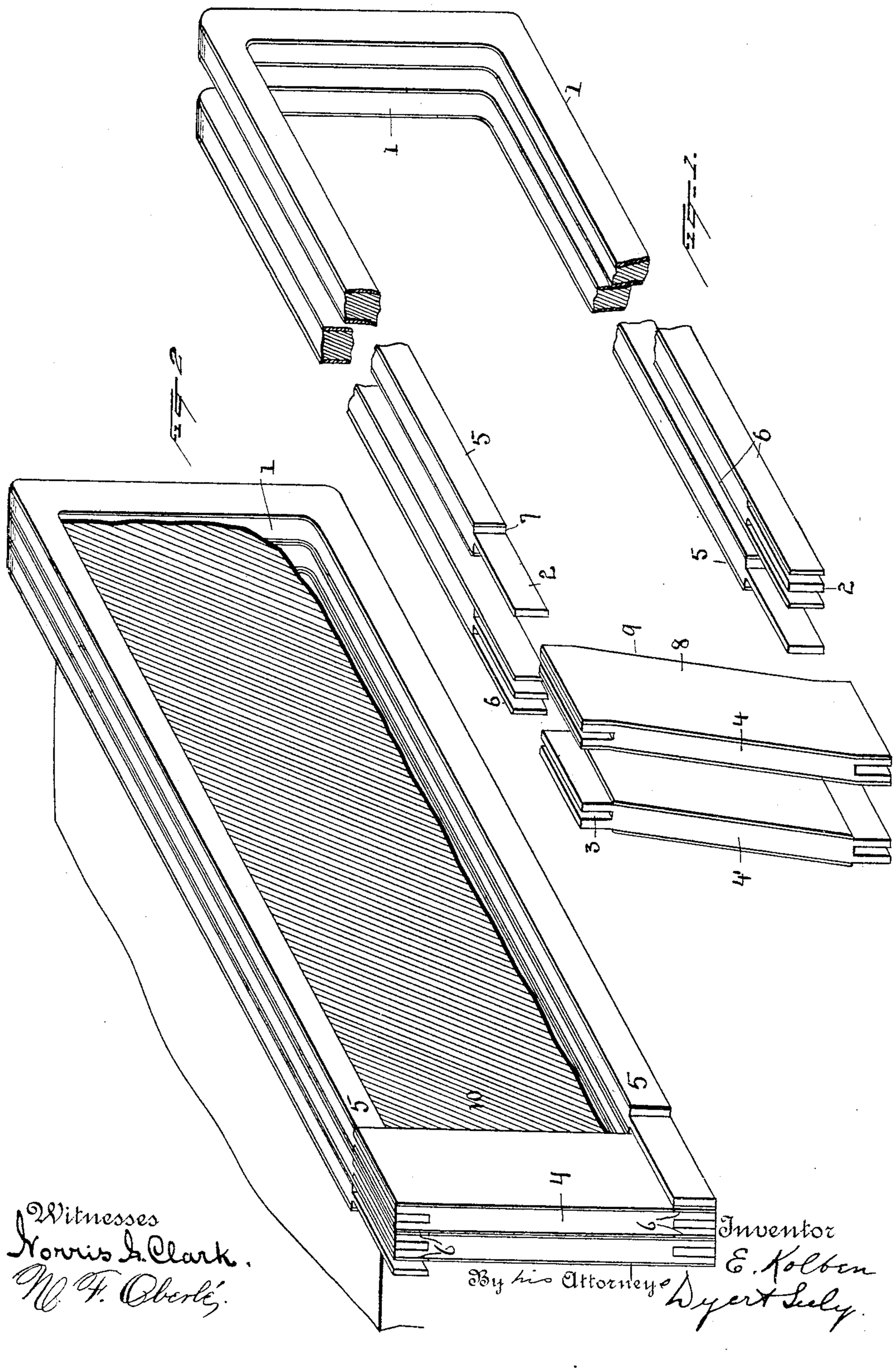
(No Model.) 2 Sheets—Sheet 1.

E. KOLBEN.

ARMATURE CONDUCTOR AND MEANS FOR INSULATING THE SAME.

No. 480,727. Patented Aug. 16, 1892.



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(No Model.) 2 Sheets—Sheet 2.

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ARMATURE CONDUCTOR AND MEANS FOR INSULATING THE SAME.

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Fig. 3.

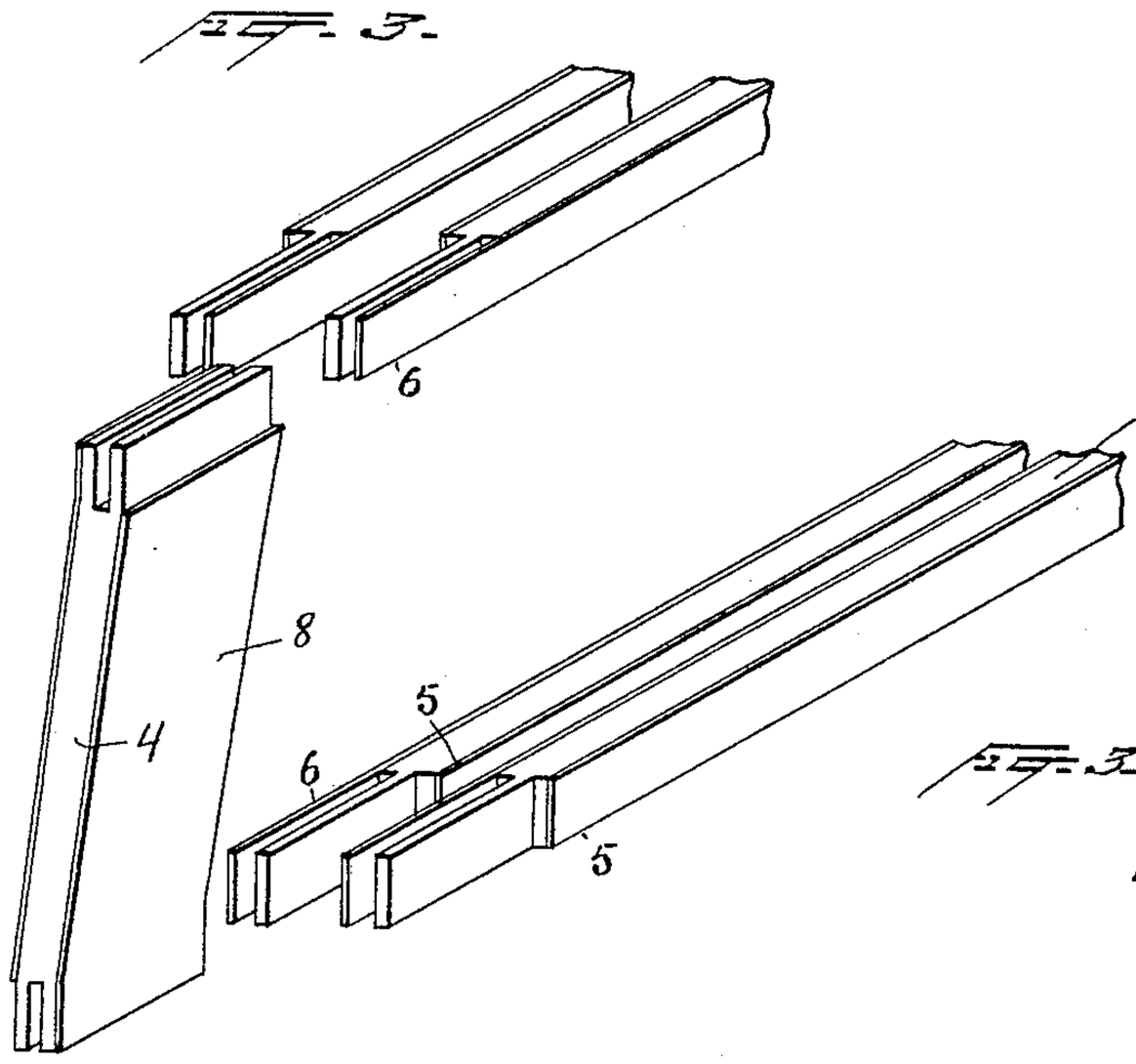


Fig. 3a.

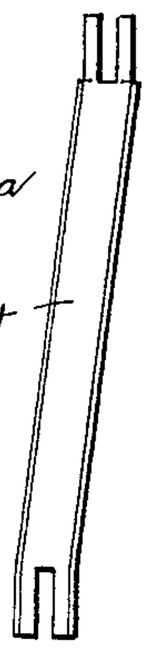
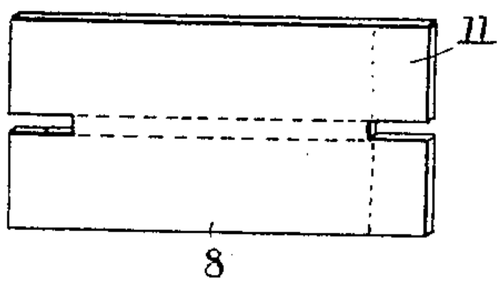


Fig. 4.



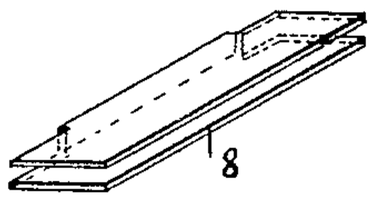


Fig. 5.

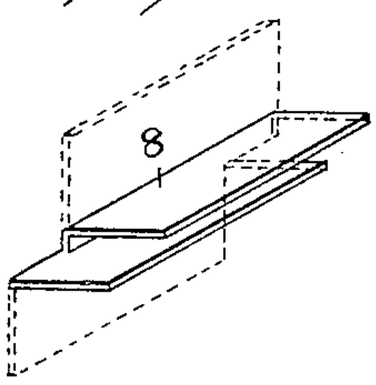


Fig. 5.

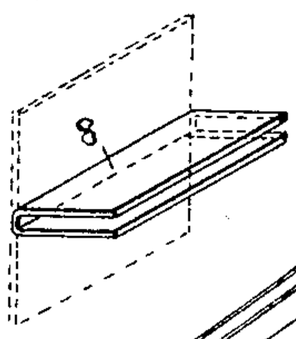
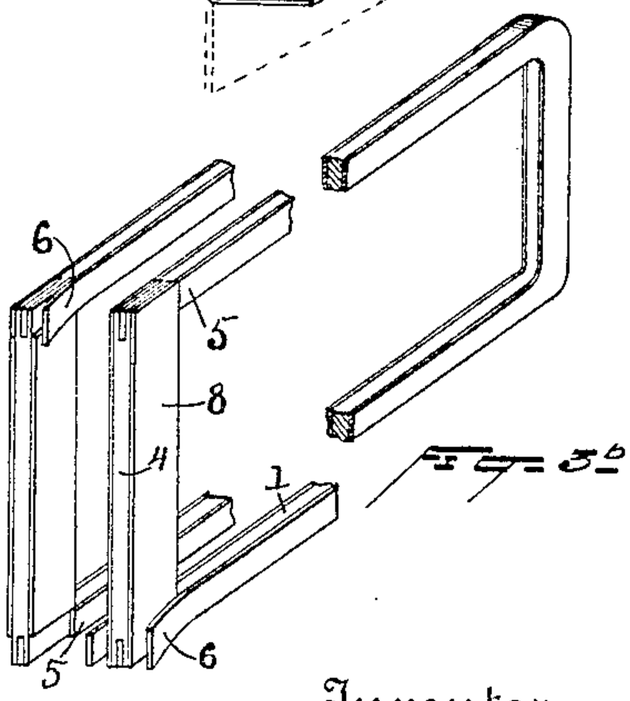


Fig. 5a.



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UNITED STATES PATENT OFFICE.

EMIL KOLBEN, OF SCHENECTADY, ASSIGNOR TO THE EDISON GENERAL ELECTRIC COMPANY, OF NEW YORK, N. Y.

ARMATURE-CONDUCTOR AND MEANS FOR INSULATING THE SAME.

SPECIFICATION forming part of Letters Patent No. 480,727, dated August 16, 1892.

Application filed February 8, 1892. Serial No. 420,784. (No model.)

To all whom it may concern:

Be it known that I, EMIL KOLBEN, a subject of the Emperor of Austria-Hungary, residing at Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Armature-Conductors and Means for Insulating the Same, of which the following is a specification.

The present invention relates to conductors forming the coils of an electro-magnetic machine-armature, and especially of armatures used in large multipolar dynamo-generators. According to the present invention the conductors forming the convolutions of the coil are separated by two strips or sheets of insulating material in such manner that no breaks in the continuity of the insulating material occur directly across the metallic face of the conductor; and it consists in the several features and combinations hereinafter set forth and claimed.

In the accompanying drawings, which illustrate the improvements, Figure 1 shows the conductors required to form two convolutions of the coil, the parts being separated to show their construction more clearly. Fig. 2 shows a short portion of an armature-core surrounded by three convolutions of the coil made by conductors similar to those shown in Fig. 1. Fig. 3 shows similar conductors with a different arrangement of insulation. Figs. 3^a and 3^b show still other modifications; and Figs. 4, 5, and 6 show insulation adapted to be used on the cross conducting-bars.

The conductors are formed of copper or other suitable bars 1, bent into U shape and having milled ends or tongues 2, adapted to fit correspondingly-milled ends 3 in the cross-bars 4. Evidently the location of the tongues and grooves may be reversed. Each bar 1 has applied to its two vertical faces strips of insulating material 5 6, preferably of mica, paper, or pressed board and having a shape corresponding with that of the U-shaped bars, the numeral 5 being applied to the strips at ends which terminate at the shoulders 7 of the U-shaped bars, and the numeral 6 being applied to the ends of said strips which extend to the ends of the milled tongues 2. In Fig. 1 the first U-bar has the ends 5 of insulating-strips at the top and ends 6 of said strips at the bottom, while the second U-bar has the insulating-strips arranged in reverse order. Following strips are to be likewise arranged in alternate order. The cross-bars 4, which, it will be understood, connect the upper limb of one U-shaped piece to the lower limb of the next adjacent U-shaped piece, are also provided with insulating-sheeting 8, covering both of their sides for the whole length or for the whole length minus the length of one or both milled ends, and also preferably covering the inner edge 9 for a purpose hereinafter indicated.

Some of the shapes of the insulating-layer 8 which may be employed are shown in Figs. 4, 5, and 6. The form shown in Fig. 4 is that employed on the cross-bar 4 in Fig. 1, this form covering the whole length of the sides of the cross-bar, while the form shown in Fig. 5 is that employed on the cross-bar 4′, this being shorter than the cross-bar, and the form shown in Fig. 6 is that employed on the cross-bar illustrated in Fig. 3, and is short at one end on one side and at the opposite end on the other side. The cross-bar 4 of Fig. 3^a is covered with an insulating-sheet formed by a blank like that of Fig. 4, with the end 11 cut off. The upper end of this cross-bar would fit a U-shaped conductor on which the insulation was long, while the lower end would fit a conductor with short insulation, while in the next adjacent convolution the arrangement would be the reverse.

By reference to the several figures (except Fig. 3^b) it will be seen that when an end or either side of an end of a U-bar has short insulation that end is connected with a cross-bar on the sides, or on one side of which the insulation is long—that is, extends to the end of the tongue of the cross-bar. It will also be seen that when the convolutions are placed together, as in Fig. 2, on the armature-core 10, the conductors are everywhere separated by two sheets, strips, or layers of insulation, and where there is a break in one strip this is covered by a continuous strip on the adjacent conductor. This construction effectually prevents any conducting material—such, for instance, as metallic particles—from getting between the insulation and the bars, so as to

connect one bar with another. The only way it is possible for a particle to cause this connection is by puncturing the continuous sheet of insulation. The arrangement shown in Fig. 3[b] also gives two overlapping layers of insulation, as above described. In this arrangement the U-shaped conductors, as well as the cross-conductors, are alternately provided with long and short insulation. This causes some of the main conductors with long insulation to be connected to cross-conductors with long insulation; but it will readily be seen that the end sought for is obtained by this mode of applying the insulation.

From what has been said and from examination of the several modifications illustrated it will be seen that the gist of the invention resides in the application of insulating-strips to the sides of the conductors in such manner that two thicknesses of insulation shall stand between the convolutions of the conductor and that these thicknesses of insulation shall break joints and not primarily in the particular shape of the insulating-strips employed. When the coil is formed on the core, as described, the outer face formed by the edges of the cross-bars 4 is finished off and is employed as the commutator-face. Since the insulation on these cross-bars extends around them at the rear edges, there is no danger of the insulation working out far enough to interfere with a proper operation of the commutator-brushes, neither is there danger of these strips being pulled out by being caught by said brushes.

What I claim is—

1. The combination, with a conductor forming an armature-coil, of strips of insulation on the sides of each convolution, the strips on one face of a convolution breaking joints with the strips on an adjacent face of the next convolution, whereby said convolutions are separated by two thicknesses of insulation and no complete break in said insulation occurs, substantially as described.

2. The combination, with several U-shaped conductors and several cross-conductors connected to form an armature-coil, of insulating-layers on both sides of each U-shaped bar and on both sides of each cross-bar, said insulation being arranged so that the layers overlap each other, substantially as described.

3. The combination, with several U-shaped conductors and cross-conductors connected to form an armature-coil, of U-shaped strips of insulation placed on each side of each U-shaped conductor and insulating material on the sides of the cross-conductors, the connected ends of the U-shaped bars and the cross-bars having, respectively, long and short or short and long insulation, substantially as described.

4. An armature-coil composed of bars connected end to end to form a continuous conductor, the turns of the coil being separated throughout by two layers or sheets of insulating material, joints in one layer being covered by a continuous section of the other layer, substantially as described.

5. The combination of several U-shaped conductors having tongues at the ends and cross-conductors formed to fit the same, said conductors forming an armature-coil, the cross-bars having continuous insulating-layers on their sides and rear edges, and the outer edges of said cross-bars being finished off, whereby the edge of the armature serves as a commutator-surface, substantially as described.

6. The combination, with a conducting-bar serving or adapted to serve as a commutator-bar, of a continuous sheet of insulation on its two sides and rear edge, substantially as described.

7. The combination, with adjacent bars serving or adapted to serve as commutator-bars, of continuous sheets of insulation on their sides and rear edges, whereby the several bars will be separated by two sheets and whereby all danger of said sheets working or being pulled out is avoided, substantially as described.

This specification signed and witnessed this 22d day of January, 1892.

EMIL KOLBEN.

Witnesses:
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