(No Model.) 3 Sheets—Sheet 1.

G. HOARE.

ARMATURE FOR DYNAMO ELECTRIC MACHINES.

No. 492,681. Patented Feb. 28, 1893.

Fig. 1

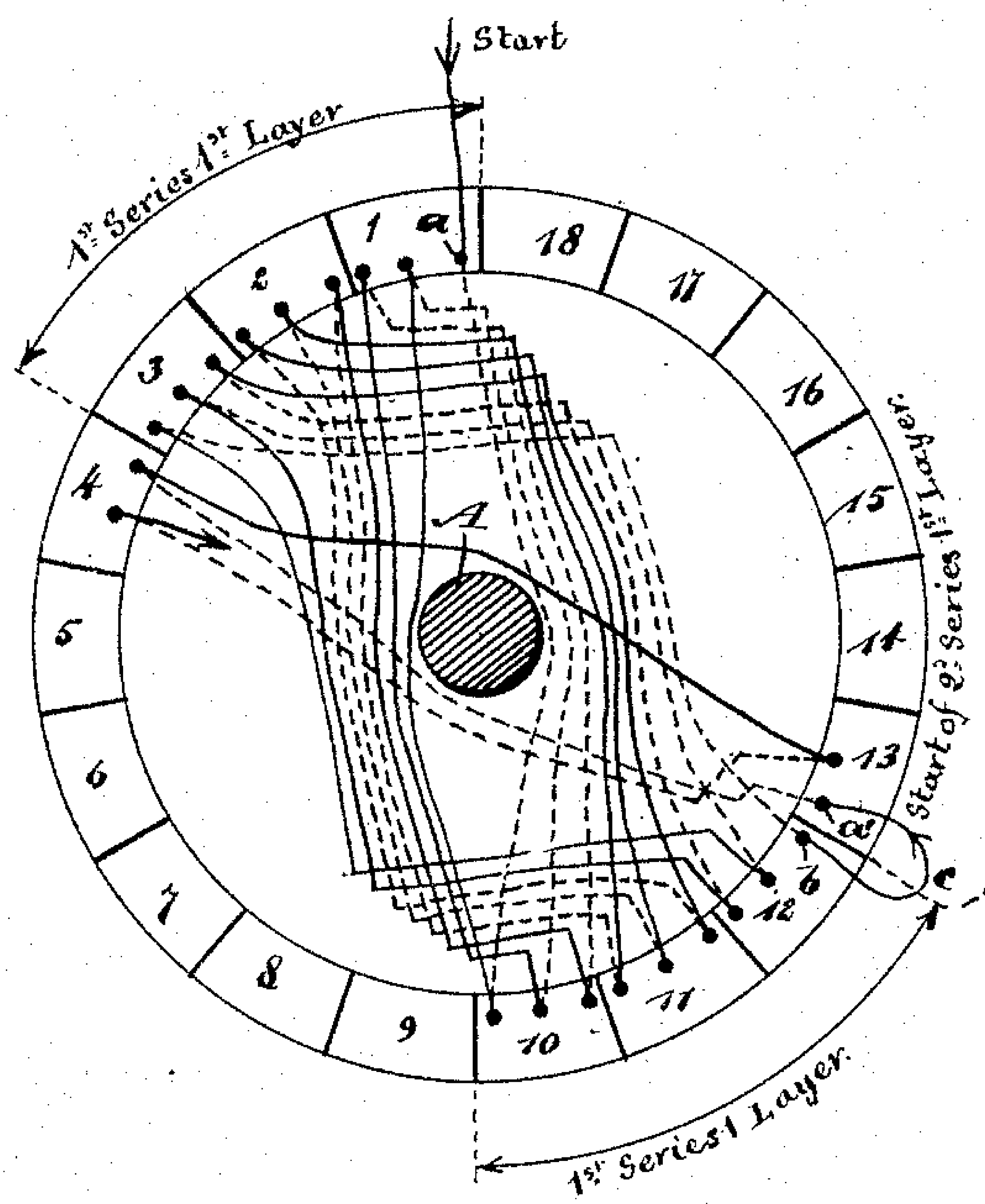


Fig. 2

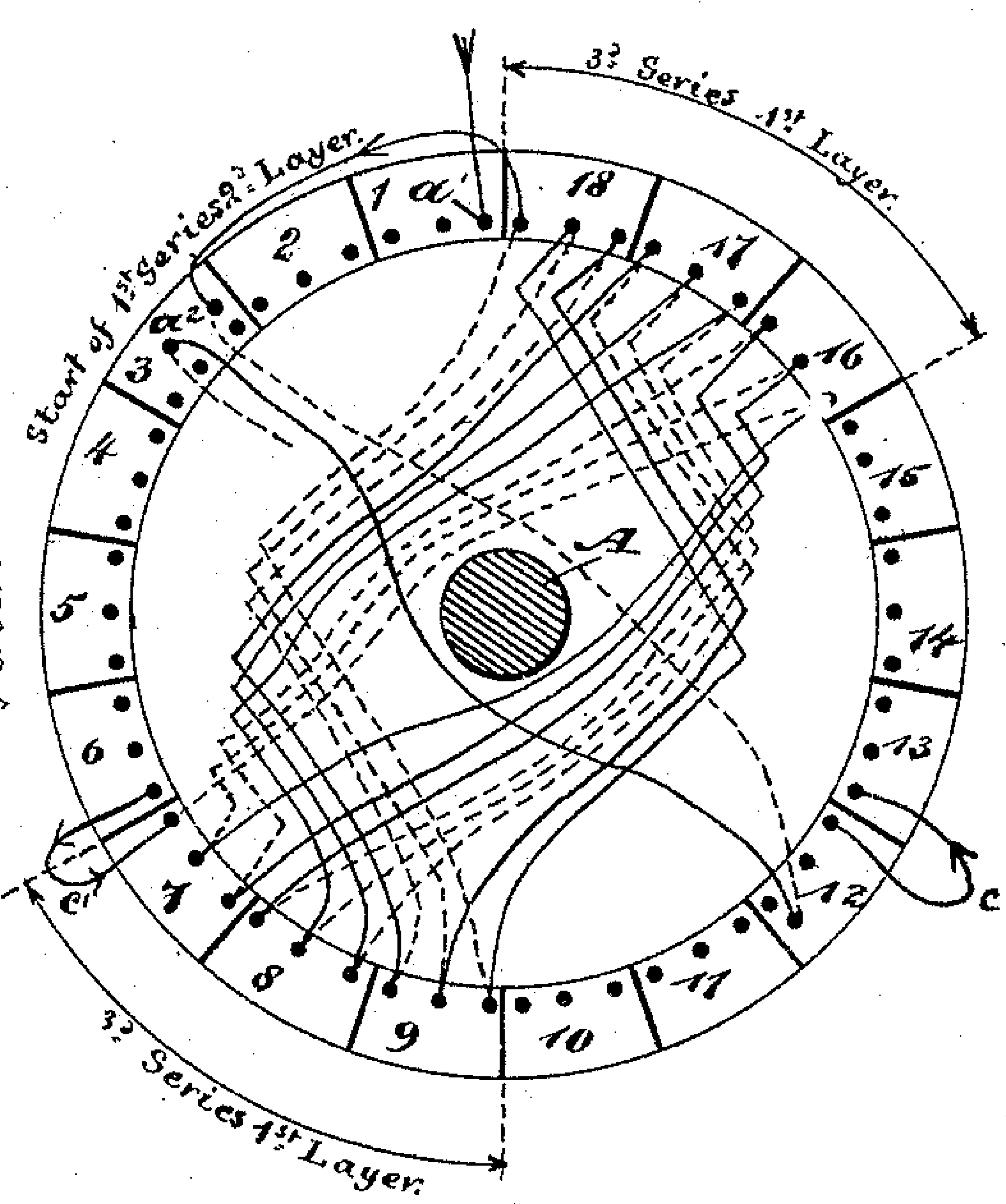


Fig. 3

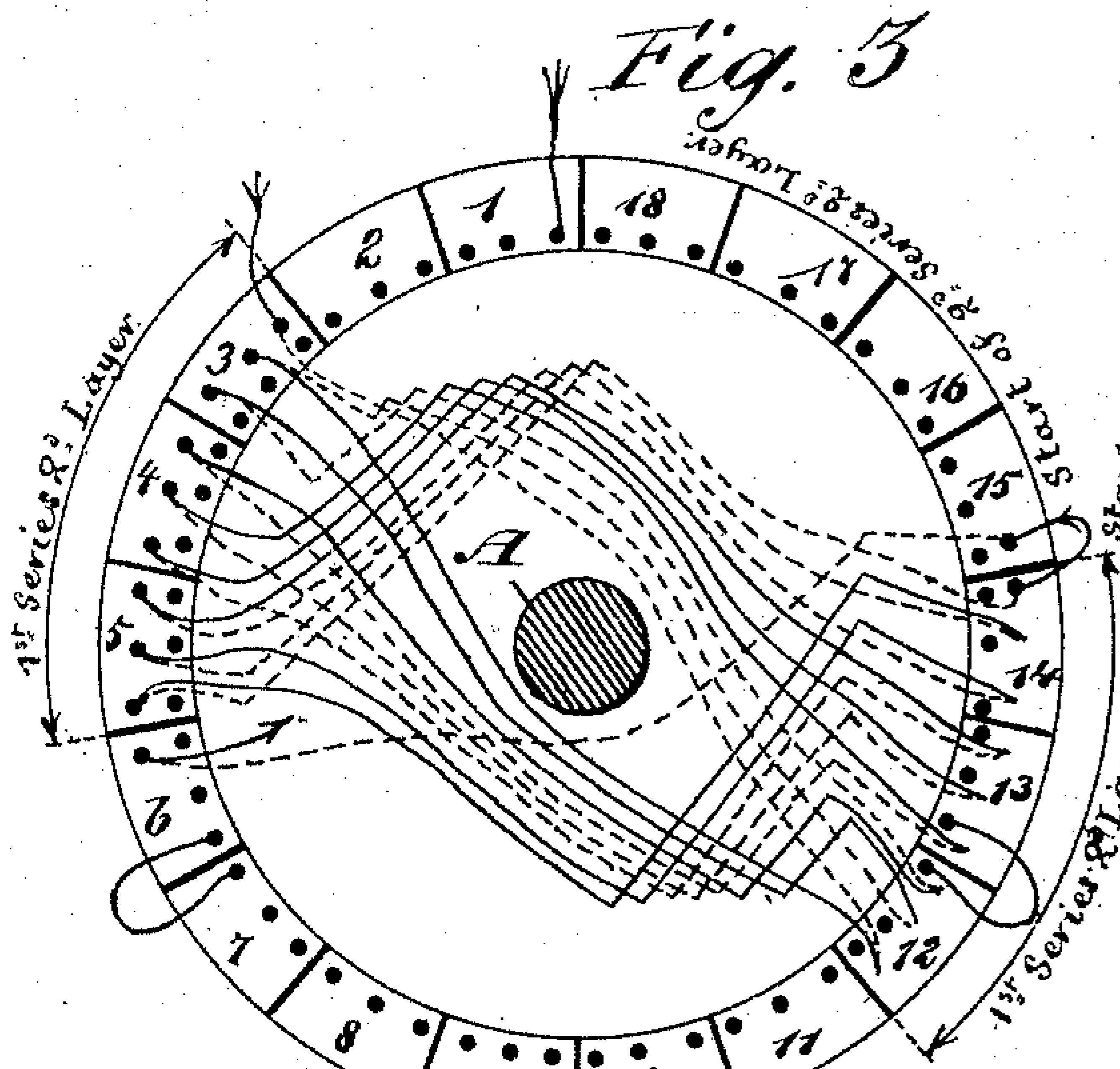
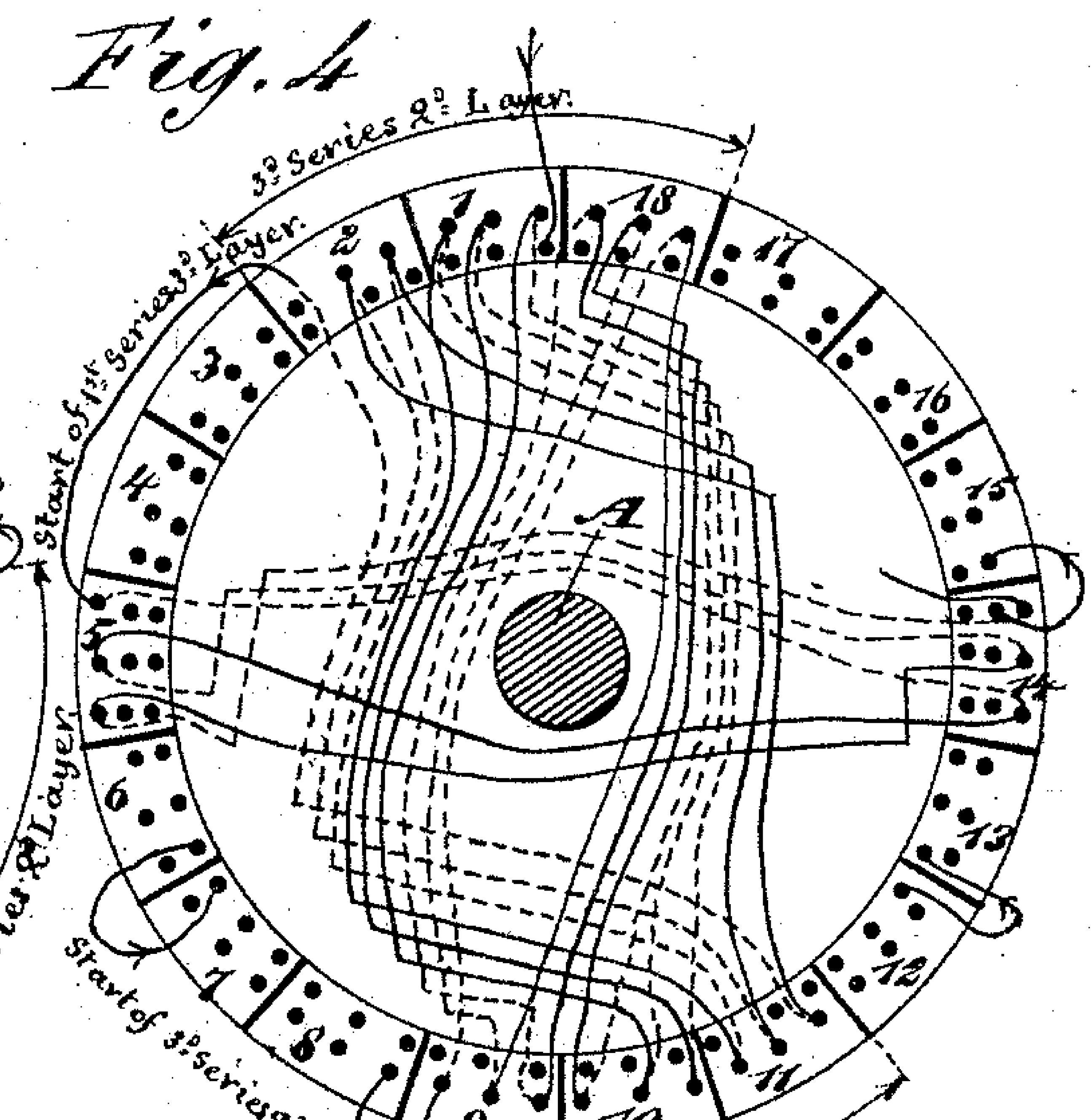


Fig. 4



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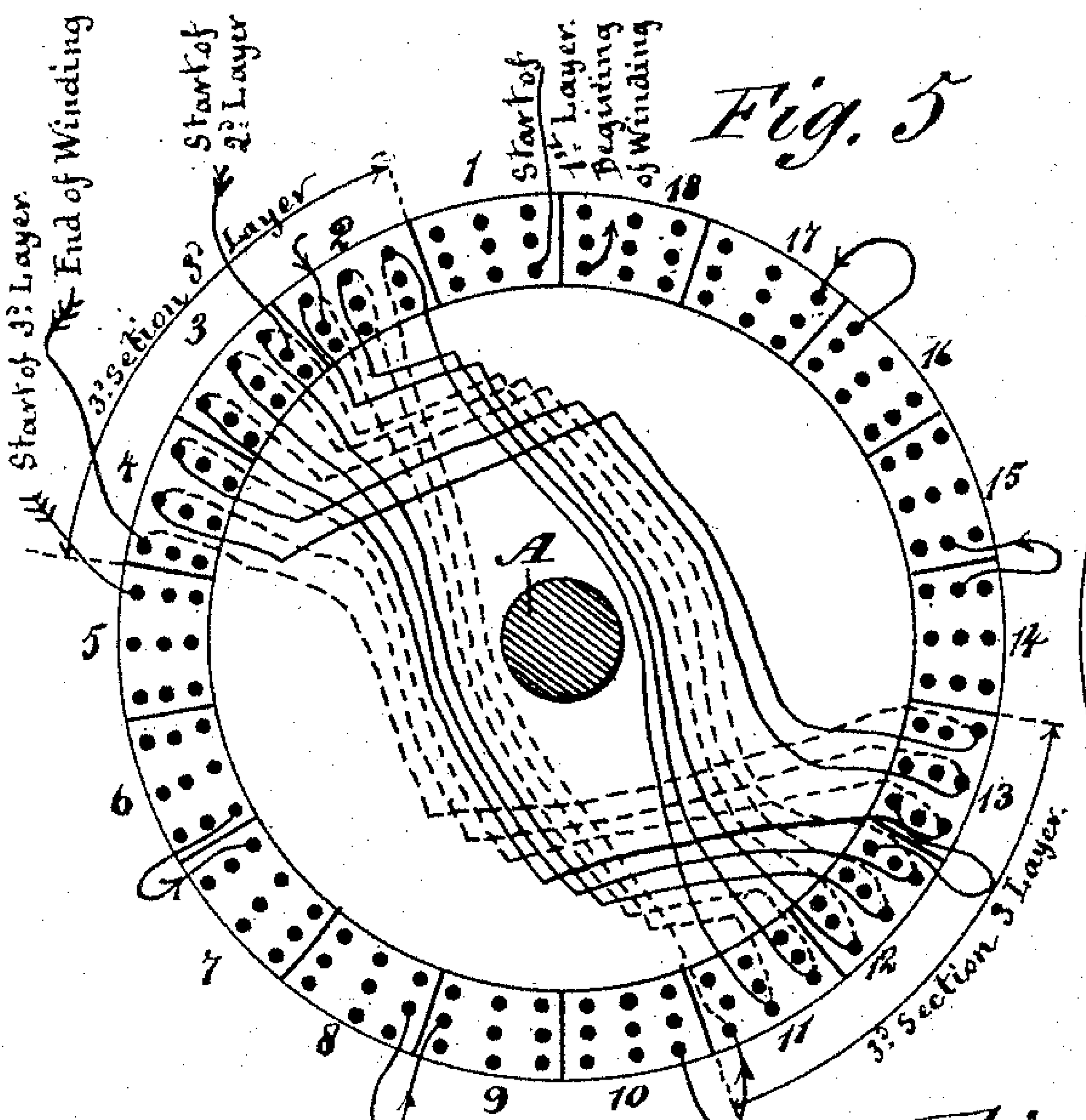

Fig. 5

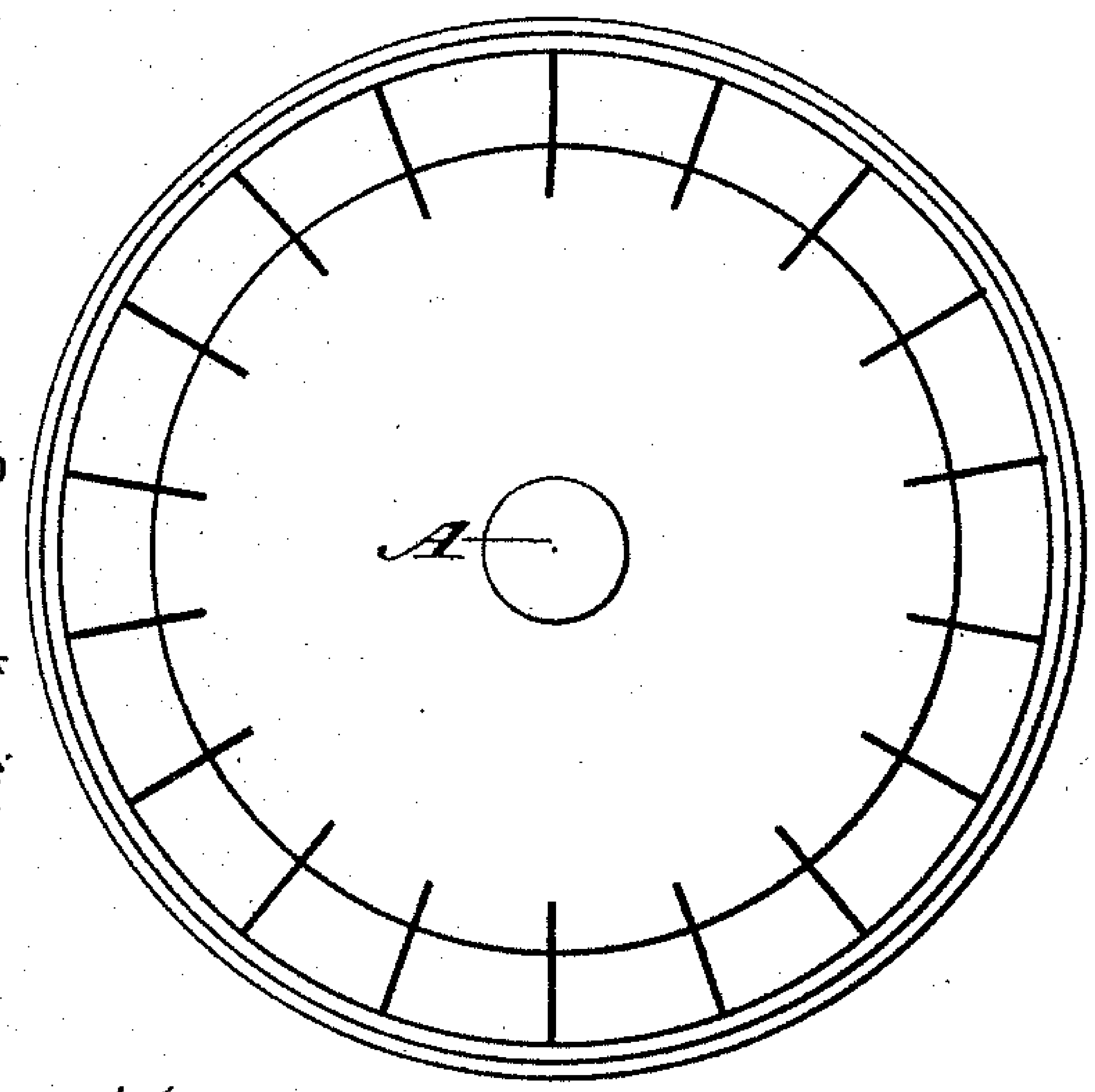

Fig. 6

Fig. 7

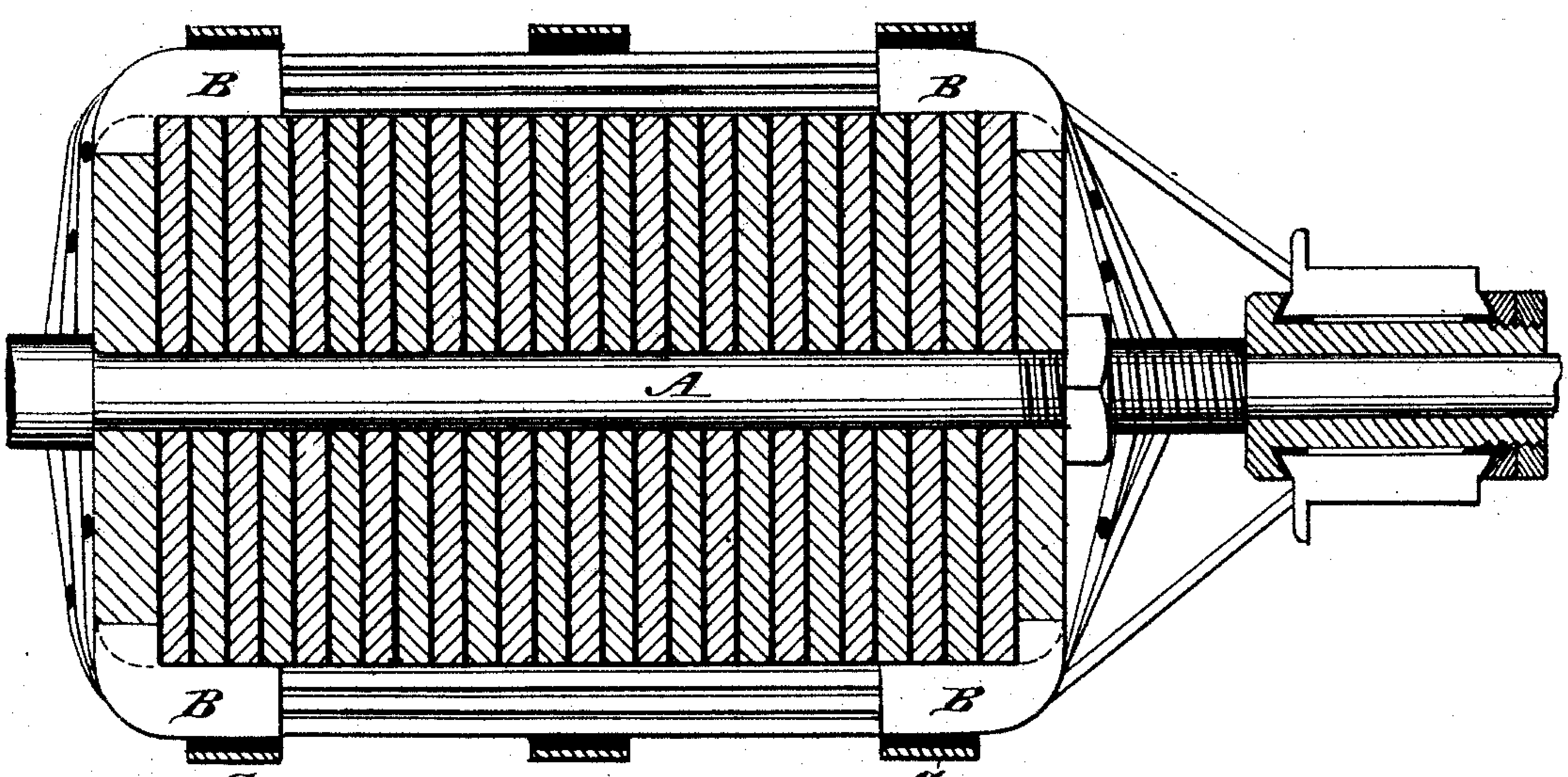

Fig. 8

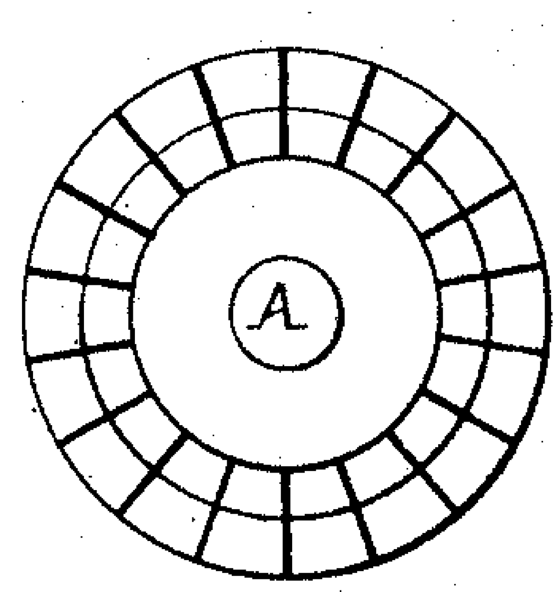

Fig. 9

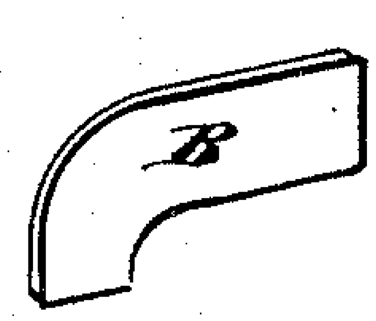

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Fig. 10

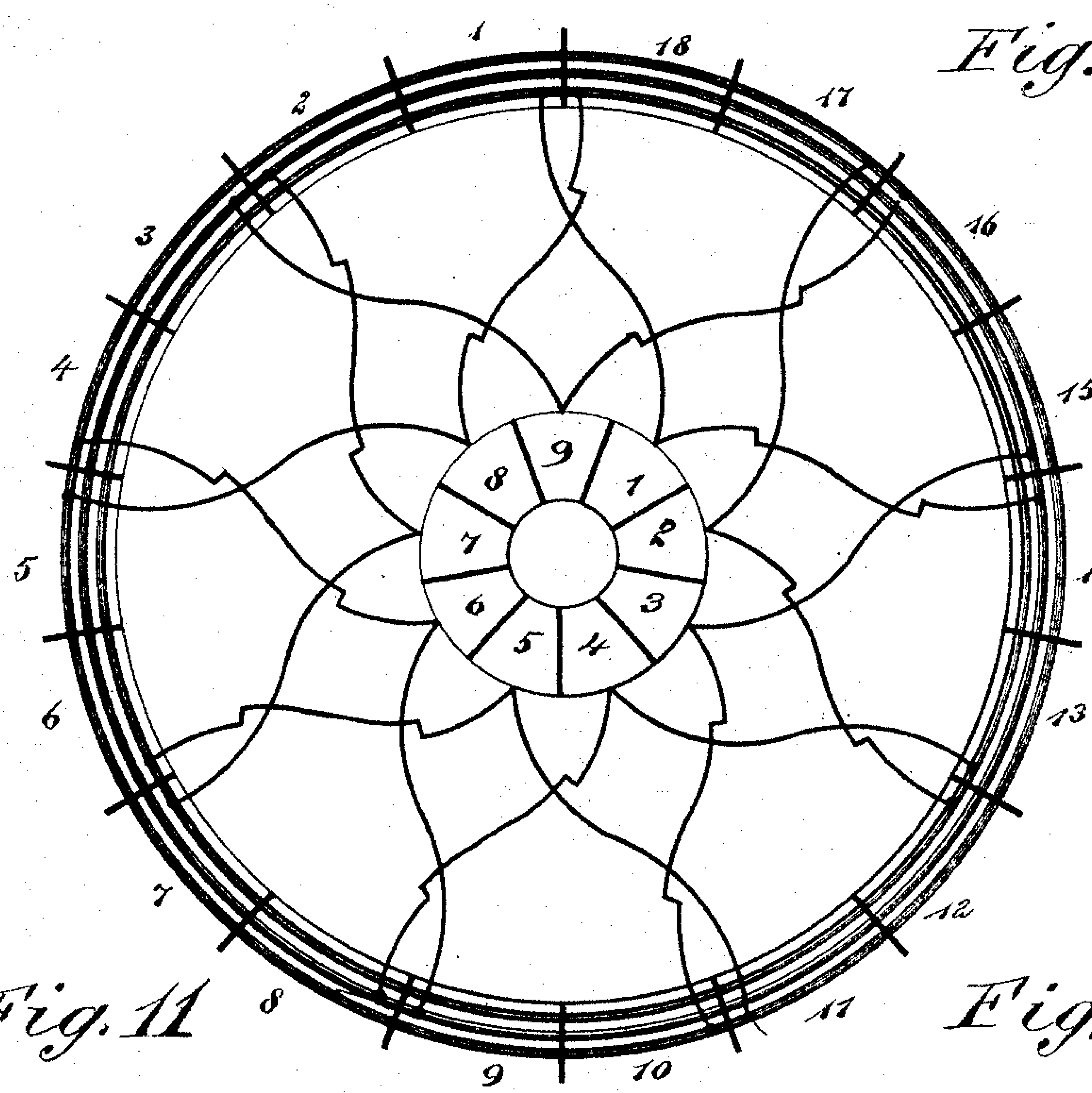


Fig. 11

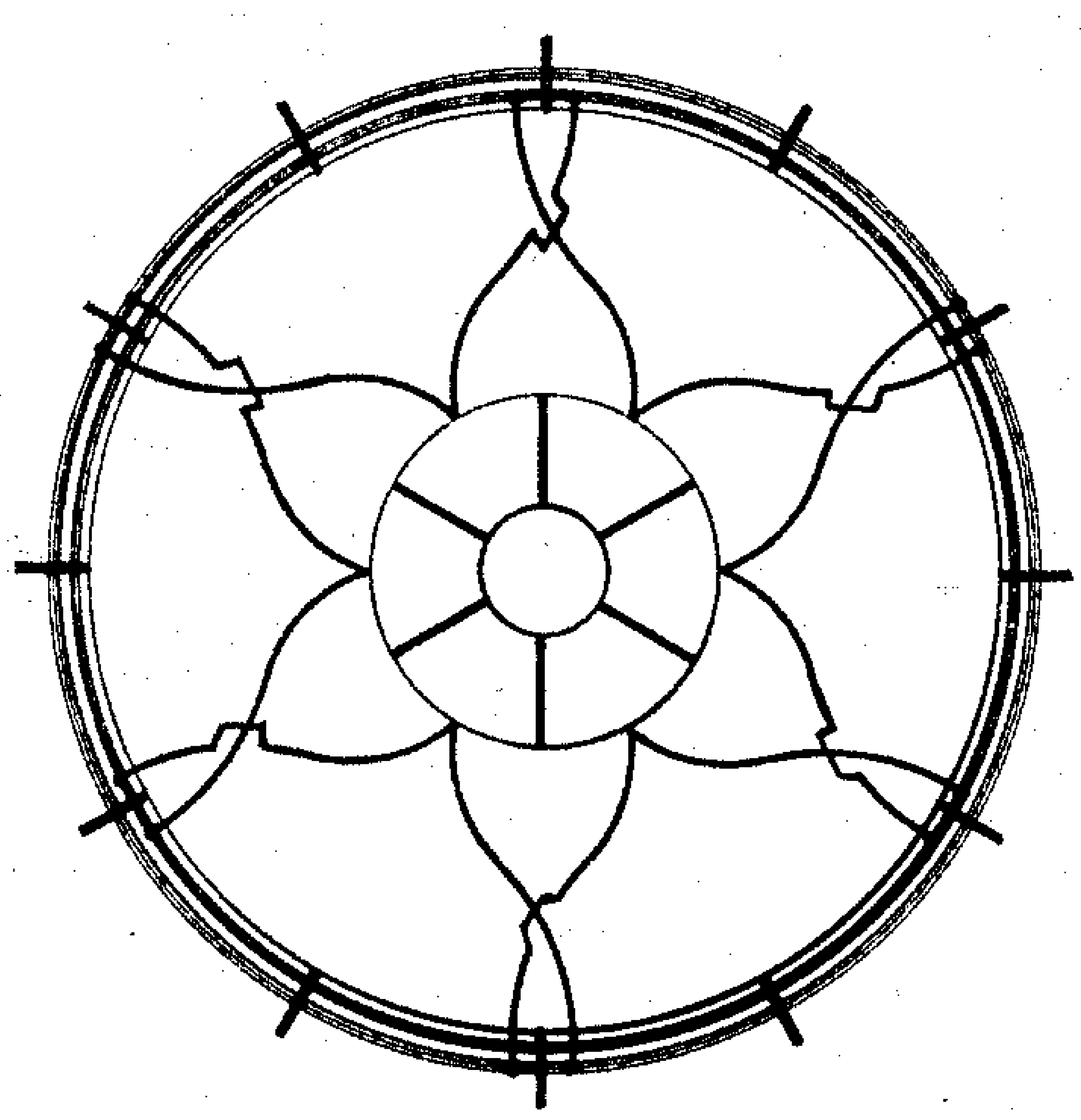
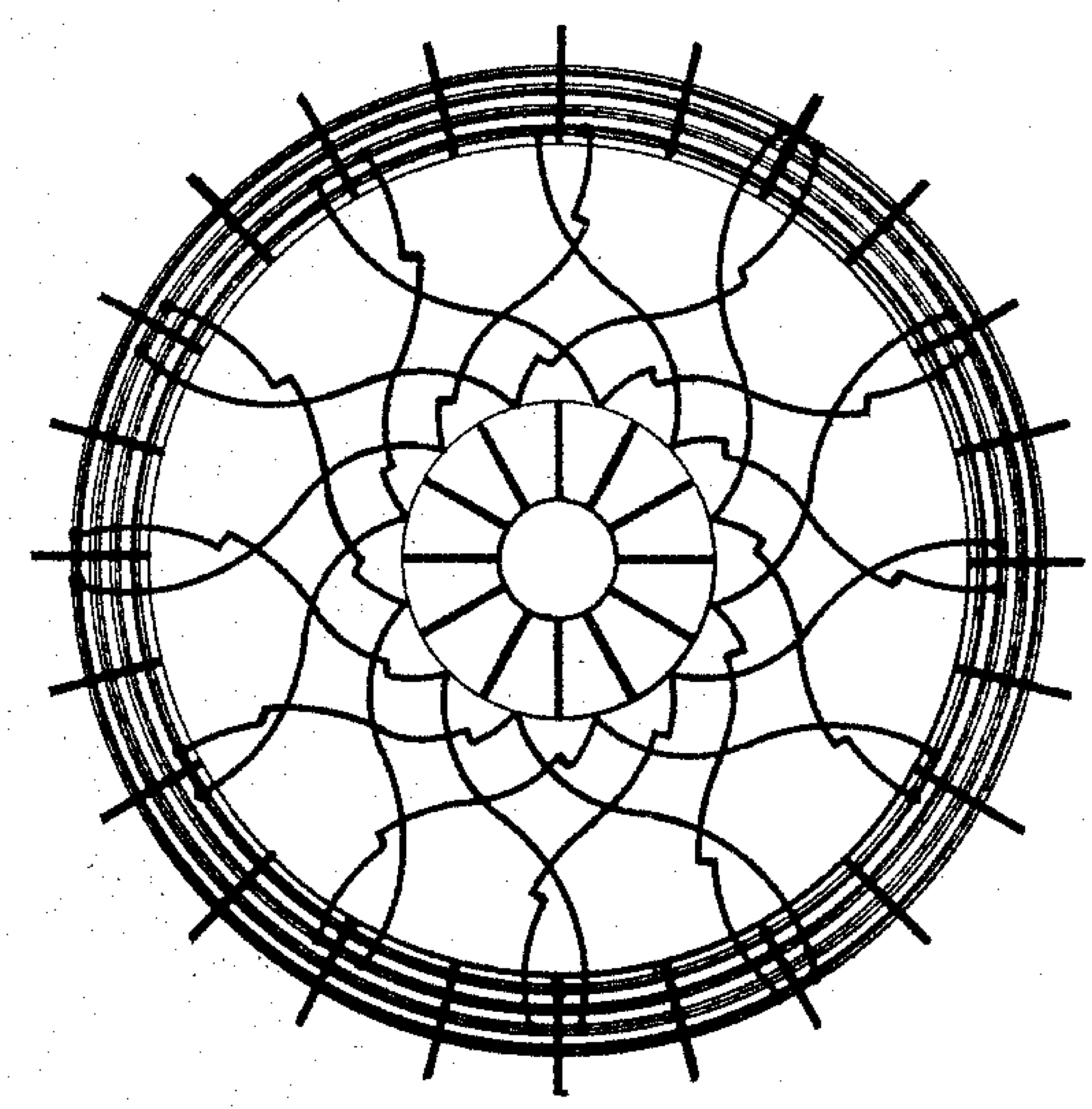


Fig. 12



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ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 492,681, dated February 28, 1893.

Application filed March 24, 1892. Serial No. 426,278. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HOARE, of Newark, in the county of Essex and State of New Jersey, have invented a new and Improved Armature, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof, in which—

Figure 1 is a diagrammatic view of my improved armature, showing the beginning and ending of the first coil of the first layer, and the beginning of the second coil of the first layer. Fig. 2 is a diagrammatic view showing the beginning and ending of the third and last coil of the first layer, and the beginning of the first coil of the second layer. Fig. 3 is a diagrammatic view showing the beginning, and ending of the first coil of the second layer, and the beginning of the second coil. Fig. 4 is a diagrammatic view showing the beginning and ending of the third coil of the second layer, and the beginning of the first coil of the third layer. Fig. 5 is a diagrammatic view showing the beginning and ending of the third coil of the third layer. Fig. 6 is an end view of the armature. Fig. 7 is a longitudinal section. Fig. 8 is a view of the inner end of the commutator cylinder. Fig. 9 is a perspective view of one of the retaining pins. Fig. 10 is a diagrammatic view showing the commutator connections of a three layer armature. Fig. 11 is a diagrammatic view showing the commutator connections of a two layer armature; and Fig. 12 is a diagrammatic view of the commutator connections of a four layer armature.

Similar letters and figures of reference indicate corresponding parts in all the views.

The object of my invention is to construct an armature for dynamos and motors, in which the various portions of the winding will be arranged so as to produce a perfect electrical balance, thereby avoiding sparking at the brushes, and consequently the cutting away of the brushes and commutator; also to facilitate the winding of the armature by providing a method in which the winding will be continuous from the start to the end.

My object is further, to provide a winding which will insure perfect mechanical balance and consequent smoothness in running; also to provide means for holding the driving pins in the heads of the armature.

My invention consists in a winding in which the wire is carried around the armature in a continuous piece, and in which the number of commutator bars is reduced to a minimum by diminishing the number of sections of the winding. My invention also further consists in driving pins inserted in the slots in the heads of the armature, extending over the face of the core, and held in place by the winding, all as will be hereinafter more fully described.

The armature core is constructed in the usual manner, with the exception of the driving pins, which are held in place in the armature by means of wire holding bands, as will be presently described.

In the present case I have illustrated in Figs. 1 to 6 inclusive, an armature formed of nine sections or coils on an armature core provided with eighteen divisions, each coil of the armature being wound in a single layer and occupying three divisions on either side of the armature.

In carrying out my improved winding, the first layer is wound in three sections constituting three coils of the armature. The second and third layers in a similar way are each wound in three sections, and the winding is continuous from the start to the end, starting at a in space 1 of the armature. The wire is carried along the top of the armature, across the end upon one side of the armature shaft A, to space 10 of the armature, thence across the commutator end to space 1, thence across the top of the armature and end thereof to the space 10, and so on until the desired number of convolutions allotted to the space has been wound. In the present case this number is three. After the third convolution in space 1, the wire is carried to space 2, and when space 2 has received its quota of the first layer of wire, it is carried on to space 3, until the spaces 2 and 11 and 3 and 12 have received one layer. The first coil being complete, beginning at a in space 1 and ending at b in space 12, the wire is looped, as shown at c, the armature being then in a reversed position, and the winding proceeds as in the first instance, beginning at a', passing the wire along the face of the armature in the space 13, carrying it across the end of the armature core and returning it in space 4, carrying it across the front end of the armature, carrying it back in space 13, and so on until the second coil is complete, when the third is begun, after having looped the wire at c'. This completes the first layer, which comprises the first three coils of the armature. The wire is looped and carried off to space 3, where the second layer is begun at a^2. The winding of this layer proceeds upon the top of the first layer in precisely the same manner as already described in connection with the first layer, the said second layer comprising three coils, the loops joining the several coils. The end of the sixth coil is carried forward to space 5, for the beginning of the first coil of the third layer. This layer is proceeded with in the same manner as that already described, bringing out a loop at the end of each coil. It will thus be seen that the coils of the second layer have an angular advance over the coils of the first layer equal to one third of the width of a coil, and that in a similar way the coils of the third layer have an angular advance over the coils of the second layer.

With an armature of this construction nine commutator bars are required in the commutator, and the connections are made as follows: The beginning of the first coil in the first layer is connected with the commutator bar 1, and the end of the first coil is connected with the commutator bar 2; the beginning of the first coil in the second layer is connected with the commutator bar 9, and the end of the first coil in the second layer is connected with the commutator bar 1. The beginning of the first coil in the third or outer layer is connected with the commutator bar 6, and the end of the first coil in the outer layer is connected with the commutator bar 5. The beginning of the second coil in the first layer is connected with the commutator bar 7, and the end of the second coil in the second layer is connected with the commutator bar 8. The beginning of the second coil in the second layer is connected with the commutator bar 4, and the end of this coil is connected with the commutator bar 3. The beginning of the second coil of the outer or third layer is connected with the commutator bar 3, and the end of the said coil is connected with the commutator bar 2. The beginning of the third coil in the first layer is connected with the commutator bar 4, and the end of this coil is connected with the commutator bar 5. The beginning of the third coil in the second layer is connected with the commutator bar 3, and the end of this coil is connected with the commutator bar 4. The beginning of the third coil of the third layer is connected with the commutator bar 2, and the end of the said coil is connected with the commutator bar 3.

By means of connecting long and short coils with the same commutator bar, an electrical balance is established which prevents sparking at the commutators, and as a consequence, the efficiency of the machine is increased and the wear of the commutator bar is made practically nothing.

In carrying out my invention on a two layer or four layer armature, as shown in Figs. 11 and 12, the same principle is involved, and it may be extended to any number of layers. Besides the advantage already mentioned for this method of winding, the further advantage of reducing the number of commutator bars to a minimum is important in the construction of a dynamo or motor, as the expense in construction and repairs of a commutator increases with the number of bars it contains.

The driving pins or plates B, which separate the divisions of the different coils of the armature, and which are preferably formed of insulating material, are made with lateral extensions which reach over the core of the armature and under the bands C, which are formed upon the periphery of the armature, for holding the winding in place so that it cannot be displaced by centrifugal force. The driving pins when inserted in the usual way, are apt to loosen and be thrown out when the winding of the armature shifts and becomes loose, and the armature is liable to destroy itself. With my improvement, the pins are securely held in place so that even though they may be loosely fitted to the armature heads, they cannot fly off.

It will be seen that while the angular advance of the coils in one layer with reference to the coils in the next layer in a three layer armature is one third the width of the coil, in a two layer armature it will be one half the width of the coil, and in a four layer armature, one fourth the width of a coil. The angular advance of the successive coils in an armature in fractions of the circumference of the armature will be the reciprocal of the number of coils, that is to say, in an armature of three coils or sections, the advance will be one third the circumference of the armature. In the case of nine coils the advance of each successive coil will be one ninth the circumference of the armature, and so on.

In my improved winding, the two parallel parts of the same convolution are located on diametrically opposite sides of the armature, so that when one portion of the turn is in any position in a symmetrical bipolar field of force, the other part of the turn is in exactly the same position in the opposite side of the field of force.

With my improved symmetrical winding, the burning out of the armature is practically impossible. My system of winding permits a wide range of commutator brush adjustment without causing sparking. It also permits of throwing the full load on or off the machine without sparking, and without necessitating a change in the position of the brushes. These advantages render it feasible to run the dynamo or motor without skilled attendants.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A dynamo or motor armature, having two or more layers of conductor, and having the coils of the superposed layers arranged with a regular angular advance over the coils in the layer beneath, the two parts of the active portion of each convolution being arranged diametrically opposite each other, substantially as specified.

2. In an armature for electric machines, the combination, with the armature heads, of driving and spacing pins inserted in the heads and extended laterally over the body of the armature core, and a band surrounding the armature and clamping the driving pins in place, substantially as specified.

GEORGE HOARE.

Witnesses:
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EDGAR TATE.