No. 627,417. Patented June 20, 1899.

# A. HINMAN.

## ELECTRIC MOTOR.

(Application filed Jan. 4, 1898. Renewed May 22, 1899.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

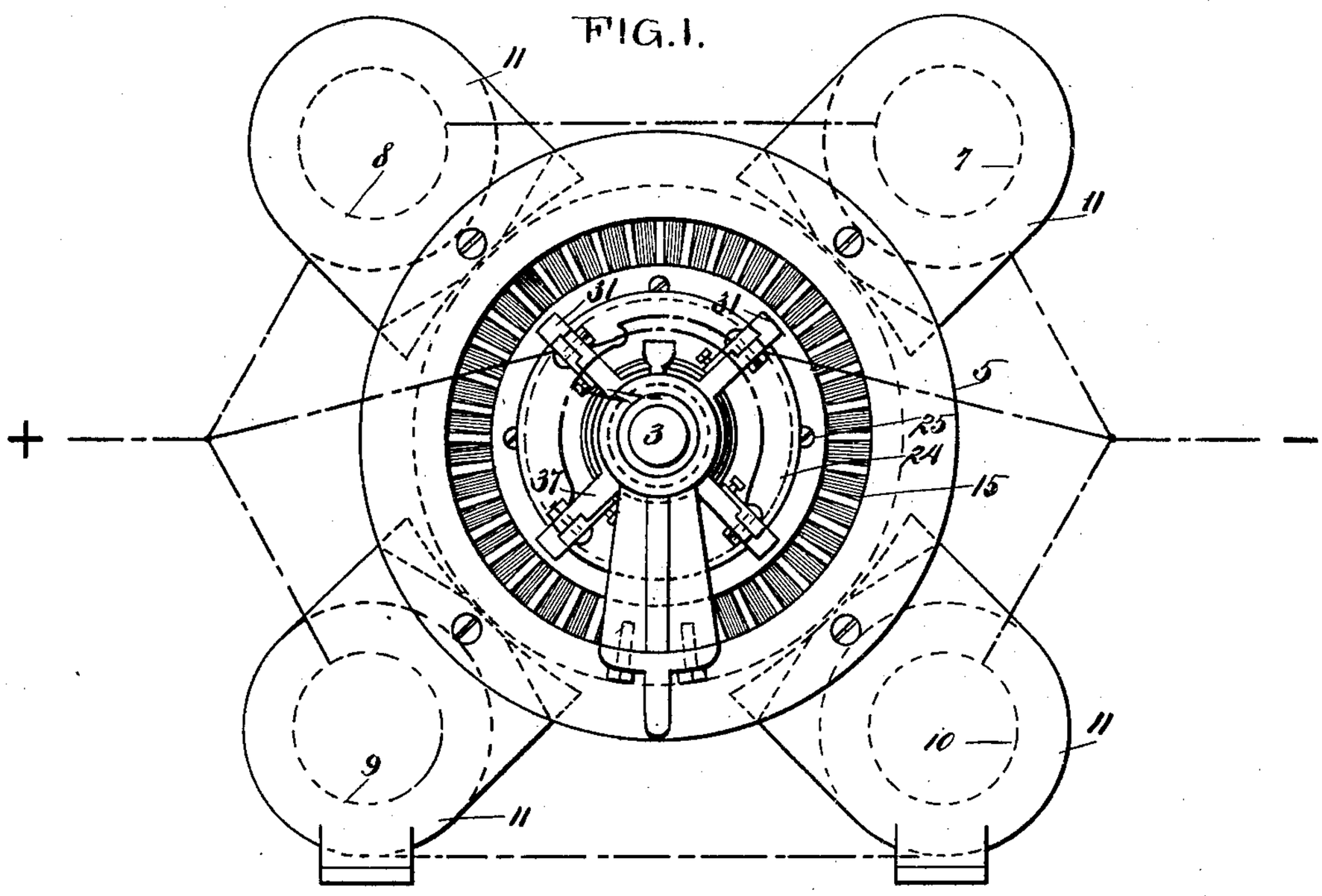
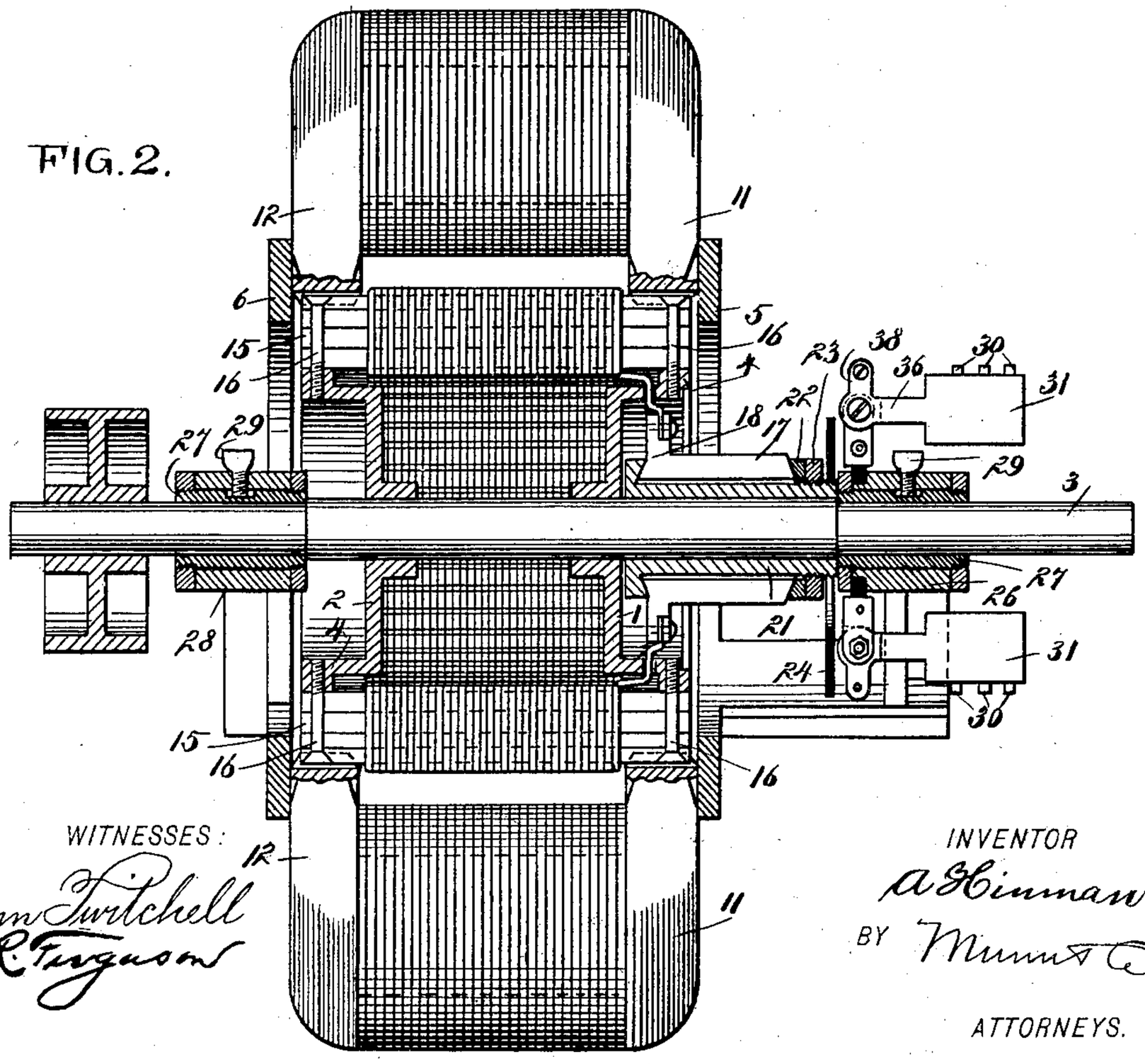



FIG. 2.

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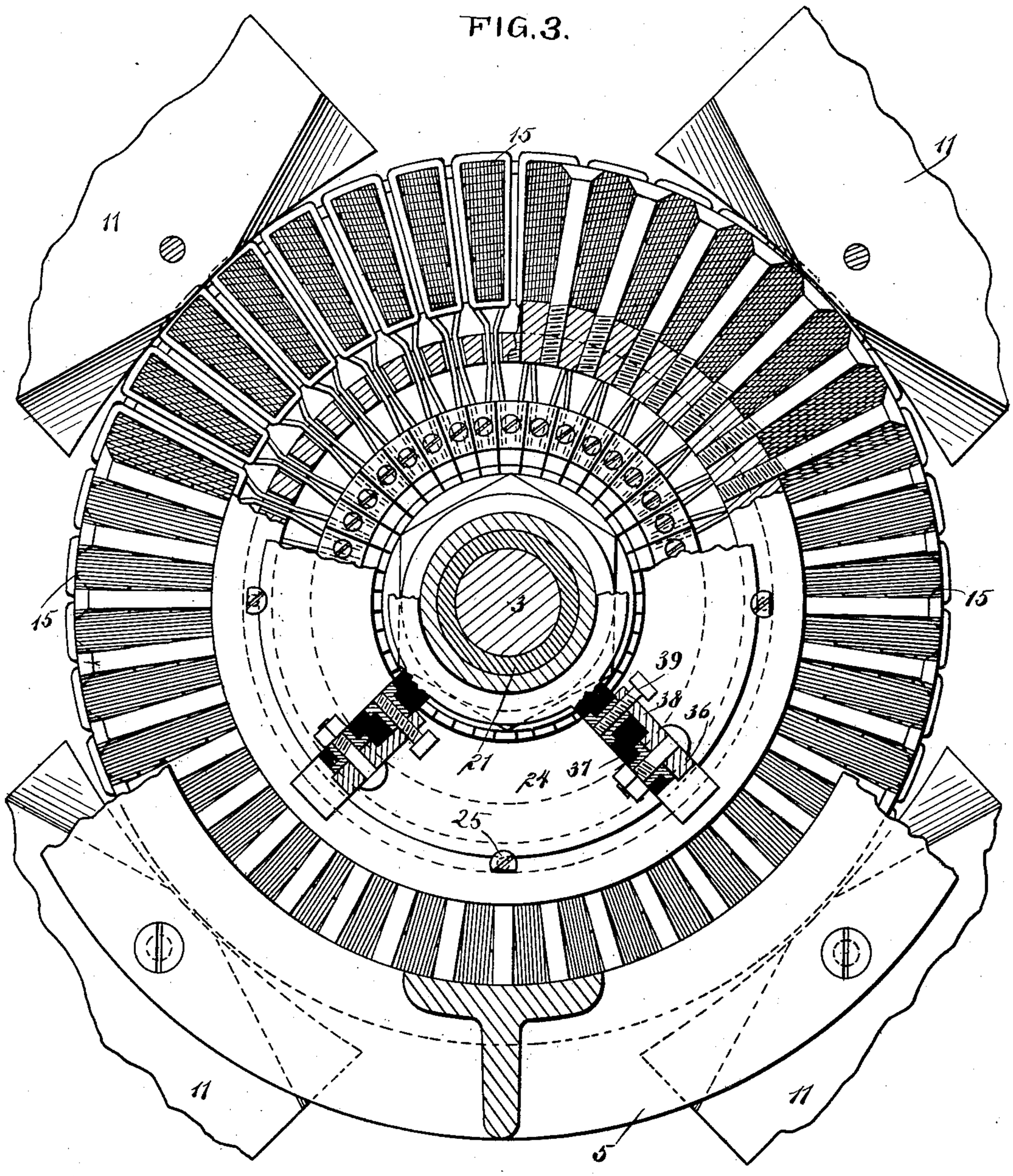
(Application filed Jan. 4, 1898. Renewed May 22, 1899.)

(No Model.) 3 Sheets—Sheet 2.

FIG. 3.

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(No Model.) 3 Sheets—Sheet 3.

FIG. 4.

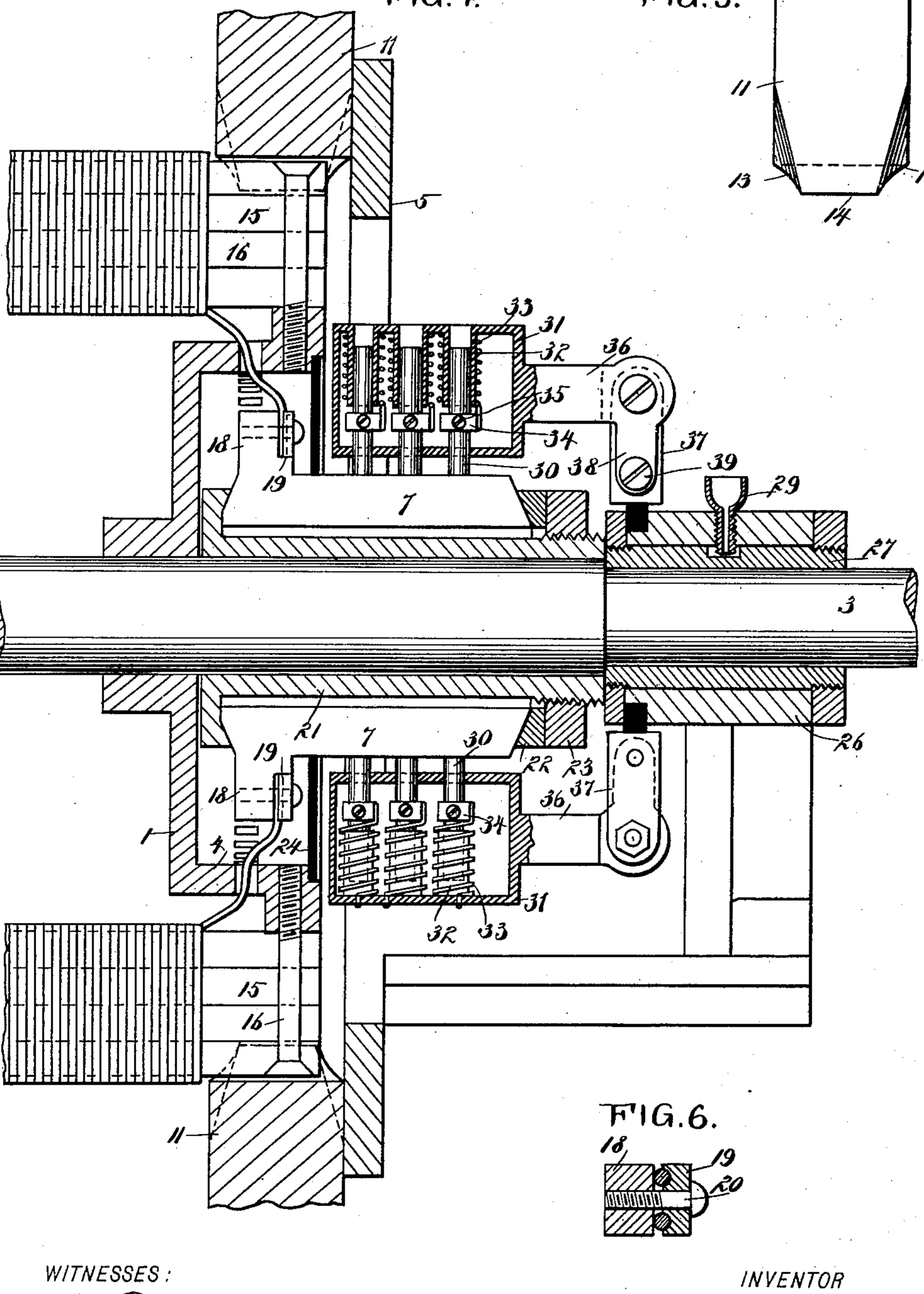


FIG. 5.




FIG. 6.




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# UNITED STATES PATENT OFFICE.

ALFRED HINMAN, OF FOREST CITY, MISSOURI.

## ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 627,417, dated June 20, 1899.

Application filed January 4, 1898. Renewed May 22, 1899. Serial No. 717,800. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED HINMAN, of Forest City, in the county of Holt and State of Missouri, have invented a new and Improved Electric Motor, of which the following is a full, clear, and exact description.

This invention relates to electric motors, and it is particularly an improvement in certain features of the motor for which I received Letters Patent of the United States under date of June 5, 1894, No. 520,782.

A main object of my present invention resides in so arranging the armature with relation to the field that the tendency to draw the armature transversely to the armature-shaft will be reduced to a minimum, thus preventing binding or wearing between the shaft and its bearing-boxes.

Another object is to provide an improved construction of gear for the armature-magnets; and a further object is to provide an improved construction of field pole-pieces.

I will describe an electric motor embodying my invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is an end elevation of a motor embodying my invention. Fig. 2 is a vertical section thereof. Fig. 3 is a partial elevation and partial section at right angles to Fig. 2. Fig. 4 is a vertical section of the commutator end of the motor. Fig. 5 is an edge view of a field pole-piece employed, and Fig. 6 is a sectional view showing a clamp employed in connection with the commutator sections or segments.

The armature comprises a frame consisting of two end sections 1 2, attached to the armature-shaft 3. These end sections have outwardly-extended flanges 4, to which the armature-magnets are attached. The end sections 1 and 2 consist of a non-magnetic metal—such, for instance, as brass.

Supported between rings 5 and 6 of non-magnetic material is a plurality of field-magnets. I have here shown four field-magnets 7, 8, 9, and 10; but it is obvious that any other convenient number may be employed. Each field-magnet consists of a core having the usual wire winding thereon and connected with the field pole-pieces 11 and 12. The pole-pieces are secured by means of screws or otherwise to the rings 5 and 6, and each pole-piece at its inner end adjacent to the armature is concaved, the radius of this concave being somewhat greater than the radius of the armature. The opposite edges of these curved or concaved portions of the pole-pieces are made narrow or wedge-shaped, as indicated at 13, while the central portion 14 is of the full thickness of the body of the pole-piece. By this construction an attraction of the armature-cores is produced all the way to the point or thick portion 14, where the current is changed in direction, and the coils of the armature are repelled from that point, and this effect is augmented by the peculiar formation of the armature-magnet cores 15.

Each core of the armature-magnet consists in a number of iron plates arranged closely together, the middle ones being substantially of the same width, the outer, however, being made progressively narrower from the inner edge to the outer edge of the core. This makes the inner edge of the core narrower than the outer edge.

In my patent above referred to the laminations of the cores are at right angles to the radius of the armature, while in this application the laminations are made parallel to the radius of the armature for two reasons—first, because the magnetism in the inside edge of the armature-core will not have any laminations to cross in going to the opposite edge, where it has to go to meet the fields, but will have the solid iron in each layer to conduct the magnetism of the field, and as the core is narrower at the inside edge the magnetism is stronger there than at the outer edge; also, the magnetism rushing from the inside edge of the core to the outer edge will tend to equalize the magnetism in the core. In the patent the magnetism at the inside or inner edge of the core will have to cross the laminations to get to the outer edge.

The several armature-magnets, with their ends, are connected to the flanged end sections 1 and 2 of the armature-frame. As here shown, the ends of the cores are so arranged as to extend underneath the pole-pieces of the fields. The cores are held in connection

with the end pieces 1 and 2 by means of screws 16, of non-magnetic material—such, for instance, as brass. These screws are passed between the ends of adjacent cores and engage in tapped holes in the flanges 4 of the end pieces 1 and 2. The heads may be countersunk, as indicated in Fig. 2, and it is obvious that these screws will maintain the ends at a proper distance apart. By extending the cores so as to pass their ends underneath the pole-pieces the cores will be attracted outwardly in the direction of the radius of the armature, while in the motor shown in my patent they are drawn or attracted to the fields in a direction parallel to the shaft of the motor and at right angles to the radius of the armature. By such construction if the armature is not kept very close to and at the same distance from each of the field-magnets there will be a pulling of the armature to the fields nearest to it, thereby producing a friction and wear on the boxing in which the shaft revolves. This would consume power and produce heat in the boxing and soon wear it out.

The wires from the armature-magnets extend through openings formed in the flange of the end section 1 of the armature-frame and connect with the commutator-segments 17. At the inner end these armature-segments have outwardly-extended arms 18, and each arm forms a portion of a clamp for the ends of the wires, the other portion of the clamp consisting of a plate 19, through which a clamping-screw 20 passes into a tapped hole in the arms 18. The commutator-segments 17 are mounted on a sleeve 21, secured to the shaft 3. At its inner end the sleeve 21 is provided with an annular flange, one wall of which is undercut to engage a beveled projection on the inner end of the commutator-segment, and a ring 22 engages against the outer end of said segments and is locked in place by a nut 23, engaging the threaded portion of the sleeve 21.

To protect the wire connections, with the commutator-segments, from dirt and dust, I employ a cover 24, consisting of fiber or other non-conducting material. This cover is made in the form of a ring, the inner diameter of which is such as to engage closely against the commutator. The outer edge of this cover 24 is designed to be seated in an annular channel formed in the outer surface of the flange 4 of the end sections 1, and it is held in place by means of screws 25, which engage in tapped holes in the flange. At one side the head of each screw is flattened, as plainly shown in Fig. 3, so that by turning the screws to bring the flattened portions adjacent to the edge of the cover 24 the said cover may be moved outward and dropped down into the space between the nut 23 and the bearing 26 for the shaft 3, as indicated in Fig. 2, so that the clamping portions of the commutator may be easily reached when it is desired to adjust the wire connections.

The boxings 27, of Babbitt metal or the like, arranged in the bearings 26 and 28, are held from rotation, while tightening the clamping-nuts holding the same, by means of the stems of the oil-cups 29, the said stems being passed through tapped holes in the bearings and engaging in depressions in the boxings.

The brushes 30 consist of copper-coated carbon. I have here shown three brushes arranged in a set, and each set is held in a brush holder or frame 31, in which are brass tubes 32, forming the sockets for the brushes. Surrounding each socket or tube is a spring 33, one end of which is secured to the holder 31 and the other end secured to a ring 34, attached to the brush by means of a screw 35. The springs will hold the brushes yieldingly, but with sufficient pressure to make a good contact against the commutator, and as the ends of the brushes wear they may be adjusted through the rings 34. The brushes and their holders are mounted in such manner that they may be swung outward away from the commutator and in a direction parallel with the armature-shaft, such outward swinging being necessary when it is desired to remove the cover 24 for making connections or repairs between the armature-magnets and the commutator.

As here shown, each holder 31 has a shank 36 extending from it and pivotally mounted on a block of metal insulated from the brush-holders and supported from the bearing 26. As here shown, the blocks are extended from a ring secured between the inner end of the bearing 26 and a clamping-nut engaging therewith. A finger 38 extends from the shank portion 36 of the brush-holder, and when the said brush-holder is in its operative position it may be so held by means of a screw 39 passing through the finger 38 and into an insulated nut in the block 37. By removing the screws 39 the carbon-holders, with the carbons, may be swung to the position indicated in Fig. 2, for the purpose before described.

In my patent referred to the wires from the armature-magnets deflect from a direct course to the commutator, and the brush-holders are placed midway between the field pole-pieces. In the present case the wires from the magnets extend in a direct or straight line to the commutator, and therefore the operation of wiring is made much more convenient than in the patent arrangement. In this application the brush-holders are placed in a radial line from the center of the pole-pieces or in a direct line with the thickened portions of said pole-pieces.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an electric motor, a field pole-piece having its end adjacent to the armature concaved or curved at a greater radius than the radius of the armature, and the said pole-piece being made thinner at the ends of said

concaved or curved portion, substantially as specified.

2. In an electric motor, a core for the armature-magnet thereof, consisting of plates, the outer plates of the core gradually lessening in width from the inner edge of the core to the outer edge, and the width of said plates being arranged parallel with the radius of the armature, substantially as specified.

3. An armature for an electric motor, comprising a frame consisting of flanged end pieces, cores for the magnets having their ends bearing on said flanges, and screws passing between adjacent cores and engaging in tapped holes in the flanges, substantially as specified.

4. An armature for an electric motor, comprising a frame consisting of end pieces having outwardly-extended peripheral flanges, the flanges of said end pieces having openings for the passage of wires from the magnets to a commutator, cores for the magnets, the ends of said cores being extended across the flanges of the end pieces, and screws passing between adjacent ends and engaging in tapped holes in the flanges, the heads of said screws being countersunk in the outer portions of the cores, substantially as specified.

5. A commutator for an electric machine, comprising segments, arms extended outward from the inner ends of said segments, the said arms forming clamp-sections, other clamp-sections consisting of plates, screws passing through said plates and engaging in the arms, and a cover of non-conducting material for protecting the clamp-sections from dust, substantially as specified.

6. In an electric motor, an armature, a commutator with which the wires of the armature connect, and a cover consisting of a non-conducting material, the said cover being adapted to slide over the commutator and to engage with a portion of the frame of the armature, and means for removably securing said cover in place, substantially as specified.

7. In an electric motor, an armature, a commutator with which the wires of the armature connect, the said connections being within an end frame of the armature, a ring-like cover of non-conducting material surrounding the commutator and having its outer edge engaged in a channel formed in said end frame, and screws for securing the covering-plates, said screws having their heads flattened on one side so that when said flattened portions are turned toward the cover the said cover may be moved upward, substantially as specified.

8. In an electric motor, a brush-holder mounted to swing outward in a direction parallel with the shaft of the motor, a commutator and a cover movable outward on the commutator when the brush-holder is swung outward, substantially as specified.

9. In an electric motor, a brush-holder, comprising a casing, a tube forming a socket in said frame, a spring surrounding said tube and having one end connected to the frame, and a carbon-clamping ring to which the other end of said spring is attached, substantially as specified.

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Witnesses:
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HERBERT L. EVERSON.