(No Model.) 2 Sheets—Sheet 1.

J. J. WOOD.

ALTERNATING CURRENT DYNAMO.

No. 489,065. Patented Jan. 3, 1893.

FIG. 1.

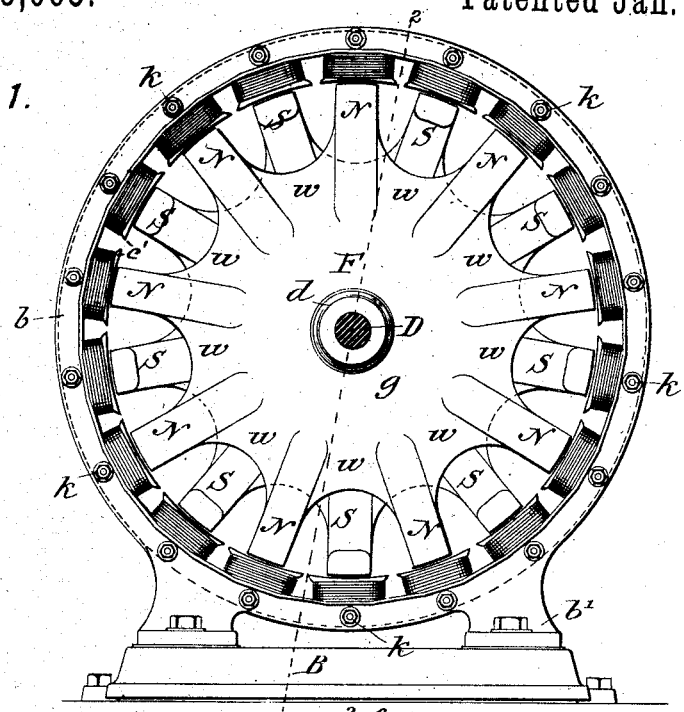
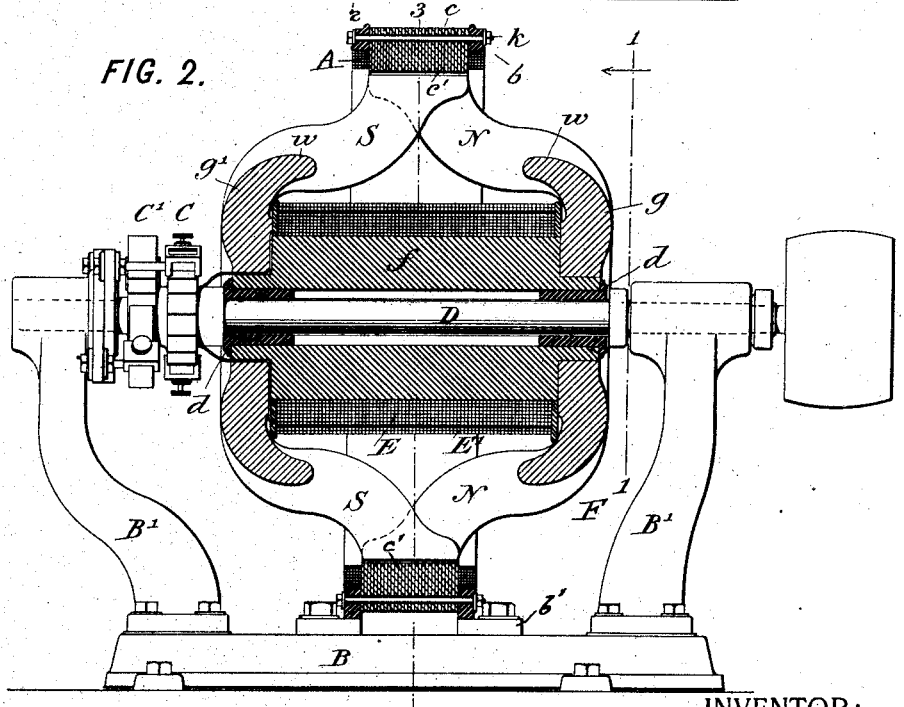


FIG. 2.



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(No Model.) 2 Sheets—Sheet 2.

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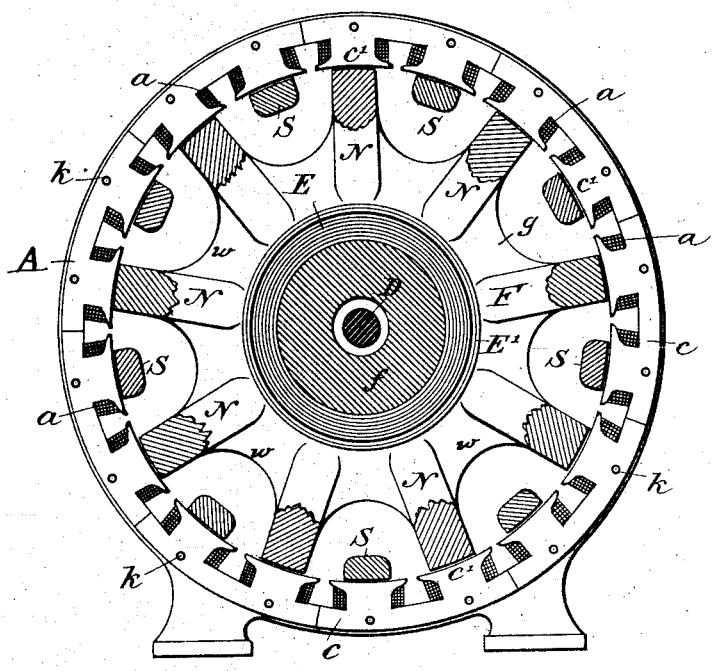
ALTERNATING CURRENT DYNAMO.

No. 489,065. Patented Jan. 3, 1893.

FIG. 3.



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UNITED STATES PATENT OFFICE.

JAMES J. WOOD, OF FORT WAYNE, INDIANA.

ALTERNATING-CURRENT DYNAMO.

SPECIFICATION forming part of Letters Patent No. 489,065, dated January 3, 1893.

Application filed July 22, 1892. Serial No. 440,921. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. WOOD, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Alternating-Current Dynamos, of which the following is a specification.

This invention relates to dynamo electric machines for generating alternating currents, or by the addition of a current rectifying commutator, for generating pulsatory currents of uniform direction.

It relates especially to dynamos of that class wherein the armature is a stationary ring, and the field-magnet is mounted to revolve within this ring, and has outwardly turned polar arms of successively alternated polarities terminating closely adjacent to the inner face of the armature core.

My present invention provides an improved construction of revolving field-magnet for dynamos of this class.

Figure 1 of the accompanying drawings is an end elevation of a dynamo constructed according to my invention partly in section on the line 1—1 in Fig. 2; Fig. 2 is a side elevation thereof, the field-magnet and armature being in diametrical mid-section on the line 2—2 in Fig. 1; Fig. 3 is a vertical transverse section through the armature and field-magnet on the line 3—3 in Fig. 2.

Let F designate the field-magnet as a whole, A the armature, *a a* the armature coils, E E′ the exciting coils of the field-magnet, and C C′ the current rectifying commutators in connection with these coils for converting the alternating current generated in the armatures coils into a pulsatory current of uniform direction for exciting the field-magnet.

The entire machine is placed upon a base B of any suitable construction, on which the armature is directly mounted and fastened. This armature consists generally of an annular core *c*, preferably of laminated iron, clamped between annular frames *b b* having feet *b′* which rest on and are bolted to the standard B. The frames or rings *b* may be made of cast iron, the laminated armature core *c* being embraced between them and fastened by insulated bolts *k* passed through them from side to side. The core is formed by preference with internal projections *c′ c′*, and the armature coils *a a* are wound on these projections, the projections being flanged on the inner side to retain the coils in place. This is a common construction in alternating current machines. The armature coils are connected serially in the manner commonly practiced in alternating current dynamos. The particular construction of armature with its core and coils is not essential to my present invention.

As a modification of the construction shown, I will suggest the employment of flat coils fastened against the continuous inner face of a ring-shaped core, as illustrated in my application Serial No. 369,823, filed October 30, 1890.

The field-magnet F is mounted on the rotative shaft D of the dynamo, which shaft turns in bearings formed on brackets B′ B′ which are fastened to the base B. The field-magnet is constructed with a tubular core *f*, preferably of steel, through which the shaft D passes, and from which it is preferably magnetically separated by sleeves *d d* of gun metal or other non-magnetizable material. Against the opposite ends of this core are placed caps or disks *g g′*, preferably of steel, which are formed respectively with polar arms N N and S S branching from them. The arms of the two disks are of equal number and are uniformly spaced, the arms N N branching from one disk being of north polarity, and the arms S S branching from the other disk of south polarity. When the two disks are applied, the arms of one disk are alternated with those of the other, forming polar ends projecting between polar ends of the other disk with like intervening spaces. The arms branch from the disk first in outward direction, then backwardly toward the middle of the core, and then are gradually turned outward and project away from the core, terminating in exterior polar faces which being turned off in a lathe constitute segments of a cylinder of such diameter as to fit freely but closely within the armature so that the field-magnet may be rotated therein. The field-magnet is wound with one or more exciting coils which are applied around the exterior of the core *f* between the opposite disks *g g′* and within the polar arms N S. Two coils are shown, a main coil E and a regulat-

ing coil E'. These coils receive continuous or pulsatory currents of uniform direction from any suitable source. The field-magnet being in place within the armature, the polar faces of its arms N S revolve closely adjacent to the armature projections and coils. Each armature coil receives consequently the inductive action of alternately north and south poles in rapid succession, thereby generating alternating currents in the armature coils in the manner well understood.

Dynamo machines have before been made wherein a field magnet consisting of a core having polar arms branching from its opposite ends and terminating in external polar faces of alternately contrary polarities, has revolved within a ring-shaped armature. In such machines, however, the armature and field-magnet have been made of equal width, and the polar arms of the field-magnet have been simply turned back at the ends and extended across the exterior of the exciting coil thereof, instead of projecting outwardly away therefrom, and presenting merely their outturned polar ends to a narrow armature, as in my improved construction. The constructions heretofore made have involved a serious loss of efficiency by reason of the leakage of lines of magnetic force between the polar arms, and from arm to arm through the armature core without cutting the armature coils, with the result that the efficiency of such machines has been so low as to render them commercially impracticable in competition with other alternating machines. My invention provides an improved construction whereby this serious practical defect is avoided. The polar arms instead of being laid backwardly close against the exterior of the exciting coil, are turned outwardly away therefrom at or near the middle thereof, and terminate in outwardly radiating polar ends. The armature core is reduced from the entire width of the field-magnet to a width of approximately only one quarter thereof, and the polar ends or faces of the arms N S are made of the same restricted width as the armature core. In this manner the lines of force are confined and concentrated, being forced to pass from the arms N N to the arms S S by entering the armature core, and consequently passing through and cutting the armature coils, so that very nearly all of the lines of force are made effective in the generation of electric potential. The field-magnet is further strengthened by constructing it with the disks *g g'*, which are turned inwardly or toward the medial plane of the field-magnet, so that these disks are cupped, as best shown in Fig. 2, so that they partly inclose the end portions of the exciting coil or coils. The cupping of the disks is effected by the formation of webs *w w* between the successive arms N N on one disk and S S on the other, these webs being turned inwardly following the direction of the arms, and thereby constituting the cupped portions of the disks, and being also formed with their outlines joining the arms by easy curves, as shown in Figs. 1 and 3, so as to distribute the lines of magnetic force to the arms. The inductive effect of the coil sets up lines of magnetic force extending longitudinally through the core *f*, and radially through the disks *g g'*, and by the cupping of these disks to partly embrace the ends of the coils, the exterior portion of the coil is made effective to add to the magnetization of the polar arms by setting up lines of magnetic force in the cupped portions of the disks, which lines are distributed to the respective arms. The field-magnet is thus made stronger than it would be without the disks, and without the cupping of the disks.

I claim as my invention the following defined novel features substantially as hereinbefore specified, namely:—

1. The combination of a revolving multipolar field magnet with a stationary ring armature within which it rotates, said armature consisting of an annular core much narrower than the field magnet, and successive coils applied to said core, and said field magnet consisting of an axial core, an exciting coil around said core, and alternated polar arms radiating from the opposite ends of said core, bending back around said coil toward the middle of the core, and having their end portions turned outwardly and terminating in poles facing and closely adjacent to said armature.

2. The combination with an exterior stationary ring armature having successive coils applied to the inner side of its core, of a revolving field magnet consisting of an axial core of greater length than the width of the armature, an exciting coil around said core, and polar arms radiating from the opposite ends of said core, extended inwardly past the ends of the coil toward the middle thereof, each arm entering between two of those of opposite polarity, and the polar ends of the arms turned outwardly away from the exciting coil and terminating in polar faces within and closely adjacent to the armature, whereby the polar ends approach the armature abruptly on its inner side, and the loss by leakage of lines of force between the polar arms and armature core without cutting the armature coils is reduced to the minimum.

3. A field magnet consisting of an axial core, an exciting coil around said core, laterally-expanded heads or disks at the opposite ends of said core, cupped toward the middle thereof so as to partially inclose the ends of the coil, and polar arms branching from the cupped disks, extended toward the middle, each arm entering between two of the arms from the opposite end, and the polar ends of the arms turned outwardly away from the exciting coil and terminating in exterior polar faces.

4. A field-magnet consisting of an axial core *f*, an exciting coil E around said core, polar arms N N, S S, radiating from the oppo-

site ends of said core, bending back around said coil toward the middle of the core, each arm entering between two of those of opposite polarity, and having their end portions turned outwardly to form radiating poles, and webs *w w* formed integrally with said arms between them at the ends of the coil, partly inclosing the end portions thereof, and joining the arms with curves sweeping toward the arms, so that the lines of force induced in said webs are divided and diverted into the arms.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES J. WOOD.

Witnesses:
CHAS. C. MILLER,
CHAS. JONES.