(No Model.)

E. KOLBEN.

CONDUCTOR FOR ARMATURES.

No. 491,567. Patented Feb. 14, 1893.

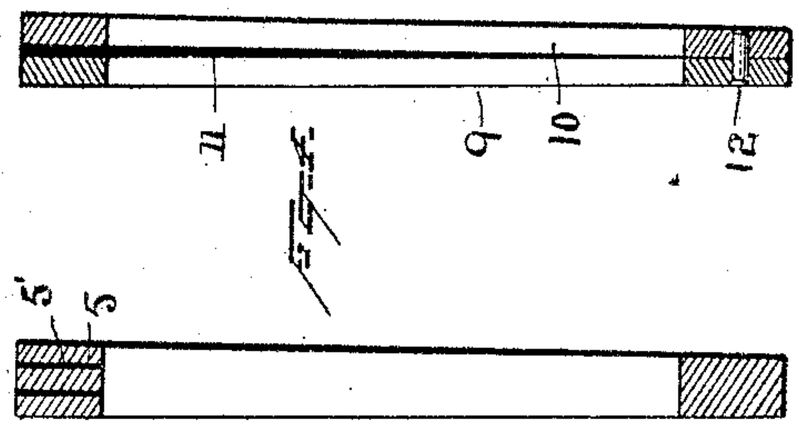

Fig. 3.

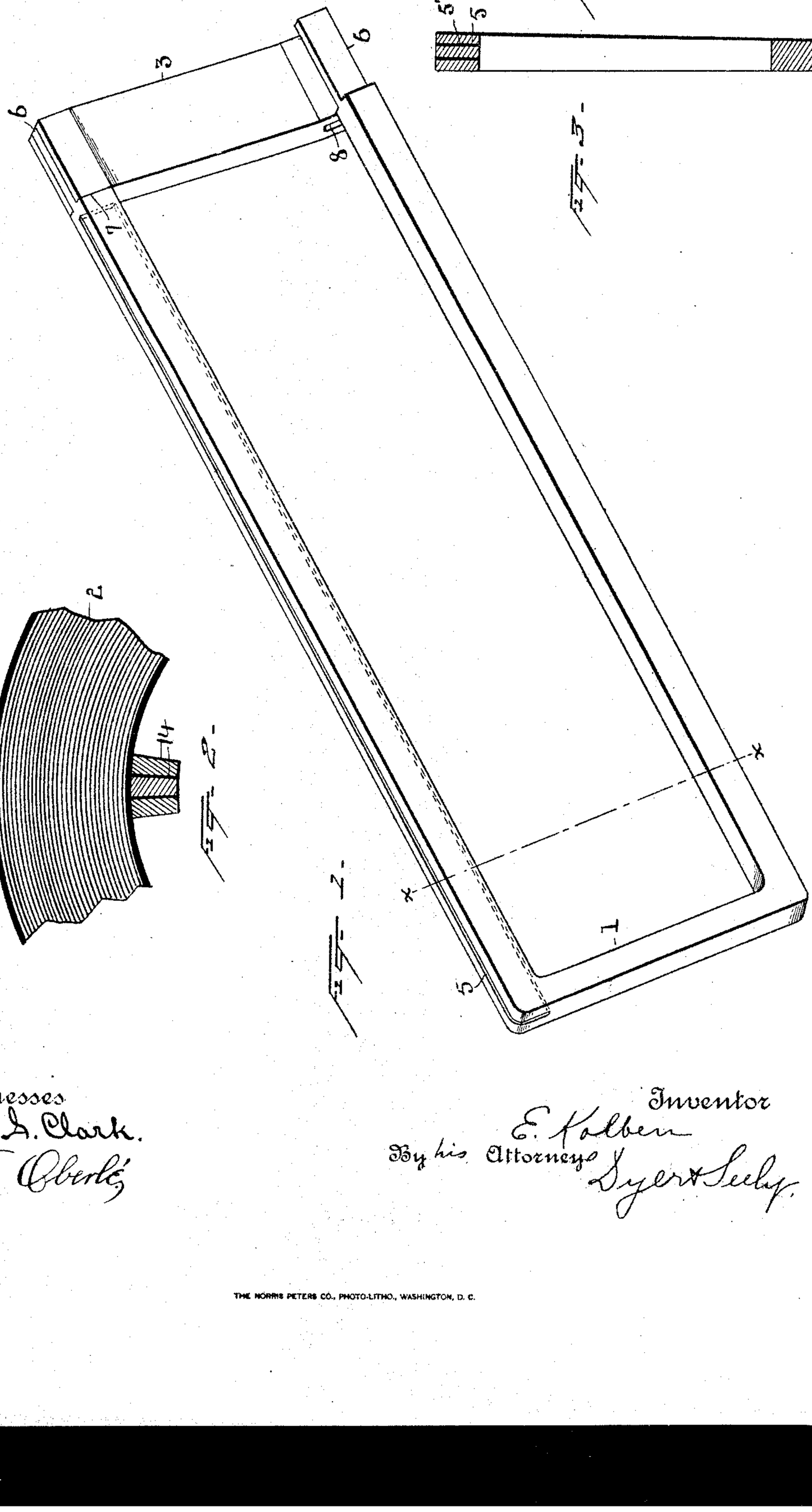

Fig. 2.

Fig. 1.

Witnesses
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UNITED STATES PATENT OFFICE.

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

CONDUCTOR FOR ARMATURES.

SPECIFICATION forming part of Letters Patent No. 491,567, dated February 14, 1893.

Application filed February 8, 1892. Serial No. 420,785. (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 Conductors for Armatures, of which the following is a specification.

The present invention relates to armatures for electro magnetic machines, and especially to the conductor forming the armature coil in machines of large size, in which said conductor is necessarily large in order that it may safely and economically conduct the heavy currents. It is well known that when a thick bar of copper is moved in a strong magnetic field, local or eddy currents are generated in the bar itself, and such currents are objectionable mainly because of the heat produced thereby.

The objects of the present invention are primarily to prevent these local or eddy currents in the large conductors, and to so form the conductor that it shall cover the armature core without waste of space, and the invention consists in the improved conductor and in the several features and combinations hereinafter described and specified in the claims.

In the accompanying drawings illustrating the invention, Figure 1 is a perspective view of one section of the form of conductor which I employ; Fig. 2 is a sectional view through a portion of an armature, on a line corresponding to *x*—*x* of Fig. 1; Figs. 3 and 4 illustrate slight modifications to be described.

In forming the armature coil I preferably employ a series of U, or similar shaped, metal bars 1 placed side by side on an insulated core 2, one end of each bar being connected to an end of the next adjacent bar by a cross-piece 3, as more fully set forth in an application filed by me of even date herewith, Serial No. 420,784. The conductors may be insulated from each other as set forth in said application. The several conducting bars are, however, shown in this case insulated from each other by simple layers of insulation 4. In order to reduce or prevent the formation of the eddy currents above referred to, I cut a saw-kerf 5 through the outer limb of the U-shaped piece, as shown in Figs. 1 and 3, and this kerf is preferably filled with insulating material, although it is evident that it may be left as an air-space if desired. This saw-kerf is cut so that it occupies a radial plane in respect to the armature core and thus divides the bar so that it presents thin strips to the field magnet poles. The ends of the U-shaped bars are milled to form tongues 6 and shoulders 7, the latter being at such distance in advance of the end of the saw-kerf that the conductivity and strength of the bar at this part will not be interfered with. The cross-piece 3 is provided with corresponding milled or grooved ends 8, adapted to fit the ends first mentioned, this also being more fully described in the application above referred to. Evidently the tongue and groove arrangement may be reversed.

In Fig. 3 I have shown more than one saw-kerf 5 through the upper limb of the U-shaped bar, these kerfs being filled with a suitable insulating material 5′.

In Fig. 4 the conductor is shown as composed of two halves 9, 10, separated through a considerable portion of their length by the insulation 11, and secured together by suitable rivets or similar devices 12. This, it will be seen, separates the laminations of the upper limb of the bar but not those of the lower, where there is less or no need therefor.

In view of the fact that the outer circumference of the armature core is considerably longer than the inner circumference, it becomes important to so form the conducting bars that they, together with the thin insulation between them, may be symmetrically arranged and may entirely cover the surface of the core. To accomplish this I form the U-shaped bars so that the sides 13 of the outer limbs, and the sides 14 of the inner limbs thereof are in substantially the same radial lines. This, it will be seen, gives to the outer limbs a greater width than to the inner limbs, and in order that the area of the cross-section and the conductivity of the two limbs in each conductor may be maintained equal, the inner limb is made correspondingly thicker. By this construction the width of the outer limbs bears the same relation to the outer circumference of the core that the width of the inner limbs does to the inner circumference

of the core, thus causing the conductors, when the several bars are placed side by side, to entirely cover the surface of the core, without the use of large quantities of insulation to fill up spaces, or without leaving large open spaces between the conductors on the outer periphery of the armature. Making the bar on the outside of the armature core comparatively thin between its outer and inner faces, and comparatively thick or wide in the opposite direction, is advantageous also when the armature is run in fields of the outside type, inasmuch as it reduces the magnetic resistance due to the gap between the field and the iron core.

It will be apparent that the benefit derived from the lamination produced by the kerf or kerfs in the upper limb of the conductor is not dependent on having said conductor of the particular contour shown, and the term "U-shaped" is employed to define, not only that exact shape, but other similar shapes adapted to be used in the same general manner.

It will further be evident that a part of the advantages resulting from forming the inner and outer limbs of the conductor with faces in the same radial lines, might be attained, though less perfectly, by making the outer and inner limbs wide and thin respectively, but making the faces 13, 14 parallel instead of making them in radial planes.

What I claim is,

1. A U-shaped bar conductor adapted to form part of an armature coil and having one limb wider than the other and having a radial saw-kerf dividing the wider limb for a part of its length only, substantially as described.

2. A U-shaped conductor adapted to form a part of an armature coil, one leg of said conductor being laminated, and the other leg and the section connecting the two legs being solid, substantially as described.

3. A U-shaped conductor having milled ends and adapted to form a part of an armature coil, one leg of said conductor being laminated, the other leg and the section connecting the two legs being solid, and a conductor milled to fit one of said ends and adapted to connect it to a similar adjacent conductor, substantially as described.

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

EMIL KOLBEN.

Witnesses:

FREDERICK BATHURST,

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