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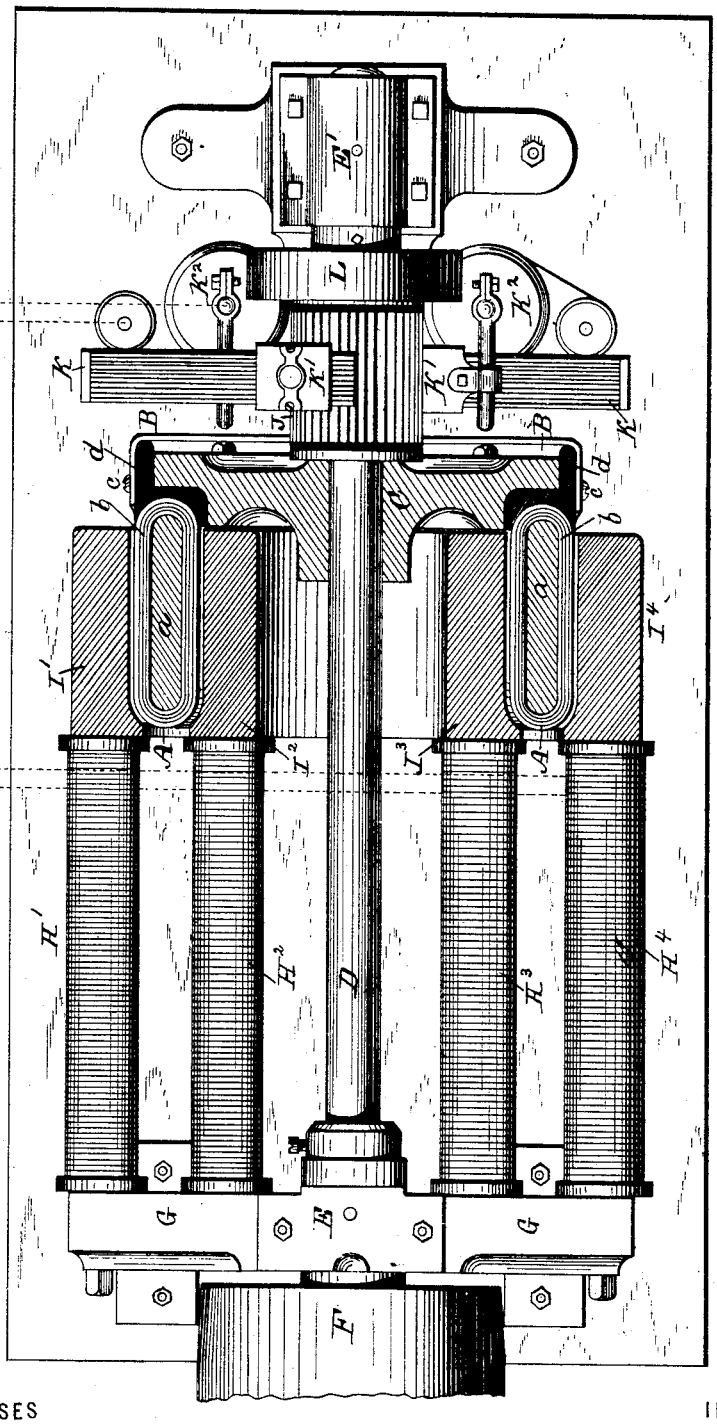
E. A. SPERRY.

DYNAMO ELECTRIC MACHINE.

No. 260,132. Patented June 27, 1882.



WITNESSES

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Fig. 2.

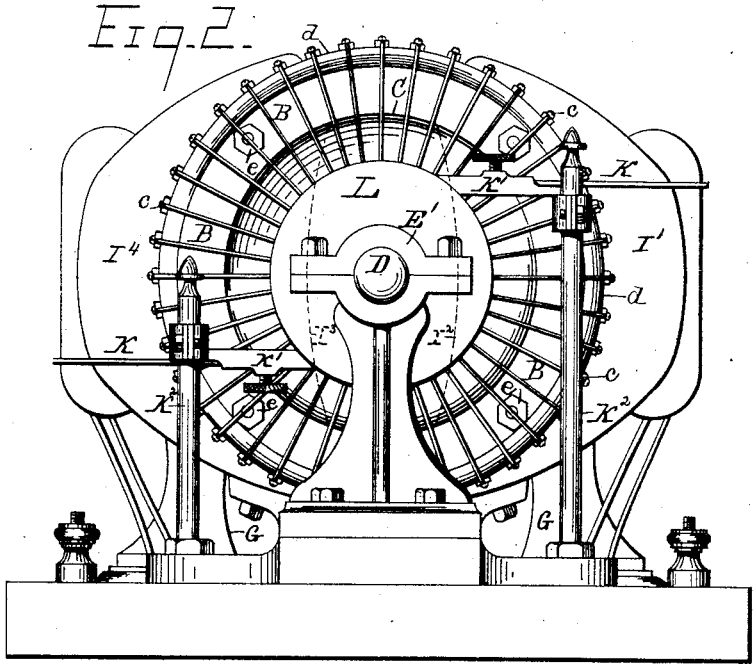

Fig. 3.

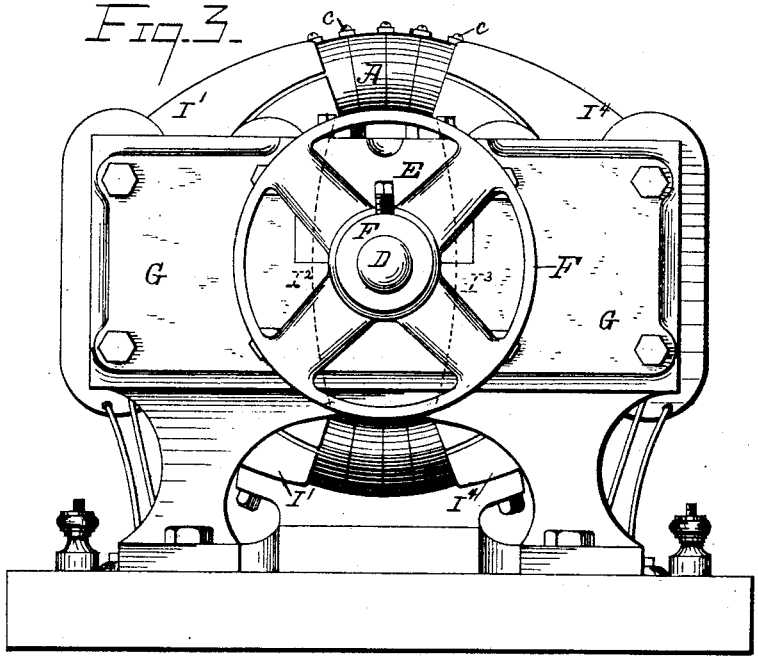

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Fig. 4.

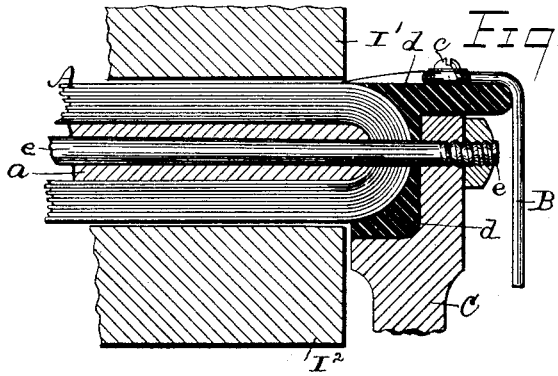

Fig. 5.

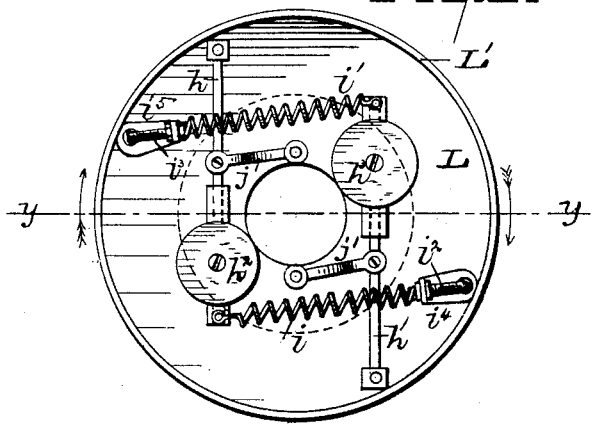

Fig. 6.

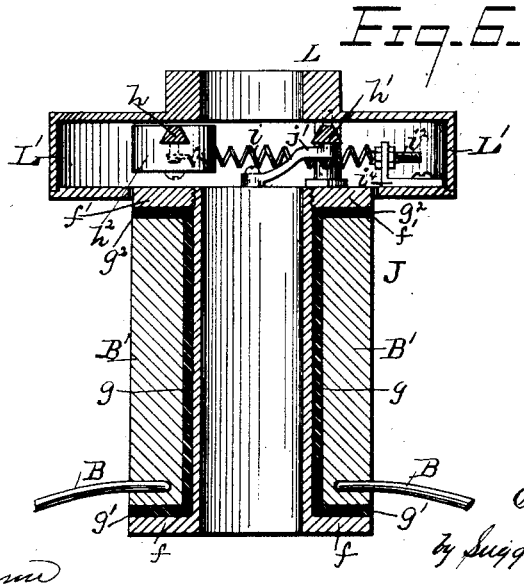

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Fig. 8.

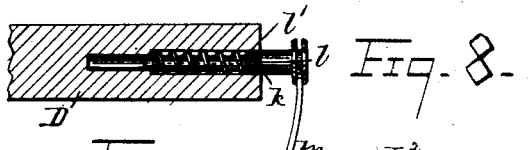

Fig. 7.

Fig. 9.

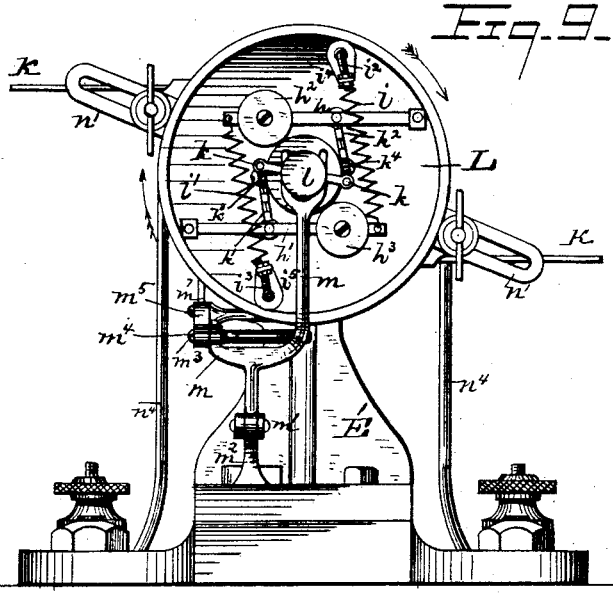

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Fig. 10.

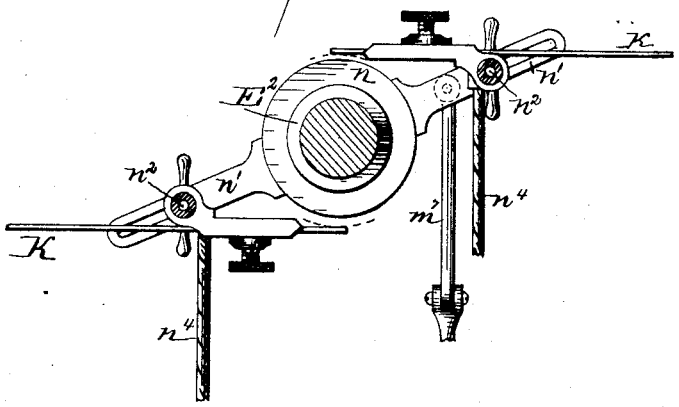
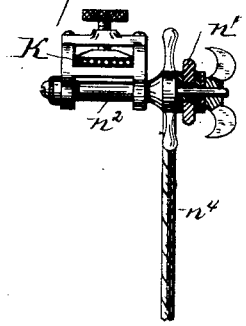


Fig. 11.



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UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CORTLAND, NEW YORK.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 260,132, dated June 27, 1882.

Application filed December 22, 1880. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, of the town of Cortland, county of Cortland, and State of New York, have invented certain new and useful Improvements in Dynamo-Electric or Magneto-Electric Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in dynamo-electric machines; and it has for its objects, first, to subject a greater proportion of the wire wound on the armature to an intense magnetic field; second, to automatically control the current generated by the machine to secure uniformity thereof; and it consists, first, in so disposing the field magnet or magnets as to present a pole of like polarity, both interior and exterior, to an annular armature; second, in mounting the armature in such a manner as to present both its interior and exterior surfaces magnetically free to the pole-pieces of the field; third, in varying the relative position of the commutator-brushes by suitable mechanism connected thereto, actuated by variations in the speed of rotation of the armature.

In the accompanying drawings, Figure 1 represents a plan view of the machine, showing armature and pole-pieces in horizontal section. Fig. 2 is the front elevation of the same. Fig. 3 is the back elevation of the same; Fig. 4, section showing attachment of armature to disk; Fig. 5, an elevation of the governor with commutator detached; Fig. 6, horizontal section of the governor on line *y y*, Fig. 5, with commutator attached; Fig. 7, side elevation of a portion of the machine, showing the governor-controlling commutator-brushes as attached; Fig. 8, vertical section of a portion of the same; Fig. 9, front elevation of same, showing construction of governor; Fig. 10, view of the commutator-brush holders, showing mode of attachment; Fig. 11, vertical section of a portion of the same.

Similar letters refer to similar parts throughout the several views.

The armature A A, Fig. 1, is composed of an annulus of soft iron, either massive or otherwise, (shown in section by *a a*,) upon which is wound a number of coils of insulated wire, *b b*, with their terminals so arranged that the coils are connected in series or multiple-arc in the usual manner and at point of juncture with a radial wire, B, by screw *c*, which is secured to an insulating-ring, *d*, the armature being secured to a disk, C, by bolts *e*, Fig. 4, which are inserted through or protrude from its iron core. One of the important features of my invention is to so attach the armature that it will present the greatest possible amount of surface for the magnetizing effect, and at the same time insure a rigid attachment. This is accomplished by the above system of bolting the armature at its end, the bolts *e* affording sufficient pressure to the small contact-surface, insuring the required rigidity, the disk being secured to the shaft D, which is supported by bearings E E′ and which is provided with pulley F, the armature being so secured to the disk that when the shaft revolves it will revolve in a true circle. There are other ways of securing the armature to the shaft, as by placing it on a drum or cylinder of some thin non-magnetic substance open at one end; but the method described is preferred. In whatever manner it is arranged, it should be so mounted as to present its internal and external surfaces magnetically free to the pole-pieces of the field.

The field-magnet is composed of a casting, G G, which contains the journal E, and to the face of which are bolted the cores of the helices H' H^2 H^3 H^4. To the free end of each of these cores are secured castings I' I^2 I^3 I^4, (see Figs. 1, 2, and 3,) the shape of which is shown in the drawings. The inner surfaces of the extension-pieces I' I^4 are turned concentric with shaft, and very little larger than the outer diameter of armature. The outer surfaces of the extension-pieces I^2 I^3 are turned concentric with the former, a very little smaller than the inner diameter of the armature. The terminals of the helices are coupled in such a manner that the current magnetizes I' I^2 of one polarity and I^3 I^4 of the other polarity, thus placing magnets of like polarity, both internal and external, to the armature. These may be formed as shown in the views, or each pair coupled in one casting and magnetized by one or more helices. The method herein represented and described is preferred.

In the well-known forms of dynamo-electric machines using annular armatures, owing to

the relative position of their field-magnets, that portion of the coil only is efficient which lies exterior to the ring. Those portions which lie along the screened internal surface are not only inefficient, but add materially to the resistance and heating effect of the armature and nothing to the electro-motive force of the current generated. By the above-described arrangement of the field-magnets I obviate this by making that portion of the coil lying internal to the ring equally efficient to that which is external thereto, thus reducing the ineffective wire wound on the armature to a minimum.

The commutator J, Figs. 1 and 6, is constructed of a cylindrical casting, *f*, bored to loosely fit the shaft, with a flange on one end, and threaded at the other to fit the nut *f'*. On the exterior of this cylinder is placed an insulating substance, *g g*. Against the inner surfaces of both flange and nut are placed rings of non-conducting substance $g' g^2$, into which are cut radial grooves, equidistant, and numbering the same as the coils on the armature. Into said grooves are placed the commutator-sections, of metal, B', which are held in position by pressure exerted by the nut *f'*. To these are secured the flexible radial conductors B, the sections being insulated as usual. The commutator may be made in different ways, but in every instance must be free to revolve on the shaft through a considerable arc, retaining its connections with the armature-coils.

The commutator-brushes, Fig. 2, K K, are composed of conductors, preferably flexible, arranged in clamps K', and supported by standards K^2, to which they are adjustably attached, and which are placed in connection with their respective binding-posts—one direct, the other, as usual, by way of the field.

The governors hereinafter described are to hold the contact-points of the commutator-brushes in the most favorable region of the commutator at different speeds by an automatic movement of either the commutator or brushes.

The former, which will be hereinafter more fully described, but forms no part of this application, I will make the subject-matter of another application.

The governor L is the arrangement to attain the object above mentioned by manipulation of the commutator, and is constructed as follows: The short cylindrical casting L' (see Figs. 5 and 6) bears a hub, which is bored to fit the shaft, and provided with a set-screw. In this cylinder are placed levers *h h'*, which have a fulcrum at their extremity, near the periphery of the cylinder, and extend beyond the shaft on its opposite sides. Near the free ends of these levers are adjustable weights h^2 h^3. On the extension of the levers, beyond the weights, are attached the springs *i i'*. To the other extremity of said springs are attached bolts i^2 i^3, which pass through angle-plates i^4 i^5, attached to casting L' by means of screws, and are adjusted by nuts and jam-nuts, as shown.

At suitable points on the levers *h h'* are links *j j'*, which place the same in connection with the commutator by being attached to the face of nut *f'*, said attachment being made in such a manner that when their free extremities are thrown from the center by the centrifugal action on the weights, in combination with the springs, the commutator is turned on the shaft through an arc which is proportional to the amount of this action and in direction opposite to the rotation. The commutator being connected with the armature-coils by the flexible radial wires B, its motion backward makes the necessary correction, which brings the contact-points of the brushes in the most favorable position on the commutator, as hereinabove described. The method, however, sought to be covered by patent is that attained by mechanism illustrated, (see Figs. 7, 8, 9, 10, and 11,) in which the commutator is stationary on the shaft, as in other machines; but the brushes are automatically controlled by the governor, which is constructed similar to the preceding, with levers *h h'*, weights h^2 h^3, and retractile springs *i i'*. The levers, however, are connected to a yoke, *k*, by chains k' k^2, which pass around the pulleys k^3 k^4. The yoke is attached to a short rod, *l*, which fits the shaft, the latter being bored at its center to receive it, together with spring *l'*, and is also provided with a slot to receive yoke *k*. The rod *l* has at its extremity a deep groove, in which are placed the forks of a lever, *m*, having a fulcrum at *m'*, which is supported by casting m^2, and at point m^3 is attached to rod m^4, which is connected to bell-crank lever m^5, having fulcrum at m^6, and connected with commutator-brush clamp *n* by means of rod *m'*.

The commutator-brush holder *n* is composed of an annular-shaped casting, (see Fig. 10,) having two ear-shaped slotted projections, *n'*, into which are fixed the rods n^2, bearing the commutator-brushes K. The rods n^2 are insulated from *n'*, (see Fig. 11,) the attachment being effected by thumb-nuts. These rods bear flexible conductors n^4, the ends of which are placed in connection with their respective brushes, said conductors being placed in proper electrical connection in the machine. The annular casting *n* is bored to loosely fit the boss E^2, which projects from the inner end of the journal E. The centrifugal action on the governor draws the yoke and its rod in toward the journal, compressing the spring *l'*, and, by means of the rod *l*, levers *m* m^5, rods m^7 m^4, and brush-holder *n*, moving the commutator-brushes on the commutator in direction of rotation a distance proportional to the speed; but on a decrease of the same they are turned back by spring *l'*, as will be readily understood, thus keeping the contact-points of the brushes in the most favorable position on the commutator, as in the case described above.

Referring to the general construction of my

machine, it will be observed that the field-magnets are all attached to the same base, and all project therefore in the same direction, and that the base is supported entirely independent of the revolving armature, which, with its connections, is mounted upon an independent frame, so that the adjustment of the field-magnets and armature with respect to each other is very easily effected, and either the field-magnets or the armature may be removed and replaced without necessitating the removal of any of the field-magnets from their base or the armature from its support. By curving the inner surfaces of the pole-pieces so that the inner margins of each pair approach each other I present extensive magnetic surfaces to the armature.

In dynamo-electric machines it is found that the current-strength varies greatly with the varying speed of the rotation of the armature, to obviate which, together with the sparkling at the commutator, specially-adapted motive power has been applied direct to the machine; but this greatly increases the expense attending the use of the light, and, besides, does not secure a uniform current. By means of the governor above described I am enabled to apply any motive power used for other purposes to drive my machine, and any variation in the speed of the rotation of the armature is conteracted by said governor, and a uniform current thereby secured.

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

1. In a dynamo-electric machine, the combination, with the stationary helices H' H^2 H^3 H^4, having cores all projecting in the same direction from a common base or yoke, and provided with the separate curved pole-pieces, said pole-pieces being arranged in pairs of similar polarity, and one pole-piece of each pair partially embraced by but separated by an intervening space from its fellow, of the annular armature A, having its surface of greatest width parallel with its axis and wound with transverse coils, said armature being suitably supported and arranged to rotate between the pole-pieces of each pair, and a commutator connected with the coils of said armature, substantially as described.

2. In a dynamo-electric machine, the separate pole-pieces, arranged in pairs of similar polarity, the inner opposite margins of the pole-pieces of each pair projecting toward each other, in combination with the annular armature supported at one edge and projecting into the spaces between the pole-pieces of each pair, the arrangement being such that both sides and the greater portion of the free edge of the armature are presented to the pole-pieces, substantially as described.

3. In a dynamo-electric machine, the combination, with a transversely-wound annular armature, having an iron core, *a*, the disk C, and radial commutator-conductor B, of an insulating-ring, *d*, and binding-screw *c*, substantially as described.

4. In a dynamo-electric machine, the combination of the governor L, located on the shaft of the machine and provided with a system of weights and levers, as described, the rod *l* and spring *l'*, and the commutator-brushes and connecting mechanism, whereby the movement of the brushes is controlled, substantially as described.

5. In a dynamo-electric machine, the combination of the governor L, mounted on the shaft of the machine, the rod *l*, spring *l'*, lever *m*, rod m^4, bell-crank lever m^5, and rod m^7, with the commutator-brushes K and their clamps, all arranged substantially as set forth for the purpose specified.

6. In a dynamo-electric machine, the combination of the transversely-wound annular armature, the insulating-ring, and the supporting-disk with the connecting-bolts, substantially as described.

ELMER A. SPERRY.

Witnesses:
M. STANLEY BIERCE,
W. D. TISDALE.