No. 806,217. PATENTED DEC. 5, 1905.

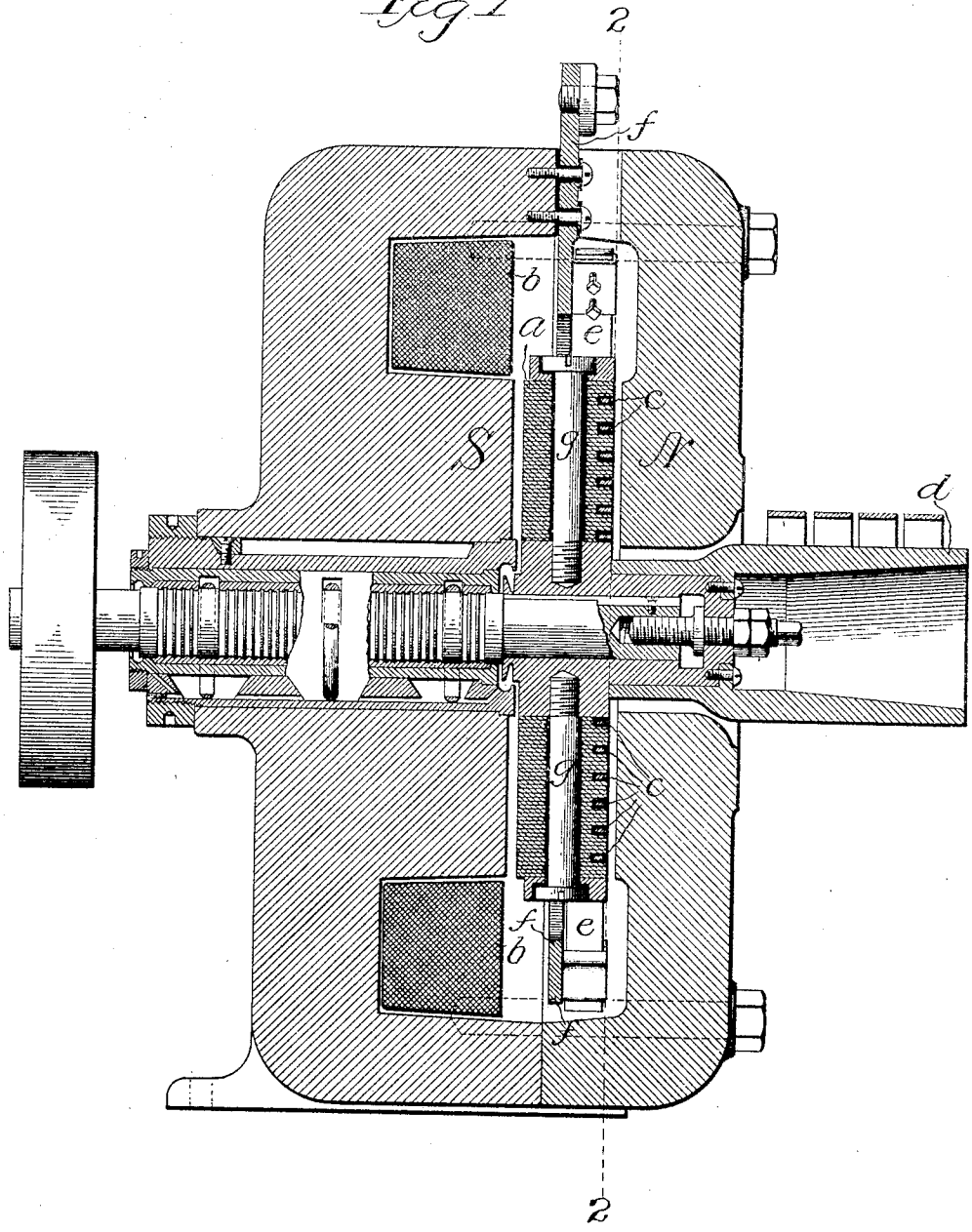
H. H. WAIT.

DYNAMO ELECTRIC MACHINE.

APPLICATION FILED APR. 24, 1905.

2 SHEETS—SHEET 1.

Fig 1



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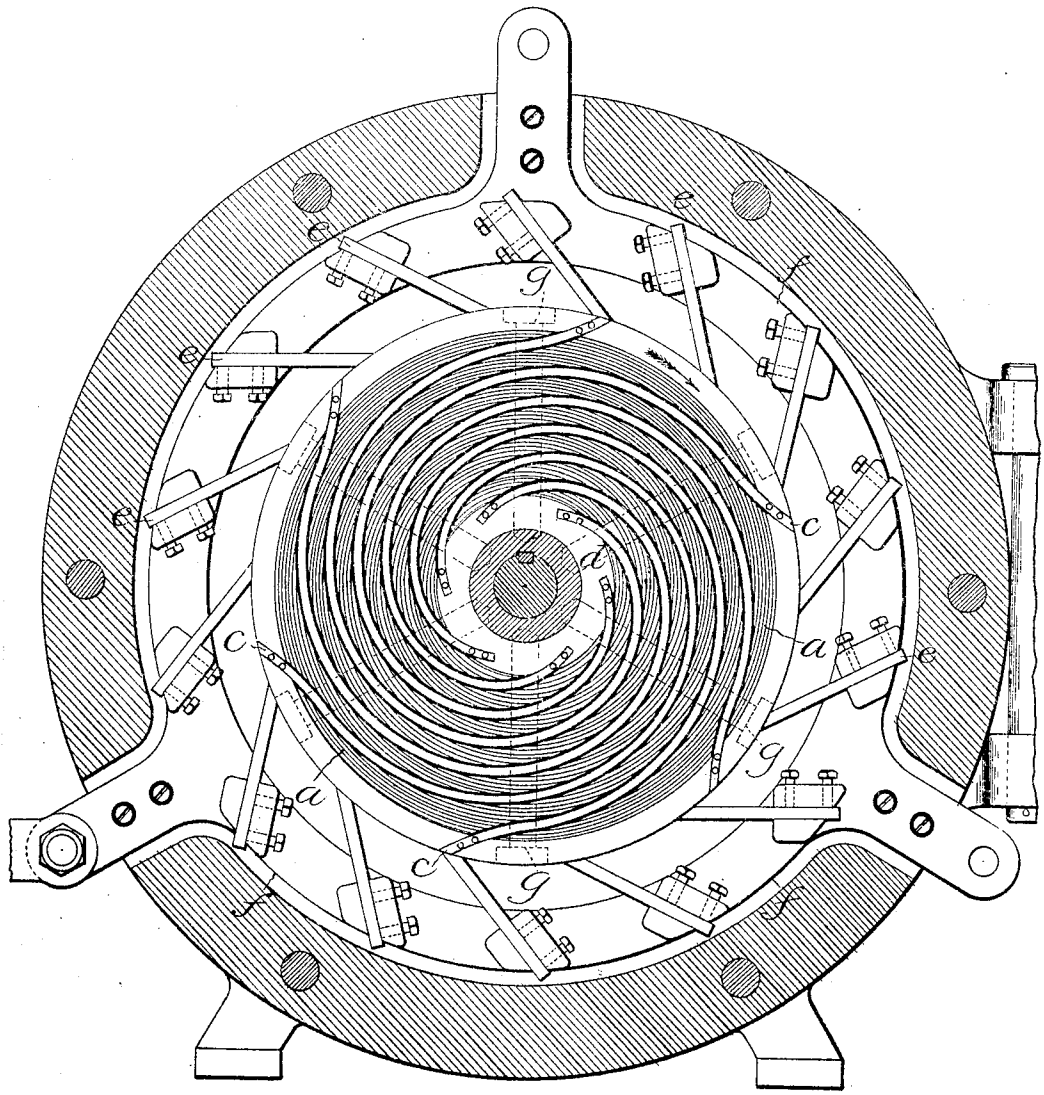
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC MACHINE.

No. 806,217. Specification of Letters Patent. Patented Dec. 5, 1905.

Application filed April 24, 1905. Serial No. 257,107.

To all whom it may concern:

Be it known that I, HENRY H. WAIT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Dynamo-Electric Machines, of which the following is a full, clear, concise, and exact description.

My invention relates to a dynamo-electric machine, and more particularly to a machine of the general type known variously as "unipolar," "homopolar," or "acyclic." Machines of this kind are designed to be driven at high speeds, and are therefore especially adapted to be direct driven by turbine-engines.

The object of this invention is to provide an improved construction of the rotor or armature by which the efficiency of the machine may be increased.

I will describe my invention by reference to the accompanying drawings, which illustrate the preferred embodiment thereof, in which—

Figure 1 is a vertical sectional view of the machine, and Fig. 2 is a vertical cross-section taken on line 2 2 of Fig. 1.

The same letters of reference are used to designate the same parts in the above views.

The machine shown in the drawings is of the radial type, in which a disk *a* is arranged to rotate in an annular field of force concentric with said disk, the lines of force passing transversely through said disk. It may be stated at this point, however, that certain features of this invention are applicable also to the type of machine in which the armature or rotor is cylindrical, with a magnet-pole arranged outside of the cylinder, concentric therewith. In the machine shown the magnetic field is established by an annular magnet-pole N facing one side of the disk and a magnet-pole S facing the other side of the disk, the frame of the machine being formed, as shown, to constitute a return magnetic circuit or yoke connecting said poles N and S outside of the disk. The field-winding *b* is shown surrounding the annular pole-piece S.

In accordance with my invention the disk *a* or rotary member is built of thin laminæ of steel, the direction of the laminations being substantially coincident with the direction of the magnetic flux—that is to say, transverse to the direction of the electromotive force which is induced in said disk by the movement thereof through the field. The object of using steel laminæ is to allow the passage of magnetic flux to occur as freely as it would if the rotor was of solid steel, while at the same time to oppose the resistance of the separations between the several laminæ to the flow of eddy-currents in the disk. The inductors consist of copper bars *c*, embedded in channels in the face of the disk and disposed generally in spiral grooves from the central portion of the disk to the periphery. Preferably the spiral of the inductor *c* is such as to make a complete turn in passing from the center to the edge of the disk. As the disk rotates in the direction of the arrow in Fig. 2, electric currents are induced in the spiral conductors in a direction to flow from the center of the disk toward its periphery. Collecting-brushes are therefore provided, one set of brushes resting upon a copper ring *f* at the periphery of the disk and the other set upon the collecting ring or shaft *d*, the latter being electrically connected with the inner ends of the several inductors *c* and the peripheral ring *f* being connected with the outer ends thereof. The brushes *e e* therefore form the terminals of the machine, from which the current is taken off to supply the external circuit.

The laminated disk *a* can be constructed by winding a steel band in a spiral in the way tape is wound upon a spool. The band may be slightly heated before winding, so that as it cools the convolutions of the spiral will be drawn tightly together to form a very solid construction. The disk thus built up may be provided with bolts *g g*, passing radially through the same to hold the convolutions in place. The steel band may be coated with non-magnetic material, such as shellac, to increase the insulation between adjacent turns.

One of the principal features of the invention lies in the use of conductors for the rotor, which are inclined with respect to the direction of their motion through the magnetic field. One of the advantages of this construction is that the induced current flowing in the conductors tends itself to set up a field of force, and by the inclination of the conductor in one direction or the other this field may be caused to oppose or assist the magnetization of the coils and in this way to compound the machine. In a machine having the conductors perpendicular to the direction of motion the gross effect of their current is neither to assist nor oppose the magnetizing-

coil. It will be seen, particularly by reference to Fig. 2, that the current flowing in each spiral conductor forms a loop which acts as a supplemental magnetizing-winding to assist the field-coils.

Another advantage in inclinining the rotor-conductors is that each conductor will lie in all radial elements of the field, so that the potential between the inner and outer ends of all conductors at any one instant will be substantially the same. The advantage, in other words, is to equalize the flow of current through all the conductors to compensate for possible variations in the field strength at different places around the circumference.

It will be apparent that the ideas set forth may be utilized to advantage in machines differing widely, particularly in construction, from the one specifically shown by the drawings, and I therefore do not desire to be limited to that particular construction; but,

Having described my invention, I claim—

1. In a unipolar dynamo-electric machine, the combination with a field-magnet establishing a substantially uniform field, of an armature arranged to move in said field, and inductors carried by said armature inclined to the direction of their motion through the field, substantially as and for the purpose set forth.

2. In a unipolar dynamo-electric machine, the combination with a magnet having pole-pieces arranged to establish a unidirectional field of force, of an armature arranged to move within said field, a magnetizing-winding for said field, conductors carried by said armature adapted to have currents induced therein by the passage through said field, said conductors being inclined to the direction of their motion through the field, whereby the currents through said conductors establish a magnetic flux coacting with the field-flux, and means for collecting the current and externally completing the circuit between the terminals of said moving conductors.

3. In a unipolar dynamo-electric machine, the combination with a magnet-pole arranged to establish a unidirectional field of force, of a rotor arranged to move within said field of force, said rotor-carrying inductors extending spirally through the field, the inclination of each spiral being such that any conductor lies in substantially all the radial elements of the field.

4. In a unipolar dynamo-electric machine, the combination with annular magnet pole-pieces of opposite polarity facing each other, of a laminated disk armature built up of a spirally-wound, magnetizable steel band, said armature having spiral channels in its face and copper inductor-bars embedded in said channels, and means for collecting the currents induced in said bars at the central portion and at the periphery of said disk, substantially as set forth.

5. In a unipolar dynamo-electric machine, the combination with magnet pole-pieces of opposite polarity establishing a substantially uniform field of force, of an armature mounted to rotate within said field, said armature being laminated in the direction of the magnet-flux and having spiral channels or grooves in its surface with copper conductors embedded in said channels, the curve of each spiral making substantially a complete turn, and means for collecting the currents at the inner and outer terminals of said conductors.

6. In a unipolar dynamo-electric machine, the combination with a magnet arranged to establish a unidirectional field of force, of an armature arranged to rotate within said field, and conductors carried by said armature, said conductors extending spirally around the armature, substantially as and for the purpose set forth.

7. In a unipolar dynamo-electric machine, the combination with a magnet arranged to establish a unidirectional field of force, of an armature arranged to rotate within said field, said armature being laminated in the direction of the magnetic flux through the same, spiral channels in the face of said armature within the field of force, conductors embedded in said channels, and means for collecting the currents induced in said conductors at the terminals thereof, each spiral lying in substantially all the radial elements of the armature within said field of force.

8. In a unipolar dynamo-electric machine, the combination with a magnet arranged to establish a unidirectional field of force, of an armature arranged to rotate within said field, conductors carried by said armature, and means for collecting the currents induced in said conductors, said conductors being spirally arranged with reference to the field of force, whereby variations in the strength of the field at different parts thereof are compensated for.

9. In a unipolar dynamo-electric machine, the combination with a magnet arranged to establish a unidirectional field of force, of an armature arranged to rotate within said field, spiral conductors carried by said armature, and means for collecting the currents induced in said conductors, said conductors being so disposed with relation to said armature that the induced currents flowing therein establish a magnetomotive force coacting with the magnetomotive force of the field, whereby the advantages of compound winding are secured.

In witness whereof I hereunto subscribe my name this 17th day of April, A. D., 1905.

HENRY H. WAIT.

Witnesses:
DE WITT C. TANNER,
IRVING MACDONALD.