(No Model.)

W. E. SAWYER.

DYNAMO ELECTRIC MACHINE.

No. 254,056. Patented Feb. 21, 1882.

Fig. 2.

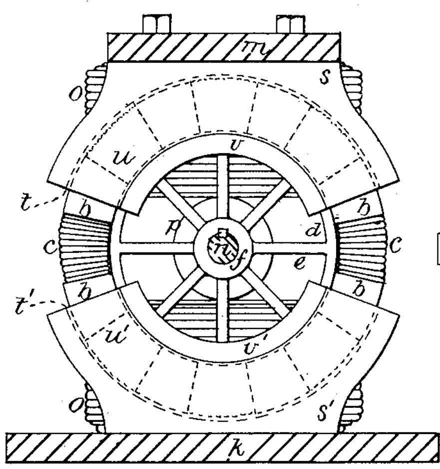


Fig. 1.

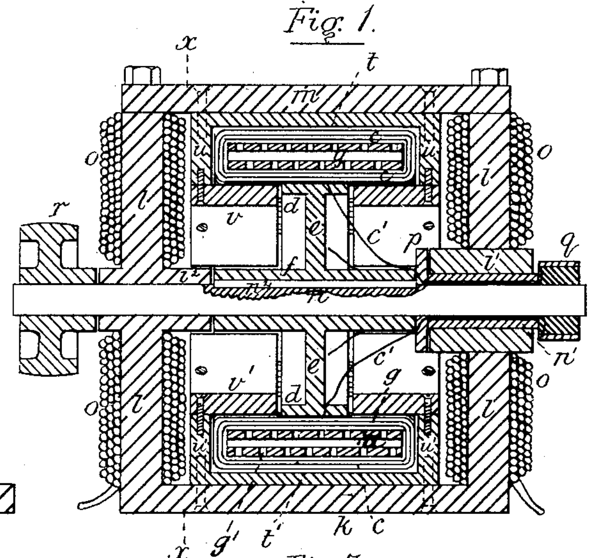


Fig. 4.

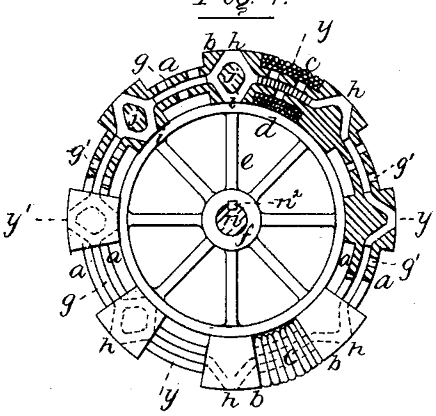


Fig. 3.

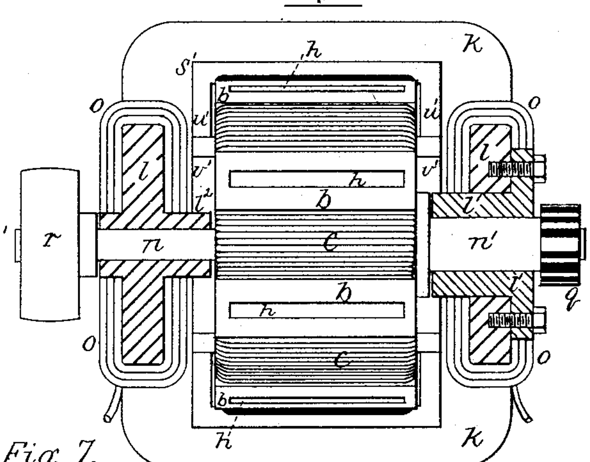


Fig. 5.

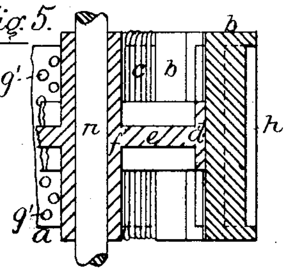


Fig. 7.

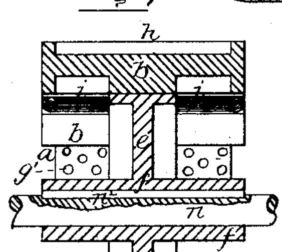
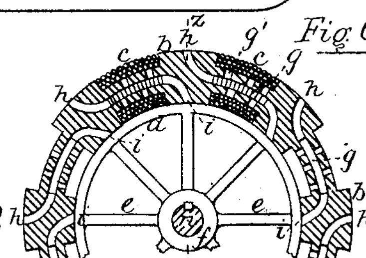


Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM E. SAWYER, OF NEW YORK, N. Y., ASSIGNOR TO BERNARD LANDE, OF SAME PLACE.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 254,056, dated February 21, 1882.

Application filed December 3, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM EDWARD SAWYER, of New York, county and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

My invention relates to that class of machines for generating electric currents, having a paramagnetic ring-armature, around which an electric conductor is wound, and which is caused to revolve in magnetic fields; and it consists, first, of certain improvements in the paramagnetic ring, whereby it and the electric conductor wound thereon are kept at a moderate and safe temperature; and, second, of certain improvements in the construction of the frame and inducing electro-magnets and poles, whereby the machine is very compact and efficient, and simple and economical in construction.

Dr. Antonio Pacinotti, in the year 1860, invented a machine having a paramagnetic ring-armature provided with pole pieces, between which an electric conductor was wound, forming one continuous circuit, and joined at intervals to commutator-plates in such a manner as to produce a current of electricity, constant in direction and intensity, when the armature was caused to rotate before the poles of the field-magnets of the machine.

A modification of the Pacinotti machine, in which the pole-pieces of the ring-armature were omitted and the whole of the ring surrounded by the electric conductor in one continuous circuit, was patented by Gramme and D'Ivernois in the year 1871.

Now, the armature forming a part of my present improvements in dynamo-electric machines is the same as the Pacinotti armature in its principle of operation and in the method of winding the conductor thereon, and also in the construction of the paramagnetic ring as regards the projecting pole-pieces, but with this essential difference: the Pacinotti ring and projecting pole-pieces were solid, whereas the pole-pieces of my armature, as well as the parts of the ring surrounded by the conductor, are provided with air-passages so arranged as to cause constant currents of air to pass through the interior of the ring as it rotates, for the purpose before stated.

The other improvements, as well as the particular construction of the armature, will be fully understood by the following description of the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal vertical section of a dynamo-electric machine embodying my improvements. Fig. 2 is a transverse section cut through the line *x x*. Fig. 3 is a plan view, showing the frame in central section. Fig. 4 shows part transverse sections and part side elevations of two arrangements of the air-passages for the circulation of air through the armature, the dividing-line being on *y y*. Fig. 5 is a part longitudinal section of the armature, cut on the line *y' y'*, Fig. 4. Fig. 6 is a part transverse section of the armature, showing another arrangement of the air-passages; and Fig. 7 is a transverse section of the same, cut on the line *z z*.

The armature consists of the flat ring *a*, holder-pieces *b b*, projecting an equal distance on the inside and outside of it, and also on its ends, thus leaving recesses, in which is wound the insulated electric conductor *c c*, the outside layer of which is flush with the peripheral and end surfaces of the pole-pieces *b b*. The armature, when so wound with the insulated conductor *c*, is secured at the central part of the inside periphery of the polar extensions *b b* to the ring *d* of a diamagnetic wheel, of which *e e* are the spokes and *f* the hub. The ring *a* and polar projections *b b* are cast in one piece, and preferably of malleable iron, which is cored out so as to provide air-passages through the ring and polar projections, the same continuing to the exterior periphery only, or through both the exterior and interior peripheries of the pole-pieces *b b*.

At the right-hand side of the line *y y*, Fig. 4, the air-passages *g g* are shown as passing through the center of the parts of the ring *a*, on which the wire *c* is wound, and out at the sides, as shown at section, Fig. 1, thereby allowing the air flowing through the passages *g g* to come in contact with wire *c*, and also to flow between the various turns of the wire. Further contact of the air with the wire may be had by perforating both parts of the ring *a*, as shown at *g' g'*. The air-passages *g g* extend out through the external periphery of the polar projections *b b* by the openings *h h*. At the left-hand side of Fig. 4 the air-passages g g are shown as having exits i i at the internal periphery of the polar projections b b, as well as openings h h at their external periphery, said openings i i being at the side of the rim d of the diamagnetic wheel, as shown at Fig. 7, which is also a sectional view of Fig. 6. These two sets of openings h h and i i provide for a better circulation of air through the passages g g as the armature revolves. These air-passages g g, as shown in the two arrangements of the same in Fig. 4, may also in each case be considered as one continuous air-passage through the armature, having deflectors formed by the connecting-pieces j j in the body of the polar extensions b b, to give the right direction to the air through the openings h h or the openings h h and i i. In Figs. 6 and 7 the air-passages g g are shown as commencing at h, on the exterior periphery of each of the polar projections b b, passing through the parts of the ring a, as before described, and ending at i on the interior periphery of each succeeding polar extension.

It is obvious that a constant circulation of air takes place through the air-passages as the armature rotates, and so keeps both the iron rings and the surrounding insulated wire comparatively cool, thus adding to the effectiveness of the machine by preventing any great increase of resistance on account of the increase of temperature in the wire, and insuring against damage to the same by excessive heating.

The improvements in the frame of the machine consist in forming the base-plate k and side pieces, l l, of one piece of metal and connecting the side pieces together at their upper ends by the top plate, m. The side pieces, l l, are provided at their centers with bearings l' l^2, in which the shaft n rotates, and on them, above and below these bearings, are wound the field-magnet coils o o.

The connecting-pieces c' c' of the conductor c pass out to the commutator q, through the guard-collar p, and through grooves formed in the contact-surfaces of the shaft n and the sleeve n', which forms one of the journals of the shaft n, said journal n' being larger in diameter than the journal at the other end of the shaft. The shaft is provided with a key, n^2, which fits into a keyway cut in the hub f, and with the guard-collar p, fitting in between the bearings l' l^2, so that there is no end-play to the armature. On the shaft n, just outside the bearing l^2, is secured the driving-pulley r.

To facilitate placing the armature in the frame, the bearing l' may be separable from its side piece, l, of the frame, so that the ends of the connecting-pieces c' c' of the conductor c may be readily passed through the grooves under the sleeve n' when the shaft is being passed through the hub f. The bearing l' is then slipped over the sleeve n' and secured to its side piece, l, as shown in Fig. 3.

The magnetic field poles consist of the grooved curved castings s s', adapted to have the armature-ring rotate freely therein, the surfaces t t' of the grooves facing the outside periphery, and the surfaces of the side flanges, u u', the ends of the armature-ring. These grooved curved poles s and s' are rigidly secured respectively to the top plate, m, and base-plate k of the frame. To further surround the conductor on the armature by the poles s s', as has been before suggested by others, to more fully utilize the induction in the conductor c from the poles of the field-magnets, I propose to bolt the curved plates v v' to the inside edges, respectively, of the flanges u u', as shown at Figs. 1 and 2.

There is no novelty in my present improvements in dynamo-electric machines as regards the method of connecting the conductor c with the commutator q, nor in the method of winding and connecting the coils o o of the field-magnets; so it is unnecessary to further show or describe the same. The methods embodied in the Pacinotti, Gramme, and D'Ivernois or other machines embracing the same principles may be used in my machine.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A ring-armature on the Pacinotti principle, composed of one piece of metal, and having air-passages extending through the parts on which the induced conductor is wound and out at the external periphery of the polar projections, substantially as and for the purpose set forth.

2. A ring-armature on the Pacinotti principle, composed of one piece of metal, and having air-passages extending through the parts on which the induced conductor is wound and out at the external and internal peripheries of the polar projections, substantially as and for the purpose set forth.

3. A ring-armature core composed of the parts a a and polar extensions b, having air-passages g g and openings h h, in combination with the conductor c, wound on the parts a a, substantially as set forth.

4. A ring-armature core having the polar projections b b, depressions a a, for the reception of the conductor c, the air-passage g g, openings h h in the outside periphery and openings i i in the inside periphery of the polar projections b b, substantially as set forth.

5. The armature composed of a paramagnetic ring with polar projections b b, and having air-passages, as described, and an insulated electric conductor wound thereon between the polar projections, in combination with the diamagnetic wheel d e f, substantially as set forth.

6. A frame for dynamo-electric machines, composed of a base-plate, k, and side pieces, l l, having bearing l' l^2 in their center for the armature-shaft n, and forming cores for the coils of the field-magnets o o, substantially as described.

7. In combination with the frame k l l m, the grooved curved poles s s', substantially as set forth.

8. In combination, the frame k l l m, poles

s s', having side flanges, *u u'*, and the curved plates *v v'*, substantially as described.

9. In a dynamo-electric machine, the ring-armature *a b c*, diamagnetic wheel *d e f*, poles *s s'*, frame *k l l m*, field-armature coils *o o* on the side pieces, *l l*, and bearings for the armature-shaft in the center thereof, substantially as set forth.

10. A ring-armature core composed of the parts *a a* and polar extensions *b*, having air-passages *g g* and openings *h h*, in combination with the deflectors *j j*, substantially as set forth.

In witness whereof I have hereunto set my hand, at New York, county and State of New York, this 1st day of December, A. D. 1881.

WILLIAM EDWARD SAWYER.

In presence of—
ALFRED SHEDLOCK,
GALEN C. THATCHER.