B. ELSHOFF.

ROTOR CONSTRUCTION.

APPLICATION FILED SEPT. 7, 1906.

900,839. Patented Oct. 13, 1908.

3 SHEETS—SHEET 1.

Fig 1

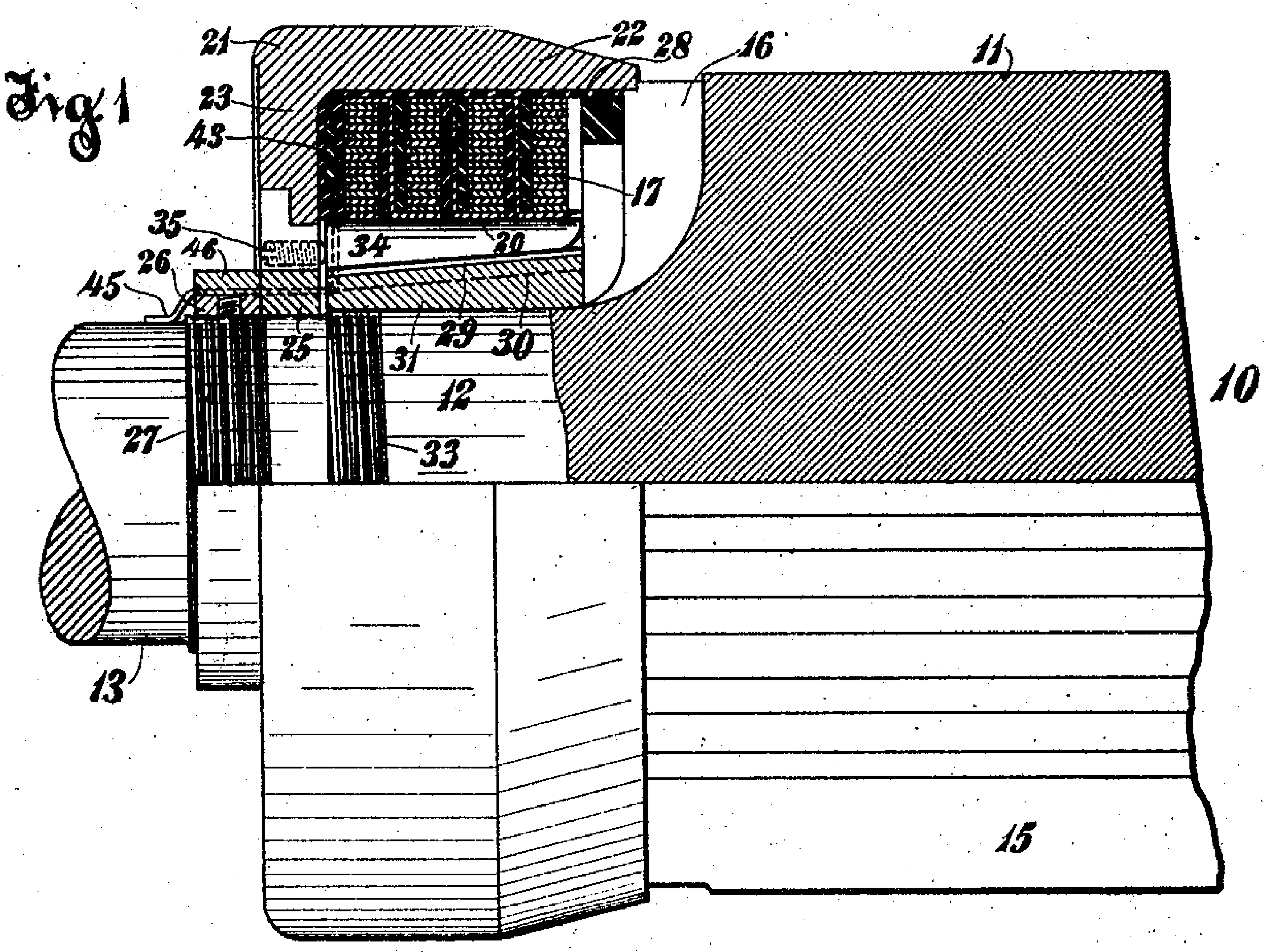
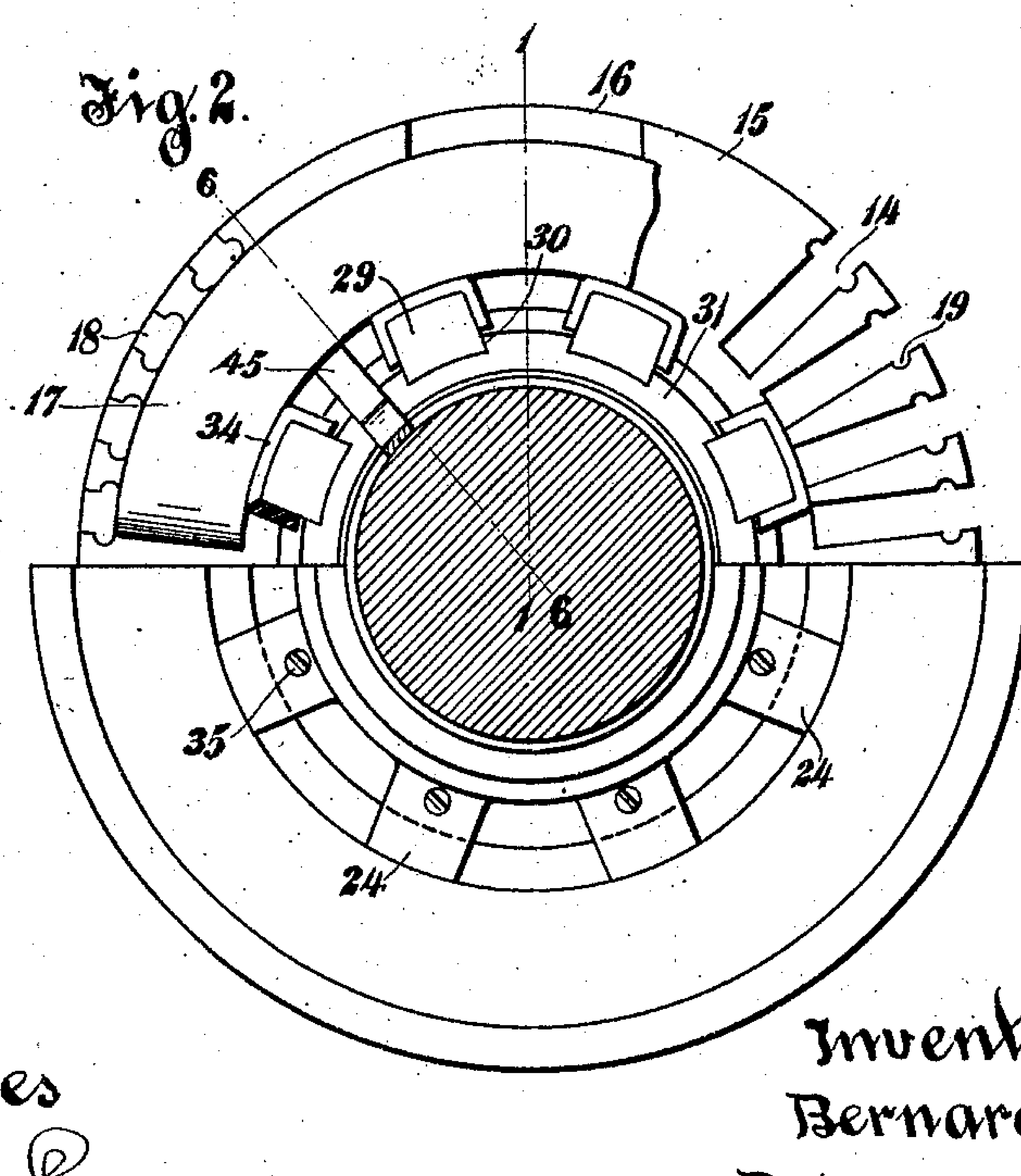


Fig. 2.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 3

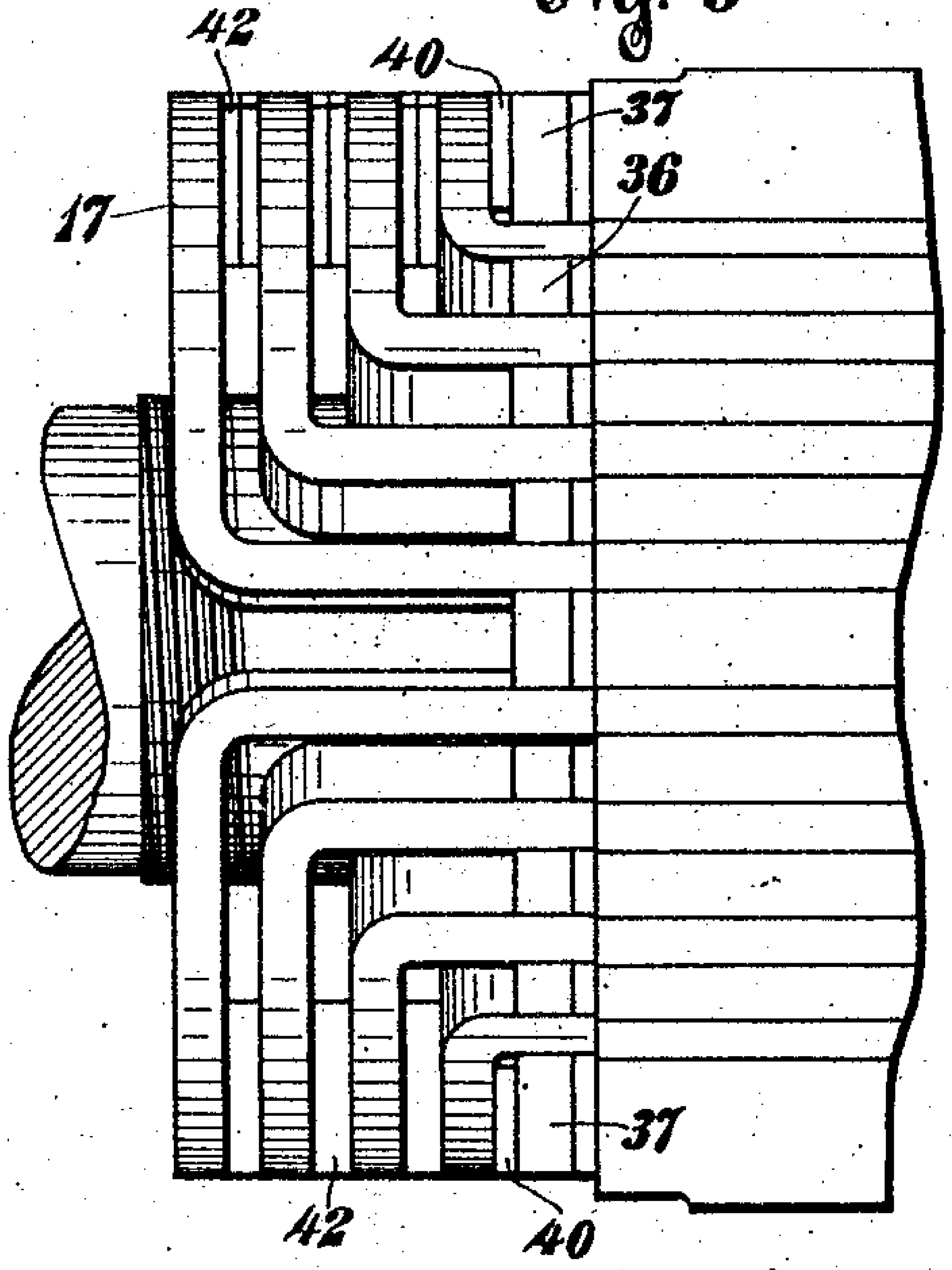

Fig. 4

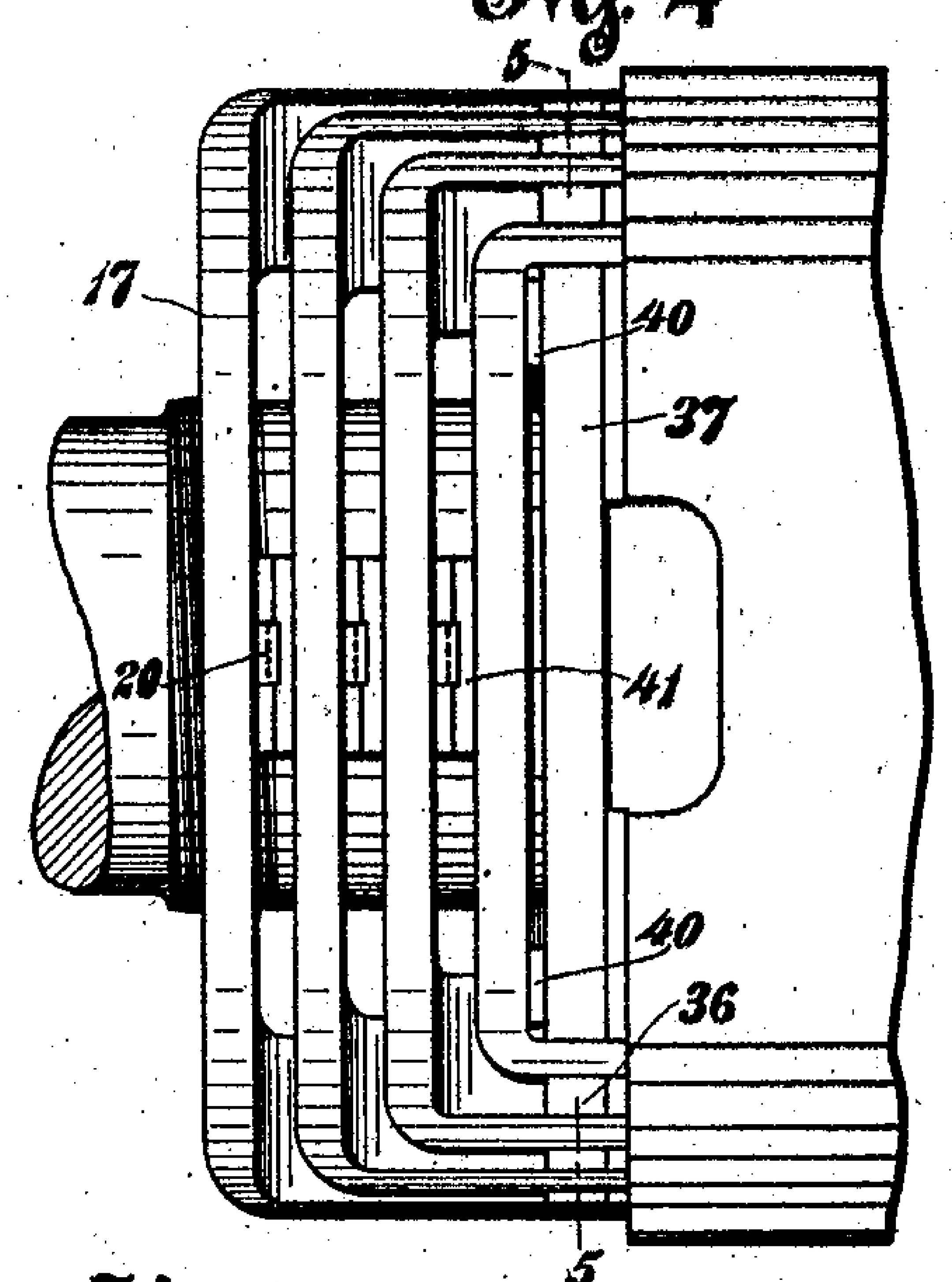

Fig. 5.

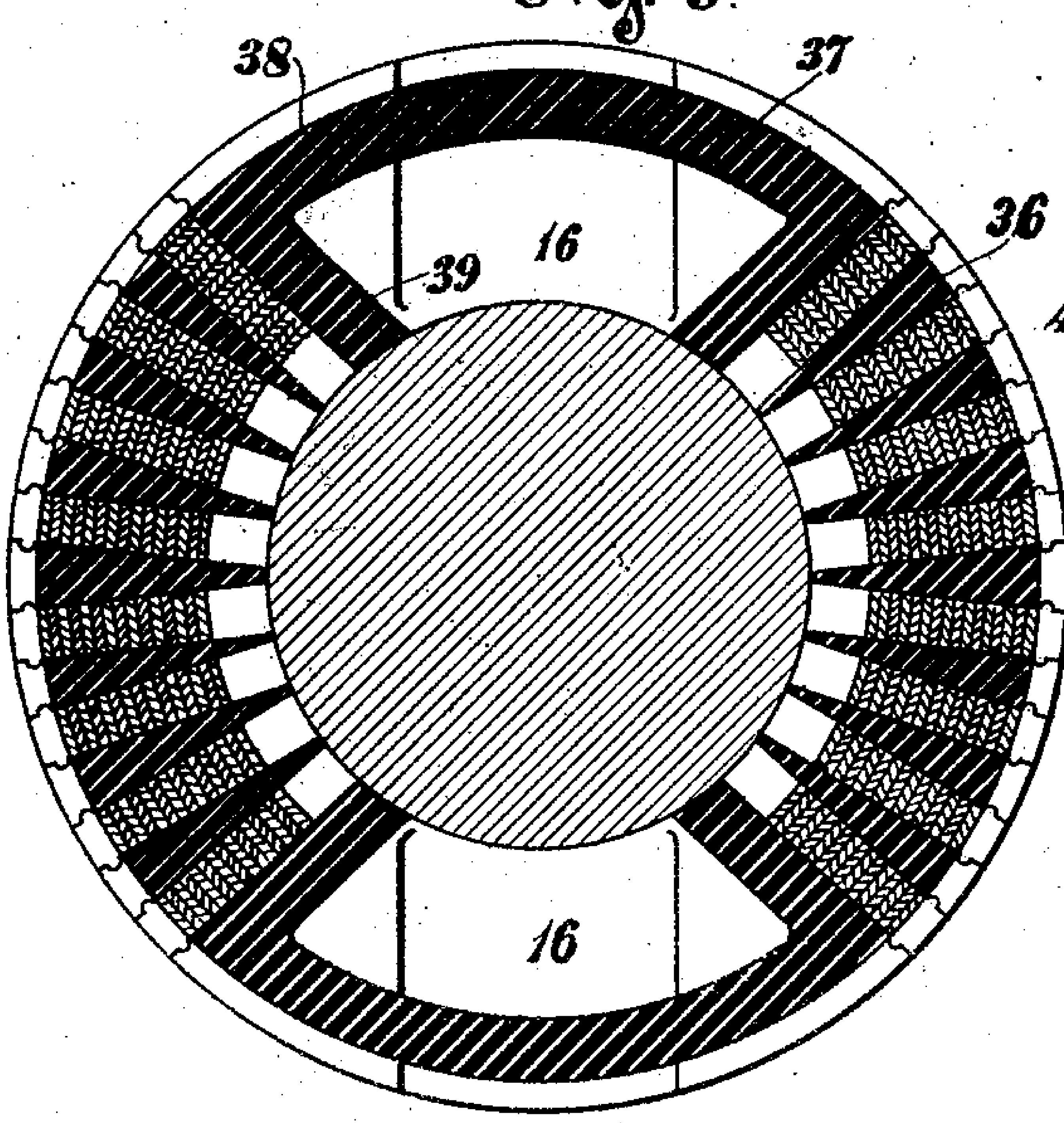

Fig. 6

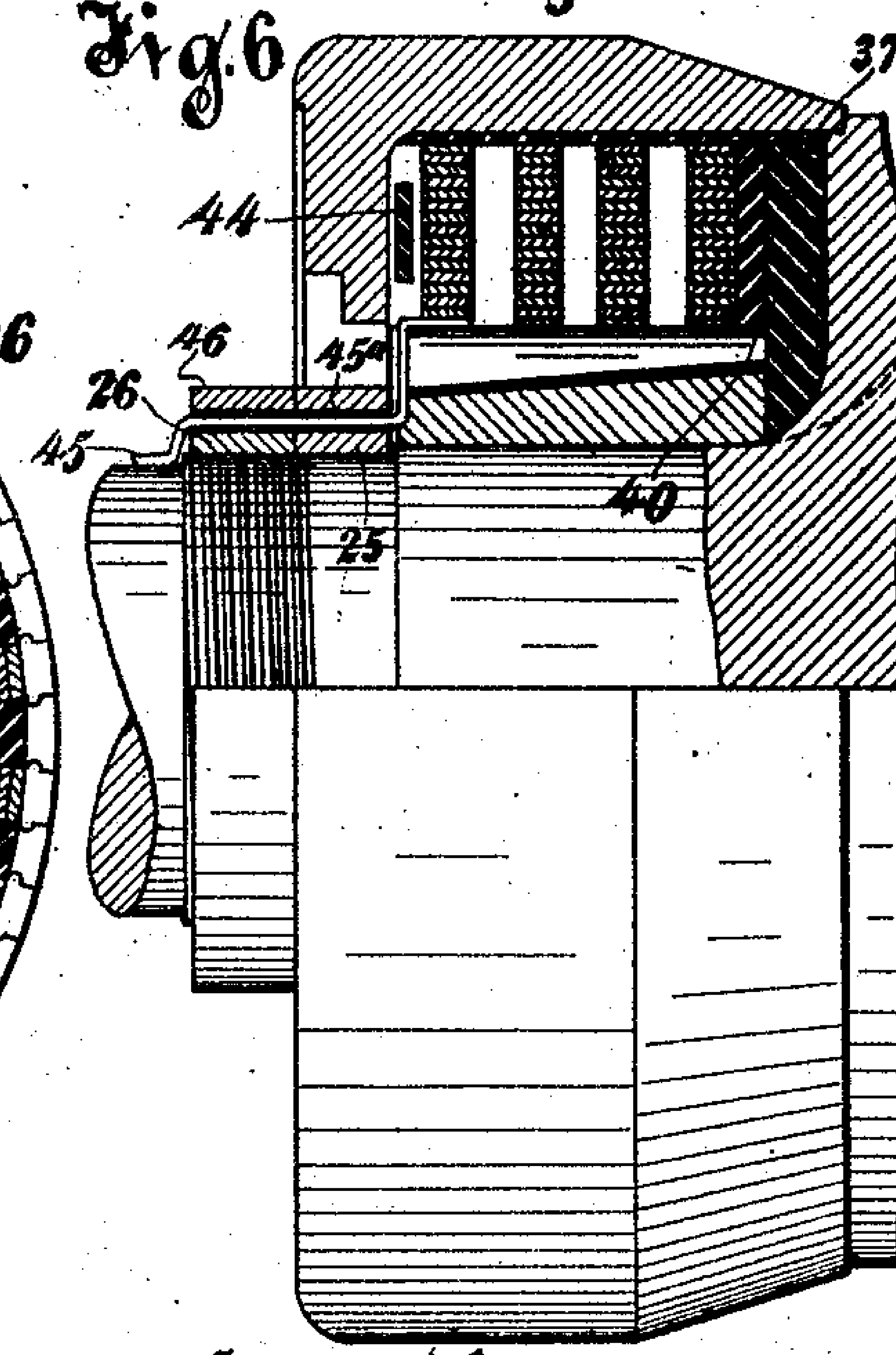

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Fig. 7.

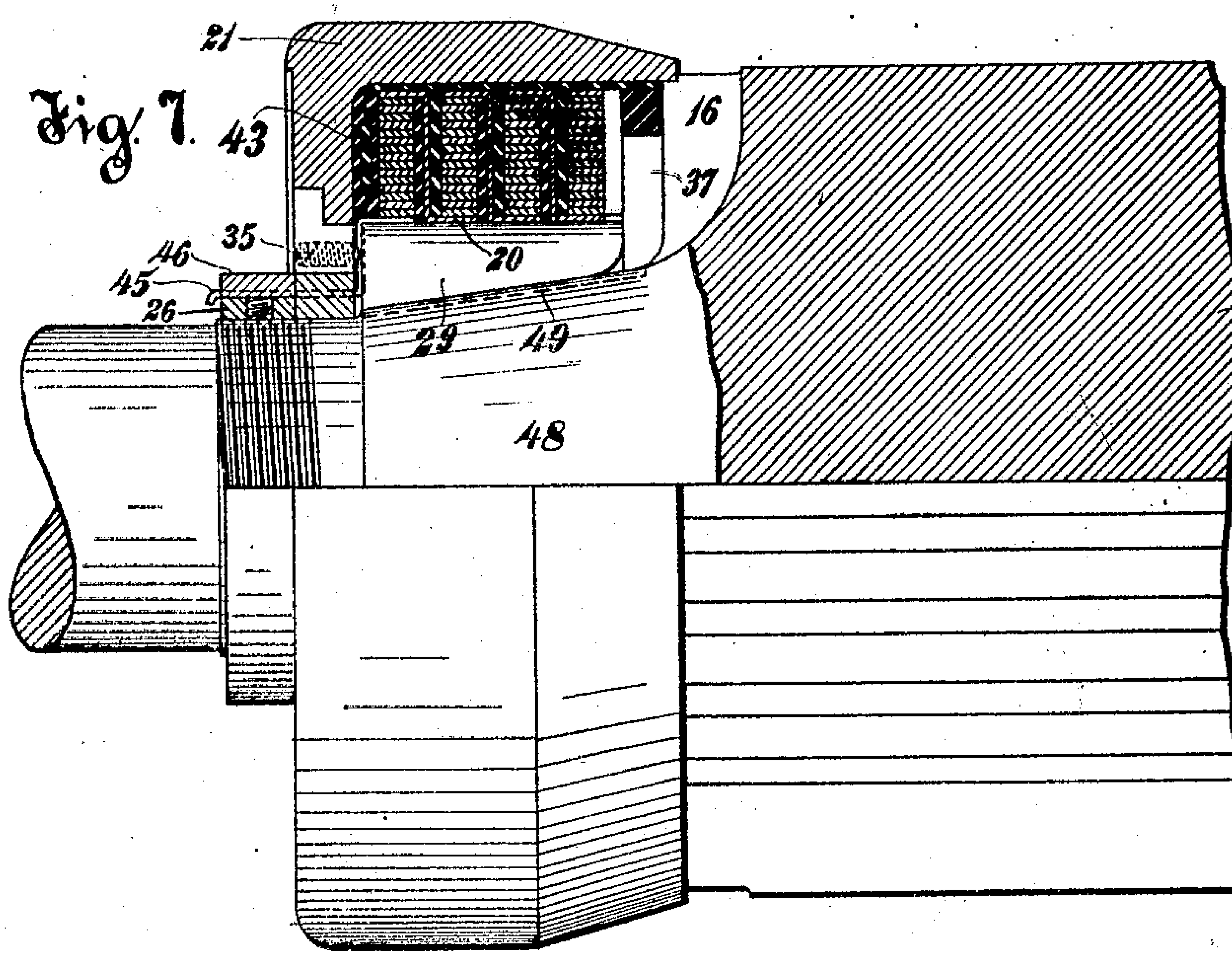


Fig. 8

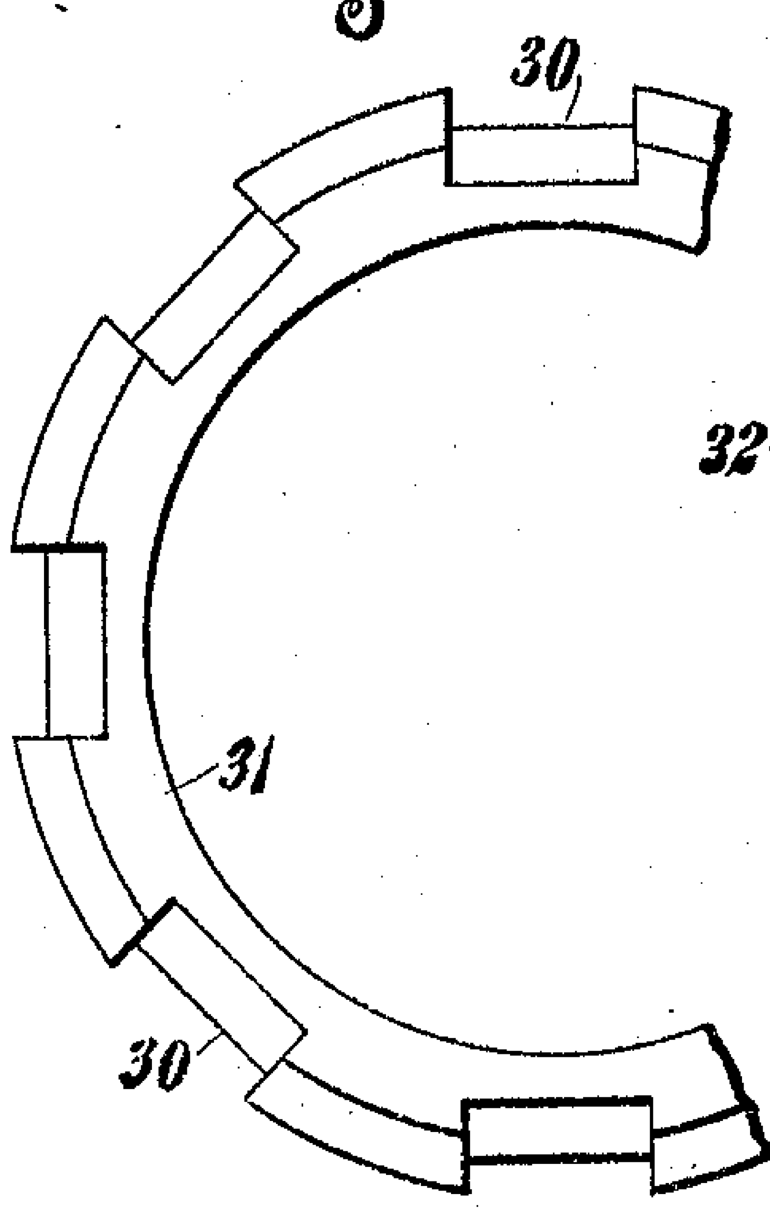


Fig. 9

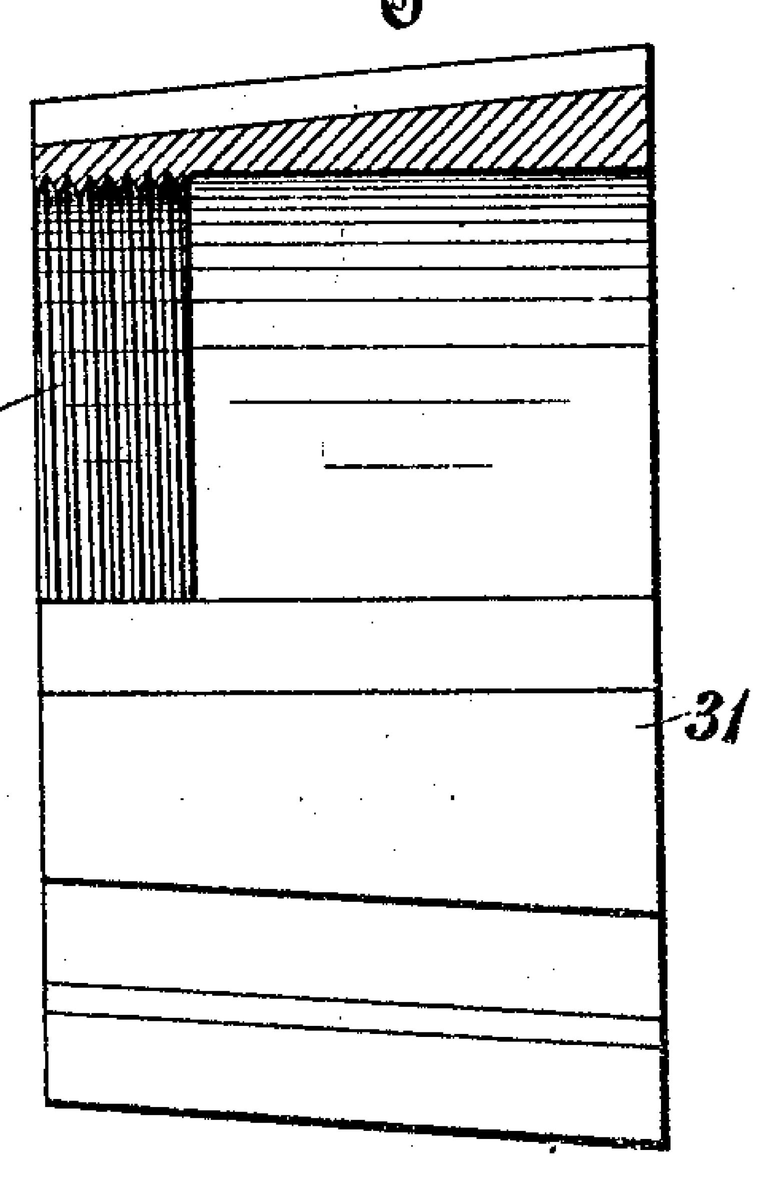


Fig. 10

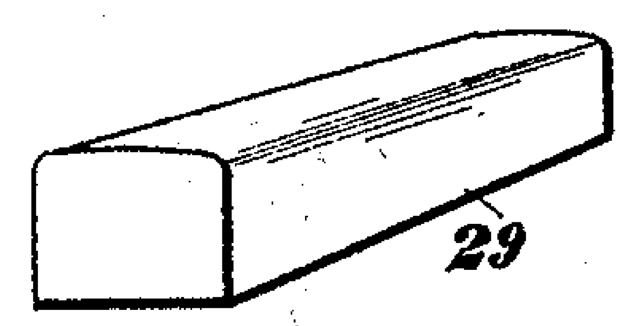
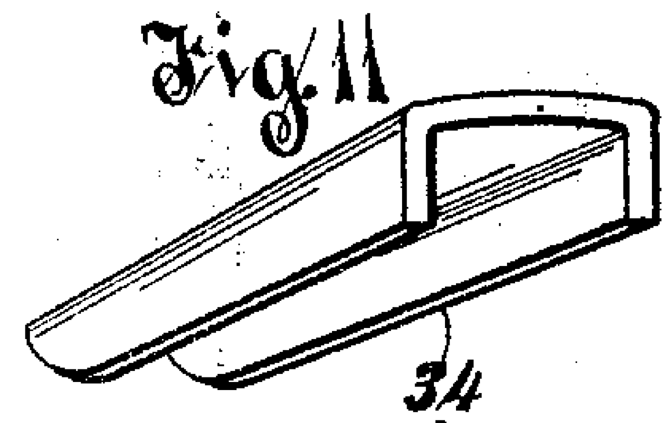


Fig. 11



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UNITED STATES PATENT OFFICE.

BERNARD ELSHOFF, OF NORWOOD, OHIO, ASSIGNOR TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY, AND THE BULLOCK ELECTRIC MANUFACTURING COMPANY, A CORPORATION OF OHIO.

ROTOR CONSTRUCTION.

No. 900,839. Specification of Letters Patent. Patented Oct. 13, 1908.

Application filed September 7, 1906. Serial No. 333,612.

To all whom it may concern:

Be it known that I, Bernard Elshoff, citizen of the United States, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Rotor Constructions, of which the following is a full, clear, and exact specification.

My invention relates to rotary members of dynamo-electric machines and particularly to the rotary field members of turbo-alternators.

One of the objects of my invention is to provide a rotary member for high speed machines which is strong, compact and consists of few parts all of which are well protected against displacement by centrifugal force.

A further object is to provide an improved and simplified means for supporting, adjusting and retaining in position the portions of the coils extending beyond the core.

My invention consists in the details of construction and combination and arrangements of parts described in the specification and set forth in the appended claims.

For a better understanding of my invention reference is had to the accompanying drawings in which

Figure 1 is a partial sectional elevation of a rotary field member constructed according to my invention the section being taken along the line 1—1 of Fig. 2; Fig. 2 is an end elevation, parts being broken away and in section; Fig. 3 is a partial elevation with the end-cover for the field coils removed, showing the supporting and bracing insulating blocks between the coils and the end of the rotor; Fig. 4 is a similar view of the rotor revolved 90° from the position shown in Fig. 3; Fig. 5 is a section along the line 5—5 of Fig. 4; Fig. 6 is a view similar to Fig. 1, the section being taken approximately along the line 6—6 of Fig. 2; Fig. 7 is a view similar to Fig. 1 showing a slight modification of my invention; Fig. 8 is a partial end elevation of a collar or sleeve employed in the construction shown in Fig. 1 for supporting the wedges or seats which retain in position the end-turns of the coils; Fig. 9 is a sectional elevation of the same; Fig. 10 is a perspective view of one of the coil seats or wedges; and Fig. 11 is a perspective view of one of the insulating shoes for the coil retaining seats or wedges.

My invention consists in the details of construction and in the combinations and arrangements of parts described in the specification and set forth in the appended claims.

Referring now to the figures of the drawing I have shown at 10 a portion of a rotary member which is in this case a rotary field member of a turbo-alternator. The core 11 of the rotary member is solid and is preferably provided with integral shaft projections 12 to which the shaft ends 13 are secured. The core and shaft projections are preferably made from a single steel forging. The core is provided with radial slots 14 for the reception of field coils, and with solid pole pieces 15, a two pole rotor being here shown. The pole pieces are in this case separated by eight radial coil slots, there being four concentric coils per pole. Each pole piece is provided at each end of the core with a ventilating slot or recess 16 which extends from the periphery inward toward the shaft projection. The coils, the end-turns of which are shown at 17, are retained in position by non-magnetic coil retaining wedges 18 which engage slots 19 in the ends of the teeth. The coils are all connected in series, the four coils of each group being connected together by straps or conductors 20 which extend in this case from the outer layer of one coil to the innermost layer of the adjacent coil as is clearly shown in Fig. 1. The coils are provided with collector leads, one of which is shown in Figs. 1, 2, 6 and 7, for connecting the coils to the collector rings (not shown).

The parts of the coils which project beyond the core are held in position so that they can not be distorted or displaced by centrifugal force and so that there can be no relative movement or vibration of the parts, which might destroy the insulation. At each end of the core, is an end-cover 21 for the end-turns of the field-coils consisting of a ring or cylindrical portion 22 surrounding the coils, and a portion 23 integral therewith and extending inwardly at right angles to the ring or cylindrical portion. The inner edge of the ring 22 of each end-cover engages and fits closely within a groove at the edge of the core, and the inwardly extending portion 23 rests upon radial arms 24 of a ring or collar 25 fitting directly on the shaft projection of the core. The inner edge of the inwardly extending portion 23 of each end-cover 21, and the outer ends of the radial arms 24 are provided with interfitting notched portions forming rabbet joints. Each ring or collar 25 and the end-cover are pressed inward toward the core and are held in position by a ring or nut 26 which engages a threaded portion 27 of the shaft projection. The end-turns are preferably separated from each of the outer surrounding rings 22 by one or more sheets of insulation 28.

The end-turns of the coils at each end of the core are supported and pressed outwardly against the ring 22 of the end-cover 21 by wedges 29, the inner surfaces of which are inclined, and are seated in slots 30 of a sleeve or collar 31 having an inclined or beveled outer surface. The sleeves or collars, one of which is shown in Figs. 1, 8 and 9 are mounted on the cylindrical portions of the shaft projections, each of the sleeves being provided with a screw-threaded portion 32 which engages a screw-threaded portion 33 on the corresponding shaft projection. Fitting closely over each wedge 29 is an insulating shoe or channel-shaped member 34 which may be pressed into shape from fish-paper or other suitable sheet insulation, or may be molded into the desired shape from plastic insulating material. The shoes 34 insulate the coils from the wedges but do not interfere with the circulation of air between and around the end-turns of the coils, as would be the case if the wedges and coils were separated from each other by sheets of insulating material. In Figs. 10 and 11 respectively are shown in perspective one of the wedges and one of the insulating shoes. In this case eight equally spaced wedges are employed at each end of the core, and the rings 25 each have eight radial arms 24 located opposite the wedges. I provide means for adjusting each wedge 29 separately so that all portions of the coils are forced outward against the cylindrical portions 22 of the end-covers with equal pressure. In this case this is accomplished by means of set screws 35 mounted in the radial arms 24 and bearing against the ends of the wedges. Thus each wedge can be separately adjusted and hence all the coils can be forced outward against the end-ring with equal pressure, regardless of slight inequalities in the thickness of the coils.

The projecting portions of the coils are carefully spaced apart and braced and are spaced from the end-covers and the core by insulating spacing members as will now be described. Referring particularly to Figs. 3, 4 and 5, it is seen that between the coils at their points of emergence from the core are wedge-shaped blocks of insulating material 36 which fit tightly between the coils and extend inward to the rounded part of the shaft projection.

Located opposite each pole and within the innermost coil of each group is a wedge-shaped insulating member 37 consisting of an arc-shaped portion 38 which extends across the end of the pole and substantially radial arms 39 which extend inward, and rest against the face of the pole. It is seen that the shape of the bracing members 37 is such as not to interfere with the outward flow of air through the recesses 16 in the ends of the poles. The members 37 are separated in this case from the innermost coils of the groups by insulating blocks 40. The insulating blocks brace the coils and prevent the coils from vibrating and rubbing against the comparatively sharp edges of the slots, and hence eliminate the danger of abrasion of the coil insulation. The middle portions of the end-turns of the coils are carefully spaced from each other by spacing members 41 These spacing members also serve to hold in position the straps 20, which connect together the coils of each group. As is shown in Figs. 1, 3, 4 and 7 the spacing members each consist of two blocks between which the straps 20 are tightly held. The straps 20 of the two groups of coils are preferably located at opposite ends of the machine, and therefore the spacing members at each end of the core, for one group of coils may consist of solid blocks 42, the spacing members at the same end of the core but for the opposite group of the coils consisting of two parts as shown in Fig. 3. The outermost coils are spaced from the inwardly extending portion 23 of each end-cover by spacing members consisting of insulating blocks 43 mounted on an insulating ring 44 (shown in cross section.)

Referring now to Fig. 6 it is seen that the collector lead 45 which is attached to the outermost coil of the group extends inward between the coil retaining wedges and outward along the shaft through an opening 45^a between two of the radial arms 24 of the ring 25, over the ring or nut 26 which retains the ring 25 in position and out to the collector ring (not shown.) The two collector rings are preferably located at opposite ends of the machine, and hence only one collector lead is shown. The collector leads are held in position on the nut 26 by an outer surrounding ring 46, seated directly on the ring 26. This ring is provided with an opening to receive the lead.

In Fig. 7 I have shown a slight modification of my invention. The core 47 here shown is similar to the core 11 shown in Fig. 1 except that the shaft projections 48 are inclined and support directly the coil seats or wedges, thus dispensing with the wedge supporting sleeves or collars. In this case the inclined shaft projections are provided with grooves 49 in which are seated the coil supporting wedges 29. As in the first construction the end-turns at the end of the core are surrounded by an end-cover 21 having an inwardly extending portion 23 which engages the outwardly extending arms 24 of the ring 25, and each wedge 29 can be adjusted by means of a set screw 35 located in the radial arms.

It is seen that the rotor is compact, consists of few parts which are held rigidly in position. By means of the adjustable wedges 29 and set screws 35 all portions of the coils can be forced outward against the end-covers regardless of differences in thickness of the coils or wedges. The construction shown in Fig. 3 consists of fewer parts than that shown in Fig. 1, but I prefer the former construction for the reason that it is a difficult matter to cut the grooves for the wedges into the inclined shaft projections, while it is a comparatively simple matter to cut the grooves into the sleeves or collars employed in the construction shown in Fig. 1. All parts of the coils are so well braced and supported by the insulating spacing members that there can be no displacement, vibration or rubbing of the parts. When the rotor is in motion a large volume of air passes between the radial arms of the rings 25, between the coil supporting wedges and outward through the slots or recesses 16. Also the insulating shoes permit air to pass between the end-turns.

I do not wish to be confined to the exact details shown as many changes can be made without departing from the spirit and scope of my invention, and I aim in my claims to cover all such changes.

What I claim as new and desire to secure by Letters Patent is:—

1. In a rotor of a dynamo-electric machine, a core, coils carried thereby, said coils having end-turns projecting beyond the ends of the core, an end-cover surrounding the end-turns at each end of the core, a member resting on the shaft and engaging said end-cover, a plurality of wedges for forcing the end-turns outward against the end-cover, and means carried by said member for adjusting each wedge separately.

2. In a rotor of a dynamo-electric machine, a core, coils carried thereby, said coils having end-turns projecting beyond the ends of the core, an end-cover surrounding the end-turns at each end of the core, a member mounted on the shaft, said member having radial arms engaging said end cover, wedges for forcing said end-turns outward against the end-cover, and means carried by said radial arms for separately adjusting the wedges.

3. In a rotor of a dynamo-electric machine, a core, coils carried thereby, said coils having end-turns projecting beyond the ends of the core, an end-cover surrounding the end-turns at each end of the core, said end-cover consisting of a cylindrical ring-shaped portion, and an inwardly extending portion at right angles thereto, wedges for forcing said end-turns outwardly against the end-cover, a ring or collar having radial arms engaging the inwardly extending portion of the end-cover, said arms being located opposite the said wedges, and means mounted in said radial arms for independently adjusting the said wedges.

4. In a rotor of a dynamo-electric machine, a core, coils carried thereby, said coils having end-turns projecting beyond the ends of the core, an end-cover surrounding the end-turns at each end of the core, a member supported on the shaft or shaft projection of the core, and engaging said end-cover, a plurality of wedges for forcing the end-turns outwardly against the end-cover, and screws carried by said member for adjusting each wedge separately.

5. In a rotor of a dynamo-electric machine, a core and shaft, coils carried by said core and projecting beyond the ends thereof, an end-cover surrounding the projecting ends of the coils at each end of the core, a ring or collar having radial arms engaging the end-cover, wedges for forcing said end-turns outwardly against said end-cover, and adjusting screws carried in said radial arms for adjusting each wedge separately.

6. In a rotor of a dynamo-electric machine, a core having shaft projections at each end, coils carried by said core and extending beyond the ends thereof, an end-cover surrounding the projecting ends of the coils at each end of the core, coil seats or wedges supported on said shaft projections, an end-member mounted on each shaft projection and engaging said end-cover, and means carried by said end-member for adjusting each wedge separately.

7. In a dynamo-electric machine, a core having shaft projections at its ends, coils carried by said core and projecting beyond the ends thereof, coil seats or wedges supported by said shaft projections, a ring or collar mounted on the shaft or shaft projections, at each end of the core and engaging the corresponding end-cover, and screws or bolts mounted in said member for adjusting each wedge separately.

8. In a dynamo-electric machine, a slotted core having shaft projections, coils carried by said core and extending beyond the ends thereof, end covers surrounding the projecting ends of the coils, a sleeve or, colla. mounted on each of the shaft projections, said sleeve or collar having a beveled outer surface, coil seats or wedges carried by said sleeve, a member mounted on said shaft projection and engaging the end-cover, and means carried by said member for adjusting each wedge separately.

9. In a dynamo-electric machine, a slotted core, said core having shaft projections, shafts secured to said projections, coils located in the slots of the core and extending beyond the ends thereof, end-covers surround-

ing the projecting ends of the coils, each end-cover having an inwardly extending portion, a ring or collar mounted on the shaft or shaft projection at each end of the core, said ring or collar having radial arms or projections engaging the inwardly extending portion of the end-cover, a sleeve having an outer beveled surface mounted on each shaft projection, said sleeve being provided with a plurality of slots, a coil seat or wedge located in each slot, and means carried by the radial arms or projections on the rings or collar for adjusting each wedge separately.

10. In a dynamo-electric machine, a slotted core, said core having field coils extending beyond the ends of the core, an end-cover surrounding the projecting ends of the coils, at each end of the core, coil seats or wedges for forcing the end-turns outwardly against the end-cover, and an insulating shoe fitting over each wedge.

11. In a dynamo-electric machine, a slotted core, coils carried thereby, having end-turns beyond the ends of the core, end-covers surrounding the end-turns, coil seats having their inner faces beveled or inclined, said coil seats resting upon a member having an inclined outer surface, an insulating shoe fitting over each coil-seat for insulating the latter from the end-turns, and means for adjusting each coil seat separately.

12. In a rotor of a dynamo-electric machine, a core, field coils carried thereby, said coils being arranged in groups, each group consisting of a number of concentrically arranged coils, conductors for connecting the coils of each group in series, and spacing blocks between the end-turns of said coils, said spacing blocks serving also as supports for the said conductors.

13. In a rotor of a dynamo-electric machine, a core, groups of concentric field coils carried thereby, strap conductors for connecting the coils of each group in series, and a pair of adjacent insulating blocks separating the end-turns of each pair of adjacent coils, each one of said strap conductors being located between a pair of said insulating blocks

14. In a rotor of a dynamo-electric machine, a core having shaft projections and slots to receive field coils, groups of concentric coils in said slots the depth of the slots being such that there is a space between the ends of coils which project beyond the core and the shaft projections, means for bracing the coils at their points of emergence from the core comprising members of insulating material bearing against the ends of the core and extending between adjacent coils, said members also extending inward beyond the innermost layers of the coils and engaging the shaft projections, rigid covers inclosing the ends of the coils, and means between the shaft projections and the ends of the coils for forcing the latter outward in firm engagement with the end covers.

15. In a rotor of a dynamo-electric machine, a core, said core having radial slots and pole pieces, said pole pieces being recessed at their ends forming ventilating openings, a group of concentric coils around each pole piece and extending beyond the ends of the core, and a wedge-shaped block of insulating material between the sides of the innermost coil of each group and in engagement with the ends of the core, said block being cut away from the inner side so as to permit an outward circulation of air through the recess in the pole.

16. In a rotor of a dynamo-electric machine, a slotted core, coils located in the slots of the core and extending beyond the ends thereof, an end-cover surrounding the projecting ends of the coils, a ring or nut for holding said cover in position, a collector lead extending outward from said coil over said ring or nut, and a second ring located over said ring or nut for holding the collector lead in position.

17. In a rotor of a dynamo-electric machine, a slotted core having shaft projections, coils located in the slots of said core and extending beyond the ends thereof, an end-cover surrounding said coils, a collar on a shaft projection and supporting the end-cover, wedges for forcing said coils outward against the end-cover, a nut for holding said end-cover in position, a collector lead extending outward from one of said coils through said collar and a ring surrounding said nut and holding the collector lead in position.

In testimony whereof I affix my signature, in the presence of two witnesses.

BERNARD ELSHOFF.

Witnesses:
ARTHUR F. KWIS,
FRED J. KINSEY.