(No Model.) 3 Sheets—Sheet 1.

E. THOMSON.

DYNAMO ELECTRIC MACHINERY.

No. 399,800. Patented Mar. 19, 1889.

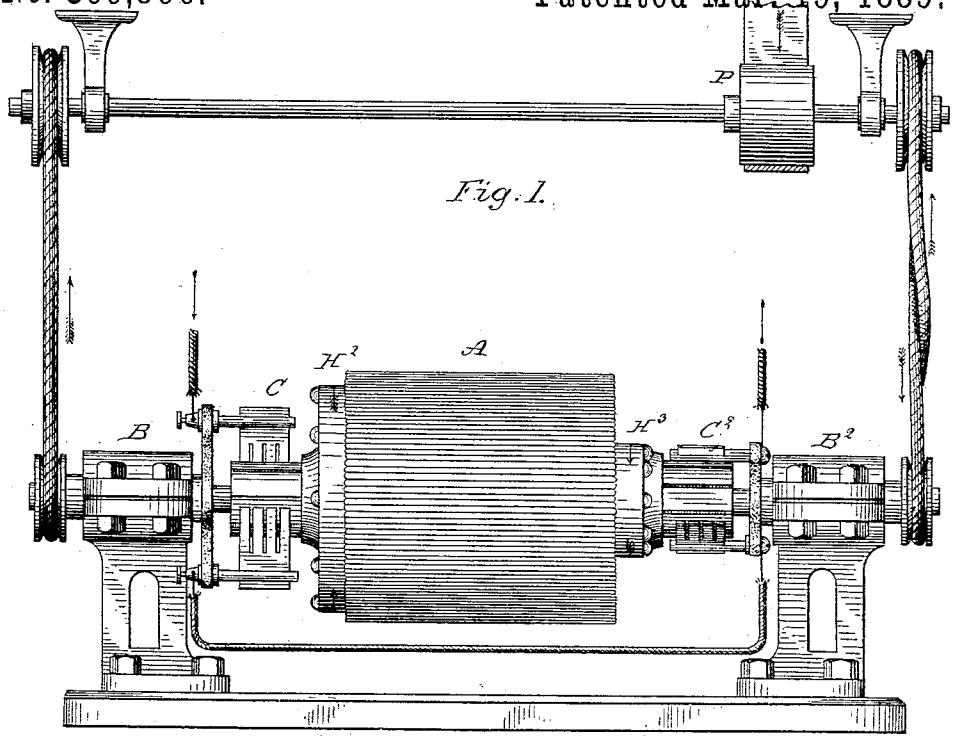

Fig. 1.

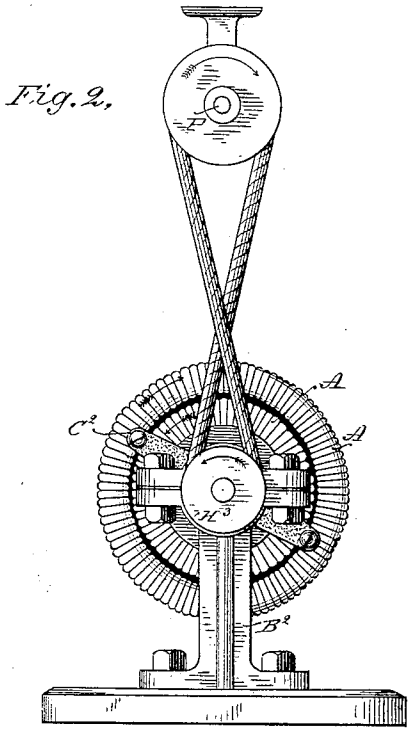

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

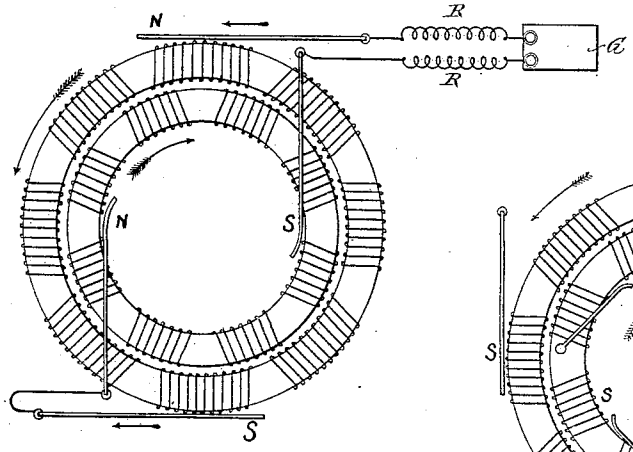


Fig. 4

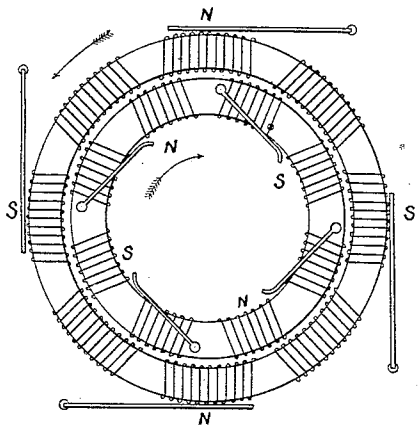


Fig. 5.

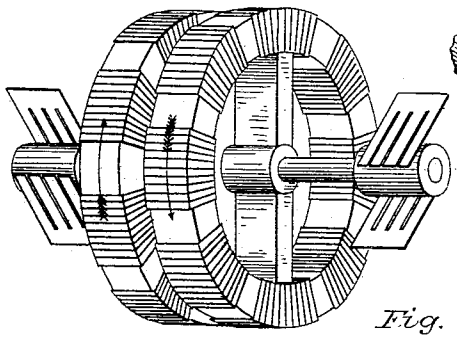


Fig. 6.

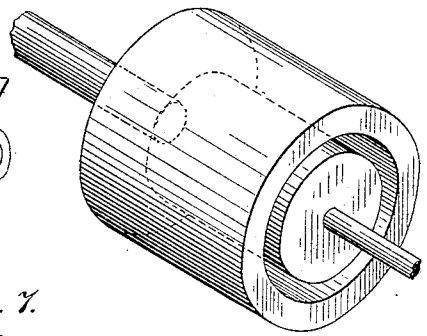
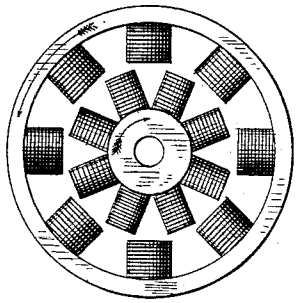


Fig. 7.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 8.

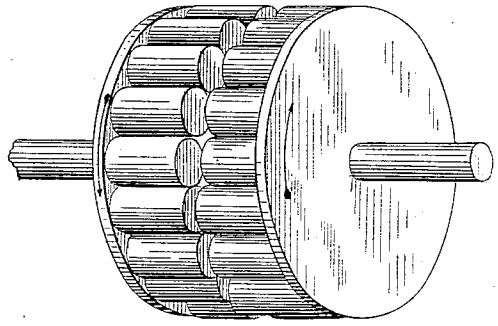


Fig. 9.

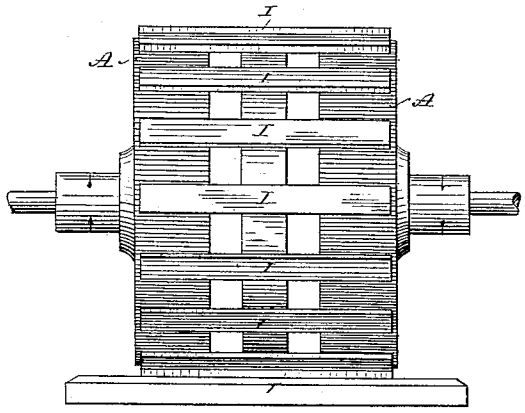


Fig. 10.

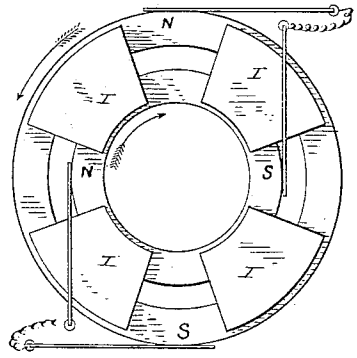
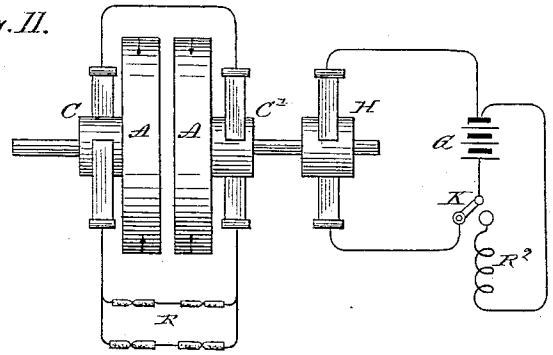


Fig. 11.



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By his Attorney:

Inventor:
Elihu Thomson
H. C. Townsend

UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE THOMSON-HOUSTON ELECTRIC COMPANY, OF CONNECTICUT.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 399,800, dated March 19, 1889.

Application filed May 25, 1883. Serial No. 96,092. (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 New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Dynamo-Electric Machines or Motors, of which the following is a specification.

My invention relates to dynamo-machines in which there are combined two or more series or sets of bobbins, each set wound upon one or more iron forms or cores and revolving in opposite directions, and each provided with a commutator, the whole operating by the interaction of two sets of bobbins or coils moving oppositely and in inductive relation to one another.

My invention consists in the application to such a machine of a connecting mass of iron between the two sets of coils or armatures, as will be hereinafter described.

Various forms of machine to which my invention may be applied are shown in the drawings.

Figure 1 is an elevation of one form of the machine. Fig. 2 is an end view thereof. Fig. 3 illustrates diagrammatically the disposition of the commutator brushes and circuits in the machines. Fig. 4 shows the relative positions of the consequent points in the machine when a larger number of such points are produced in the two revolving systems. Figs. 5, 6, 7, and 8 illustrate modified forms and dispositions of armatures. Figs. 9 and 10 show how my invention may be applied to the machines to bring the armatures into closer inductive relation and to permit the armatures to be revolved at a greater distance apart without destroying their interaction. Fig. 11 illustrates diagrammatically an arrangement for charging the machine at starting.

In Figs. 1 and 2, B B^2 indicate the bearings for two separate shafts, said shafts being arranged in line with each other and each carrying a ring-armature, A, consisting of a ring or band of iron wound with coils, as in a Gramme generator.

H^2 indicates a suitable disk or frame, to which one of the armatures A is bolted, while H^3 is a similar armature-support for the other armature. H^2 is supported on the shaft running in B and H^3 on the shaft running in B^2. The coils on each armature are connected in the way, usual in a Gramme machine, with one another and with the commutators C C^2. The commutator-brushes are carried on suitable adjustable supports or yokes, as usual, and are insulated from such supports in the ordinary way. Suitable connections are made to said brushes and to the circuit upon which the machine works. The two shafts are revolved in opposite directions from a shaft, P, to which they are belted, the latter being driven by any suitable power; or when the machine is used as a motor, the shafts in B B^2 serve to drive shaft P. The commutator-brushes are set, as indicated in Figs. 1 and 3, so as to connect segments of each commutator-ring that are in a plane nearly at right angles to the plane of the segments in the other ring; or, in other words, the brushes of C are in a plane at right angles to the plane of the brushes in C^2.

Fig. 2 shows the one armature located inside the other, and their direction of revolution is indicated by the arrows. The circuit-connections of the two armatures or systems may be widely varied.

In Fig. 1 a simple series-connection is shown, the positive brush of one system being connected to the negative of the other. This may be varied by connecting positives together to form one common positive, and negatives together to form one common negative; or the two brushes of the one system may operate on a circuit independent of the other.

By preference, when the machine is used as a generator, a small continuous-current generator is placed in circuit with it and put in motion. The original currents will either be greatly increased when rotation is given to the machine in a direction opposite to that in which it would tend to revolve or the electro-motive force developed will force said original current over a greater resistance.

It will be seen that my machine differs from all other generators in that all the wire generates current, and by virtue of the opposite direction of movement of the two-coil systems the effect of a double velocity is secured in their interreaction one upon the other.

The general principle of the action when the coils of the two systems are connected and commutated, as described, is shown in Fig. 3. By the passage of current through the coils of each ring north and south polarity are induced in the opposite sides of each ring at the points N. S., as indicated.

The lines of consequent polarity in the two rings are at right angles to one another. The rings are caused to revolve in a direction opposite to that in which they would tend to revolve if the machine were used as a motor—that is, the movement is such as to drive the north poles toward one another, and similarly the south poles. Acting as a motor, the inverse operation takes place. Each ring becomes a source of generated currents or of power, as the case may be. Resistances R R may be disposed in the circuit, and a small generator, G, of any suitable kind used to start the generation of current, when desired. Said generator may after the machine begins to operate be removed from circuit. Many consequent poles may be formed in each ring by suitably disposing the coils and brushes; but these are matters at present well understood in the art, and may be varied in many ways.

Fig. 4 illustrates diagrammatically the relative position of consequent poles and commutator-brushes when four consequent poles are produced in each armature.

In Fig. 5 two-ring armatures are indicated as revolving in opposite directions, side by side. Their number may be increased, the alternate rings being at the same time arranged to revolve oppositely.

Fig. 6 shows the shells of two cylindrical armatures placed one within the other. These are wound with wire after the ordinary fashion of cylinder-armatures and made to revolve in opposite directions.

Fig. 7 shows two rings of iron with radial projections extending toward one another, that may be connected and wound in endless or closed circuit, as in a Gramme machine, or in any ordinary way usual in armature constructions for dynamo-electric machines.

Fig. 8 shows two ranges of bobbins mounted on suitable disks or carriers and extending horizontally toward one another in a direction transverse to the path of revolution. These ranges of bobbins may replace the rings of Fig. 1, having similar connections thereto, or may be connected and commutated in other ways.

It is not essential that the rings or ranges of coils or cores should run close to one another, provided iron bars or connecting-pieces be suitably arranged to convey the magnetic influences from one ring or armature to the other, and to thus preserve their magnetic relation. Such an arrangement is shown in Fig. 9, where I I indicate bars or masses of iron mounted upon a suitable fixed support and extending at their opposite ends over the two separated armatures A A. These bars may or may not possess initial magnetism; but few bars would be needed, provided they were set so as to overlap each ring at positions nearly corresponding to the middle point between the commutator-brushes. This disposition is shown in Fig. 10, where the masses of iron are shown applied to concentric rings like those of Fig. 1.

I I I indicate the masses of iron suitably supported. Even when the rings are close to one another the plates I I may be used with good result to intensify the effect. They act by bringing the rings into close inductive relation by their power to concentrate and convey magnetic polarization. They may be applied to any of the various forms and constructions herein indicated. The work done by each ring may be varied, and several commutators may be employed with double or triple windings. A form wherein an extra set of coils on one armature is used for giving an initial inductive charge to the machine is indicated in Fig. 11.

A A indicate the two rings, one of which, connected to commutator C, is wound singly, while the other may be wound doubly or with two sets of coils, and is provided with a second commutator, H, to which the second winding or set is to be connected. The amount of wire in the second set as compared with the first may be large or small, as described. If used simply for charging purposes, it would be small; but if employed also for supplying a working resistance it would be large.

The main commutators are connected in any suitable way and work through the resistances R. A small generator, G, may be used for supplying current through H to start the machine. After the machine is started, the generator G may be cut out and the current from commutator H, taken through a working-resistance, R^2, by means of a switch, K, or the commutator H, may be put on short circuit. The extra coils, commutator H, and circuits therefor tend to give magnetic stability to the apparatus.

What I claim as my invention is—

The combination, substantially as described, with two systems of coils, each system wound over a suitable core or cores and revolving in opposite directions, of a commutator for each system and a stationary bridge-piece or pieces of iron for bringing the two systems into close inductive relation.

Signed at Boston, in the county of Suffolk and State of Massachusetts, this 23d day of May, A. D. 1883.

ELIHU THOMSON.

Witnesses:

HARRY B. ROGERS,

E. C. WHITNEY.