(No Model.) 3 Sheets—Sheet 1.

E. THOMSON.

DYNAMO ELECTRIC OR ELECTRO DYNAMIC MACHINE.

No. 323,975. Patented Aug. 11, 1885.

Fig. 1.

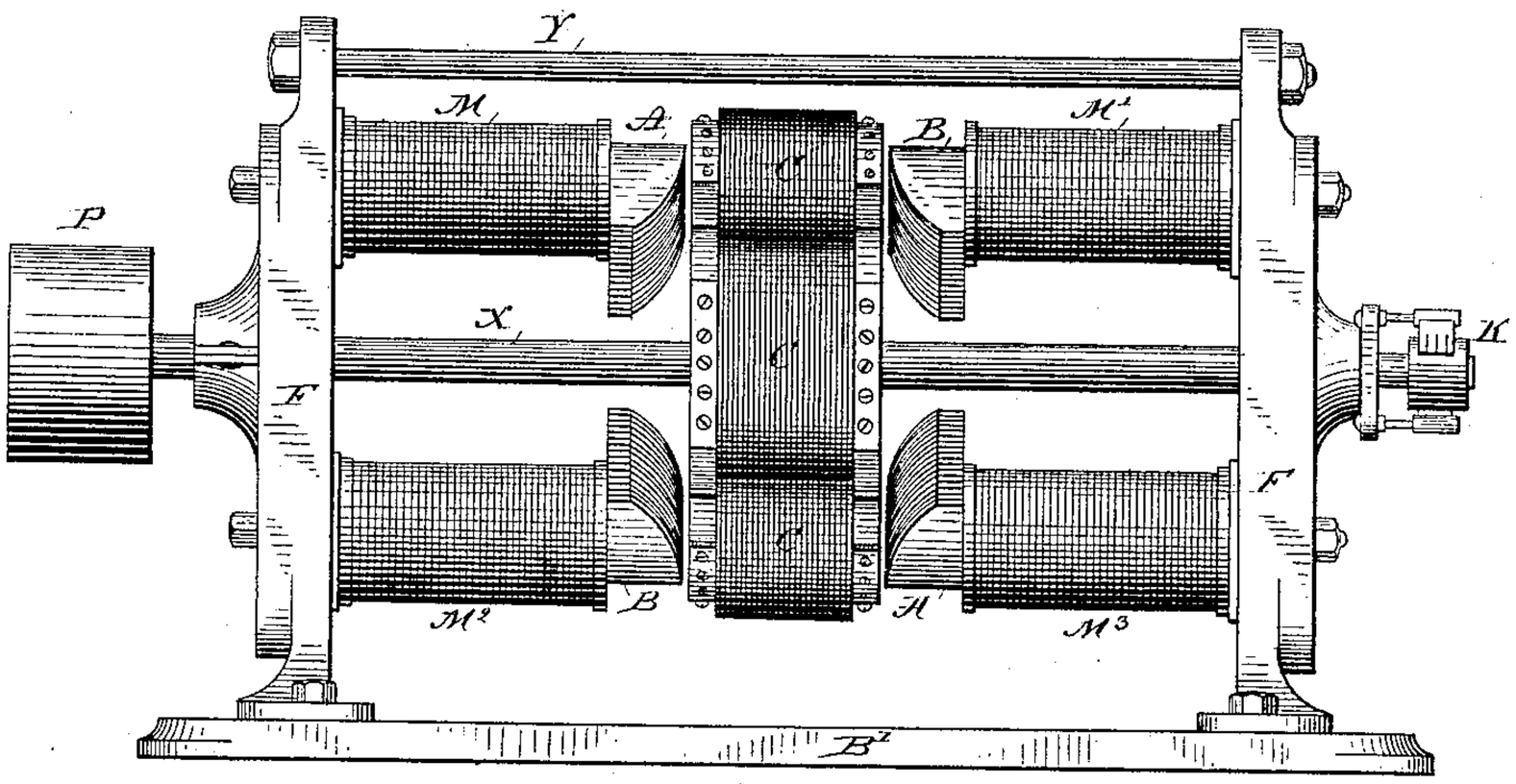
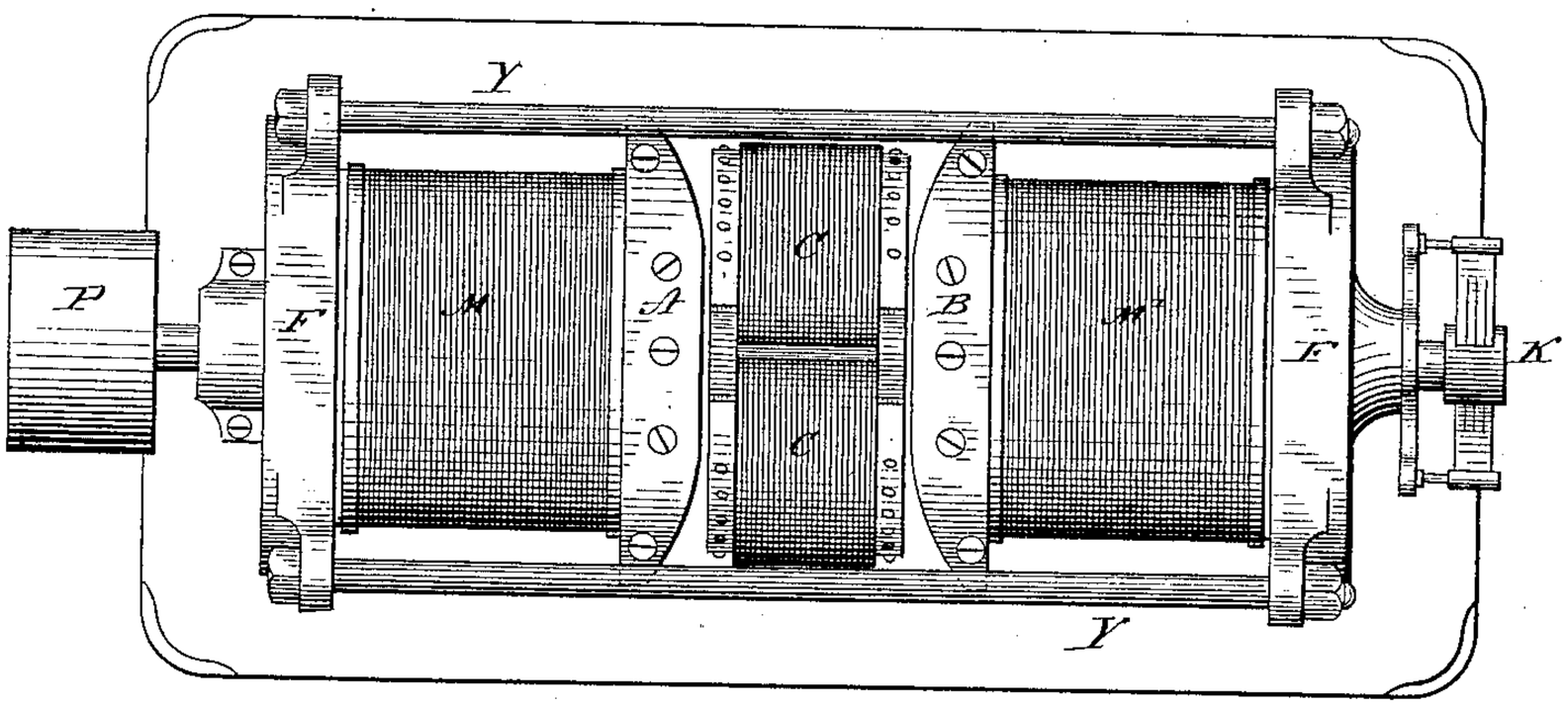


Fig. 2.



Witnesses:
Ernest Abshagen
Thos. Dorney

Inventor:
Elihu Thomson
By his Attorney: H. L. Townsend

(No Model.)

3 Sheets—Sheet 2.

E. THOMSON.

DYNAMO ELECTRIC OR ELECTRO DYNAMIC MACHINE.

No. 323,975. Patented Aug. 11, 1885.

Fig. 3.

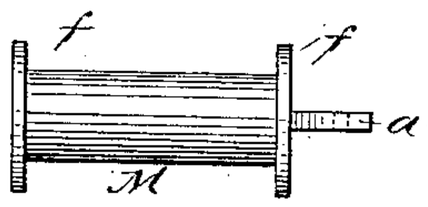


Fig. 5

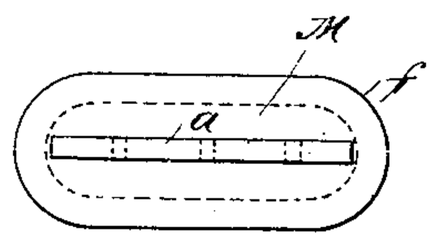


Fig. 4.

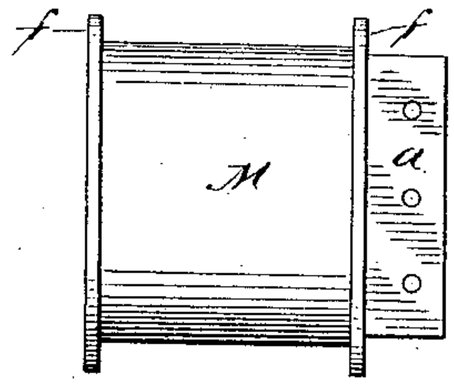


Fig. 6.

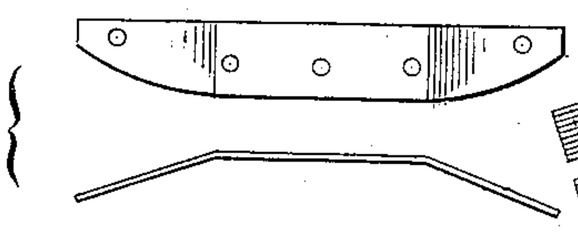


Fig. 7.

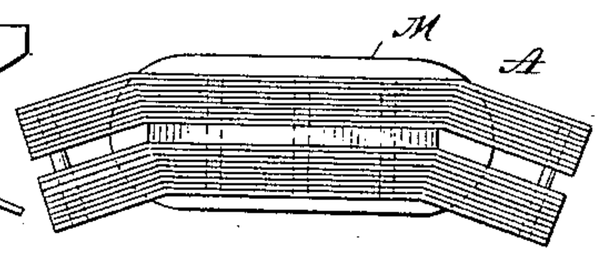


Fig. 8.

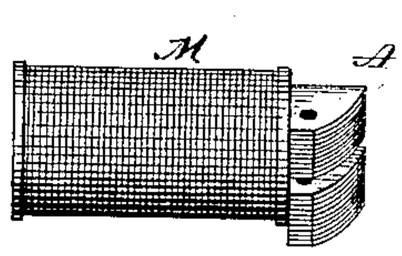


Fig. 10.

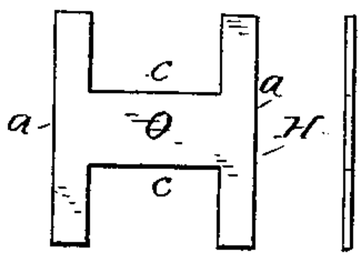


Fig. 11.

Fig. 12.

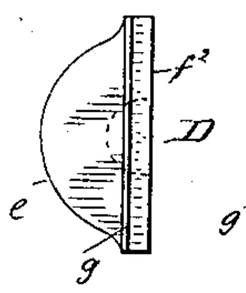


Fig. 13.

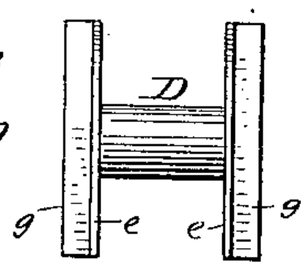


Fig. 14.

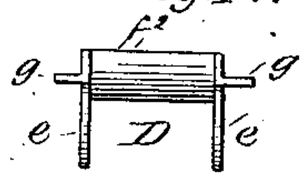


Fig. 9.

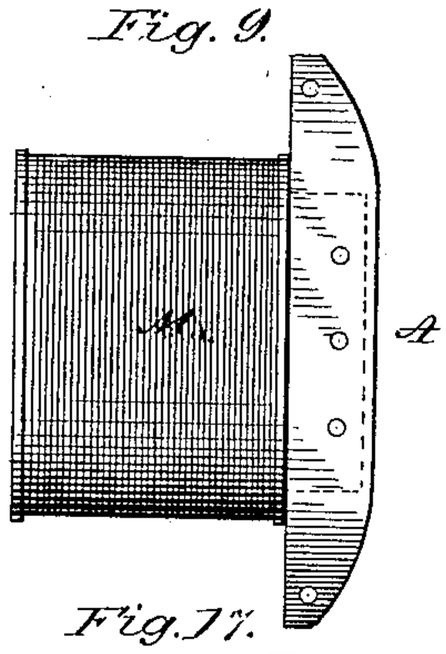


Fig. 15.

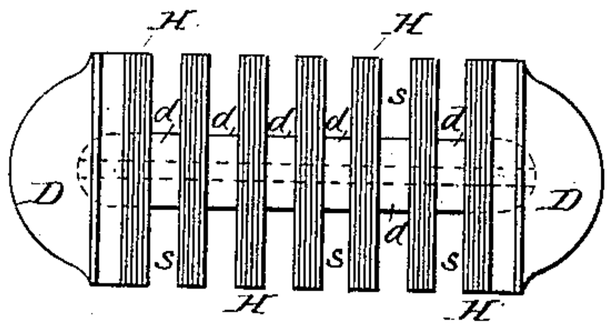


Fig. 17.

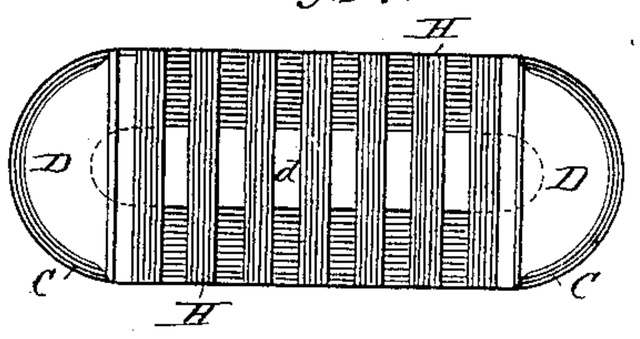


Fig. 16.

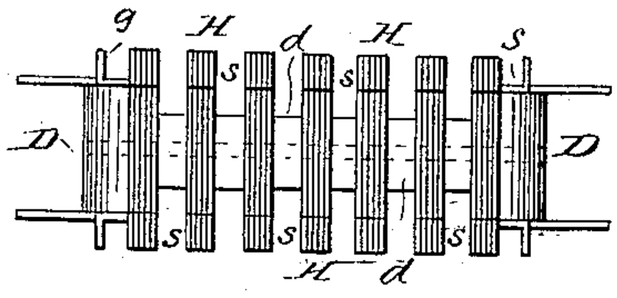
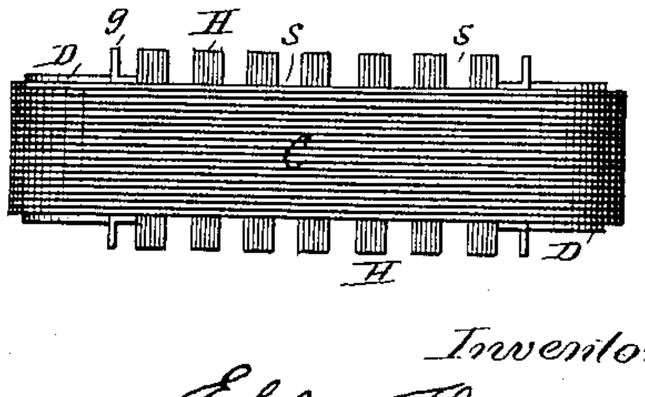


Fig. 18.



Witnesses.
Ernest Abshagen
Thos. Toomey.

Inventor:
Elihu Thomson
By his Attorney: E. B. Thomson

(No Model.) 3 Sheets—Sheet 3.

E. THOMSON.

DYNAMO ELECTRIC OR ELECTRO DYNAMIC MACHINE.

No. 323,975. Patented Aug. 11, 1885.

Fig. 19.

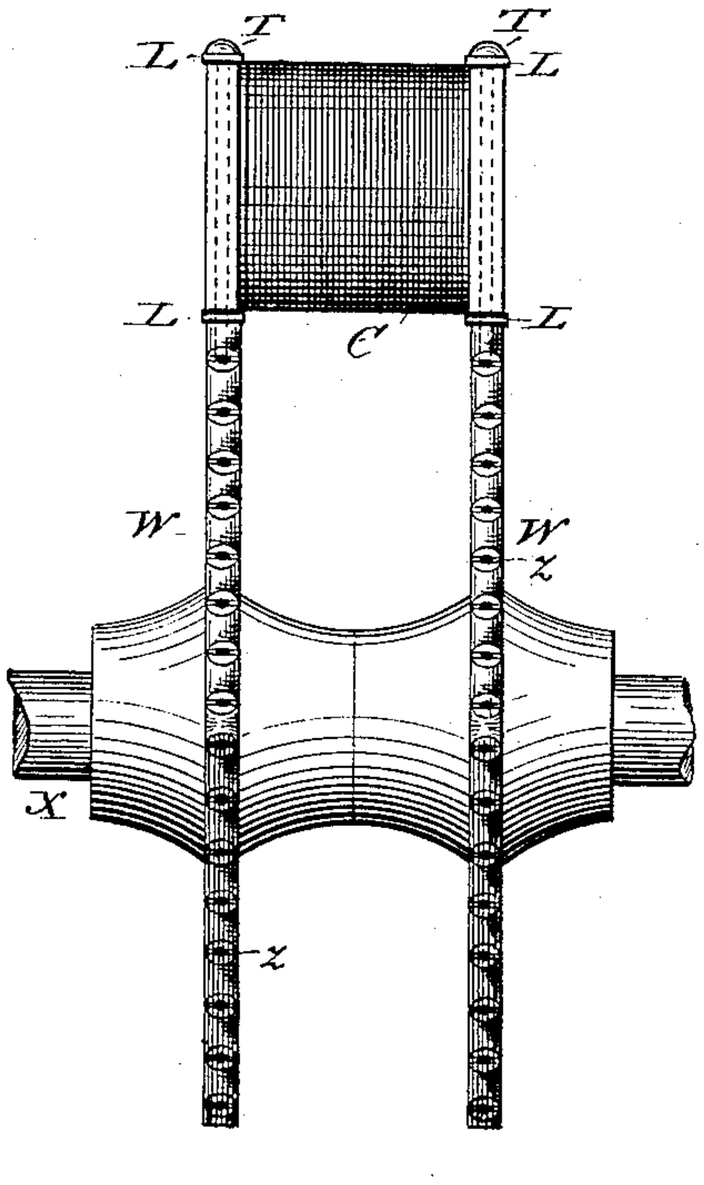


Fig. 20.

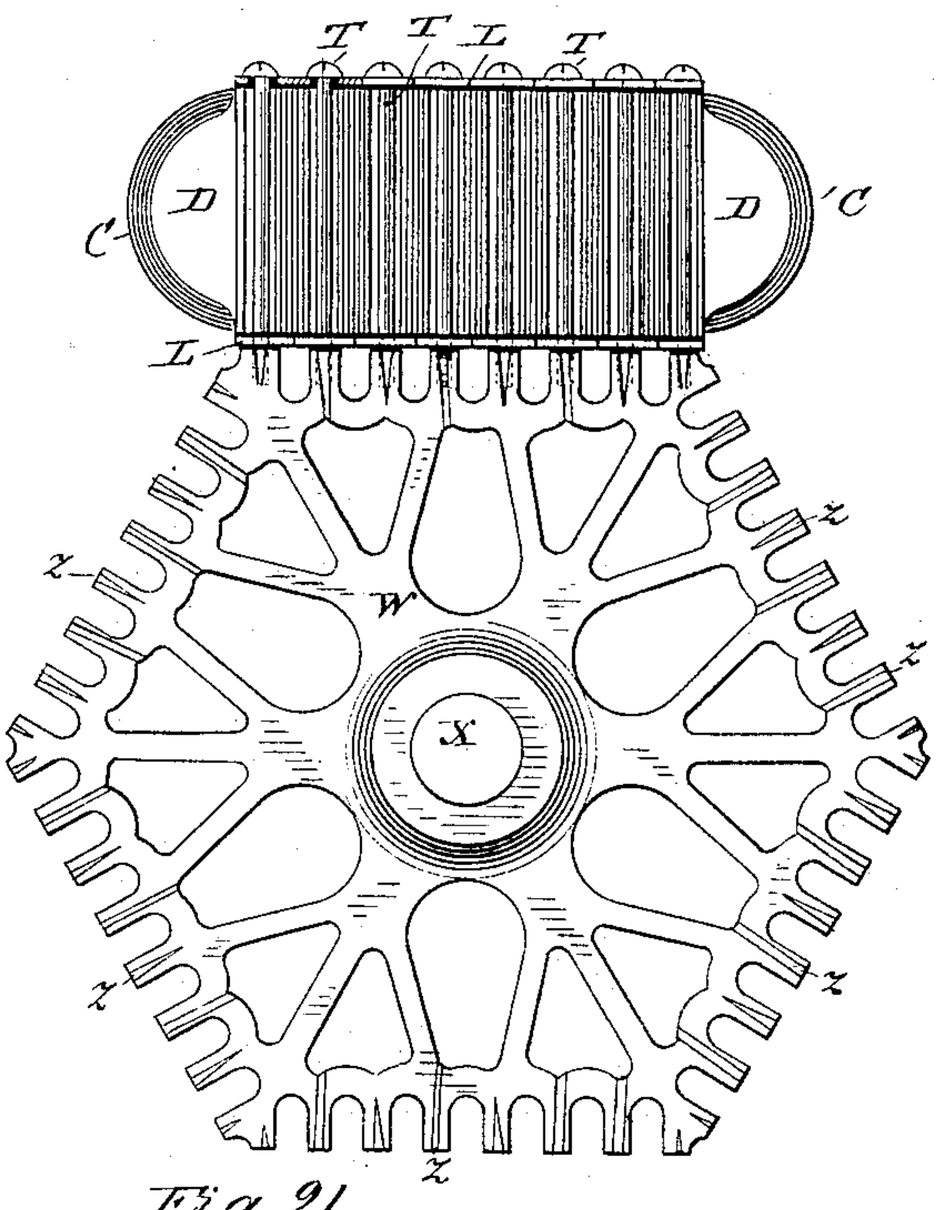


Fig. 21.

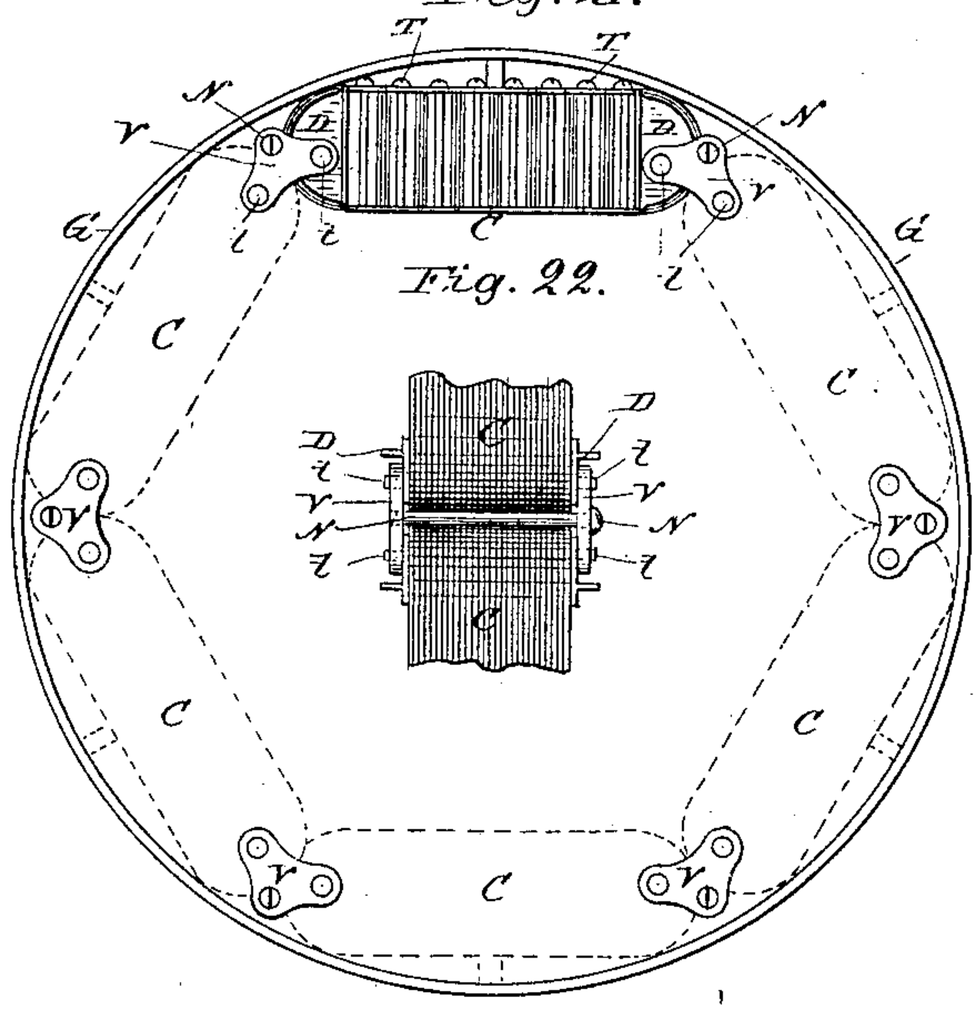
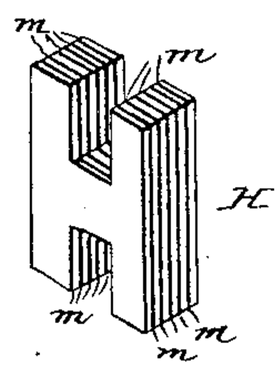


Fig. 22.

Fig. 23.



Witnesses:
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Thos Toomey

Inventor:
Elihu Thomson

By his Attorney: H. B. Townsend

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

DYNAMO-ELECTRIC OR ELECTRO-DYNAMIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 323,975, dated August 11, 1885.

Application filed September 10, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Dynamo-Electric or Electro-Dynamic Machines, of which the following is a specification.

My invention relates to improvements in the construction of dynamo-electric machines and motors, and more particularly to that class of machines in which the armature is made up from a series of bobbins mounted on a suitable carrier or support, and moved bodily past the poles of field-magnets.

In the form of machine herein illustrated the bobbins making up the armature are wound upon suitable cores, independent of one another, and mounted and revolved so that the magnetic axes of the cores are carried into and out of coincidence with the magnetic axes of the cores for the field or stationary magnet or magnets.

The commutator or collector and method of connecting the bobbins to one another and to said commutator or collector form no part of my present invention, and I have, therefore, omitted to describe them. As is well understood by electricians, they admit of very many variations.

My present invention consists in the details of construction and combinations of parts more particularly specified in the claims at the end of this specification.

Figure 1 is an elevation, and Fig. 2, a plan, of a machine constructed according to my invention. Fig. 3 is a side view of a field-magnet core unwound Fig. 4, a plan of the same, and Fig. 5 an end view looking toward the pole end. Fig. 6 shows in plan an edge view the shape of the sheet-metal pieces used in building up the pole-piece of the field-magnet. Fig. 7 is an end view looking toward the pole end of the field-magnet with its pole-piece constructed of sheet-metal pieces, such as shown in Fig. 6. Fig. 8 is a side view of such field-magnet, and Fig. 9 a plan of the same. Fig. 10 shows in plan one of the sheet-metal plates from which the cores of the armature-magnets are made. Fig. 11 shows the same in edge view. Fig. 12 is a side view of a piece designed for attachment to the sides of the core for an armature-magnet; Fig. 13, an end view, and Fig. 14, a top view, of the same. Fig. 15 is an end view of a core for the armature-helix complete, looking toward its pole. Fig. 16 is a plan of the same. Figs. 17 and 18 are corresponding views showing the core wound. Fig. 19 is an edge view of the spiders by which the magnets making up the armature of the machine are carried, and shows one of the magnets in place. Fig. 20 is a side view of the spider and single magnet. Figs. 21 and 22 illustrate in side view a device which I employ for giving additional strength to the armature structure. Fig. 23 illustrates a detail of construction.

B′ indicates the base of the machine, made of wood or metal, and F F iron magnet yokes and standards supporting the bearings of the armature shaft X, at one end of which latter is a pulley, P, and at the other a commutator, K.

Secured by bolting to the standards F F are the field-magnet cores and coils M M′ M^2 M^3 whose pole-extensions A B A B are placed opposite one another, as shown, with a space between for the armature. The poles opposed as A B are of opposite polarity. Between these polar extensions runs an armature, C C C, carried by the shaft X, and consisting of a non-magnetic frame or carrier keyed to the shaft, on or near the periphery of which carrier are secured, as herein described, a set of armature coils or helices, wound each upon a compound core of iron, peculiarly made, as hereinafter set forth.

The novelties of construction I introduce render this type of machine very efficient, where formerly it did not take a high rank among generators of electricity.

Rods of brass or other non-magnetic substance Y Y serve to give stiffness to the framework of the machine.

The details of construction are as follows: I make the poles of the magnets M M′ M^2 M^3 of finely-divided iron, and for this purpose attach pole-extensions of thin sheet-iron of special shape. The iron core of M, as shown in Figs. 3, 4, and 5, has end flanges, *f f*, either cast or forged thereon or made of insulating material, and slipped on before winding.

Projecting from the core where the pole-extensions are to be attached is a piece, *a*, perforated, as shown, to receive attaching-bolts. A number of strips or pieces of sheet-iron, shaped as in Fig. 6, and with holes to correspond to those in *a*, just described, are cut or punched and bent, as in the lower part of Fig. 6. The ends of each strip are cut away on a curved line, as shown, so that the various parts of the armature, in revolving between the poles, may gradually come into and recede from close proximity with the pole-face of the poles A B. Figs. 7, 8, and 9 show how these strips are employed to build up the pole A. The magnets are placed (when wound) in the dynamo, as in Figs. 1 and 2, with the bent portions of A B toward each other, and the tapered or cut-away portions tapering away from the armature. The number of pieces, Fig. 6, to be used in constructing the polar extensions A B is not definite, but it suffices to have a reasonably thorough division of the poles—such as may be secured by fifty pieces, for example, in each pole.

With the construction just described, disagreeable hum, loss of power by currents being set up in the field-poles, and other inconveniences are avoided.

The armature of the machine is made up of a number of electro-magnets, each having a core built up from a series of thin iron plates, H, shaped as shown in Fig. 10. The edges *a* of the plate are the pole edge, while the spaces *c* are for containing the wire wound upon the core. In constructing the armature core it is preferred (though not essential) to supplement these by malleable-iron castings D, applied to the sides of the core, of the form shown in the three views, Figs. 12, 13, and 14, and used as described herein.

Figs. 15 and 16 show a preferable form of the bobbin or helix core complete.

I prefer to build up the core from a number of bundles of the pieces H H H H, Figs. 10 and 11, separated from one another a small distance by any means—such as by washers *d d d*, of iron or wood, interposed. At each end of the compound pile of pieces is preferably used a piece, D, as shown, to round the ends of the bobbin and hold the wire to be wound thereon in place. The flanges *e e* serve to hold the wire in place where it passes over the side of the compound core, while the body f^2 is rounded, as indicated by the dotted line, Fig. 12, to form a good bearing for the wire in turning at the edge. The flanges *y* serve to hold in place the bolts which are employed in securing the electro-magnet to its carrier or frame.

The piece D could be made of brass or even insulating material, but a slight loss of magnetic power of the core would be incurred. It is convenient to bolt the whole core so formed together by a center bolt (indicated in dotted lines) before winding.

Figs. 17 and 18 show the armature-coil in place.

In the Figs. 15, 16, 17, 18, it will be noticed that spaces *s s s s s* exist at the sides of the coil or core. These serve to permit the secure fastening of the magnets to a pair of spiders or carriers, W W, Figs. 19 and 20, placed on the shaft X of the machine. Screw-bolts T T T T T pass through the aforementioned spaces *s s*. A long washer or strip, L L, of iron, brass, or insulator, is placed above and below the core and coil C, as in Fig. 19, at its portion where it is secured by the screw-bolts T T, &c. These bolts pass into threaded holes made in bosses on the frame W, as shown. All these holes are preferably cut or slit out laterally, as shown. The bolts T T are best made of fine steel. The washers L L are also slit out laterally from the holes where the bolts T pass through them. All points where metallic contacts could otherwise exist are insulated, as around the bolts T T, and under their heads. At these points paper-covering or washers or a coating of enamel is interposed. The pieces L L are not allowed to make contact with the spider W, the bolts T, or the core H H, &c., separation being effected by interposed paper, japan or enamel. Slits Z Z Z, &c., are cut at various points in the hub or carrier W, the better to stop off any possible circulation of currents in it. The spiders, hubs, or carriers W, secured to the shaft X, are made preferably of bronze and of sufficient mass to secure ample strength. As an additional safeguard, however, I sometimes provide additional strength to resist centrifugal tendency, as illustrated in Figs. 21 and 22. Upon the parts D D, I form lugs or projections *t t*, upon which are strung links V V, held in place by a screw N, uniting two opposite links, V V, Fig. 22. This serves as an efficient binding to hold the coils C C in place; but for very high speeds of driving I also place a band, G G, of brass or German-silver wire wound over the whole exterior. This is insulated by resting on paper interposed between it and all metal portions of the machine. Despite this band, which is only wide enough to cover the coil C so as not to extend over the screws T T laterally, any coil C may be readily removed by taking out the screws T T, &c., which hold the coil in place, after which a lateral movement to either side releases the coil and removes it from under the band G. Any coil may be removed for repairs or replacement in a few minutes. This and other constructional advantages are secured in my invention—such, for instance, as the winding of the armature-coils in an ordinary lathe.

It will, of course, be understood that for the purpose of still further improving the subdivision of the armature magnet-cores the individual plates H may be separated from one another by thin strips of insulating material, as indicated at *m*, Fig. 23. This material may be paper or a shellac or other coating upon the metal.

What I claim as my invention is—

1. In a dynamo-electric machine or motor,

a field-magnet core having an extension, as *a*, and sheet-iron plates secured to said extension and forming the pole-pieces acting on the armature.

2. In a dynamo-electric machine or motor, a field-magnet pole-piece, constructed from a number of superimposed sheet-iron plates, which are each bent in a plane parallel to the plane of the rotation and having a curved edge presented to the armature.

3. The combination, with the field-magnet core, of the perforated extension *a*, and a series of thin sheet-iron plates bolted to said extension and forming the field-of-force pole-piece.

4. In a dynamo-electric machine or motor, an armature having a series of magnets supported in a suitable frame and revolved bodily around the axis of said frame, each of said magnets having a core composed of a number of H-shaped pieces of iron mounted so that the edges of their legs shall form the poles of the magnets.

5. In a dynamo-electric machine or motor, an armature consisting of a frame carrying a series of electro-magnets, each consisting of a bundle or pile of H-shaped iron plates wound with insulated wire.

6. An armature-core mounted on a revolving carrier with its magnetic axis transverse to the plane of rotation, and provided with spaces, as *s s*, extending radially through its poles for the passage of bolts, whereby it may be fastened to its carrier.

7. The combination, with the armature-magnets mounted on a suitable frame with their magnetic axes parallel to the shaft, by which said frame is revolved, of fastening-bolts passing radially through openings in polar extensions of said magnets into the frame, as and for the purpose described.

8. The combination, with a non-magnetic carrier mounted on a suitable shaft, of a series of magnets having their axes parallel to the shaft, the insulated plates or washers L L, and the fastening-bolts passing transversely through the magnet poles and the plates L, as and for the purpose described.

9. The combination, with the magnet-core, made up of a series of thin H-shaped pieces of iron, of the side plates, D, having rounded body, and retaining-flanges to keep the armature coils in place.

10. The combination, with a series of armature-magnets mounted on a suitable frame, of connecting-links, as V, for the purpose described.

11. The combination, with the series of armature-magnets having laterally-projecting pins, of retaining-links strung on said pins, as and for the purpose described.

12. The combination, with a series of armature-magnets mounted on the periphery of a suitable frame and parallel to the armature-shaft, of bolts passing transversely through the poles of the magnets for securing them to the frame, and a retaining-band, G, less in width than the length of the magnet-cores, so as to permit the easy removal of an armature magnet or magnets, as and for the purpose described.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 1st day of September, A. D. 1884.

Witnesses: ELIHU THOMSON.
W. O. WAKEFIELD,
A. L. ROHRER.