E. THOMSON & E. J. HOUSTON.
Dynamo Electric Machine.

No. 232,910. Patented Oct. 5, 1880.

Fig. 1.

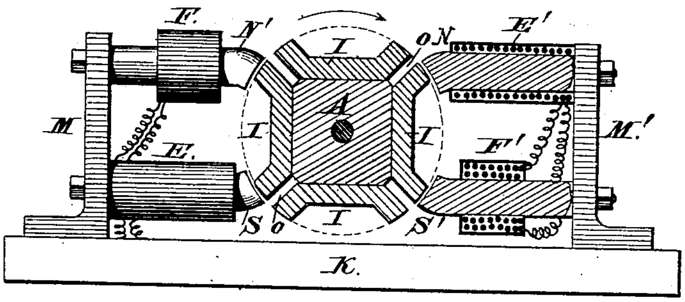


Fig. 2.

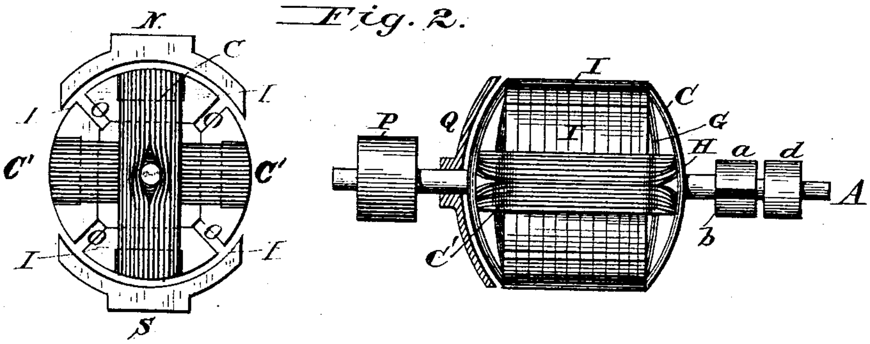


Fig. 3.

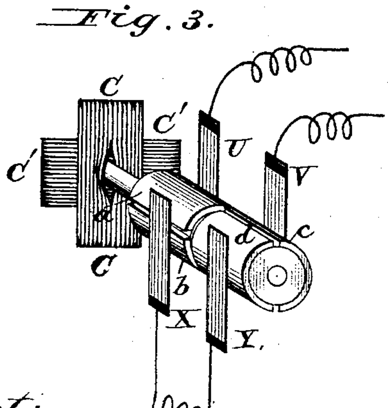
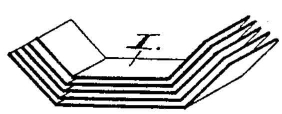


Fig. 4.



Attest:
William Crawford
Robert Applegate

Inventors.
Elihu Thomson
Edwin J. Houston

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ELIHU THOMSON AND EDWIN J. HOUSTON, OF PHILADELPHIA, PA., ASSIGNORS TO AMERICAN ELECTRIC COMPANY, OF NEW BRITAIN, CONN.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 232,910, dated October 5, 1880.

Application filed November 14, 1878.

To all whom it may concern:

Be it known that we, ELIHU THOMSON and EDWIN J. HOUSTON, both of the city and county of Philadelphia, Pennsylvania, have invented an Improved Form of Dynamo-Electric Machine, whereby the production of a continuous unvarying electrical current is rendered practicable without the complication usually found in machines for this purpose, of which the following is a specification.

The machine hereinafter to be described is designed to be employed for all purposes in which a uniform current of electricity is needed, as in telegraphy, electro-chemical operations, electric lighting, electro-magnetism, &c.

The invention consists substantially of certain peculiarities in the construction of a spool or armature, and in the mode of carrying out the currents produced in the same to the poles of the machine.

In the armature used in the practice of our invention two or more varying currents are produced, which are united in such a manner as to correct each other's inequalities, and thus produce a constant or unvarying current.

In Fig. 1, N N′ and S S′ are the poles of two electro-magnets, M M′, supported on the stand K. These poles N N′ and S S′ are shaped to conform to the armature, which revolves between them. The poles N N′ are magnetized with north polarity and the poles S S′ with south polarity.

The coils F F′ and E E′ are provided for the magnetization of the magnets M M′. The coils E E′, which produce the poles N and S, are stationary; but the coils F F′ are movable back and forth upon the magnet-cores of which N′ S′ are the poles, the direction of rotation of the armature being from S to N′ and from N′ to S, respectively. The object of this arrangement is to permit, by the movement of the coils F F′, of the strengthening or weakening of the poles requisite to prevent the shifting of the neutral point of the armature during its rotation.

The neutral point is that position of a coil upon an armature where it is not developing current, or where its polarity is on the point of changing. The position of the neutral point is dependent upon the distribution of the magnetic field in which the armature is moved, and also dependent on the strength of the current developed in said armature, and therefore upon the speed of motion of said armature. Consequently, if the speed of the armature be changed, other conditions being the same, the position of the neutral point will change, and since the perfect operation of any commutator is dependent upon a constant position of the neutral point being maintained, it is desirable to be able to so maintain it. This is effected by the movement of the coils F F′ upon the field-magnet cores, since the distribution of the magnetic field is in this manner controllable, the strength of the poles of an electro-magnet being greatest when its coils are upon its extremities. The same result may be obtained by shifting the field-magnet cores themselves.

In Fig. 2 the construction of the armature is shown. The core I I I I is constructed of four separate sections of iron of the form shown—that is, with radially-projecting ends. Spaces are left between the ends of these sections, as at O O; but, if desired, the separate sections may be united to form a hollow rectangle. The separate sections are arranged around the axis carrying the armature, so as to form a hollow figure, with radial projections occupying points at right angles to each other.

To avoid induction-currents in the core each separate section is constructed, as shown in Fig. 4, of several separate pieces, formed and piled so as to produce the required form.

In the diametrically-opposite spaces on the armature-core coils C C and C′ C′ are wound by being carried over the ends of the armature, as shown in Fig. 2. It will thus be seen that the wire of the two separate coils thus produced will cross each other near the axis of the armature.

To prevent inequality in the length of the wire employed in the coil C C as compared with that of the coil C′ C′, one half of the coil C C is first wound on the armature, as shown at G, after which the whole of the coil C′ C′ is wound, and finally the other half, H, of the coil C. It is evident that the same effect as to equality in length can be produced by winding the coil C in separate thirds, between which separate halves of C′ C′ pass. Other equivalent relations may also be used.

Plates or shields of brass or other non-magnetic material are used upon the ends of the armature, covering these ends in such a manner as to produce a smooth uniform surface and prevent the churning of the air and consequent loss of power which would otherwise occur in driving the machine.

The armature may be revolved between the poles N N′ and S S′, Fig. 1. The poles N′ and S, as also N and S′, are situated at such a distance apart as to be joined by the separate sections of the armature-core in certain positions of revolution. When preferred, the two poles N and N′ may be united to form a single extended pole, N, Fig. 2, and S and S′ likewise united to form a single pole, S, Fig. 2.

By the arrangement of the parts above described a varying, reversed, and intermittent current is produced in the coils C C and C′ C′ when revolved, the direction of the currents depending on the direction of revolution; but the positions of the coils are such that when one coil, as C C, is producing its maximum current the other coil, C′ C′, is producing its minimum current.

To utilize the currents in the coils C C and C′ C′ to produce a continuous and practically unvarying current, a special commutator is employed, which prevents the short-circuiting which would occur if the ends of the coils were carried out to conducting-pieces and the same collector used with each coil.

In our invention we employ for controlling and utilizing the currents generated the commutator shown in Fig. 3, or its mechanical equivalent. The half-circles, of copper or other conducting material, *a b c d*, are mounted on the axis A of the armature before described, so as to revolve with it, and are insulated from each other and from the axis A. Any two of these half-circles, as *a* and *b*, are connected with the ends of the wire of the coil C′ C′, and the remaining two, *c* and *d*, are connected with the ends of the wire of the coil C C.

Four collectors or brushes, U V X Y, rest upon the half-circles *a b c d* in such a manner that when the coils C C or C′ C′ are in their position of least current the brushes or collectors corresponding thereto, and serving to convey the current from the extremities of the wire of the coils aforesaid, shall rest upon the division or space between two corresponding half-circles, as *a b*. As shown in Fig. 3, the brushes U and X are supposed to rest on the half-circles *a* and *b* and the brushes V Y on the half-circles *c* and *d*, respectively.

If the coil C′ C′ connected with the half-circles *a b* is generating no current in the position shown, the collectors U X will rest upon the spaces between *a* and *b*, as shown, while the coil C C will be generating its maximum current, and the half-circles *c d* corresponding thereto will have their points of separation situated midway between the collecting-brushes V and Y resting on them.

Any two of the collecting-brushes that are positive and negative with respect to each other may be connected by a conducting-wire, W, and the remaining two thus become the electrodes or terminals, from which the current is taken for its utilization.

By winding the armature-core I I I I, Fig. 2, with a double set of coils—that is, two other coils wound parallel to and by the side of the coils C′ C′ and C C, respectively—and by providing a duplicate commutator connected thereto, two distinct and separate constant currents may be obtained, which may be applied for the purposes hereinbefore described.

By increasing the number of sections I I I I, Fig. 2, of the armature-core, and consequently of the coils wound thereon, a corresponding increase of the number of available currents may be obtained without affecting the method of production and utilization of these currents.

We do not here claim a cylindrical armature inclosed by coils wound longitudinally on the exterior thereof, as in the well-known Siemens machine; nor do we claim an armature provided with grooves in which the wire is wound longitudinally, as long known and used under the title of the "Siemens armature."

We claim as our invention—

1. In a dynamo-electric machine, movable field-magnet coils F F′, substantially as described, for the purpose of governing the distribution of the magnetic field, and also of securing proper operation of the commutator.

2. In a dynamo-electric machine, a compound armature-core having the form of a hollow square or other suitable figure divided into separate sections, as described, said sections being arranged end to end circumferentially around an axis in such a manner that of any two consecutive sections the ends of one section shall be in juxtaposition with field-magnet poles that are of north and south polarity, respectively, at the same time that the ends of the other section are in juxtaposition with field-magnet poles of like polarity, for the purpose specified.

3. In a dynamo-electric machine, the combination of an armature consisting of a sectional armature-core, substantially such as described, wound with two separate coils, one of which surrounds sections of the said core that are in juxtaposition to poles of the field-magnets that are north and south, respectively, at the same time that the other coil surrounds sections of the armature-core that are in juxtaposition with poles of like polarity, with a commutator, substantially such as described, by which said coils are put into connection end to end in such manner that a positive terminal of one coil shall be electrically connected to the negative terminal of the other coil, for the purpose of producing a current in one direction.

4. In a dynamo-electric machine, the method of securing equality in the length of wire composing any single armature-coil C′ C′ with that composing any other single and separate armature-coil C C by winding upon the armature-core one half of the coil C′ C′, then the whole of the coil C C, and finally the remaining half of the coil C′ C′, for the purpose of securing electrical equality in the action of such coils.

5. In a dynamo-electric machine, the combination of the field-magnet poles N N′ S S′, as described, with the armature-core constructed of four sections, I I, &c., constituting a hollow square figure, and wound, as described, with two separate coils, C C and C′ C′, situated in planes at right angles to each other, and with a commutator consisting of four insulated half-circles, *a b c d*, connected to the terminals of the coils C C and C′ C′, as described, the whole arranged to operate in the manner and for the purpose specified.

6. The construction, in the manner described, of the separate sections I I I I of the armature-core—that is, of several separate pieces of iron—for the purpose of preventing the circulation of induced currents in the sections.

7. In a dynamo-electric machine, the covering or shield Q Q, of non-magnetic material, applied to the armature, for the purpose set forth.

ELIHU THOMSON.
EDWIN J. HOUSTON.

Witnesses:
W. NEWTON MEEKS,
EDWARD W. VOGDES.