(No Model.) 2 Sheets—Sheet 1.

R. E. BALL.

DYNAMO ELECTRIC MACHINE.

No. 338,692. Patented Mar. 30, 1886.

Fig. 1.

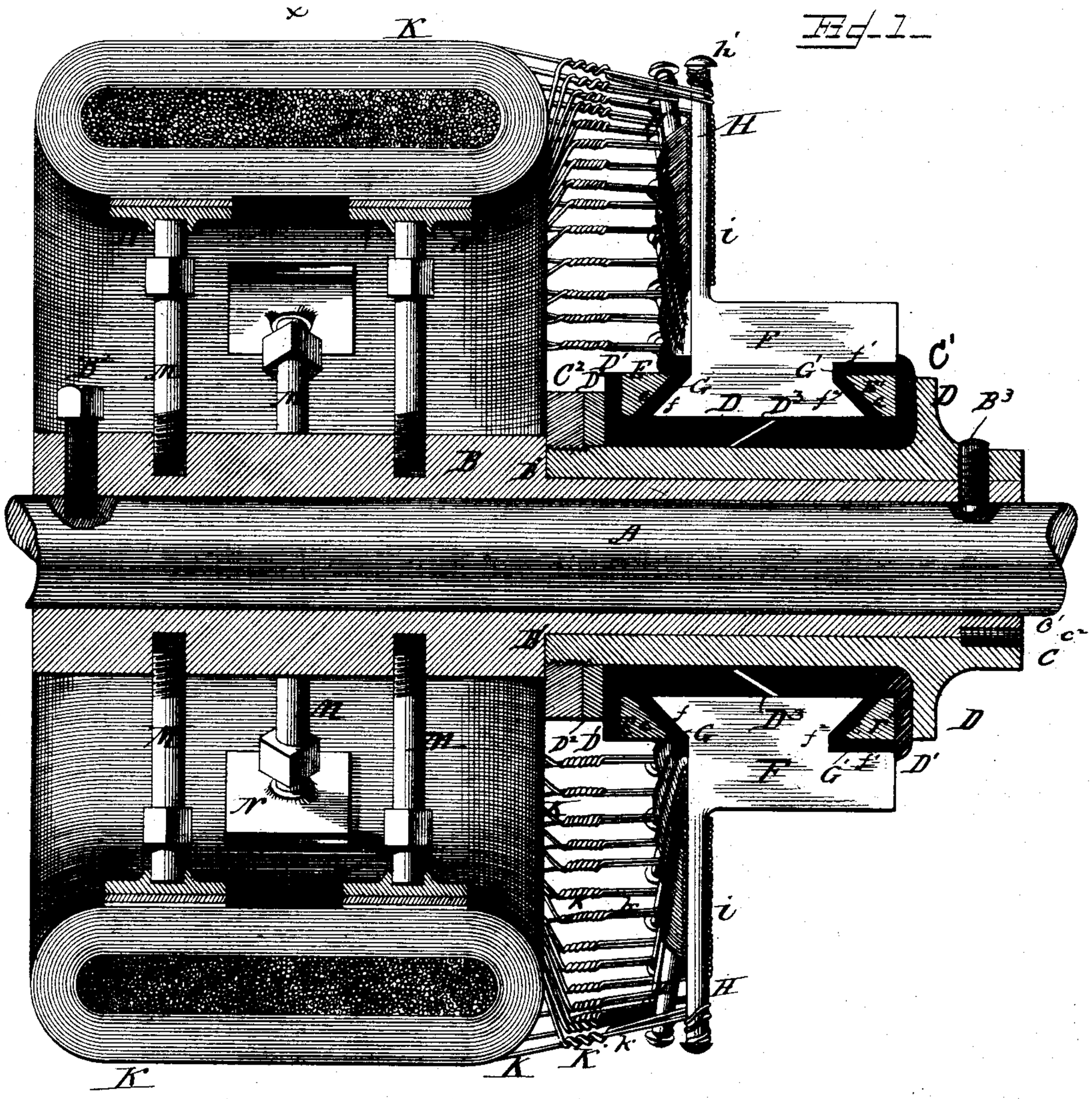
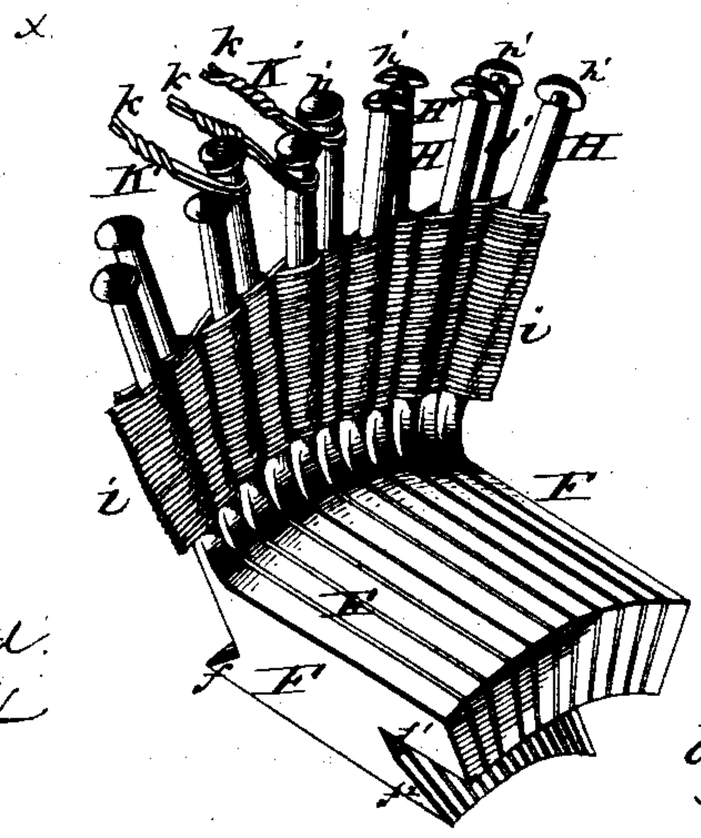


Fig. 3.



WITNESSES
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(No Model.)

2 Sheets—Sheet 2.

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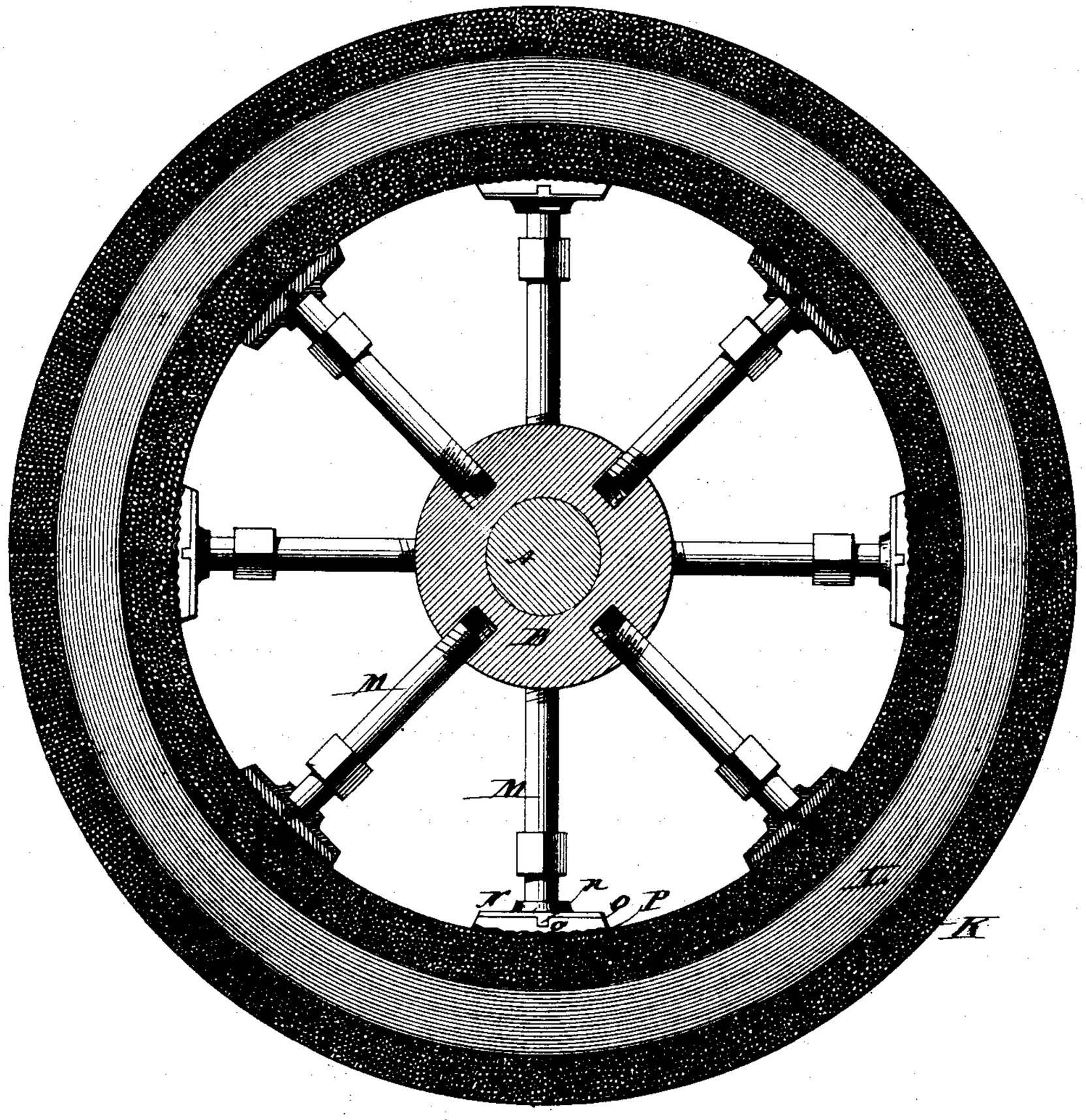
Fig. 2.



WITNESSES

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R. E. Ball

INVENTOR

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UNITED STATES PATENT OFFICE.

ROYAL E. BALL, OF NEW YORK, N. Y.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 338,692, dated March 30, 1886.

Application filed April 25, 1885. Serial No. 163,479. (No model.)

To all whom it may concern:

Be it known that I, ROYAL EDWARD BALL, a citizen of the United States, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

My invention has relation to dynamo-electric machines, and has for its object, first, the provision of a novel form of commutator; secondly, the provision of novel means for attaching the commutator to its shaft; thirdly, the provision of a novel means for connecting the several commutator-sections to the terminals of the armature-coils; fourthly, the provision of novel means for attaching the armature to its shaft.

My invention consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

Referring to the accompanying drawings, Figure 1 is a longitudinal sectional view of the armature, its shaft, and the commutator of a dynamo-electric machine embodying my improvements; Fig. 2, a transverse section of the same on the line *x x* of Fig. 1; Fig. 3, a perspective view of a portion of the commutator, showing the manner in which the commutator-sections are secured to the terminals of the armature-coils, and the manner of insulating the legs of the commutator-sections from one another.

A designates the shaft upon which the armature and commutator are fixed, and through the medium of which they are revolved.

B designates a long sleeve or hollow cylinder, which is slipped on over the shaft, extending from one side of the armature to the outer end of the commutator on the other side. This sleeve B is made of brass, bronze, or other suitable metal, and to it are directly attached the armature and commutator. The sleeve B is reduced at its outer end, forming a shoulder at B′, and is secured to the shaft A by means of two screws, B^2 B^3—one at each end—which pass through the sleeve and into the shaft.

C designates the commutator-hub, which is slipped upon the sleeve B at its reduced portion, so that its inner end contacts with the shoulder B′. The outer ends of the sleeve B and the hub C are flush, and a screw-threaded hole, *c′*, is formed at their line of junction, running in the direction of the longitudinal axis of the sleeve. The hole *c′* is formed one half on the exterior of the sleeve B and the other half on the interior of the hub C, and into the said hole is screwed a screw, c^2, which serves to firmly secure the hub and sleeve together. The screw B^3, which, as before mentioned, serves, in conjunction with the screw B^2, to retain the sleeve B in position on the shaft, serves also to assist in securing the sleeves B and C together, being passed through both before entering the shaft.

C′ designates a flange, which is formed integral with the hub C, near its outer end, and C^2 designates a nut which is screwed upon the inner end of the hub. The flange C′ is rounded off on the inside, and between said flange and nut the commutator-sections are placed and held, as will be presently described.

D designates a hollow spool or cylinder of wood, paper, fiber, rubber, or other suitable insulating material, having a flange, D′, at each end. Said cylinder is slipped on over the sleeve C before screwing on the nut C^2, and the washer D^2 is inserted between the nut and the end of the cylinder, to prevent the former from cutting or abrading the latter. The cylinder D is made in two parts, being divided diagonally at D^3.

E E′ designate two metallic rings, which are fitted on over the cylinder D at each end, the outer sides of the rings bearing against the flanges D′. These rings are beveled off or dished upon their inner sides at *e*, being triangular in cross-section.

F F designate the commutator-sections, which are constructed of the usual material and are set edgewise upon the cylinder D. A triangular projection or lug, *f*, is formed on the lower corner of each section F, at its inner end, the angle coinciding with the angle *e* of the ring E, between which and the triangular lug *f* is placed a ring of suitable insulating material, G. The insulating material extends up above the ring E, and its lower edge touches the cylinder D, thereby completely insulating the commutator-sections from said ring. The outer edge of the commutator-sections opposite the lug *f* is undercut or notched at *f′*, and a lug, f^2, is formed, similar to the lug *f*. A ring of insulating material, G′, V-shaped in section, is inserted between the sections and

the metallic ring E′, completely, covering the latter on top and on its beveled side, and thereby preventing all contact between said ring and the commutator-sections.

Referring now more particularly to Fig. 3 of the drawings, which illustrates more clearly the manner in which the commutator-sections are connected to the terminals of the armature-coils, H H′ H H′ designate the arms of the several sections F F F. Each of these arms is cylindrical, and on the end thereof is a screw, *h*′. Every other arm of the series H H′ is bent in sufficiently to be out of line with the arms next to it, for the purpose of preventing accidental electrical contact between these arms, and for the further purpose of allowing a greater number of commutator-sections and a corresponding smaller armature-section being used than heretofore, for it is well-known that in machines of this class it is of advantage to have as many sections on the armature as possible. In addition to bending in every other arm H H′, I further guard against displacement of the arms and against accidental electrical contact being established by the lodgment of dust or particles of metal from the commutator between the arms by weaving strips of tape or cord *i i i* round the arms and then saturating the same with shellac or equivalent material.

K K K designate the armature-coils, and *k k k* the terminals of the same. One terminal from each coil is twisted, as shown at K′, with the terminal of the next coil, and the two wires are wrapped once or twice around the upper end of the arm H or H′, and then around the shank of the screw *h*′, which is then firmly screwed down, thus establishing a perfect electric contact.

It will be observed that in the connection just described there are no sharp bends in the wire, and by reason of this fact the wire is stronger than where such bends exist, the strain, if any exists, falling upon the wire between the twist and the point where the wire first contacts with the arm H or H′. The manner in which I propose to secure the armature to the sleeve B can be best understood by reference to Fig. 1, and to the detail perspective view, Fig. 3. The armature itself is of a very well-known type, and consists simply of a coil of iron wire, L, upon which are wrapped the coils K K K. Heretofore great difficulty has been experienced in endeavoring to firmly secure this type of armature to the shaft, and the ordinary manner of attachment is by means of metallic heads having angular grooves on the inside for the reception of the rounded edges of the armature, the heads being held together by means of bolts and nuts. In my case the armature is supported by a number of radial arms, M M, having a squared portion, M′, which arms are screw-threaded at one end and fitted into screw-threaded holes in the sleeve B, and at the other end are fitted into and work in sockets in metallic blocks N. These blocks N have each a rib, *n*, upon its face, that fits into a slot, *o*′, in a wide wooden shoe, O, which bears against the interior of the armature. The outer face of each of the shoes O is grooved at *o*′ *o*′ *o*′, such grooves running, when the block is fixed in position, in the direction of the wire of the armature-coils, and between the shoe and the wire is placed a sheet of heavy fabric or other porous material, P, which, when the armature is about to be placed in position, is thoroughly saturated with shellac-varnish or similar substance. After placing the armature in position upon the shoes, the screws M M are turned until they force the cloth pad P tightly against the interior of the armature and into the interstices between the wires of the coils. The shellac drying firmly glues the pad to the shoe M and the armature, and they are thereafter almost inseparable.

It will be noted that the commutator may be drawn off or placed upon the sleeve B by removing the screws B^3 and c^2 and unloosening the terminals of the coils, and that the armature may be removed from the shaft by removing the screws B^2 and B^3, but without displacing the commutator.

I claim—

1. In a dynamo-electric machine, the combination, with the armature and the shaft, of shoes having grooved faces and screws seated in said shoes and screwing into a sleeve upon said shaft, fibrous packing being interposed between said grooved shoes and the interior of the armature, substantially as described.

2. In a dynamo-electric machine, the combination, with a ring-armature, grooved shoes bearing against the same upon the inside, and a fibrous shellac-soaked packing interposed between said armature and shoes, of blocks attached to said shoes, and screw-threaded arms screwing into a sleeve upon said shaft and seated in said blocks, substantially as described.

3. In a dynamo-electric machine, the combination, with the armature and its shaft and the commutator, of a sleeve fitting said shaft and projecting out from within the armature through the hub of the commutator, substantially as described.

4. In a dynamo-electric machine, the combination, with the commutator and the armature and its shaft, of a sleeve fitted over said shaft and secured thereupon, said sleeve serving to receive the ends of radial arms upon which said armature is supported, and having a reduced end which passes through the hub of the commutator, substantially as described.

5. In a dynamo-electric machine, the combination, with the armature-shaft and a sleeve secured thereupon, to which the armature is attached by means of radials arms, of a commutator whose hub fits over said sleeve and is secured thereupon by means of a screw-key which enters a hole formed at the junction of said hub and sleeve, substantially as described.

6. In a dynamo-electric machine, the com-

bination, with a sleeve fitted upon the armature-shaft and carrying the armature, of a hub fitted upon said sleeve and provided with a flange at or near one end and a nut at the other end, cylinders of insulating material having flanges, and commutator-sections which are set between said flanges and held in position by the nut and flange upon the hub, substantially as described.

7. In a dynamo-electric machine, the combination, with the armature-coils, of commutator-sections whose projecting arms are bent in at intervals, or alternately, to prevent contact of the same and permit of the employment of a larger number of sections, substantially as described.

8. The combination, with the commutator-sections E E and their arms H H′, of the tape *i*, woven upon and between said arms, substantially as described.

Signed at New York, in the county of New York and State of New York.

ROYAL E. BALL.

Witnesses:

GEORGE F. ESCHBACH,

J. B. CONNOLLY.