(No Model.)

D. A. SCHUYLER & A. G. WATERHOUSE.

DYNAMO ELECTRIC MACHINE.

No. 291,944. Patented Jan. 15, 1884.

Fig. 1.

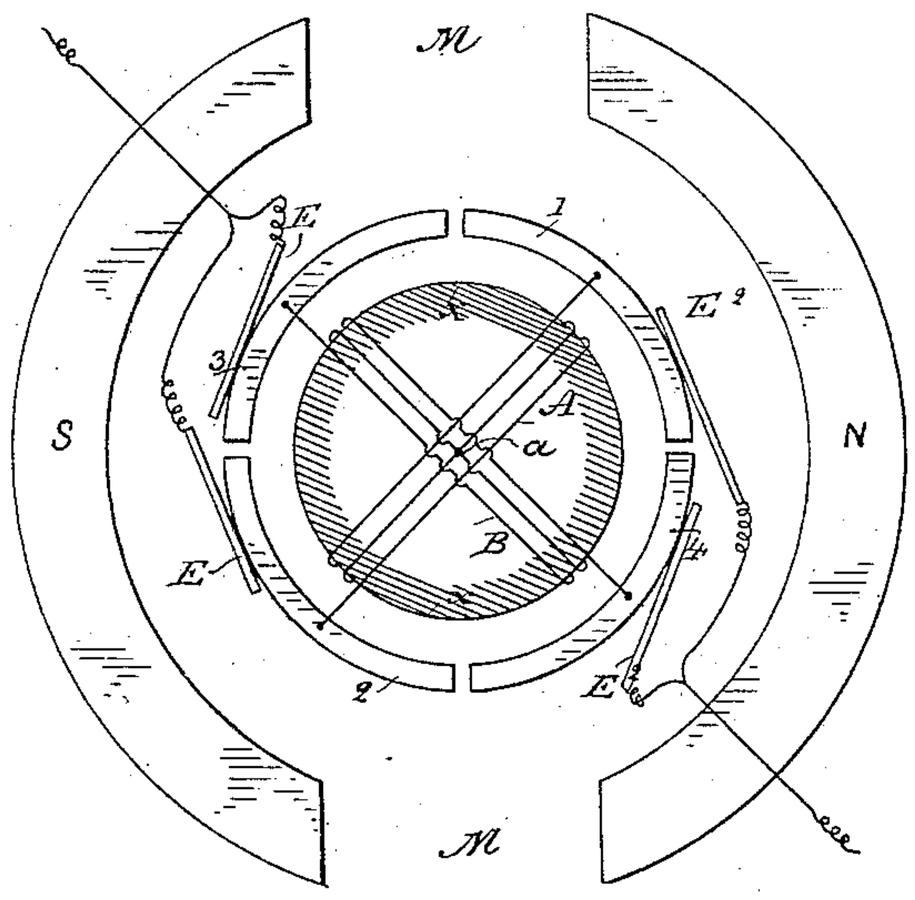


Fig. 2.

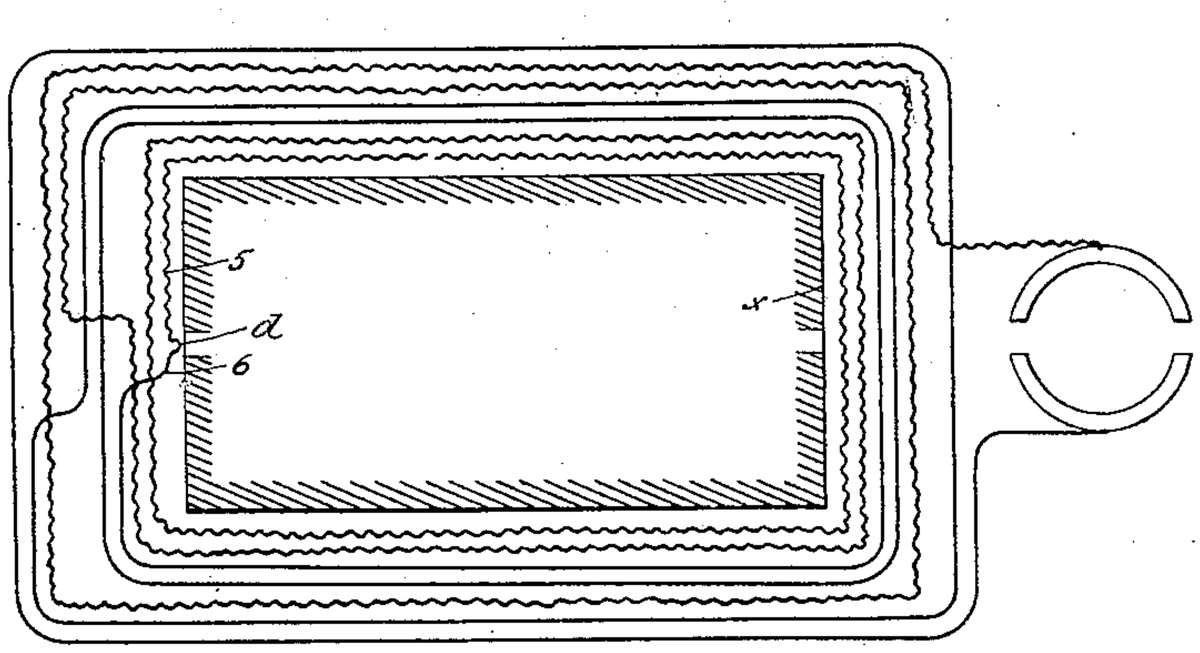
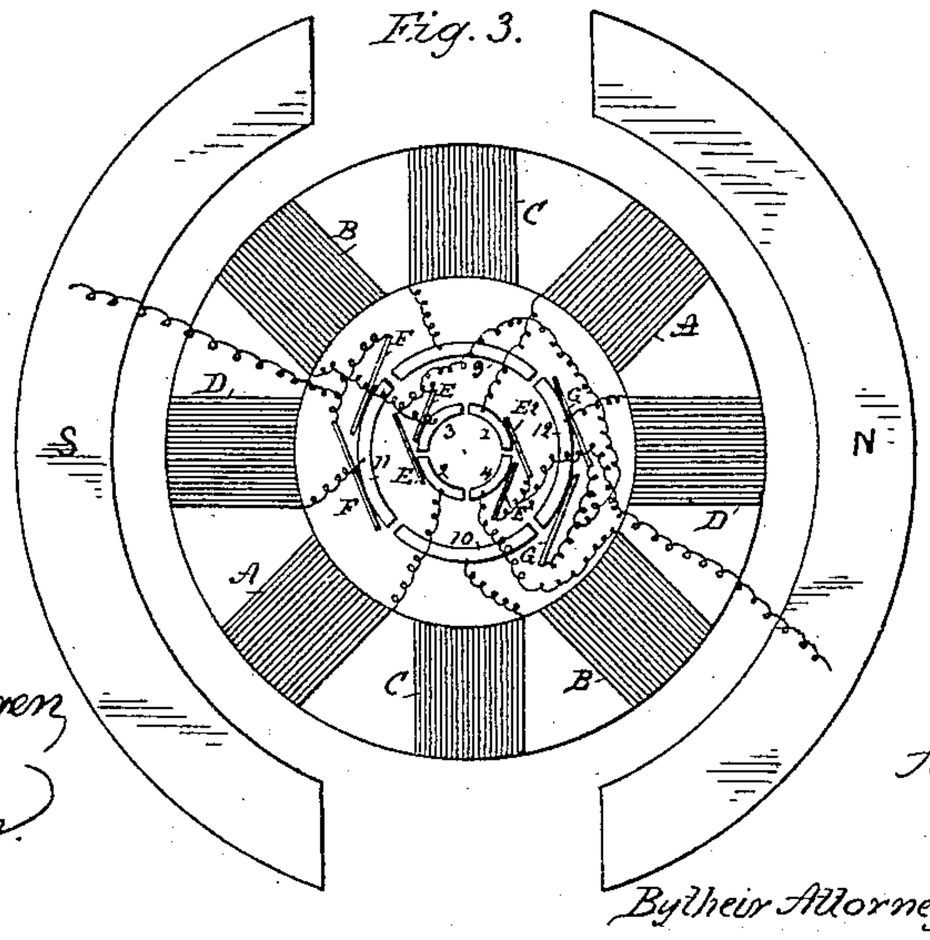


Fig. 3.



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UNITED STATES PATENT OFFICE.

DANIEL A. SCHUYLER AND ADDISON G. WATERHOUSE, OF NEW YORK, N. Y., ASSIGNORS TO THE SCHUYLER ELECTRIC LIGHT COMPANY, OF SAME PLACE.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 291,944, dated January 15, 1884.

Application filed April 5, 1883. (No model.)

To all whom it may concern:

Be it known that we, DANIEL A. SCHUYLER and ADDISON G. WATERHOUSE, citizens of the United States, and residents of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

Our invention relates to dynamo-electric machines of the class in which the armature coils or bobbins are wound over and over upon the exterior of a cylindrical core or carrier arranged to rotate on its longitudinal axis.

Our invention consists, first, in the combination, with two curved field-of-force pole-pieces, of a cylindrical armature arranged to rotate on its longitudinal axis between said pole-pieces, and provided with two armature-coils wound upon the exterior thereof at right angles to one another, the middle portions of the two coils being connected together, while the two free ends of one coil are connected to diametrically-opposite segments of a commutator, and the two free ends of the other to two other diametrically-opposite segments of the commutator, the two latter segments being in a plane at right angles to the first.

Our invention consists, further, in the combination, with two curved field-of-force pole-pieces, of a cylindrical armature having two sets of coils and two commutators, each set arranged as set forth in the preceding paragraph, the coils of one set being in planes removed circumferentially about forty-five degrees from the coils of the other set, while the commutator-brushes of the one set are connected to the commutator-brushes of the other, so as to combine the currents generated in the one set with the currents generated in the other.

Our invention consists, further, in the combination, with two curved field-of-force pole-pieces, of a cylindrical armature or carrier rotating on its longitudinal axis between them, two sets of armature-coils wound upon the exterior of said cylinder, each set consisting of two coils wound at right angles to one another and connected at their central portion, two commutator-cylinders, each having four segments, to which the four ends of the two coils in one set of two coils are connected, and a connection from the positive brush of one commutator to the negative brush of the other, so that the current from one set may be combined for tension with the current of the other.

In the accompanying drawings, Figure 1 is a diagram illustrating the principle of our invention. Fig. 2 is a diagram illustrating a preferred method of winding in each coil. Fig. 3 is an end view of an armature provided with two sets of coils, and shows the manner in which the commutator-brushes of the two sets may be connected to combine their currents for tension.

Referring to Fig. 1, the circular line X indicates the outline of a cylindrical armature or carrier of any desired pattern in end view, and arranged to rotate upon its longitudinal axis in the well-known manner between two curved pole-pieces, N S, of a suitable field-of-force magnet.

A and B indicate, respectively, two armature-coils wound upon the exterior of the armature longitudinally and parallel to its axis, and across the ends of the cylinder. Coils A and B are wound at right angles to one another, as shown. Four plates or segments of a commutator-cylinder of usual construction are indicated by the figures 1 2 3 4, respectively, the two ends of coil A being connected, respectively, to the opposite segments, 1 2, while the ends of coil B are in a similar manner connected to the segments 3 4 in a plane at right angles to segments 1 and 2. In practice it will be understood that the commutator does not occupy a position outside of the circumference of the armature, but is relatively smaller, and is mounted on the armature-shaft. In the figure, coil A is shown as connected at one end with segment 1, the coil itself being wound over the exterior of the cylinder in the direction indicated, and the opposite end connected to segment 2. Coil B is connected and wound in a similar manner between segments 3 and 4. At the middle of the length of each coil a connection is made with the middle of the other, as indicated at *a*, by baring the insulated wire or otherwise, through which the current of either portion of one coil may find circuit to and through that portion of the other coil that is for the time being of the opposite polarity at the point of junction. The connection at *a* might obviously be formed in other ways.

E E and E^2 E^2 indicate commutator-brushes of the usual form, which bear upon the commutator, and to which the general circuit-wires are connected in the usual way. E E form together a single brush, and are placed at such a distance apart that the commutator-segments are kept in connection with a brush so long as the coil connected to the segment is generating useful current. E^2 E^2 are similarly arranged. The distance between the brushes E E or E^2 E^2 is usually about forty-five degrees, so that each segment is in connection with a brush in an arc of one hundred and thirty-five degrees in each half-circle of its revolution; but the distance between them might be more or less than the distance specified. The current is generated and collected in the usual and obvious manner.

We have described each coil A and B as if it were wound continuously between the two opposite segments. In practice the coil is sometimes wound in the manner indicated in Fig. 2, so that the two halves or portions of the coil included, respectively, between the point *a* and the two commutator-segments shall have the same average distance from the exterior of the complete armature, thus equalizing the effects in the two portions of the coil.

In Fig. 2, *d* indicates a loop made by doubling the wire which is to form the coil, or *d* may be any other electrical connection between the two halves of the coil. Starting at *d*, we take one end or half of the wire indicated by the figure 5 and wind one or more layers or turns of it upon the cylinder. We then take the other end or half of the wire and wind in the opposite direction one or more turns of it upon the first, and then resume winding with the first, thus alternating with the two halves until all is wound upon the cylinder, when the two terminals are connected to the diametrically-opposite segments of the commutator. The one half or portion of the coil is indicated by a wave-line and the other half or portion by a straight line or uniformly-curved line. In practice we prefer to wind upon the armature another set of two coils, similar to those described, and to combine the currents of the two sets in any proper way. The coils of the second set occupy positions between those of the first, as indicated in Fig. 3, in which C and D indicate two coils wound at right angles to one another in the spaces between coils A and B, the one set of coils—viz., C and D—being in planes displaced with relation to the other set by an arc of forty-five degrees. Coils C and D are connected to one another in the same manner as coils A and B, and the two ends of each coil C D are connected to the diametrically-opposite segments of a second commutator, the segments of which are indicated by the figures 9 10 11 12, respectively, the ends of coil C being connected to segments 9 and 10, while coil D is connected to segments 11 12.

F F and G G indicate the commutator-brushes. The commutator for this set is shown larger than that for the first in order to facilitate the showing of the connections; but it will be understood that both commutators are of the same construction, and would in practice be parallel and of the same size. It is, however, displaced with relation to the first commutator by an angle equal to the relative displacement of the two sets of coils. The same result would be accomplished by the shifting of its commutator-brushes, the divisions between the segments being then on the same line, parallel to the shaft, with those in the first commutator. The current of the second set may be combined with that of the first by properly connecting the brushes of the two commutators. If quantity is desired, the positive brushes are connected into a compound brush and the two negative similarly.

If electro-motive force is desired for series electric lighting, the positive brush of one commutator is connected to the negative of the other, and the two remaining brushes form the collecting terminals, by which the current is supplied to the usual working-circuit. As here shown, the brush E E of one commutator is connected to the brush G G of the other, and the current is taken away from brushes E^2 E^2 and F F in obvious manner. It is obvious that our invention is not limited to any particular number of sets of coils and commutators, though in general two sets only are preferable for the sake of simplicity.

We are aware of United States Patent No. 261,390, and do not desire to be understood as laying any claim to a disposition of coils on a "ring" armature.

What we claim as our invention is—

1. The combination, in a dynamo-electric machine, of two curved field-of-force pole-pieces, a cylindrical armature arranged to rotate on its longitudinal axis between said pole-pieces, and two armature-coils wound upon the exterior of the armature at right angles to one another and connected at their middle portions, the two ends of one coil being connected to two diametrically-opposite segments of a commutator, while the two ends of the other coils are connected to two other diametrically-opposite segments.

2. The combination, in a dynamo-electric machine, of a cylindrical armature or carrier arranged to rotate between two curved field-of-force poles, two independent sets of coils wound longitudinally upon the exterior thereof, each set consisting of two coils wound at right angles to one another and connected at their middle portions, while the two ends of each coil are connected to diametrically-opposite segments of a commutator, and connections from the commutator of one set to the commutator of another, whereby the currents generated in the one set may be combined with the currents generated in the other, substantially as and for the purpose described.

3. The combination, in a dynamo-electric

machine, of a cylindrical armature or carrier rotating on its longitudinal axis between two curved field-of-force poles, two sets of armature-coils wound longitudinally upon the exterior of said cylinder, each set consisting of two coils wound at right angles to one another and connected at their middle portion, two commutator-cylinders, each having four segments, to which the four ends of the two coils in one set are connected, and a connection from the positive brush of one commutator to the negative brush of the other, so that the current from one set may be combined for tension with the current of the other.

4. The herein-described improvement in winding the cylindrical armature-coil, consisting in winding from the center of the coil alternately with the two free ends, so as to bring the two halves in alternate layers.

Signed at Hartford, in the county of Hartford and State of Connecticut, this 3d day of April, A. D. 1883.

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Witnesses:
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