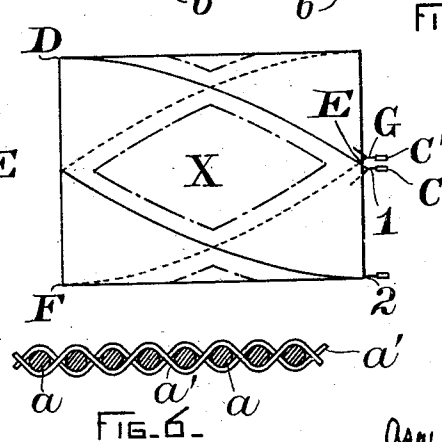
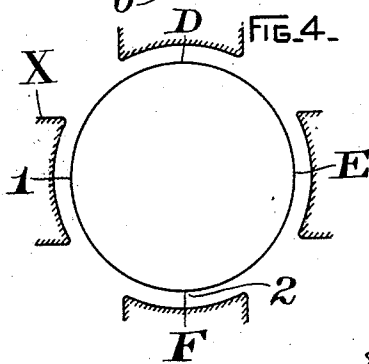
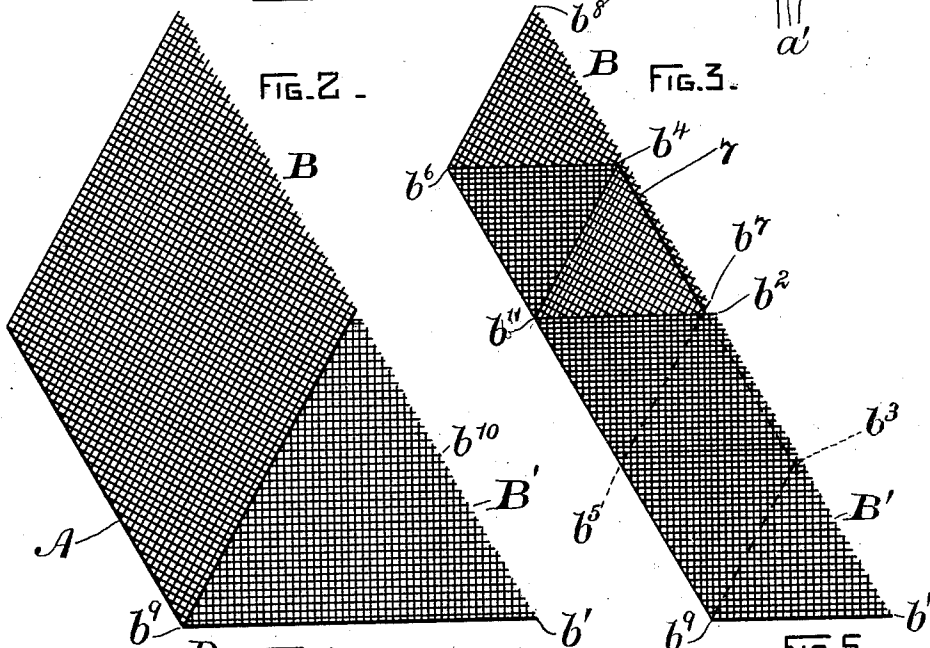
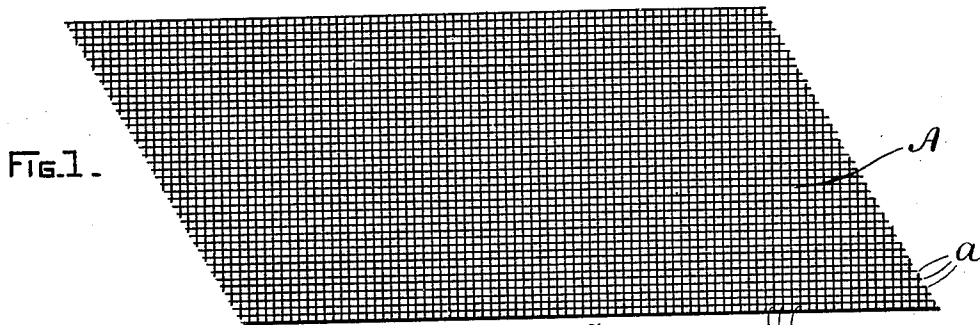


A. F. BATCHELDER.
ARMATURE WINDING.

No. 558,027.

Patented Apr. 14, 1896.



WITNESSES.
A. J. Macdonald.
A. H. Abell.

INVENTOR
A. F. Batchelder, by
Geo. R. Blodgett,
Att'y.

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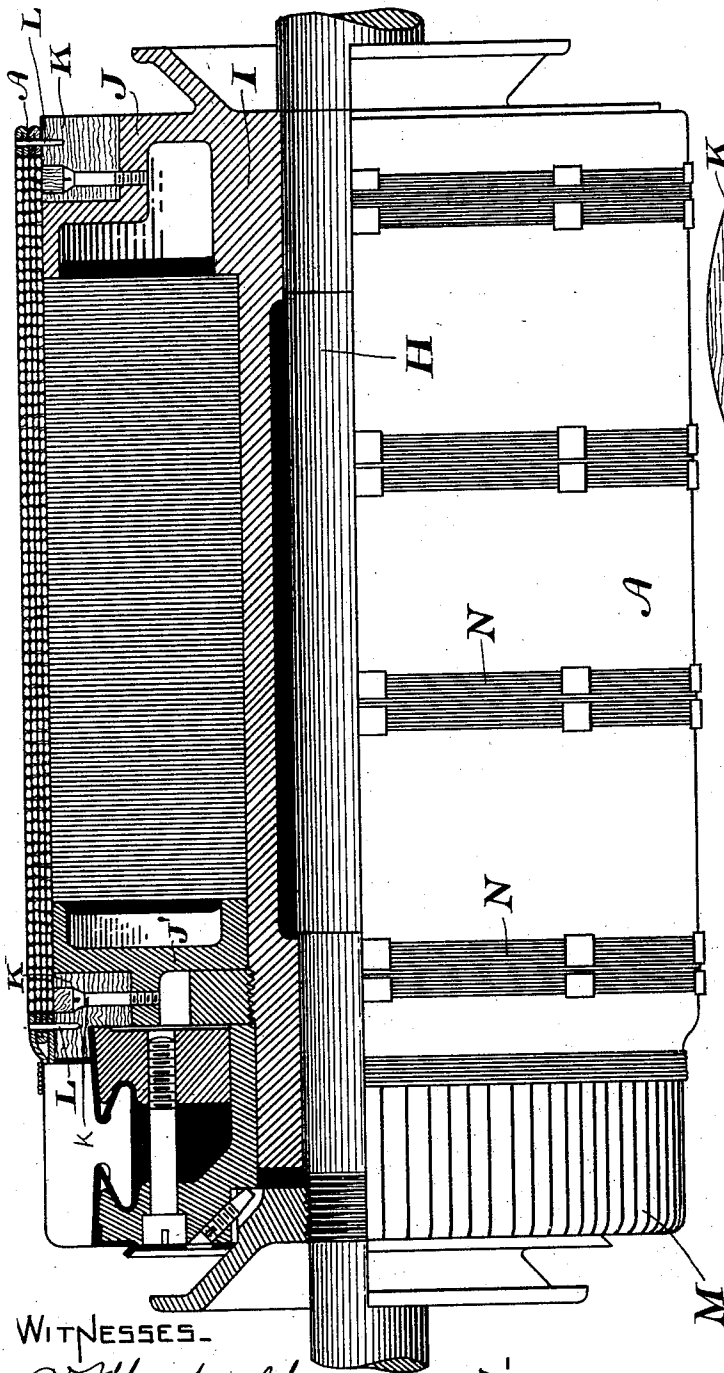


FIG. 7.

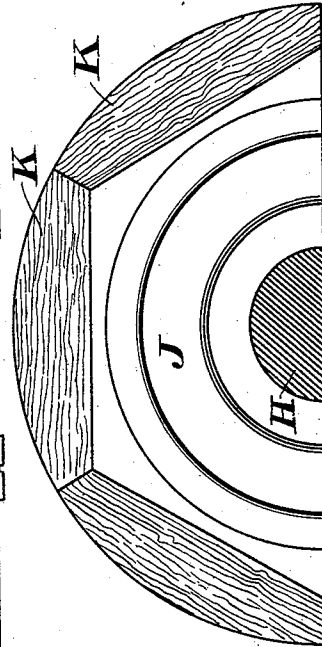


FIG. 8.

WITNESSES.

A. Macdonald.
A. H. Abell.

INVENTOR—
Asa F. Batchelder,
by
Geo. R. Blodgett,
Att'y.

UNITED STATES PATENT OFFICE.

ASA F. BATCHELDER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE
GENERAL ELECTRIC COMPANY, OF NEW YORK.

ARMATURE-WINDING.

SPECIFICATION forming part of Letters Patent No. 558,027, dated April 14, 1896.

Application filed January 25, 1896. Serial No. 576,754. (No model.)

To all whom it may concern:

Be it known that I, ASA F. BATCHELDER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Armature-Windings, (Case No. 275,) of which the following is a specification.

The present invention consists in an armature-winding made in the form of a cloth, in which the conductors form one element and suitable insulating material the other, and which may be applied to armatures having the same or varying diameters in such a manner that they may be run in machines having two or more field-poles, this being accomplished without making any change in the construction of the armature-cloth. A further advantage of this style of winding consists in the fact that a quantity of armature-cloth may be kept on hand and cut off in pieces to suit the requirements of any armature instead of, as at present, keeping a complete stock of coils for each different type of machine. By simply varying the number of folds or layers applied to the core this winding can be used for a single or multiturn armature-winding.

In the accompanying drawings, attached to and made part of this specification, Figure 1 is a plan view of a piece of armature-cloth. Figs. 2 and 3 are views of the same, showing the method of folding. Fig. 4 is a diagrammatic view of an armature, looking at the end. Fig. 5 is a side view of the same with the winding indicated by two single wires. Fig. 6 is a sectional view of the armature-cloth. Fig. 7 is a side view of an armature, partly in section, showing the winding applied thereto. Fig. 8 is a partial end view of the armature, showing end support for the winding.

Referring to Fig. 1, A represents the armature-cloth, which may be made in a variety of ways provided the conductors are properly insulated and the cloth possesses the necessary flexibility. As here shown, the conductors *a a*, running in horizontal lines, form the warp, and insulating threads or strips *a' a'*, extending at right angles thereto, form the weft. The conductors could be made to form the weft and the insulation the warp. The

cloth A is made in the form of a trapezium, with the ends cut on a diagonal and parallel, such that the length of the two ends when placed so as to form a continuous line, as in Figs. 2 and 3, will be equal to twice the circumference of the armature. Thus it will be seen that to use this winding for armatures varying slightly in diameter it is only necessary to vary the angle at which the ends are cut.

The invention will first be explained in connection with a four-pole single-turn armature, which is a common form. The cloth A is first folded at its center, as shown in Fig. 2, in such a manner as to make the ends B B' form a continuous straight line. This may be done by clamping a thin piece of material over the cloth at the center and bending the opposite end over it, after which it may be put in a press to reduce the size of the bend. Half-way between the first bend and each of the ends a second bend or turn is made in the same manner as before, the ends being folded backward toward the center bend, so that the central bend and the two ends of the cloth now form a straight line, so that, as shown in Fig. 3, the end B' lies on the side next the observer, with the end B on the opposite side of the folded cloth. One of the points *b'* or *b⁸* is now secured to the armature-core in any suitable manner and the cloth wrapped around the core in such a direction that when in place butt-joints are formed, making in the case under consideration two complete wraps around the core. For example, if for purposes of illustration a strip of paper be cut and folded as described, then wrapped around a core, starting with the end *b'*, secured to the core and wrapped so that the conductors between points *b'* and *b²* lie next the core, then it will be found that the edge between *b⁶* and *b⁸* will abut against the edge *b⁵ b⁷* on the outside, while the edge *b' b⁹* abuts with a corresponding edge *b² b¹¹* on the side next the core.

Referring to Figs. 4 and 5, the path of a single conductor will be traced. Assuming that the conductor 1 on the outside layer starts from the commutator-segment C, it runs diagonally across the periphery of the armature to a point D at the rear of the core,

ninety degrees from where it started. Here it turns and in an inside series runs to point E on the front of the armature, which is one hundred and eighty degrees from where it started. The path of the conductor from D to E, through the last-mentioned ninety degrees, is opposite the path from C to D. Hence it cannot be traced diagrammatically on the drawing Fig. 5. It again turns under and runs diagonally back to point F at the rear of the armature, having now traveled two hundred and seventy degrees. It again turns under and runs along next the core in a diagonal direction to the point G, which is just beyond the point of starting. It is now connected to commutator-segment C'. Only one line is shown on the drawing, representing the wire passing from E to F and F back to G, as the wires lie in the same plane on opposite sides of the core. The path of conductor 2 is the same as the one previously described, the only difference being that it starts ninety degrees behind conductor 1.

In order to have the conductors cut a maximum number of lines of force while traversing the field-poles, the latter are given a diamond shape, as shown in the broken and dotted lines X in Fig. 5. By observing this figure it will be noted that the conductors bear the same relation to the field-poles that they do in the ordinary four-pole machine—that is to say, any given turn is acted upon simultaneously by the north and south field-poles of the machine in such a manner that the electromotive forces generated therein are cumulative, and the difference in potential between the commutator-segments would indicate the voltage generated therein.

If it were desired to wind a two-pole armature, the armature-cloth would be folded as shown in Fig. 2, and then applied to the armature-core. In a case of this kind there would be two layers of conductors, an outside and inside series, instead of four layers, as in a four-pole machine, and the conductors in traveling from the commutator-segment to the back of the armature-core would pass through one hundred and eighty degrees instead of ninety degrees. The distance between b^9 and b^{10} would be in all cases determined by the length of the armature-core on which the winding was to be placed.

In Fig. 6 is shown an enlarged sectional detail of the armature-cloth, the conductors a showing in section and the insulation a' in elevation. While the conductors would usually be insulated before being made up into cloth, it is not essential to my invention that this be done.

Referring to Fig. 7, the winding A is shown as applied to a four-pole armature of a type commonly used for railway-motors. The shaft H is provided with a sleeve I, which carries the laminæ. Clamping-heads J and J' are provided for holding the laminæ together, and at the same time furnishing supports for the ends of the armature-winding. As a means

for holding the winding in place wooden or other insulating blocks K K are mounted on a hexagonal head formed on the end of the clamping-head J. These blocks are secured in any suitable manner, as by screws k . Pins L, preferably of insulating material, are now driven down through the winding into these blocks for the purpose of holding the ends of the wire in place. A commutator M of any suitable construction may be used, and suitable connections are made from the segments to the winding. For the purpose of holding the winding in place binding wires or bands N N are wrapped around the armature and secured in any desired manner.

The windings which have been described are those which are known in the art as "single-turn" armature-windings. This invention also extends to those armatures having two or more turns.

In making a four-turn winding, for example, the armature-cloth would be woven in such a manner that there would be a certain amount of stretch in the insulation to allow the same number of conductors on the outer periphery that there are on the inner. If there were, say, one hundred and fifty-seven conductors in each layer of a four-turn armature, those on the inner layer next the core would be put on so that they were in close proximity to each other, those on the next layer, the second one from the core, would have the same number of conductors, but would be spaced a little farther apart, and so on as each layer is applied. This can readily be done as the armature-cloth is wrapped around the core, for the tension applied to the cloth can be varied as the layers progress. The armature-cloth in this case would be folded as before, except that there would be additional folds.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An armature-winding for a dynamo-electric machine, in the form of an armature-cloth, the conductors in said cloth being applied to the armature-core in a spiral direction.

2. An armature-winding for a dynamo-electric machine, in the form of an armature-cloth in which the conductors form an inside and outside series.

3. An armature-winding for a dynamo-electric machine, in the form of an armature-cloth composed of conductors and insulation, the ends of said cloth being cut on a diagonal.

4. An armature-winding for a dynamo-electric machine, made up of armature-cloth cut in the form of a trapezium having two long and two short sides, the latter making an angle other than a right angle to the former.

5. An armature-winding for a dynamo-electric machine, comprising an armature-cloth applied in layers, the conductors in the layers extending diagonally across the core.

6. An armature-winding for a four-pole dynamo-electric machine, comprising an armature-cloth applied to the core in layers, the

outer and inner layers forming an outside and inside series.

7. An armature-winding for a dynamo-electric machine, in the form of an armature-cloth applied to the core in such a manner that the conductors pass diagonally across the core in an outside series and back again in the same manner to form an inside series.

8. An armature-winding for a dynamo-electric machine, in the form of a folded armature-cloth applied to the core in such a manner that the conductors of which the armature-cloth is composed, form turns each of which is acted upon simultaneously by all the field-poles of the machine.

9. An armature-winding for a dynamo-electric machine, comprising an armature-cloth the conductors of which are applied spirally to the core, the distance between the core and the conductors gradually increasing as the layers are applied.

10. An armature-winding for a dynamo-electric machine, comprising a laminated core, end clamps for holding the laminæ in position, wooden blocks for supporting the armature-winding mounted on a many-sided projection extending outwardly from the end clamps.

11. An armature-winding consisting of a cloth of insulated conductor with diagonally-cut ends, and folded so that the ends form a substantially straight line.

12. An armature-winding consisting of a cloth formed of insulated conductor with diagonally-cut ends, and folded to form a wrapper designed to be applied to an armature-core, and when so applied to form one or more complete wraps with abutting edges.

In witness whereof I have hereunto set my hand this 23d day of January, 1896.

ASA F. BATCHELDER.

Witnesses:

B. B. HULL,

A. F. MACDONALD.