(No Model.)

2 Sheets—Sheet 1.

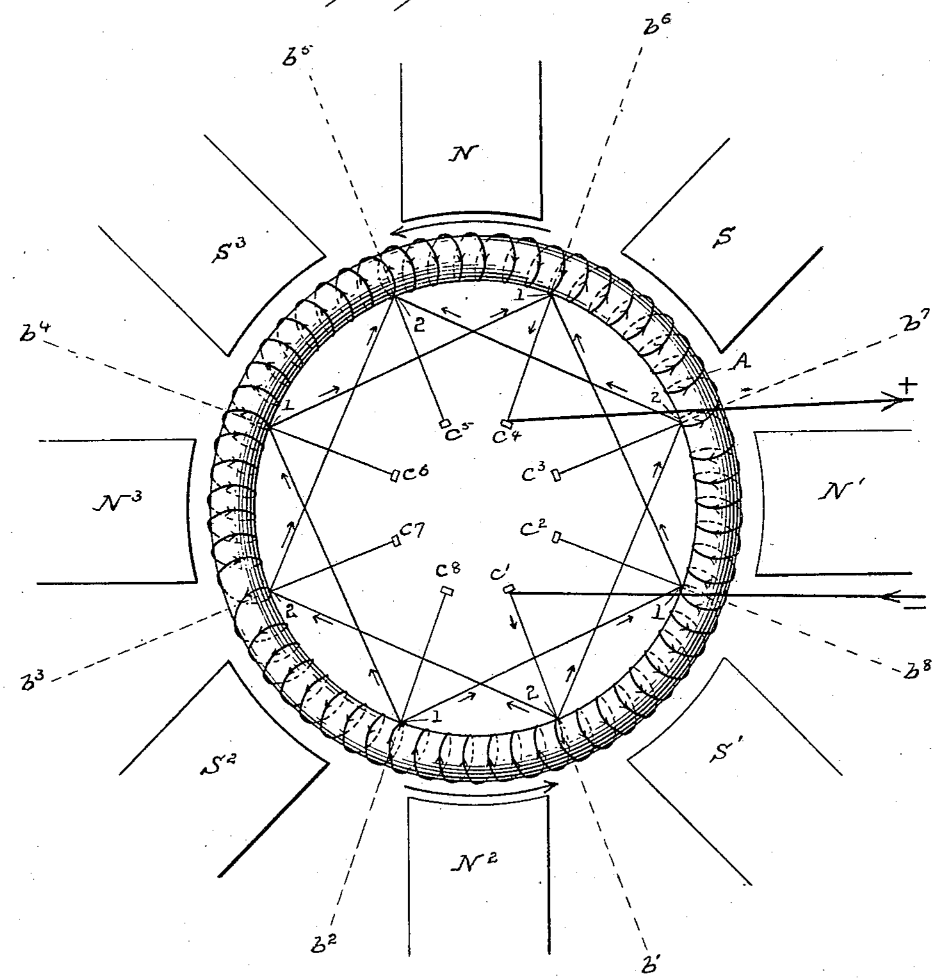
T. A. EDISON.

DYNAMO ELECTRIC MACHINE.

No. 470,930.

Patented Mar. 15, 1892.

Fig. 1.



Witnesses
Norris A. Clark.
W. F. Oberlé

Inventor
T. A. Edison
By his Attorneys
Dyer & Seely

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

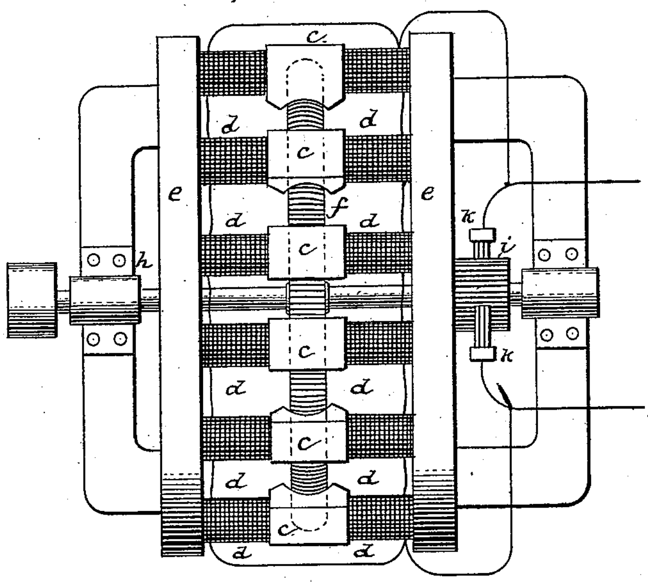
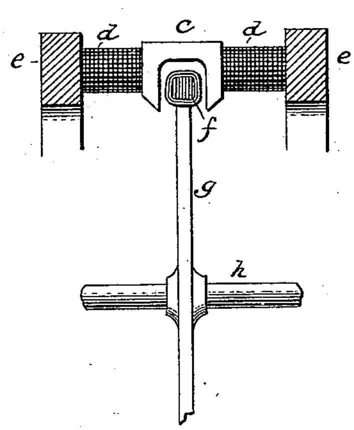


Fig. 3.



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 470,930, dated March 15, 1892.

Application filed October 10, 1891. Serial No. 408,338. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Dynamo-Electric Machines, (Case 943,) of which the following is a specification.

My invention relates to that class of dynamo-electric machines employing continuous armature-windings, my object being to improve the construction and increase the efficiency of such machines, and especially of those having a Gramme or ring form of armature and a multipolar field. Heretofore such armatures have been wound with a continuous coil connected at intervals with the consecutive conducting-bars of a commutator-cylinder. Such armatures have had to be made very small, because with a large ring the magnetic lines of force would have to travel a long distance through the iron of the ring to get from pole to pole, which would so decrease the electro-motive force as to render the machine of small efficiency. It has been proposed, in connection with a multipolar field, to provide a ring-armature core divided into separate magnetic sections with coils wound thereon symmetrically, but covering a portion only of the length of the ring-core. The points of this armature-coil in corresponding positions in like fields were to be connected to opposite segments of the commutator in said machine. It was proposed to place a second armature-core with like coils on the same shaft, the coils of the second section of the armature breaking joint with those of the first section. This construction is open to numerous objections. For example, the construction of the armature-core is expensive and complicated, and owing to the arrangement of two armatures side by side the field-magnet poles between which the armature is rotated were necessarily at quite a long distance apart. By my arrangement these objections are overcome, the armature being of the simplest possible form, and the space for it being no larger than that required for a ring-armature connected to the commutator in the ordinary manner. By my invention I so arrange the winding and the field-magnets that all of the field-magnet poles act continuously to generate current in the right direction in parts of the coils adjacent to such poles, whereby all of the coils are constantly in use. I may thus make the ring as large as may be desirable, which enables me to couple the machine, if desired, directly on a shaft of a slow-speed engine, and still to attain such high-surface velocity as will give the proper efficiency, together with great cooling facilities. To this end I employ a series of field-magnets with their poles situated concentrically around the ring, so that north and south poles alternate, thus forming a series of independent fields of force, and I connect all armature-coils in corresponding positions in like magnetic fields to the same commutator-blocks. This arrangement and its effect will be most readily understood by reference to the accompanying drawings, in which—

Figure 1 is a diagram of a machine having eight poles embodying my invention; Fig. 2, a top view of a similar twelve-pole machine, and Fig. 3 a section of a portion thereof.

Referring first to Fig. 1, A represents the iron armature-ring, which is preferably continuous and laminated and on which is wound a continuous coil of insulated wire in such manner as to cover the whole length of the core. Around this armature are placed several magnets, eight being shown in the diagram, the poles being lettered N S N′ S′, &c., but this special number of poles is not essential. A corresponding number of commutator-blocks c' c^2 c^3, &c., are shown. The dotted lines b' b^2, &c., represent the neutral lines. The ring is thus divided into eight fields, alternating fields being alike and the intermediate fields being unlike them.

In connecting the armature to the commutator all points in corresponding positions in like fields—for example, the points 1, all of which are midway between N and S poles and are moving toward N poles—are connected to the commutator-block c^6 and also to the opposite commutator c^2. These points 1 are also connected to the commutator-blocks c^4 c^8, located in the position shown, thus being connected together and to alternate commutator-blocks. The points 2 in fields of different names are similarly connected to the remaining commutator-blocks. It will be evident that the number of connections and the number of commutator-blocks may be indefinitely varied so long as all the coils in corresponding positions of like fields are always connected with the same blocks, as above explained. The external circuit, the wires of which are marked + and —, respectively, is connected to two commutator-brushes, resting on blocks c' c^4 on the neutral lines b' b^6. The arrows on the coils and wires indicate the direction of current. As the armature revolves new commutator connections are brought to the neutral points, the corresponding commutator-blocks being at the same time brought under the brushes, so that a continuous current is produced. The armature connections described are useful also in multipolar machines using more than two commutator-brushes, as is common especially in large machines.

The construction which I prefer for the machine is shown in Figs. 2 and 3. The field-magnets have grooved pole-pieces *c*, from each of which two cores *d* extend in opposite directions and circular yokes or back pieces *e*. The pole-pieces thus form a grooved circle *c*, within which the armature-ring A revolves, being connected by spokes *g*, extending from the shaft *h*, which carries, also, the commutator-cylinder *i*, on which the brushes *k k* bear. The field-magnet coils are shown in multiple with the armature-circuit; but they may be connected in any suitable manner. I prefer to have the ring-core of the armature made up of a series of flat rings placed together side by side, as shown in Fig. 3, and, as already indicated, to have the core continuous. With the continuous core and especially with the continuous laminated core and the continuous armature-coils on said core, so as to cover the entire length of it, the formation of consequent points of reverse polarity to that which the core takes under influence of the field-magnets is practically avoided.

While I have described and shown the invention in connection with a ring-armature, it will be seen that the use of the multiple fields and the connection to the commutator are also applicable and advantageous in machines having cylindrical armatures and continuous coils wound thereon.

What I claim is—

1. In a multipolar electro-magnetic machine, the combination of the armature-core, the armature-coil covering the whole surface of said core, a commutator having a number of conducting-blocks, the series of field-magnets forming a succession of alternating like and unlike fields, commutator connections between all portions of the armature-coils situated in corresponding magnetic fields and the same commutator-blocks, whereby a continuous current is produced, and the commutator brushes taking current from and delivering current to all parts of said coil, substantially as described.

2. In an electro-magnetic machine, the combination of the continuous magnetic armature-core, the armature-coil wound continuously in one direction thereon, a commutator having a number of conducting-blocks, the series of field-magnets forming a succession of alternating like and unlike fields, commutator connections between all portions of the armature-coils situated in corresponding magnetic fields and the same commutator-blocks, and commutator-brushes taking current from and delivering current to all parts of said coils, substantially as described.

3. In an electro-magnetic machine, the combination of the continuous laminated magnetic armature-core, the armature-coil wound continuously in one direction thereon, a commutator having a number of conducting-blocks, the series of field-magnets forming a succession of alternating like and unlike fields, commutator connections between all portions of the armature-coils situated in corresponding fields and the same commutator-blocks, and commutator-brushes taking current from and delivering current to all parts of said coil, substantially as described.

This specification signed and witnessed this 8th day of October, 1891.

THOS. A. EDISON.

Witnesses:
JOHN F. RANDOLPH,
CHARLES M. CATLIN.