(No Model.)

W. B. ESSON.

ALTERNATING CURRENT DYNAMO.

No. 598,657. Patented Feb. 8, 1898.

Fig. 1

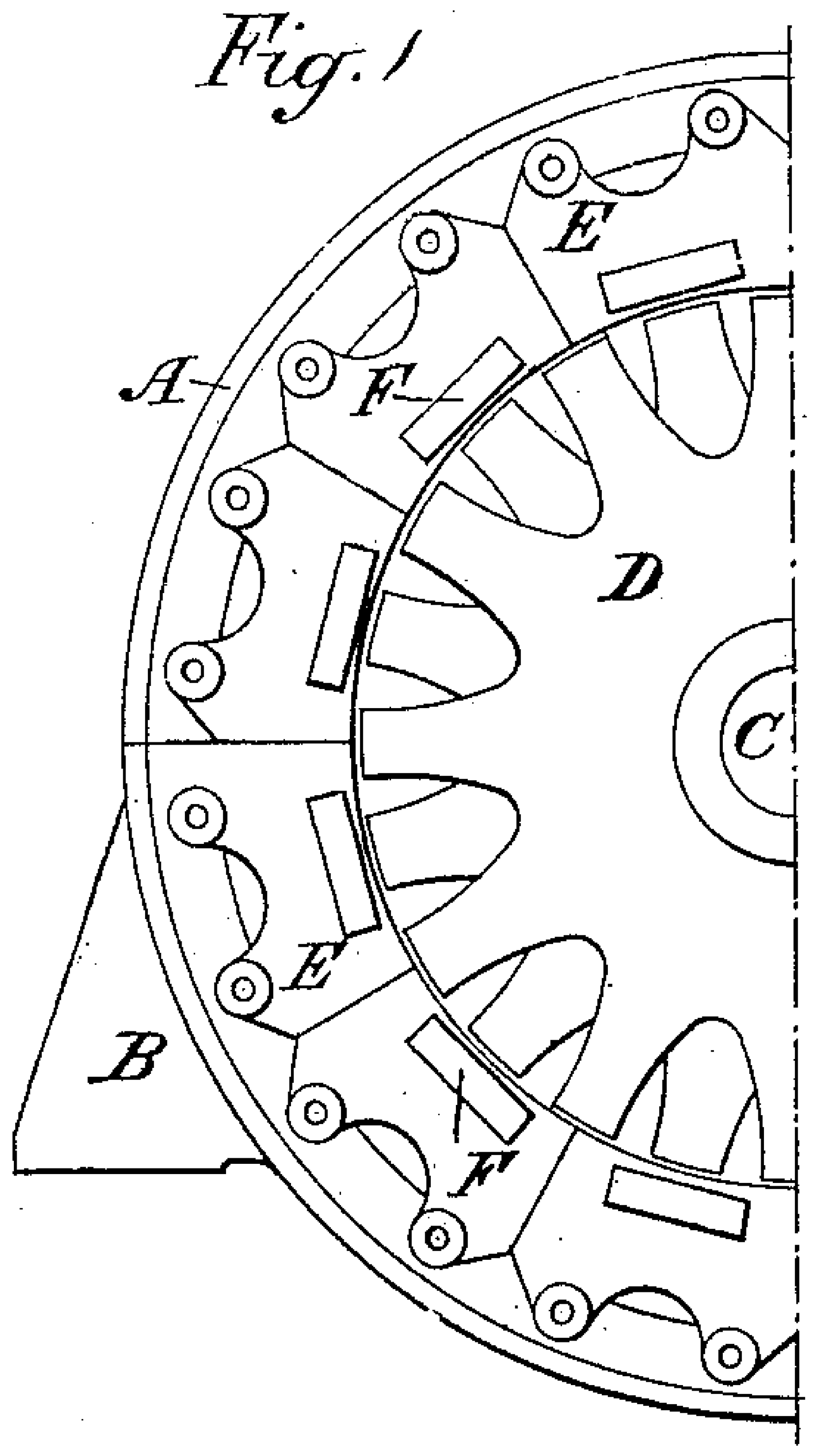


Fig. 3

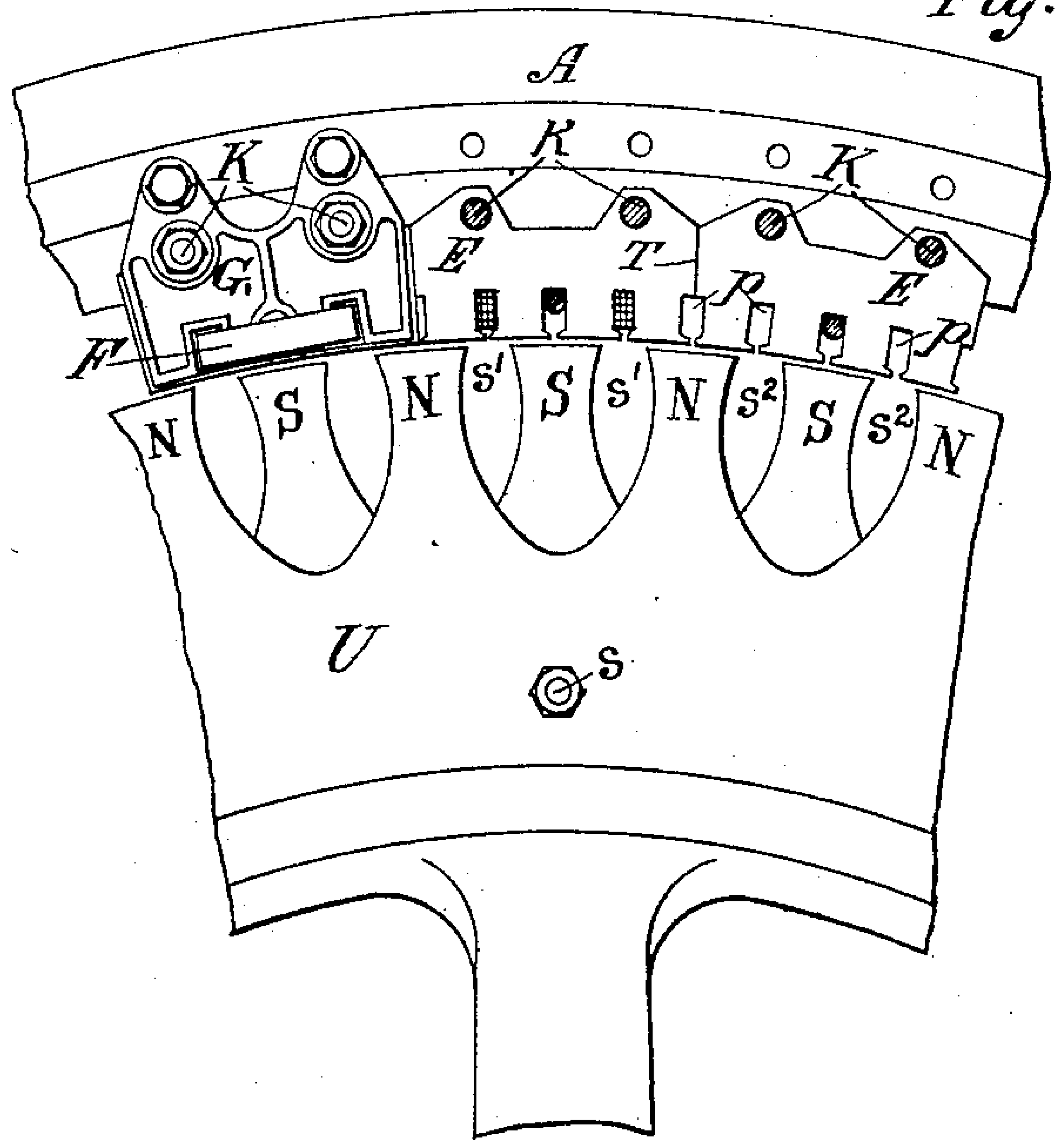


Fig. 4

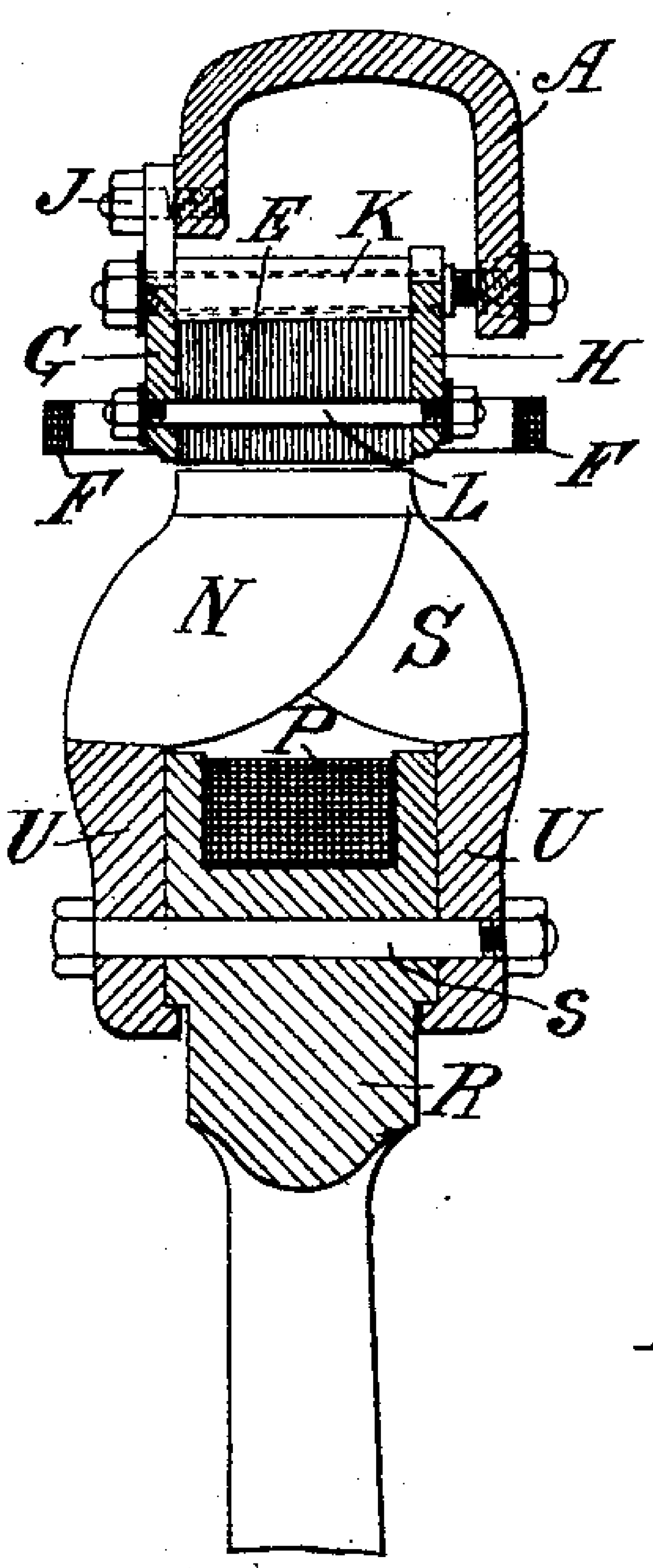


Fig. 6

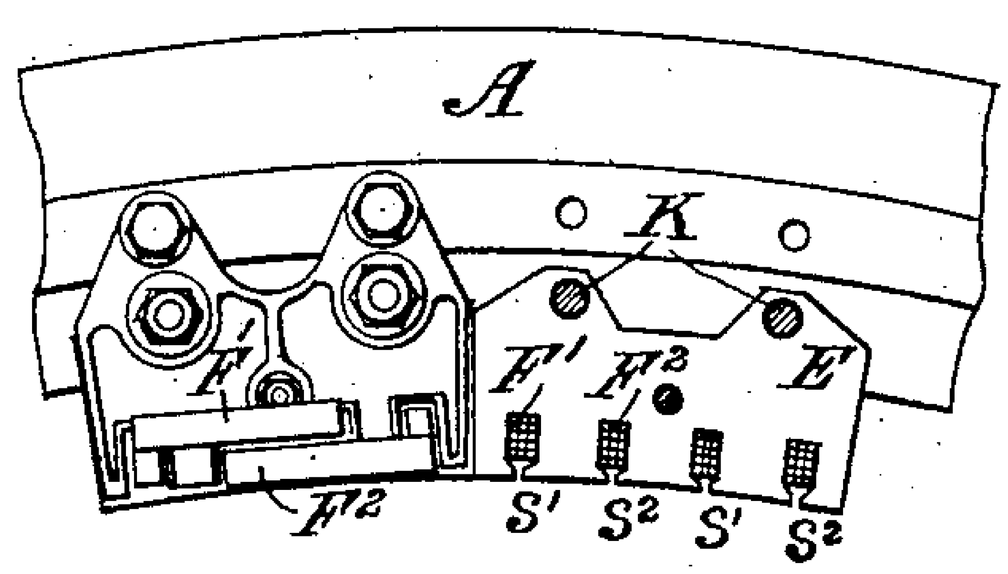


Fig. 2

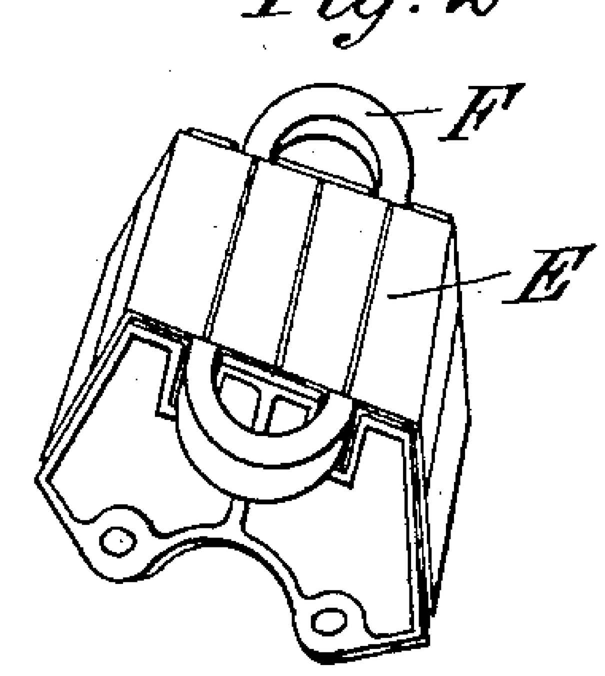


Fig. 5

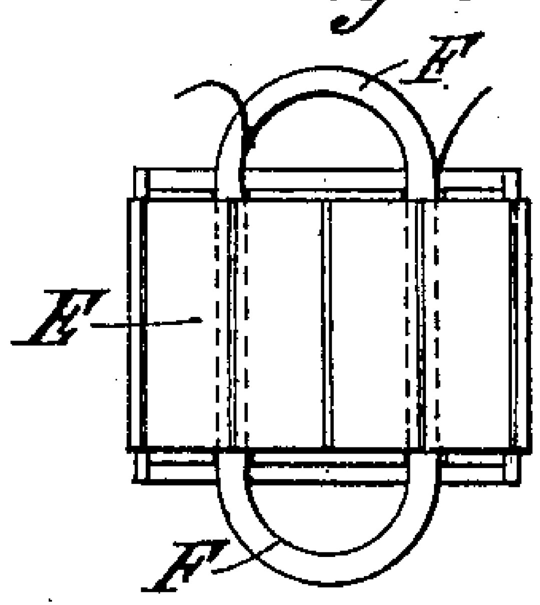


Fig. 7

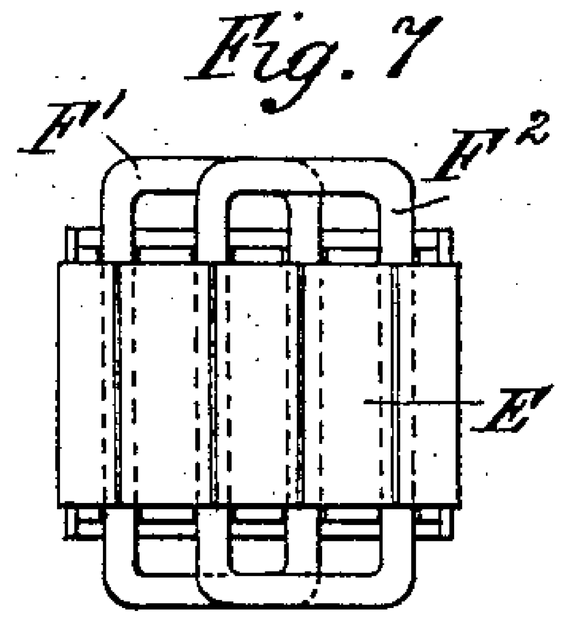
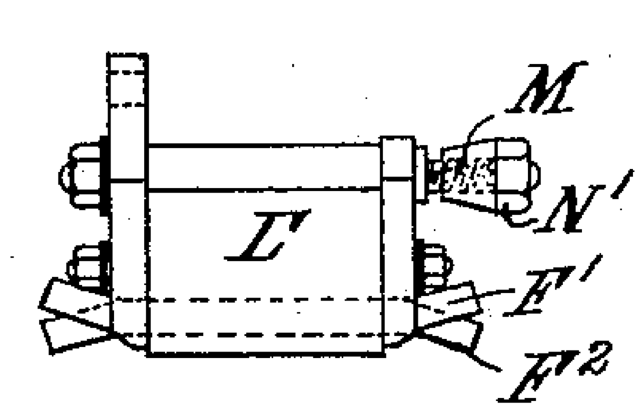


Fig. 8



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UNITED STATES PATENT OFFICE.

WILLIAM BEEDIE ESSON, OF LONDON, ENGLAND.

ALTERNATING-CURRENT DYNAMO.

SPECIFICATION forming part of Letters Patent No. 598,657, dated February 8, 1898.

Application filed April 21, 1896. Serial No. 588,433. (No model.) Patented in England March 25, 1895, No. 6,177.

To all whom it may concern:

Be it known that I, WILLIAM BEEDIE ESSON, a subject of the Queen of Great Britain, and a resident of London, in the county of Middlesex, England, have invented certain new and useful Improvements in Alternating-Current Dynamos, of which the following is a specification, and for which I have obtained Letters Patent in Great Britain, No. 6,177, dated March 25, 1895.

My invention relates to improvements in alternating-current dynamos by means of which certain advantages are obtained.

In constructing an armature according to a part of my present invention I build it up in annular form in the following manner: I take wrought-iron plates cut to a form somewhat resembling a truncated wedge and arrange these side by side and insulated from one another so as to constitute (when bound together in any convenient known manner) what I shall term "core-sections"—that is to say, sections which when put together as I shall hereinafter describe form an annular armature-core. The sections are placed together in such manner that the tapering sides of one section are placed in contact with or in close proximity to the tapering sides of the neighboring sections. Each of the said sections is separate and distinct, so as to be easily detached or otherwise separately handled when desired, and the whole are secured to a framing in any convenient manner. I provide the said sections with armature-coils in the following manner: I embed the coils in tunnels formed in the said sections, the said tunnels being made up of coincident orifices of the separate iron core-plates. The said orifices have cuts extending from them to an edge of the core-plate, so that the latter may be bent aside at the said cuts, then slipped over the previously-formed coil, and then have the bent part or parts straightened into position again. The advantage of an armature-core with a smooth clearing-surface is thus secured. By this means the building up of the armature is greatly facilitated as compared with that method of construction in which the armature-winding has to be threaded through tunnels, and a greater efficiency is obtained as compared with the case wherein the coils are wound over armature-sections.

The number of armature sections and coils which I employ is equal to half the number of the field-magnet poles. By this means great magnetic continuity of the core is obtained and an iron path as little interrupted as possible is secured for the lines of force passing between the poles.

I have hereinbefore spoken of the number of armature-coils being equal to the number of armature-sections. This is the case in monophase and triphase alternators constructed according to my invention, but in the case of diaphase alternators there would be two coils to each section suitably displaced relatively to one another.

For the purpose of diminishing loss due to eddy-currents in the field-magnets I sometimes find it convenient to provide the core-plates with orifices preferably arranged annularly and preferably symmetrically with and similar in size and shape to those hereinbefore mentioned as containing the conductors.

Another method of diminishing loss in the field-magnets due to eddy-currents which I sometimes find it convenient to adopt is to furnish the wrought-iron or soft-steel field-magnet pole-pieces with cast-iron shoes or tips which by reason of their increased electrical resistance offer opposition to the said eddy-currents.

Having now briefly described the nature of my invention, I shall proceed to show how it may be carried into effect, and for that purpose I shall refer to the accompanying sheet of drawings, illustrating a preferred form of my invention.

Figure 1 is a general view of the machine as constructed for single-phase alternating currents, showing the core-sections E E disposed circumferentially and attached to the outer supporting framing or shell A A. The armature-coil appertaining to each core-section is shown at F F. The outer shell is made for convenience in two halves with a horizontal joint, the bottom half being provided with projecting flanges or feet B B for securing the shell to a suitable bed-plate or foundation. D D shows the revolving field-magnet, which is securely keyed to the shaft C. Fig. 2 is a perspective view showing one of the core-sections E with its coil F in position as intended for a single-phase or triple-phase alternator. Fig. 3 shows part in elevation and part in section of an armature and field-magnet, while Fig. 4 shows a cross-section through armature, magnet, and outer shell. Fig. 5 is a plan of one of the core-sections E with its coil F in position. Figs. 6, 7, and 8 show the manner in which the armature-coils are arranged in the core-sections of a two-phase alternator—*i. e.*, a machine giving two alternating currents displaced as regards phase relatively to each other.

The armature-coils I make by winding insulated copper wire, tape, or ribbon on a separate former or dummy. After I remove the coils from this former or dummy I thoroughly insulate them on the exterior by coverings of prepared rubber tape or micanite cloth or other suitable material. To prevent damage while the coils are being embedded in the core-sections, I sometimes cover them additionally with micanite sheet, fiber, ebonite, or other insulating material suitable for the purpose.

When building up a core-section, I embed the armature-coil in it at the same time and in the following manner: The sections I build up of a number of thin charcoal iron plates of the shape shown at E E, Fig. 3, with orifices *p p* cut or punched in same, of which two or more are utilized for holding the armature-coils, and cuts or slits s' s^2 are made from said orifices to the edge of the plates, as shown. I lay these plates one above the other, each being separated from its neighboring plates by thin paper, varnish, or other insulating material. Each individual plate is slipped over the armature-coil, the parts of the plate at s' s' s^2 s^2, Fig. 3, being bent aside at the cuts shown to allow this to be done, and flattened again when the plate is in position. In this way the plates are laid one upon the other until they form the completed section, as shown in Fig. 2, the coil lying in the tunnels formed by the coincident orifices of the plates. In Figs. 3 and 4 the coils are shown in section lying in the tunnels so formed. The whole section is held together by insulated bolts K L, Figs. 3 and 4, passing through substantial end plates G H, Figs. 3 and 4, of gun-metal, delta-metal, brass, German silver, or other suitable material.

The section is supported in the outer shell at both front and back. At the front the end plate G, Fig. 3, is provided with two lugs, through which pass screws or studs J, Fig. 4, to secure the section to the front flange of the supporting-shell. The support of the section to the other flange of the shell at the back is secured by an elongation of two of the insulated bolts K which hold the plates of the section together. The elongated parts are screwed, as clearly shown in Fig. 8, and over these are threaded coned nuts M, which, when screwed up, fit corresponding coned or tapering holes in the back flange of the shell. These coned nuts are locked by an outer nut N′, as shown. To remove any core-section it is only necessary to slack the nuts N′, unscrew the coned nuts at the back, and the screws J at the front.

The field-magnets may be of any of the types usually employed for alternating-current machines. In Figs. 3 and 4 is shown part of the magnet of an alternator in which an engine fly-wheel R forms the central portion, with steel segments U U, bolted to same, forming the poles. The north and south poles are marked N and S, respectively, and the system is energized by a single magnetizing-coil P, wound on the fly-wheel rim. To reduce the loss in the field-magnets due to eddy-currents, I sometimes furnish the poles of the magnet, if of steel or wrought-iron, with cast-iron shoes or tips. By reason of the cast-iron having a higher electrical resistance than the steel or wrought iron the magnitude of the eddy-currents is greatly reduced.

The number of core-sections and armature-coils which I prefer to employ is in single-phase alternating-current machines equal to half the number of magnet-poles, as shown in Figs. 1, 3, and 4. In this way the number of joints in the iron core of the armature is reduced and the variation in the flow of lines of force through the magnetic circuits of the machine correspondingly diminished. The contiguous core-sections are intended to touch each other when all are in position in the containing-shell, so that there is practically no space between them. Notwithstanding this the sections can be removed easily, as when the coned nut is slacked back the section can be tilted outward from the center toward the periphery of the shell.

For the purpose of still further reducing the variation of the flow of lines through the machine, due to varying positions of the field-poles relatively to the core-sections, I sometimes find it advantageous to provide the core-plates with orifices additional to those actually required for the coils, as shown at *p p*, Fig. 3, these being arranged annularly symmetrically with and similar in size and section to the orifices utilized for the coils. In the arrangement shown in Fig. 3 I utilize one of the additional tunnels so formed for the central insulated bolt L. I vary the number of orifices and the size of them, also their distance from the inner edge of the core-section and the width of the cuts or slits s' s^2, according to the condition under which the machine is intended to run. Sometimes the plates are cut without taking any metal out at s' s^2. Sometimes an eighth of an inch or more or less is taken out.

For triple-phase alternating-current dynamos I prefer also to embed one armature-coil in each core-section. In these machines the number of sections is such as to admit of coupling the coils in sets to give the three currents displaced in the proper degree relatively to each other as regards phase.

For two-phase alternating-current dynamos I prefer to embed two coils in each core-section, suitably displaced relatively to each other. Figs. 6, 7, and 8 show how in a two-phase machine the armature-coils are embedded in the core-sections. Fig. 6 shows the finished core-section with its two coils F′ and F^2 in place, also the adjacent core-section with the coils shown in section. The orifices s' s' are utilized for one coil and s^2 s^2 for the other, the coils being bent up and down at the ends, as shown, to get them in position, and embedded in the core-sections while the latter are being built up in the manner hereinbefore described. Fig. 7 is a plan of the core-section, and Fig. 8 a side elevation, the coils being in all the figures correspondingly lettered.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an armature, a laminated core-section having the different laminæ thereof provided with coincident orifices for receiving the coil, and with cuts or slits extending from the orifices to the edges of the laminæ, whereby the laminæ can be bent aside to admit the formed coil and afterward restored to place, as set forth.

2. An armature composed of detachable core-sections each provided with slit tunnels or passages and a coil extending through said tunnels and embedded in said core-section, substantially as and for the purpose set forth.

3. An armature core-piece provided with orifices for embedding the coil and formed with additional orifices, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand this 9th day of April, 1896, in the presence of the two subscribing witnesses.

WILLIAM BEEDIE ESSON.

Witnesses:
WALTER J. KERTEN,
WALTER J. NORWOOD.