficiently to prevent straining the yoke as it contracts in cooling. This process of punching the laminations and the subsequent building up is likewise expensive. Not only that, but the only shape that can be thus conveniently or practically given to the core is that of a rectangular parallelopiped, while a cylindrical form is the most convenient to wind, as well as the most economical, since a given length of wire incloses more area when in the shape of a circle than in any other form.

Were it attempted to make the magnet-core of a simple solid piece of cast-steel and cast the yoke about it, the strains caused by the contraction of the yoke in cooling would disrupt the yoke.

My invention allows the yoke to be cast without straining around previously-cast magnet-cores, thus saving the expense of building up the cores or of bolting them to the yoke, while sufficient contact is presented to prevent pinching the lines of force.

It consists as a process in the combination of steps hereinafter particularly set forth, and specified in the claims.

It also consists in a field-magnet formed as described and claimed.

The drawings clearly illustrate my invention.

Figure 1 is an elevation of a magnet-core and a portion of the yoke, and Fig. 2 is a transverse section of the magnet-core on the line 2 2 of Fig. 1. Fig. 3 is a plan view of several magnet-cores held at their upper ends by a jig preparatory to casting the yoke. Fig. 4 is an elevation of a pole-piece adapted to be attached to the end of the magnet-core shown in Fig. 1.

The magnet-core A is first formed, being preferably cast of steel. It has slots *a a* intersecting each other and extending from one end well into the core. I have shown two of these slots intersecting at right angles. In very large cores, however, it may be desirable to have more. A groove *a'* is preferably formed in the core at the time it is made. The cores are then placed and held in the desired relation to each other, the preferred means for thus holding the cores being to bolt the inner ends of said cores to a jig B of about the same diameter of the armature to be used in the machine. The slots *a* are dammed up, preferably by filling them with sand, from their bottom about half-way up to the top. The terminus of this dam is the point where the magnet-core is to join the yoke. The cores are then placed in a mold with their ends beyond the dam projecting into the annular space provided in the mold for the yoke. The yoke is then cast, and thus integral webs of

the yoke are formed between the furcations of the core. In cooling the yoke contracts and compresses these furcated ends of the magnet-cores toward the slots therein. The sand in the slots gives sufficiently to allow this without trouble. The strain is thus removed from the yoke and the magnet-cores are securely held thereto, the grooves a' insuring a secure clasping. The slots in the cores not only allow the casting of the yoke about the cores, but they largely increase the contact between the yoke and cores, and thus prevent pinching the lines of force at the junction.

If desired, the slots may be entirely dammed up with sand. This sand will yield and allow the cast-iron yoke to contract; but since this method does not give so much contact between the yoke and cores as does that first described it is not favored. The magnets in this condition are taken from the mold, the jig removed, the field-spools placed over the cores, and pole-pieces C bolted onto the ends a^2 of the magnet-cores. These pole-pieces cause the magnet-cores to flare and thereby cover more of the armature, and they also hold the field-spools in place. They may, however, be omitted, if desired, and the spools held securely in place by other means. In this state of completion the magnets are placed in a boring-mill and the inner ends of the cores and pole-pieces bored out to fit the armature with just the desired amount of air-gap.

I have shown the magnet-cores cylindrical, and such is the preferable construction, as less wire is required for winding them, though they may be made in any desired shape. Should cores rectangular in section be used, a solid jig might be employed, as it need not embrace the ends of the cores, and the yoke is usually cast in two pieces. This is an immaterial matter, however.

In the pole-face of the core is formed the groove a^3. This groove operates to reduce the drag of the magnet-field in the direction of the rotation of the armature, and thus prevents pinching the lines of force in the air-gap and also reduces the amount of shifting of commutator-brushes required by changes of load in the armature. If desired, there may be several of these grooves instead of one.

Having described my invention, I claim—

1. The process of making field-magnets for dynamo-electric machinery consisting of taking magnet-cores with slots extending from one end, damming said slots with sand or other yielding substance, placing the cores in a mold with the slotted ends projecting into a space provided for the yoke, and casting the yoke in such space whereby the yoke embraces the magnet-cores, and in cooling compresses the cores toward their slots, thus preventing abnormal strains, substantially as described.

2. The process of making field-magnets for dynamo-electric machinery, consisting of taking magnet-cores with intersecting slots extending from one end, placing a dam against the flow of molten metal at an intermediate point in said slots, placing the cores in a mold with the slotted ends beyond the above-mentioned dam projecting into a space provided for the yoke, and casting the yoke in such space whereby the yoke embraces the magnet-cores around the outside and in the slots therein, and in cooling compresses the cores toward their slots, and thus prevents abnormal strains, substantially as specified.

3. The process of making field-magnets for dynamo-electric machinery, consisting of taking magnet-cores having one end furcated, placing a dam against the flow of molten metal at an intermediate point in the slots formed between the furcations, securing the opposite ends of the cores to a jig, placing the same in a mold with the said furcations beyond the above-mentioned dam projecting into a space provided for the yoke, and casting the yoke in such space whereby the yoke embraces the magnet-cores around the outside and in the slots therein, and in cooling compresses the cores toward their slots, and thus prevents abnormal strains, substantially as specified.

4. Field-magnets for dynamo-electric machinery composed of a plurality of solid magnet-cores, each having one end furcated by intersecting slots, combined with a yoke cast about said furcated ends of the magnet-cores, substantially as specified.

5. Field-magnets for dynamo-electric machinery composed of a cast-iron yoke, combined with cast-steel magnet-cores extending into the yoke, said cores being each formed of a solid piece of metal and having furcated ends whereby the contact with the yoke is increased beyond that provided by the outside of the magnet-core, substantially as specified.

6. Field-magnets for dynamo-electric machinery composed of a plurality of magnet-cores each having a furcated end, the furcations being adapted to be pressed together and thereby cause the end to occupy less space, in combination with a yoke surrounding the said furcations and pressing the same toward each other, substantially as specified.

7. In field-magnets for dynamo-electric machinery, the combination of a cast-iron yoke, solid cast-steel magnet-cores having furcated ends which are embedded in the yoke, and pole-shoes fitted to the pole-face ends of said cores, substantially as specified.

8. In a field-magnet, a pole-core having one end furcated by intersecting slots, substantially as specified.

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

SIDNEY H. SHORT.

Witnesses:
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ALBERT H. BATES.