(No Model.)

R. LUNDELL.

DYNAMO ELECTRIC MACHINE OR ELECTRIC MOTOR.

No. 490,810. Patented Jan. 31, 1893.

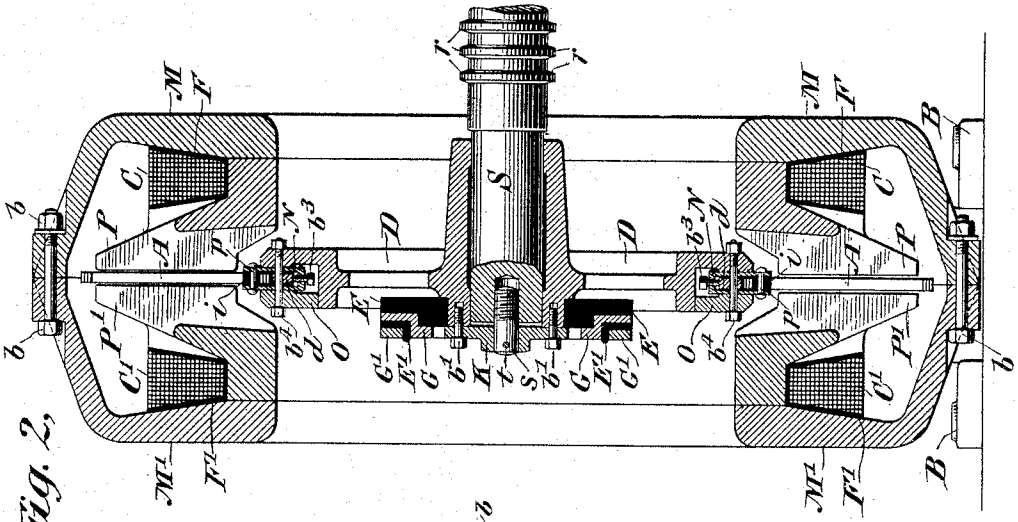

Fig. 2.

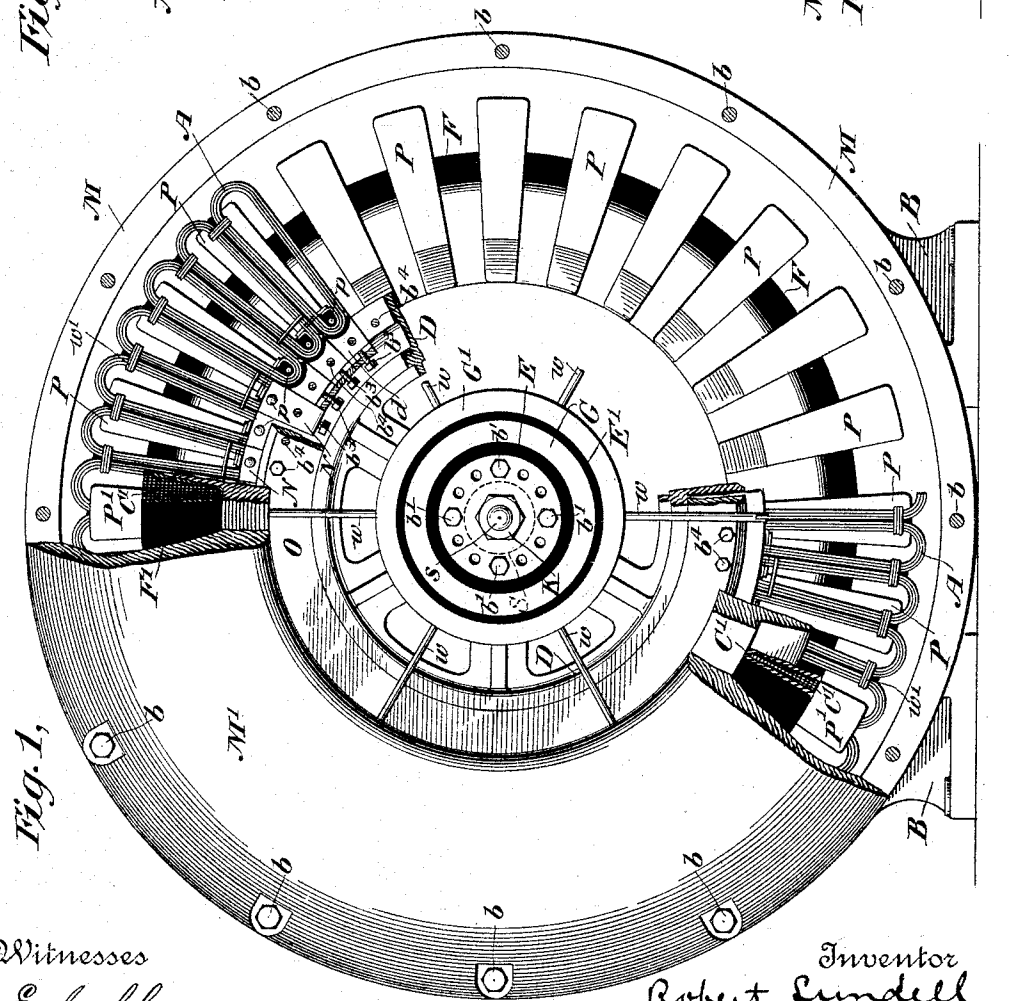

Fig. 1.

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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC MACHINE OR ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 490,810, dated January 31, 1893.

Application filed April 22, 1892. Serial No. 430,201. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LUNDELL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have made a new and useful Improvement in Dynamo-Electric Machines or Electric Motors, of which the following is a specification.

My invention is directed especially to improvements in apparatus of this nature known in the art as of the disk armature type in which the armature is of flat disk shape adapted to rotate in a narrow space between the poles of the field magnets. Its objects are; first: to devise such a machine with as little iron or magnetic material as possible, the same being so disposed as to offer a maximum heat radiating surface and a minimum amount of leakage to the magnetic line of force. Second: to wholly protect all of the current conducting parts of the machine from mechanical injury, dirt or dust, &c. Third: to make the machine as compact and durable as possible and so that it can be easily put together and taken apart for repairs &c. These objects are accomplished by the machine hereinafter described the essentially novel features of which are particularly pointed out in the claims at the end of this specification.

In order that my invention may be fully understood reference is had to the accompanying drawings in which like letters of reference represent like parts wherever used.

Figure 1 is a side elevational view of the machine part being broken away to illustrate fully the interior construction. Fig. 2 is a vertical sectional view of the same as seen looking from the right or top end of the drawing toward the left.

M M′ are the field magnet cores made each in two parts secured together by screws and constituting when united by bolts *b b* a hollow cylindrical structure with integral radially disposed multipolar pole pieces P P′ located in parallel planes between which the armature A of disk type is adapted to revolve. The field magnet coils, C and C′, two in number, are wound in annular grooves or troughs of vegetable fiber or analogous insulating material F F′ and slipped in place before the cores are secured together. Ventilating holes may if desired be drilled through the parts M M′ around the outer edges of the coils C C′ thereby greatly facilitating the cooling of the machine when in operation. These field cores are provided with a base or support B which may be bolted to the engine frame, the armature shaft S having its journal bearing on the same support and being provided with rings or ribs *r r r* adapted to fit in corresponding grooves in the journal bearing so as to prevent end thrust.

The armature A is made up of a series of individual bobbins secured to the hub D, the latter having longitudinal movement on the end of shaft S. Each bobbin consists of a thin flat strip of insulated copper wound round and round on itself and shaped in a former to substantially the conformation shown; the ends of these bobbins being joined by short conducting strips and united in multiple series by conductors *w w* to the collector rings G G′ carried by the hub D and insulated from each other by rings of insulating material E E′ also secured to the hub. The current collecting brushes are not shown but would of course bear on the lateral faces of the collecting rings G and G′. The armature bobbins are held in place by clamps N, blocks *d*, rivets *p* and radially disposed draw bolts b^3 extending through the rim of the hub and all secured in a flat or disk like position by a flat disk O and additional bolts b^4, as clearly shown, the coils being insulated from each other and the hub and attached parts by insulating material *i* and secured together at their outer periphery by strong thin insulated wire windings *w′*.

The hub D is given adjustment in the direction of the length of the armature shaft by a screw *s* secured by a pin *t* to a cap K and in turn threaded into the end of the shaft. This screw has say eight threads per inch and the hub D is provided with four screw holes each adapted to calender with any one of twelve bolt holes in the cap K and to receive the threaded ends of four bolts *b′*. By this arrangement the most delicate adjustment is given to the armature A with relation to the opposite multipolar field poles P P and P′ P′. This feature of adjustability of the armature and the manner of building the armature constitute the subject matter of a separate application filed of even date herewith and

bearing Serial No. 430,200 and reference is had thereto for a clearer and fuller understanding thereof.

In the application referred to above I show, describe and claim also a disk armature of the kind herein described, in combination with a single field magnet core having multipolar radially disposed pole pieces, and I make no claim, therefore, to these features herein. Nor do I claim herein the novel manner of adjusting the armature longitudinally and radially on the shaft in combination with means for preventing end thrust, such matters being fully claimed in the aforesaid application.

The present application is directed more particularly to the bi multipolar field cores with energizing coils for each half thereof said coils being wholly inclosed by the two hollow annular shaped or disk like field magnet cores and located on opposite sides of the armature in planes parallel therewith being thus adapted to give to the opposing or facing multipolar field poles opposite polarity through which field the armature may revolve.

It will be readily appreciated that by virtue of the hollow annular shape or conformation of the field magnet cores each of which fully surrounds or incloses its magnetizing coil, I devise a machine which presents to the armature a very strong magnetic field and presents only a minimum magnetic leakage, two very desirable features. The magnetic field is concentrated at the axial center of the machine and the magnetic material is so disposed that I not only obtain a maximum effect but avoid largely the evil effects due to heating by virtue of the large heat-radiating surface of the hollow disk-like field magnet cores.

It is of course apparent that many of the features herein described are equally applicable to electric motors and to machines other than of the disk type and my claims, in so far as they can be made to apply to such structures, will be so construed, and also that commutators might be applied in a manner well understood by electricians for the purpose of converting the apparatus into a direct or continuous current machine.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:—

1. A dynamo electric machine having two hollow disk shaped field magnet cores which wholly inclose or surround each a single field magnet coil, said field magnet coils being located on opposite sides of the armature and in planes parallel therewith substantially as described.

2. A dynamo electric machine having two hollow disk shaped field magnet cores each having radially disposed multipolar pole pieces in combination with two inclosed field magnet coils located on opposite sides of a disk shaped armature and in planes parallel therewith substantially as described.

3. A dynamo electric machine having two hollow cylindrical field magnet cores wholly inclosing two energizing field magnet coils, each core being provided with integral multipolar pole pieces, in combination with a disk shaped armature adapted to rotate between said pole pieces, the field magnet coils being located on opposite sides of the armature in planes parallel therewith substantially as described.

4. A dynamo electric machine having hollow disk shaped field magnet cores provided with integral multipolar pole pieces radially disposed in parallel planes between which the armature rotates, in combination with field magnet coils located on opposite sides of the armature, said coils being wholly inclosed substantially as shown and described.

5. A dynamo electric machine having two flat cylindrical field magnet cores provided each with multipolar field magnet poles located in parallel planes with inclosed energizing coils for said cores, the windings of which are in planes parallel to the faces of the field magnet poles, and located on opposite sides of the armature substantially as shown and described.

6. A dynamo electric machine having two flat hollow cylindrical field magnet cores placed end to end; each core having a multipolar series of radially disposed poles located in parallel planes, in combination with a pair of wholly inclosed energizing coils and a rotary disk armature, substantially as shown and described.

7. A pair of field magnet cores having each a single inclosed energizing coil and a set of radially disposed multipolar field magnet poles, in combination with a disk armature adapted to rotate between said sets of poles and provided with adjustable means for regulating its position, in two directions substantially as described.

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