(No Model.)

R. LUNDELL.

FIELD MAGNET FOR DYNAMOS AND MOTORS.

No. 468,953. Patented Feb. 16, 1892.

Fig. 1.

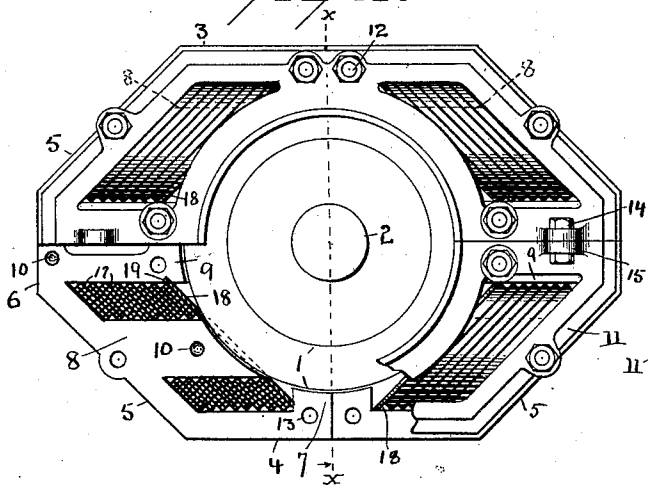


Fig. 2.

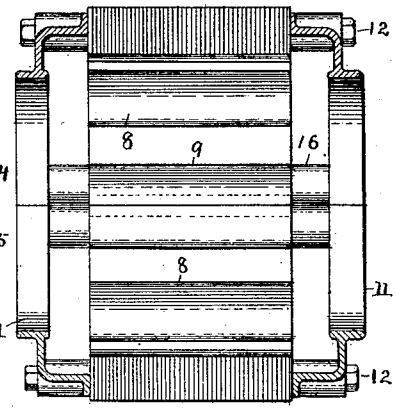


Fig. 3.

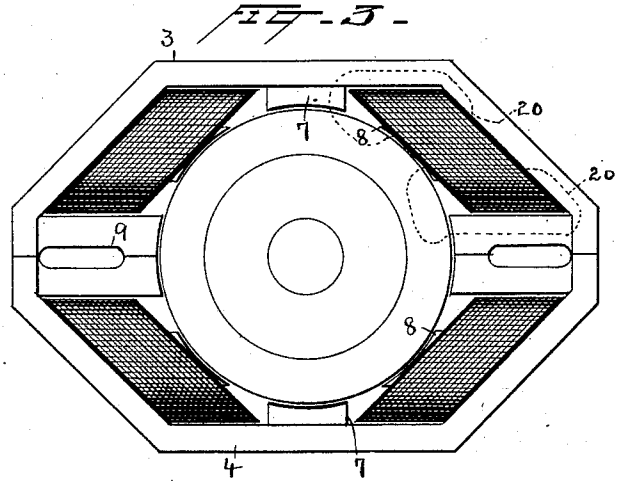
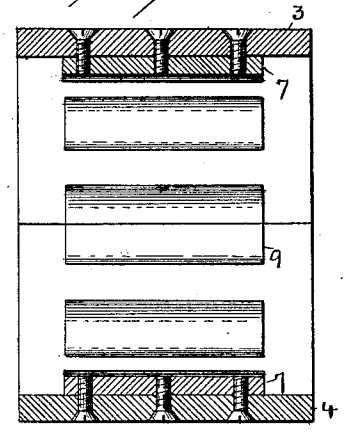


Fig. 4.



Witnesses
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FIELD-MAGNET FOR DYNAMOS AND MOTORS.

SPECIFICATION forming part of Letters Patent No. 468,953, dated February 16, 1892.

Application filed June 6, 1891. Serial No. 395,344. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LUNDELL, a citizen of the United States, residing at New York, in the county and State of New York, have invented a certain new and useful Improvement in Field-Magnets for Dynamos and Motors, (Case E,) of which the following is a specification.

The present invention relates to the construction of field-magnets for electro-magnetic machines.

The main object is to provide a multipolar motor for general use which shall be efficient at low speed and shall occupy only a small space, especially in a vertical direction; and the invention consists in the several features and combinations hereinafter described and claimed.

In the accompanying drawings, Figure 1 shows a side view of my motor, a part being broken away. Fig. 2 is a central section on the line *x x*, looking in the direction of the arrow. Fig. 3 is a side view of a modified form of motor, and Fig. 4 a central section thereof.

Referring first to Figs. 1 and 2, the armature and commutator of the motor are simply indicated by the circles 1 2. The field-magnet shown is in the form of an eight-sided polygon having two sides 3 4, of greater length than the six sides 5 6, forming the two ends of the field-magnet. The sides 3 4 of the yoke or body of the field-magnet each have a projecting pole-piece 7. The sides 5 and 6 have pole-pieces 8 9, the latter pole-pieces being parallel with each other and parallel with the sides 3 4. This field-magnet is preferably built up of M-shaped pieces of sheet metal, four of said pieces making a complete layer. One of these pieces is shown in full in Fig. 1 and extends from the line *x x* to a central horizontal line through the pole-pieces 9. It will be seen that all of these sheet-metal pieces are of the same shape, so that they may all be formed with a single die. When a certain number of pieces have been placed side by side in building up the magnet, they are secured together by rivets 10. Two of these sections or quarters are then placed together end to end, and on each side is placed a frame or casting 11 of gun-metal or brass, said frames being connected by cross-bolts 12, which pass through holes 13, formed therefor in the laminations of which the sections are built up. The armature is placed in the space between the polar extensions, and the upper half of the field-magnet, which is constructed like the lower half, is placed over the armature, and the two halves are secured together by bolts 14 in lugs 15. The frames 11 are provided with extensions 16 on the inner faces, which are bored for the reception of the cross-bolts 12. This enables me to use smaller bolts than would otherwise be practicable. Before placing the armature in position and uniting the two halves of the field-magnet, as above described, the field-magnet coils are placed on the four corner-poles 8, leaving the alternate poles without coils. I prefer to form these coils by winding rectangular or flat conductors into the form of flat coils and to place them on the poles obliquely, as shown in Fig. 1. The several flat coils would then be connected in series. These coils will be wound from the center and insulated, as described in my application, Serial No. 372,400, filed November 24, 1890, in order that both terminals shall come at the outer edge in position to be readily connected. This is for convenience in connecting up the coils. The several flat coils will be separated by insulating-washers, (indicated by the heavy lines 17,) and over the last coil or section will be placed a brass or other non-magnetic washer 18, which projects beyond the end of the pole-piece to hold the coils in place. This washer is cut away at the center in order to allow the periphery of the armature to come as near as possible to the curved end of the pole-piece. One edge of the washer will bear against the pole-piece 7, while the opposite edge will rest in a groove 19, formed in the pole-piece 9. It will be understood that this washer is slid in from the side. With the arrangement just described (it being the same for each of the poles 8) the armature can so nearly approach the pole-pieces that it will be slightly surrounded by the last section of each field-magnet coil.

In Fig. 3 the field-magnet is shown as made

in two instead of four parts—viz., an upper half and a lower half—and instead of being made of laminated iron each half is made of a single casting of mitis iron, except the pole-piece 7, which is formed separately and bolted or otherwise secured to one of the long sides. This is shown most clearly in Fig. 4. In this machine the arrangement of pole-pieces and coils is the same as that already described. In this form, however, I prefer to make each magnet-coil by winding a sufficient quantity of wire, preferably square wire, into a single large coil on a suitable former, and then by pressure to tilt the coil into an oblique position or form, and then to slip it onto its pole-piece. This must be done before the pole-pieces 7 are secured in place. It is evident that the pole-pieces which support the coils might be detachable instead of the pole-pieces 7. In that case the coils would be placed on the pole-pieces, and then both parts slipped into position and bolts passed through the frame into the pole-pieces. In this machine the side frames are omitted. The armature-journals are not shown in the drawings.

By constructing the field-magnet in the form of a flattened polygon with the upper and lower sides long and the ends shorter, and by arranging the poles as described, I get a multipolar field capable of receiving a large slow-moving armature without occupying a large space, especially in a vertical direction. This is especially desirable in motors used on street-cars. The several magnetic circuits are also short and of equal length, thus giving strong and uniform poles. Two of the magnetic circuits are indicated at the right of Fig. 3 by the dotted lines 20. While it is preferred to have the field-magnet in the form of a regular flattened polygon, I should consider a magnet of the general shape and arrangement indicated, but with curved sides or ends, as within my invention. By using oblique coils, as shown, space is economized and the wire is brought near to the armature. The poles 9, which are centrally divided, are cut away, as shown, to reduce the amount of iron.

What I claim is—

1. The combination, in an electro-magnetic machine, of an armature, a flattened field-magnet frame or yoke having three pole-pieces on each end, and intermediate pole-pieces on the two longer sides, substantially as described.

2. A field-magnet constructed in the form of a flattened polygon, the opposite sides being parallel and the sides forming the ends of the field-magnet being shorter than the intermediate sides and each side being provided with a pole-piece, substantially as described.

3. The combination, in an electro-magnetic machine, of an armature and a field-magnet constructed in the form of an eight-sided flattened polygon, the opposite sides being parallel and the six sides forming the ends being shorter than the two intermediate sides and each side being provided with a pole-piece, the pole-pieces projecting from the ends being parallel with each other, substantially as described.

4. A field-magnet constructed in the form of an eight-sided polygon, the opposite sides being parallel and the six sides forming the ends being shorter than the two intermediate sides and each side being provided with a pole-piece, the pole-pieces projecting from the ends being parallel with each other, and coils on the four corner pole-pieces, substantially as described.

5. The combination, in an electro-magnetic machine, of an armature, a field-magnet constructed in the form of a polygon, the opposite sides being parallel and the sides forming the ends being shorter than the intermediate sides and each side being provided with a pole-piece, the pole-pieces projecting from the ends being parallel with each other, and oblique coils on the corner pole-pieces, substantially as described.

6. The combination, in an electro-magnetic machine, of an armature, a field-magnet having suitable pole-pieces, and oblique coils of angular wire on some of the pole-pieces, each oblique coil being built up of several flat coils placed side by side, substantially as described.

7. A multipolar field-magnet in the form of a flattened polygon and consisting of several sections secured together end to end, substantially as described.

8. A field-magnet in the form of a flattened polygon, pole-pieces projecting from the several sides, and field-magnet coils on the alternate pole-pieces, said field-magnet being constructed of sections suitably placed and secured together, substantially as described.

9. The combination, with a pole-piece of a multipolar field-magnet, of an oblique coil on the pole-piece and a washer over the coil to hold it in position, said washer being held by the pole-pieces on either side of the coil, substantially as described.

10. The combination, with a pole-piece of a field-magnet, of a coil on the pole-piece and a washer over the coil to hold it in position, said washer projecting beyond the end of the pole-piece and being cut away at the center to admit the periphery of the armature, substantially as described.

This specification signed and witnessed this 1st day of June, 1891.

ROBT. LUNDELL.

Witnesses:
CHARLES M. CATLIN,
EUGENE COURAN.