(No Model.) 2 Sheets—Sheet 1

R. J. SHEEHY.

DYNAMO ELECTRIC MACHINE.

No. 294,688. Patented Mar. 4, 1884.

Fig. 1.

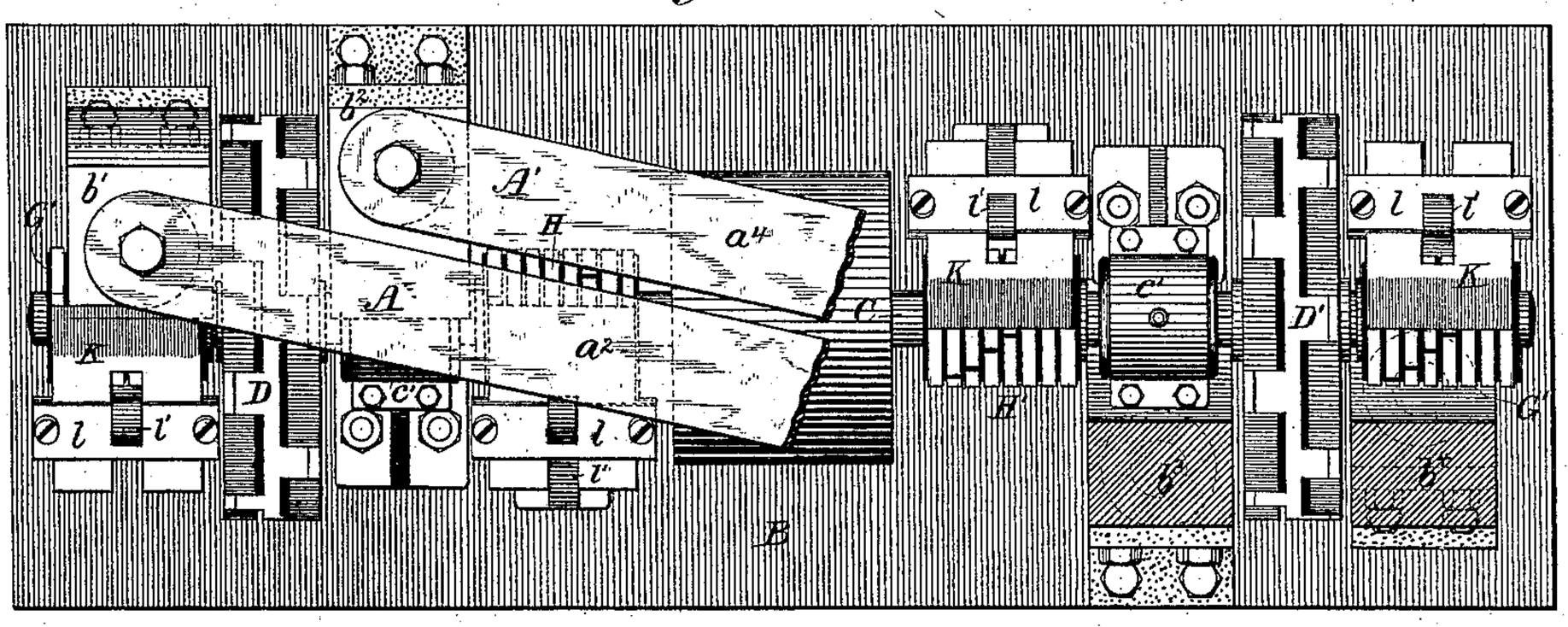
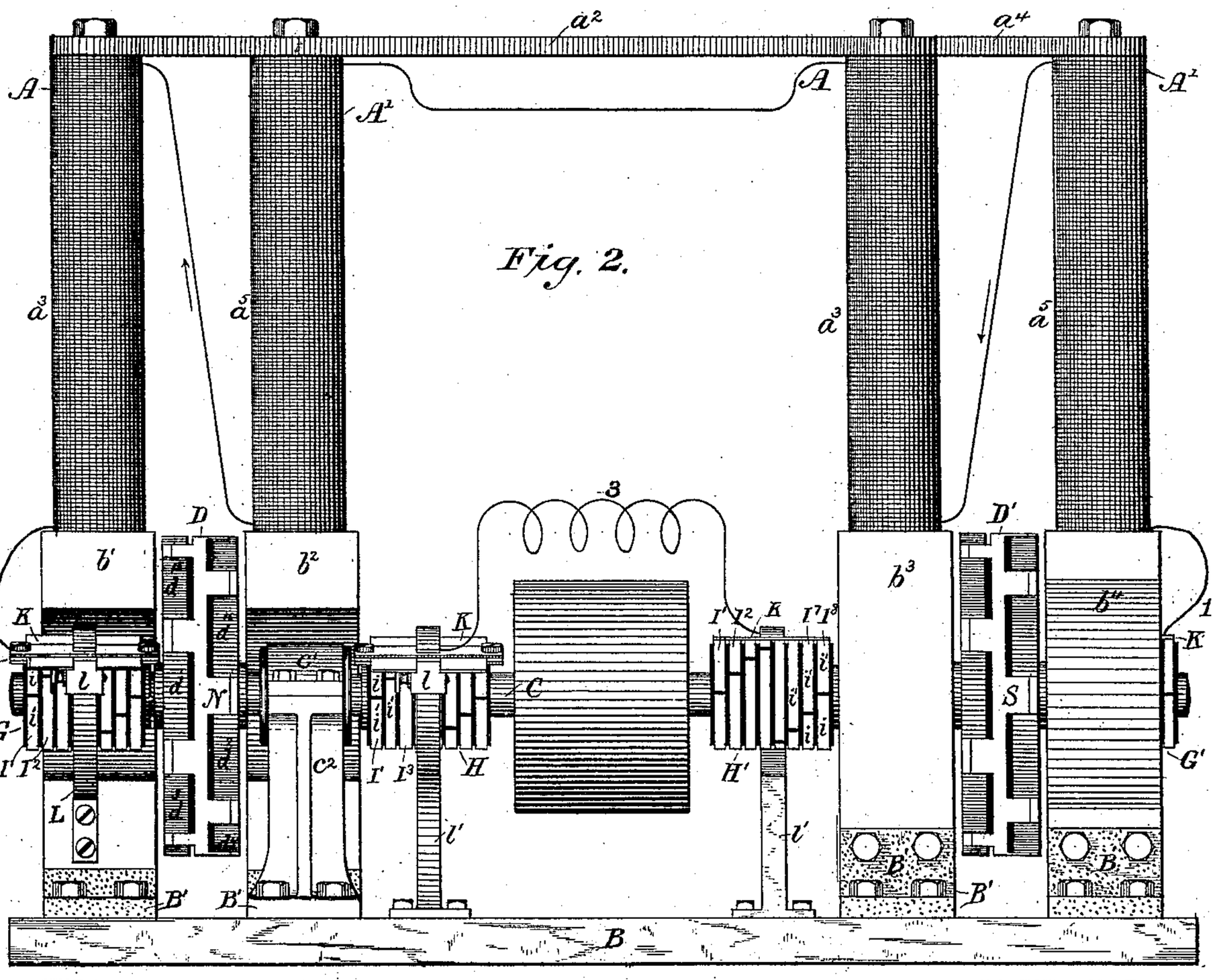


Fig. 2.



WITNESSES

Wm A. Skinkle

H. W. Elmore

INVENTOR

Robert J. Sheehy.

By his Attorneys.

Pope Edgecomb & Butler

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

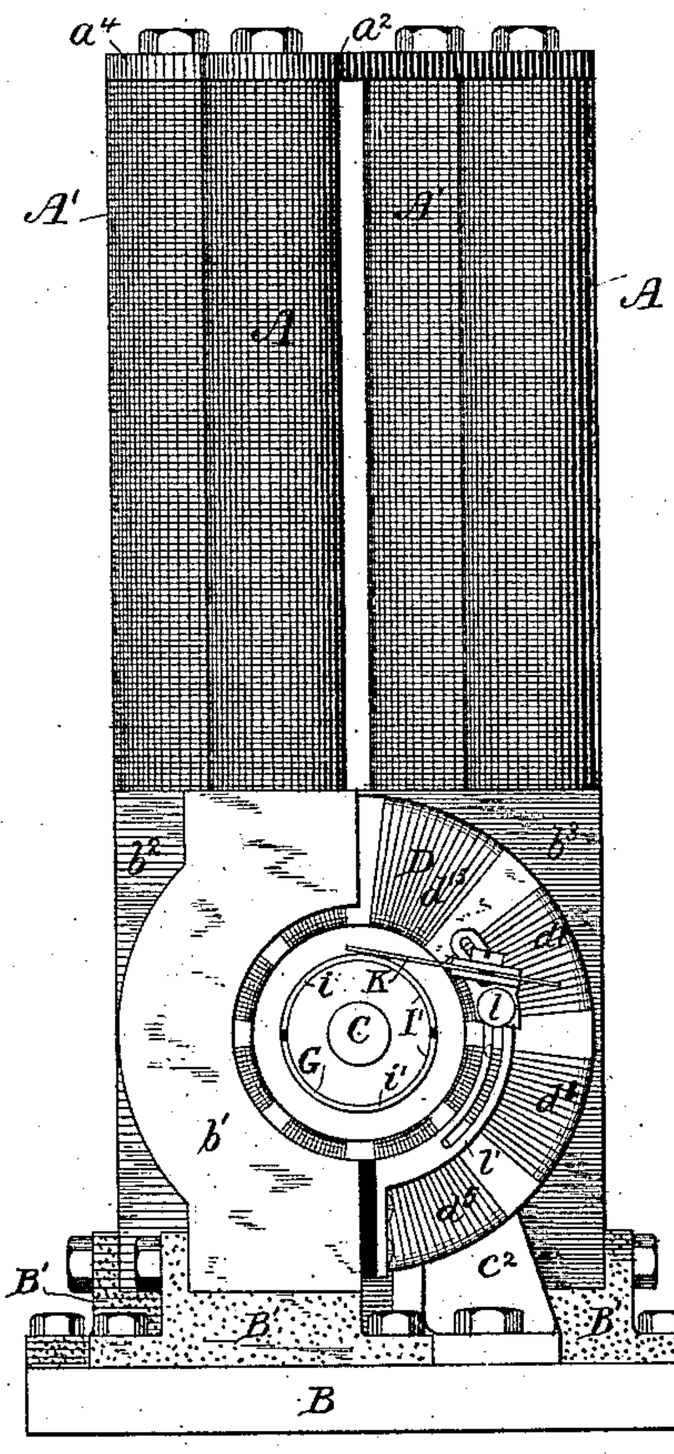


Fig. 7

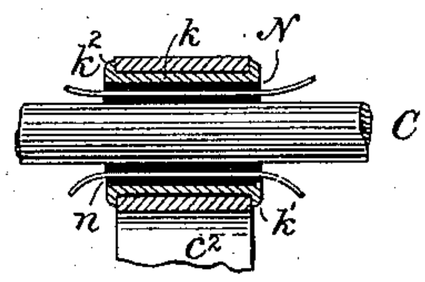


Fig. 4.

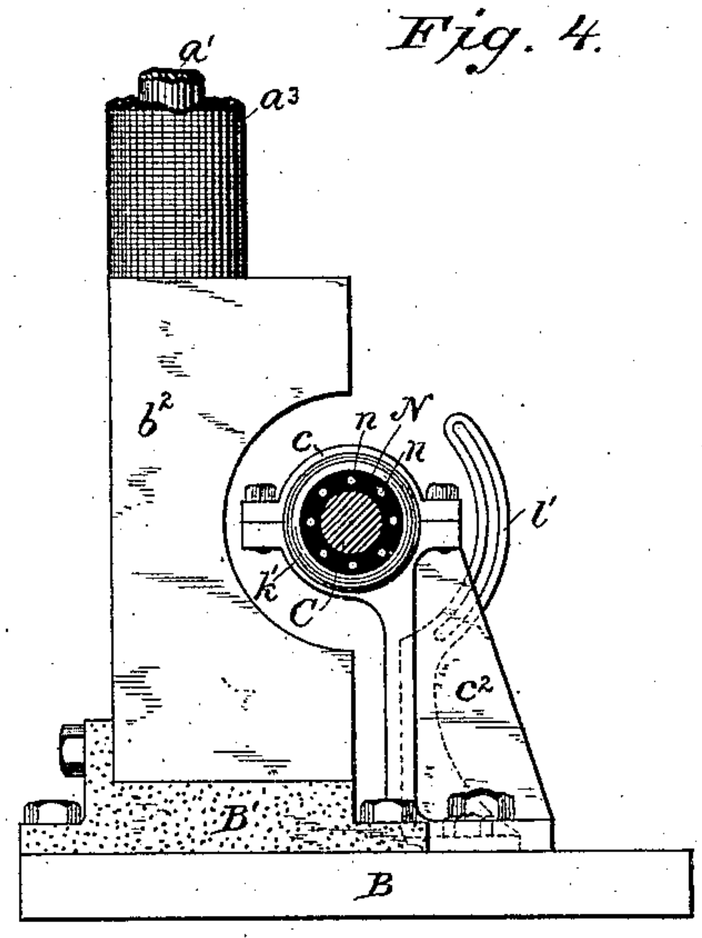


Fig. 5.

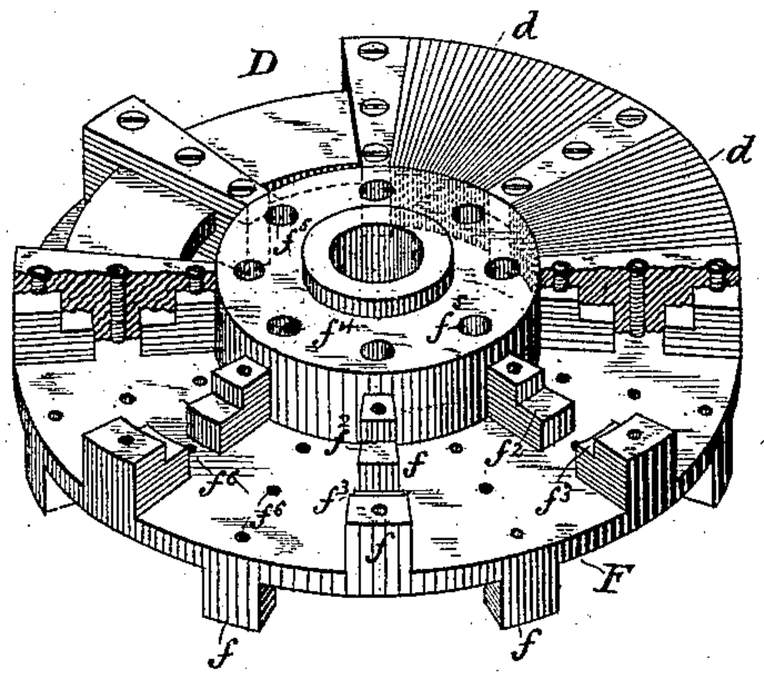
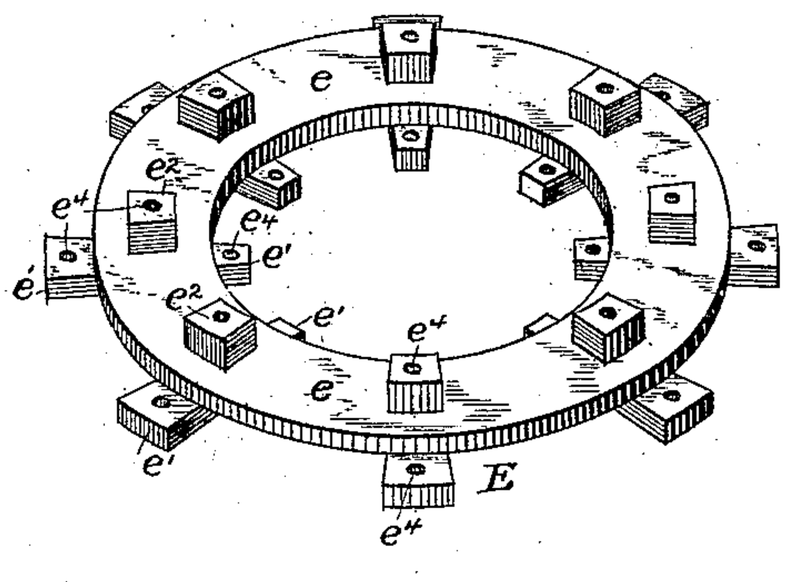


Fig. 6.



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INVENTOR

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By his Attorneys

Pope Edgecomb & Butler

UNITED STATES PATENT OFFICE.

ROBERT J. SHEEHY, OF NEW YORK, N. Y.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 294,688, dated March 4, 1884.

Application filed November 17, 1882. (No model.)

To all whom it may concern:

Be it known that I, ROBERT J. SHEEHY, a citizen of the United States, and a resident in the city, 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 relates to that class of electrical appliances which have for their object the conversion of mechanical into electrical energy.

The invention relates, in particular, to the form and construction of the armature, to the method of obtaining uniformity in the strength of current generated, to the disposition of the poles of the field-of-force magnets, and to the method of applying the power.

The main object of my invention is to construct an electric generator of the dynamo type, which shall, as far as practicable, produce a constant electric current of any required strength with the least possible expenditure of motive power; and this I accomplish by causing two or more armatures of improved construction, as hereinafter set forth, to be respectively revolved through fields of force of constant but opposite polarity, in which armatures two series of electric impulses are simultaneously induced, the phases of which are so related that when combined the resultant is a current of constant strength.

The invention, as related to the armature, consists in constructing the core of the armatures in three circular or ring-shaped sections, one of which is secured to a revolving shaft and serves as a support for the remaining two, while each of the latter carries a series of bobbins of insulated wire. The bobbins upon one ring are arranged with their central portions opposite the spaces intervening between the corresponding bobbins of the other series. The bobbins themselves, however, are of greater length than the intervening spaces, from which it results that their extremities extend beyond each other. By this construction the amount of inductive wire within the magnetic field is nearly constant at all times. The armatures are mounted upon a single shaft, which also carries suitable commutators for placing and maintaining the opposite terminals of the successive bobbins simultaneously in electric connection with suitable collecting-brushes during the periods of their revolution, in which electric impulses equal to or exceeding a predetermined strength are being induced therein.

As related to the fields of force, the invention consists in providing for each armature a magnetic field created by a magnetic force of one polarity only, and in causing the armature to be revolved therethrough, a constant proportion of the armature being at all times within the inductive influence of the same.

The invention also involves the arrangement of several armatures upon one shaft for the purpose of reducing friction and obtaining uniformity of speed.

The invention also includes certain details of construction, the exact subject-matter claimed being hereinafter specifically designated.

In the accompanying drawings, Figure 1 is a plan view, Fig. 2 a side, and Fig. 3 an end elevation, of my improved dynamo-electric machine. Fig. 4 shows the construction of one of the shaft-bearings. Figs. 5 and 6 are perspective views of the core-plates of the armature detached. Fig. 7 is a sectional view of one of the shaft-bearings, showing the insulating-sleeve through which the armature-conductors are carried on their way to the commutator.

Referring to the drawings, A and A′ represent two similar electro-magnets for producing the field of force in the generator. The magnet A consists of two parallel iron cores, a', united at their upper extremities with each other by a horizontal yoke, a^2, of magnetic material, and each wound with a coil, a^3, of insulated wire. The electro-magnet A′ likewise consists of two cores united by an iron yoke-plate, a^4, and wound with coils of insulated wire a^5 a^5. All of the coils a^3 and a^5 are electrically connected together in series and in such relations that a current traversing all simultaneously will induce magnetism of one description in the free extremities of the pole-pieces b' and b^2, and magnetism of the opposite description in the corresponding pole-pieces, b^3 and b^4. The pole-pieces are magnetically separated from each other, excepting as they

are connected through the horizontal yoke-plates a^2 and a^4 at the opposite extremities of the cores. The pole-pieces b', b^2, b^3, and b^4, each consists of a rectangular block or plate of iron having a semi-cylindrical recess formed across one edge, as shown in Figs. 3 and 4. This system of field-magnets is supported from a suitable base, B, by means of non-magnetic blocks B'. The pole-pieces are so arranged that the recessed faces of the pole-pieces b' and b^2 face in one direction, and the corresponding faces of the pole-pieces b^3 and b^4 face in the opposite direction. The two fields thus created are traversed by a central shaft, C, supported in two bearings, c' c', formed in standards c^2 c^2, secured to the base B. In each field is placed an armature, D, mounted upon the shaft C in the manner shown in the drawings.

It will be observed from the construction and arrangement of the pole-pieces and armature-shaft that at any given time approximately one half of one entire armature will be within its field of force, and that at the same time the diametrically-opposite half of the other armature will be in its field. The main purpose of this construction is to equalize the strain upon the shaft-bearings. The current generated in the main circuit is the resultant or sum of the successive impulses induced in the coils of the armatures during their revolution from certain predetermined points in the field of force to certain other points approximately half a revolution beyond. A current, however, made up of a succession of impulses of gradually-increasing intensity would not itself be of uniform strength, but varying or fluctuating in its intensity. To obviate this difficulty, I employ in each armature two series of coils, the individual coils of each series alternating with each other in such manner that the variations in the strength of the impulses proceeding from one series will be approximately counterbalanced by the variations in the strengths of the currents or impulses proceeding from the other series. My plan of constructing an armature whereby this end may be attained is as follows: The core of each armature is formed in three sections—a central and two outer sections. The central section, F, is attached directly to the shaft and acts as a support for the two outer sections. The section F consists of an annular casting or disk of soft iron having two annular series of lugs, f and f'', formed upon each of its faces. The lugs f and f'' upon one face alternate in angular position with those upon the other face. Thus each of the lugs upon the left-hand face project from points opposite the central point between the two corresponding lugs upon the right-hand face of the disk. Upon each lug f and f'' is formed a shoulder, f^2 and f^3, respectively, of which the former face from the center of the disk F toward the periphery of the same, and the latter in the opposite direction—that is, away from the periphery and toward the center. Within the inner annular series of lugs, f, there is formed upon each face of the disk F a continuous annular hub, f^4, through which are formed openings f^5, to allow the passage of the armature-conductors on their way to the commutators. The remaining disks are of similar construction. Each is composed of a plate, e, designed to fit in the recesses between the lugs f and f'' of the central disk, F, and to rest upon the shoulders f^2 and f^3. The annular plate e is provided with extension-blocks e^2 upon its inner face, intended to occupy the spaces between said shoulders. It is further provided upon its outer face with a number of radial lugs, e', designed to fit upon the lugs f and f'', to which they are secured by rivets or screws. Through each lug e' are formed three bolt-holes, e^4. One of these bolt-holes is located near the outer extremity of the lug, a second near the inner edge of the same, and the third at an intermediate point, and preferably extending through the central lug, e^2. By means of suitable bolts extending through these holes and corresponding bolt-holes, f^6, formed through the central core-section, F, the three sections of the armature are securely fastened together, with the lugs and corresponding depressions or recesses interlocking in their proper positions. The conductors forming the independent bobbins d' d^2, &c., are wound upon such portions of the annular plate e as are included between two adjacent systems of radial lugs.

Each bobbin d of the armatures D and D' consists of a coil of insulated wire wound in the ordinary manner, and all in the same direction, about the flat ring e. The outer terminal of each bobbin d is connected with an insulated segment of a commutator, G, upon one side of the armature, and the inner terminals of the same are respectively connected with the insulated segments of a second commutator, H, upon the opposite side of the armature. In like manner the inner and outer terminals of the bobbins comprised in the armature D' are respectively connected with the segments of the commutators G' and H', located upon the opposite sides of that armature. The four commutators G, G', H, and H' thus provided each consists of eight segmental rings, I' I^2 I^3, &c., and each ring comprises two nearly semicircular segments, i and i'. The adjacent ends of each pair i and i' of segments are insulated from each other, and all the segments are also insulated from each other. The commutators are mounted upon the shaft D in the usual manner and revolve therewith, but are insulated therefrom. Against the surface of each commutator rests a contact or collecting brush, K, into contact with which the successive segments are brought. The arrangement of the commutator-segments with reference to their respective bobbins is such that the respective outer and inner terminals of the successive bobbins are simultaneously brought into contact with the corresponding brushes in regular rotation. Thus the outer terminal of the bobbin d' of

the armature D is connected with the segment *i'* of the segmental ring I' of commutator G, and its inner terminal is connected with the segment *i'* of the ring I' of commutator H. The terminals of the bobbin d^2, which is the succeeding and alternate bobbin, are connected in the same manner with the segments *i'* of rings I^2, respectively, the terminals of the next succeeding and alternate bobbin d^3 with the segments *i'* of the rings I^3, &c. The conductors leading from the armature-coils to the segments are passed through longitudinal perforations *n*, Figs. 4 and 7, in the insulating-sleeve N, preferably made of compressed paper. This sleeve is contained within a metallic shell, *k*, provided on either side with flanges *k'* and k^2. The surface of the shell *k* revolves in the bearing *c'*, supported by standards c^2 c^2. The angular positions of the commutator-segments i' i^2 i^3, &c., are such that they are brought in regular succession into contact with the commutator-brush, and immediately upon or before the arrival of one of the bobbins at the point in the magnetic field where a current generated therein ceases to be of available strength, its commutator-segments sever their connections with their respective contact-brushes. At the same moment the bobbin diametrically opposite the one passing from the field of force enters the same upon the opposite side, and is connected through its commutator-segments with the respective commutator-brushes. The contact-brushes of the commutator are carried by movable brush-holders *l*, capable of angular adjustment in the support *l'*. The brush K of commutator G may be connected to one terminal of the external or work circuit, the opposite terminal of which will then be connected to the contact-brush K of commutator G'. The contact-brushes K of the commutators H' and H would in that case be connected with each other through the coils of the field-magnets A and A', the connections being such as to cause a current traversing the same to induce magnetism of, say, north polarity in the poles presented to the armature D, and of south polarity in the poles presented to the armature D', or vice versa. As shown, however, the field-magnets are included in the circuit between the brushes of the commutators G and G', and the lamps or other electric devices would be in the circuit 3 between the brushes of the commutators H and H'; or both the field-magnets and the lights may be included in either portion of the complete circuit.

Instead of employing only two armatures, D and D', any desired number may be carried upon the same shaft C and constitute one generator, the requisite number of field-magnets and commutators being also provided. It is evident, moreover, that an armature constructed in the manner hereinbefore described is applicable to machines wherein the field of force is established by two electro-magnets of opposite polarity.

The main line of conductors may be conveniently connected to the brushes of the outer commutators, in which case it will be necessary to connect the inner commutator-brushes together by a conductor of low resistance; or the main line may be connected to the said inner commutator-brushes and the outer brushes connected together; or the devices to be operated may be included in both the circuits connecting the outer brushes and inner brushes.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a central armature plate or disk of soft iron, and an annulus of soft iron carried thereby, by suitable projections, and situated in a plane parallel to the plane of said central plate.

2. The combination, substantially as hereinbefore set forth, of a central armature disk or plate of soft iron, two annuli of soft iron—one on either side of said disk—and means of attaching said annuli to the face of said disk, substantially as described.

3. The combination, substantially as hereinbefore set forth, of the central armature-disk, upon each face thereof an annulus of soft iron, means of attachment, substantially as described, and coils of conductors surrounding each annulus, except at the points of attachment.

4. The combination, substantially as hereinbefore set forth, of a central shaft, a disk of soft iron carried thereby, situated in a transverse plane thereto, an annulus of soft iron carried upon the face of said disk, shouldered lugs projecting from said disk, lugs projecting from said annulus for fitting said shouldered lugs, and bolts for securing them in place.

5. The combination, substantially as hereinbefore set forth, of a central disk of soft iron, two series of bobbins—one on either side thereof—the bobbins of one series being placed in intermediate angular positions to those of the other series, and said bobbins lying lengthwise in a plane parallel to the plane of said disk, substantially as described.

6. The combination, substantially as hereinbefore set forth, of two field-magnets having their respective parts parallel the one to the other, two semicircular fields arranged in the same axial line, produced by said magnets in the manner described, and facing in opposite directions.

7. The combination, substantially as hereinbefore set forth, of two independent magnetic fields arranged in the same axial line, one produced by two semicircular pole-pieces of similar polarity, and the other by the remaining pole-pieces of the electro-magnets producing said first-mentioned field.

8. The combination, substantially as hereinbefore set forth, of two fields, one produced by two semicircular pole-pieces of similar polarity, and the other produced by the remaining pole-pieces of the electro-magnets producing said field first mentioned, a single shaft traversing both fields, and two armatures

mounted on said shaft and having equal and diametrically-opposite sections respectively situated in said fields at the same time.

9. The combination, substantially as hereinbefore set forth, of two magnetic fields respectively created by the pole-pieces having similar polarity, of two independent electro-magnets, two armatures having diametrically-opposite sections of coils respectively traversing said fields simultaneously, and the four commutators described for collecting the currents generated in said armatures.

10. The combination, substantially as hereinbefore set forth, of two fields created and disposed in the manner described, two armatures revolving in said fields, a single shaft upon which said armatures are mounted, and a central pulley by which said shaft is impelled.

In testimony whereof I have hereunto subscribed my name this 16th day of November, A. D. 1882.

ROBERT J. SHEEHY.

Witnesses:

DANIEL W. EDGECOMB,

MILLER C. EARL.