(No Model.) 2 Sheets—Sheet 1.

G. W. FULLER.

DYNAMO ELECTRIC MACHINE.

No. 286,414. Patented Oct. 9, 1883.

Fig. 1

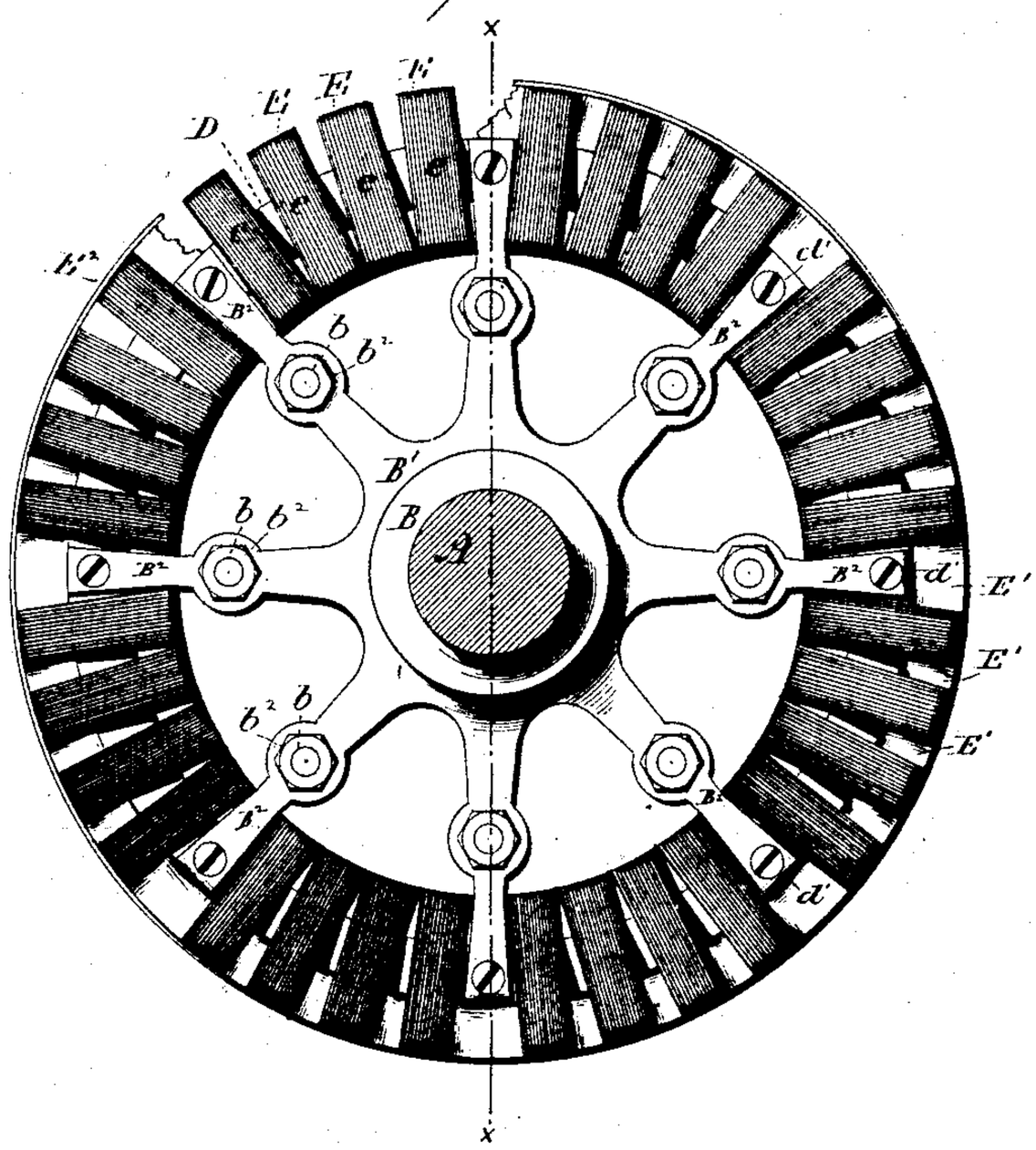
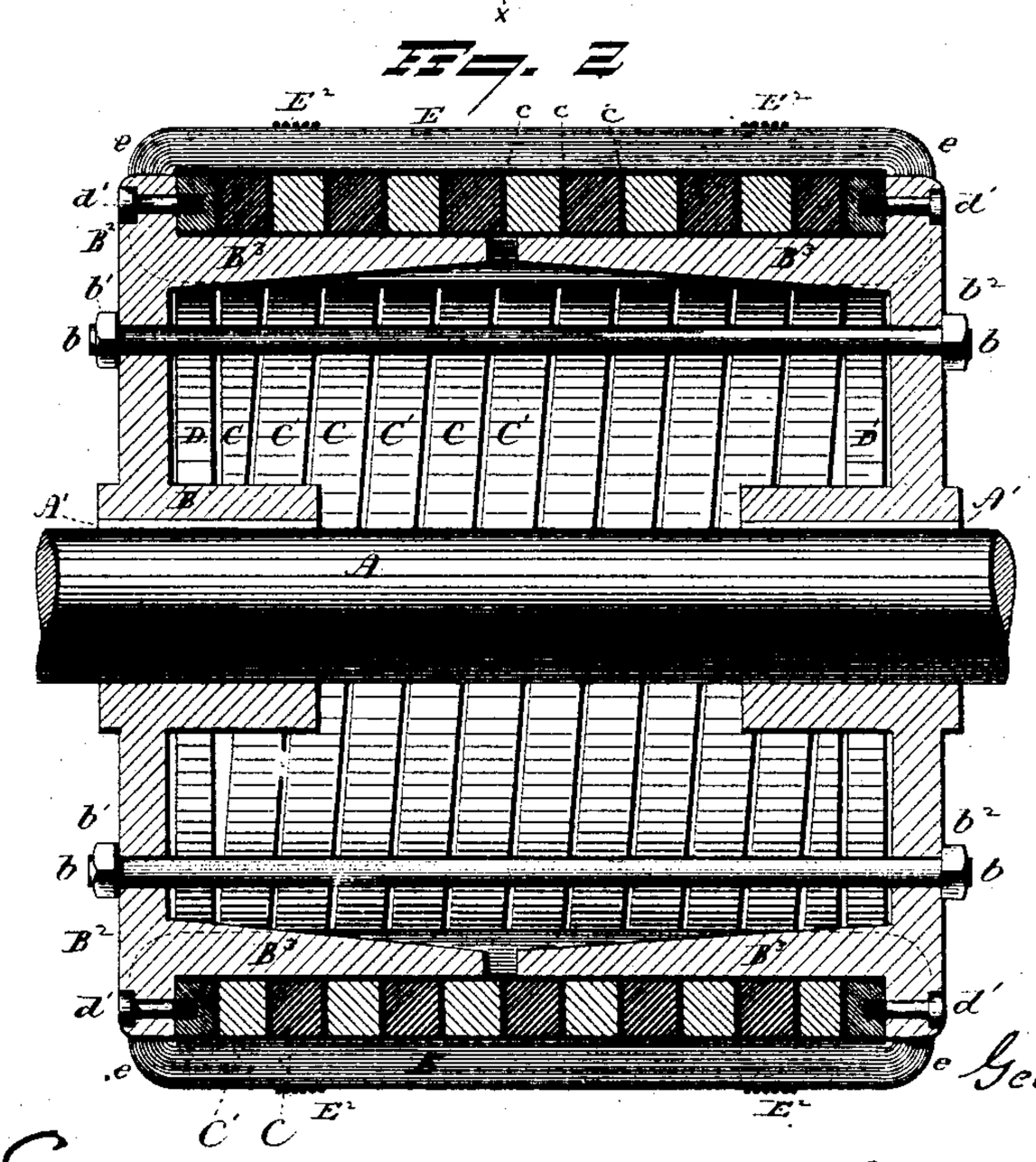


Fig. 2



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

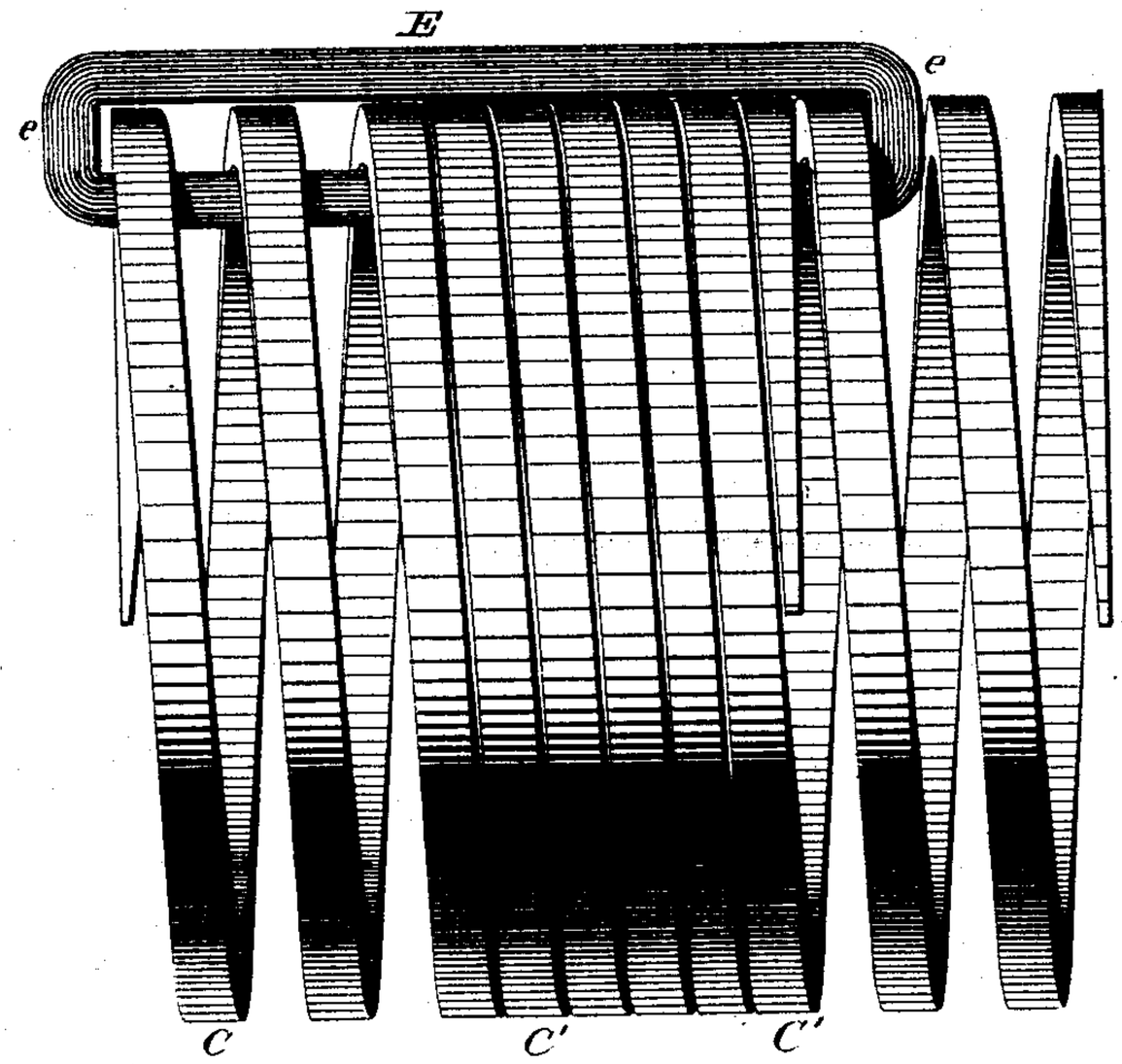
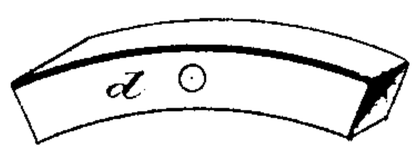


Fig. 4



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UNITED STATES PATENT OFFICE.

GEORGE W. FULLER, OF NORWICH, CONNECTICUT.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 286,414, dated October 9, 1883.

Application filed August 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. FULLER, of Norwich, Connecticut, have invented certain Improvements in Dynamo-Electric Machines, of which the following is a specification.

It is an important object of my invention to simplify the construction of that class of dynamo-electric machines in which the induction-coils traverse longitudinally the interior and exterior surfaces of a hollow cylindrical core; and I accomplish this result by constructing such a core of one or more spirals, which can be inserted by a cork-screw motion into induction-coils which have been previously wound in the form of oblong links. When the core is composed of a single spiral, I employ a comparatively thin ribbon, the sides of which are spirally imposed. In inserting such a spiral into such coils, the adjoining convolutions are capable of being sprung apart sufficiently to allow the ends of the coils to pass between the convolutions. When two or more spirals are employed, their convolutions are respectively interplaced. For example, when two spirals are employed, the pitch of each spiral is regulated with reference to preserving sufficient space between these convolutions to admit the convolutions of a similar spiral, and such space may be of sufficient width to allow the passage through it of the ends of the coils in the act of inserting the spirals into the coils. By supporting the spiral or spirals of which my core is composed upon or by means of devices composed of non-conducting materials, so that there is no outside electrical connection of the terminals of a spiral with each other, I am enabled to avoid the presence in the core of a complete circle of metal, or closed electrical circuit, in which currents of electricity can be established by induction. At the same time, by using iron, either wrought or cast, as the material for the spirals, I am enabled to have a practically closed magnetic circuit.

My invention is applicable to dynamo-electric machines of various types, as well to those having annular armature cores as to those having armatures the cores of which are cylindrical or spherical in form. The mechanical advantages possessed by my spiral core are of considerable economic importance, especially in the case of an annular or hollow cylindrical core, which is to be longitudinally traversed interiorly and exteriorly by induction-coils. Ordinarily such coils are applied by winding the wire of which they are composed upon the core itself, which is a laborious, tedious, and expensive operation. By my invention the coils may be wound upon a lathe into suitably-formed links, which is a much easier and more economical method of winding them. The spirals composing the core may be successively inserted through these links by a cork-screw motion.

The accompanying drawings, illustrating my invention applied to a hollow cylindrical armature, are as follows:

Figure 1 is an end elevation of the armature, showing the coils in place and one of the star-shaped heads by means of which the core is supported upon the armature-shaft. Fig. 2 is a longitudinal section through the line *x x* on Fig. 1. Fig. 3 is a side elevation of the two spirals, showing one spiral fully inserted through one of the induction-coils and the other partially inserted. Fig. 4 is an isometrical perspective of one of the segments, which are curved upon the same radius as the spiral and are interposed between the ends of the core, respectively, and the ends of the induction-coils, and are fastened to the arms of the star-shaped heads by which the core is supported.

The drawings represent an armature of the class in which the convolutions of each of the induction-coils, respectively, traverse in a longitudinal direction both the interior and the exterior surfaces of the hollow cylinder which constitutes the armature-core. The induction-coils are symmetrically arranged upon the hollow cylinder, and are thus adapted to be rotated between the curved faces of the field-magnets of a dynamo-electric machine. I have not deemed it necessary to show any mode of connecting the coils with each other, or to show any of the parts of a dynamo-electric machine excepting the armature, as the mode of employing induction-coils upon cylindrical armatures in dynamo-electric machines is perfectly well known.

In the structure shown in the drawings the usual armature-shaft, A, is inserted through

the hubs B of the star-shaped heads B′, which are clamped in position by means of the bolts *b*, extending from one head to the other, and provided at their opposite ends with the nuts *b′* and *b²*. These bolts are inserted in holes through the radial arms B² of the heads. Near the ends these arms are provided with the laterally-projecting fingers B³, which afford the bearings for the interior surface of the hollow cylindrical core, and which are provided with facings of insulating material, upon which the concave surfaces of the spirals C C′ bear.

The two spirals C C′ have the same axis and the same pitch. Their convolutions, which, as will be seen, are interplaced, are prevented from contact with each other by means of the tablets of insulating material *c*, which are inserted in those parts of the spaces between the convolutions which are in radial alignment with the clamping-bolts *b*.

The two spirals C and C′, when their convolutions are interplaced, form a hollow cylinder, which is centralized by the bearing of its interior surface upon the facings of insulating material laid upon the projecting fingers B³. This cylinder is stayed in position longitudinally by two rings, D and D′, each composed of short segments *d*, curved upon the same radius as the spirals, and of such thickness that they can be interposed between the end of the cylinder and the ends of the induction-coils. The segments *d* are fastened to the ends of the radial arms B² by the screw *d′*. Strips of insulating material are interposed between the ends of the cylindrical core and the rings D D′, respectively.

The induction-coils E are wound on a lathe in the form of flattened links with straight parallel sides, and the spirals are successively inserted through these links by a corkscrew motion. The pitch of the spirals is such that the space between any two of the convolutions is large enough to allow the passage of the end *e* of a coil. One of the spirals, C, is first fully inserted through all the coils, and there is then room for the similar insertion of the second spiral, C′. The segments *d*, composing the rings D and D′, are then inserted between the ends of the coils and the ends of the core, and the coils are symmetrically grouped around the perimiter of the hollow cylinder, leaving at each end six spaces for the arms B² and fingers B³ of the heads, respectively. The tablets of insulating material having been placed between the convolutions, the bolts *b* are inserted, and the heads B′ and the spirals are then clamped together by the application of the nuts *b′* and *b²*.

The symmetrical arrangement of the circle of induction-coils E is effected by the spacing-blocks E′, which are deposited in the spaces between the exterior portions of the coils, and are held in position by the clamping-bands E² E², or by wrappings of fine wire, which surround the armature, as shown in the drawings.

The hubs B of the heads B′ are fixed upon the shaft A by means of the keys A′, or otherwise, so that when the shaft revolves it carries with it the spirals, which constitute the core of the armature upon which the armature-coils are supported. The armature is then appropriately arranged in a dynamo-electric machine, and the coils are suitably connected in any desired manner.

In forming the spirals which constitute the core I preferably prepare a hollow cylinder of soft iron, and then mount it in a lathe, and, having turned it to the required diameter, then cut it into two spirals of like pitch by the use of a double-pointed chaser having the required lead. It will, however, of course be understood that such spirals can be made by bending rods or wires of soft iron into the required form, as is more fully described in another pending application.

I claim as my invention—

1. In a dynamo-electric machine, a hollow cylindrical armature the core of which is composed of one or more spirals, in combination with induction-coils the convolutions of each of which traverse longitudinally the interior and exterior surfaces of the cylinders composed of the said spiral or spirals, and means for supporting the said cylinder and induction-coils upon the armature-shaft.

2. A hollow cylindrical armature-core composed of iron spirals of like diameter and pitch, suitably supported upon a rotating shaft, but insulated therefrom, and having their convolutions, respectively, insulated from each other, for the purpose of preventing the presence in the core of a continuous metallic circuit, in which currents of electricity can be established by induction when the said core is provided with induction-coils and employed as an armature in a dynamo-electric machine.

3. A hollow cylindrical armature-core composed of one or more spirals, in combination with the star-shaped heads B′, affixed to the armature-shaft A and provided with the laterally-projecting fingers B³, for the purpose of centralizing the said core relatively to the armature-shaft.

4. A hollow cylindrical armature-core composed of one or more spirals, substantially as set forth, and the rings D and D′, each composed of the segments *d*, secured to the radial arms B² of the heads B′, and means for longitudinally clamping the heads and core together, substantially as and for the purpose set forth.

GEO. W. FULLER.

Witnesses:
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JOS. C. EARLE.