

(No Model.)

2 Sheets—Sheet 1.

A. L. PARCELLE.

ARMATURE FOR DYNAMO ELECTRIC MACHINES.

No. 486,234.

Patented Nov. 15, 1892.

Fig. 1.

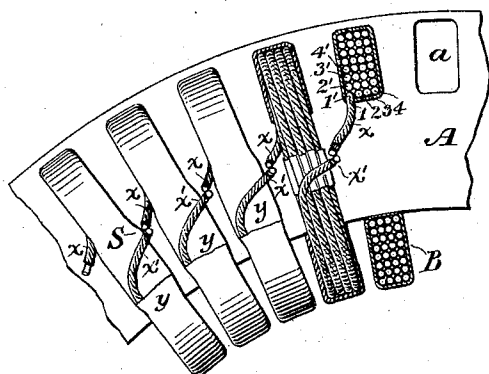


Fig. 2.

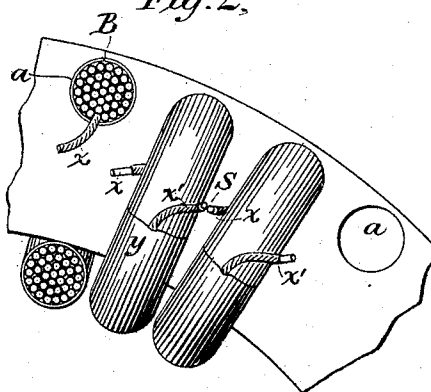


Fig. 3.

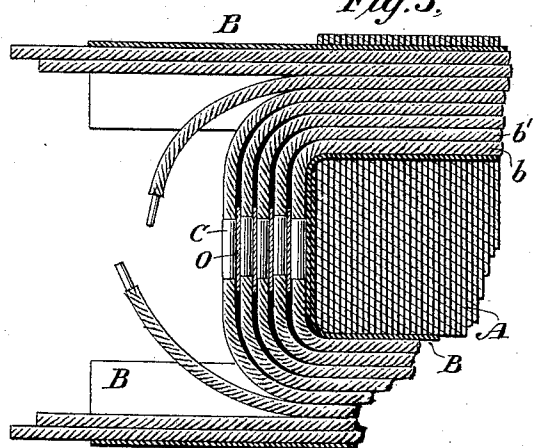


Fig. 4.

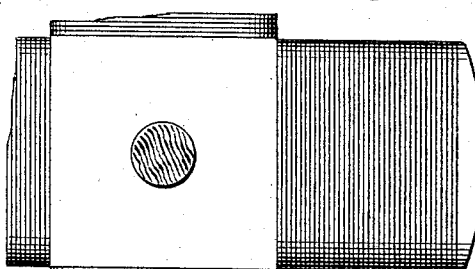


Fig. 8.



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Fig. 5,

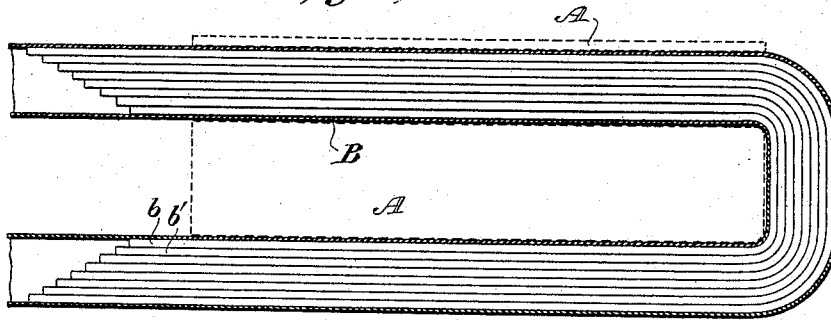


Fig. 6,

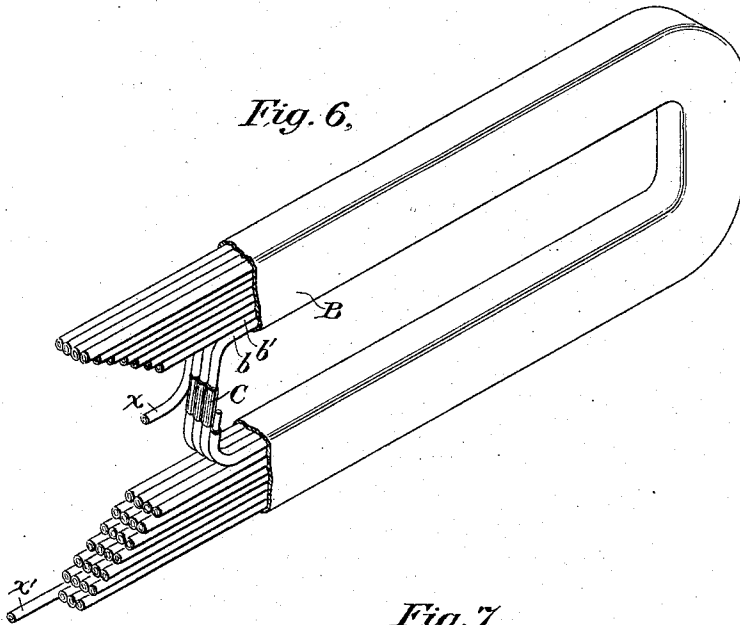
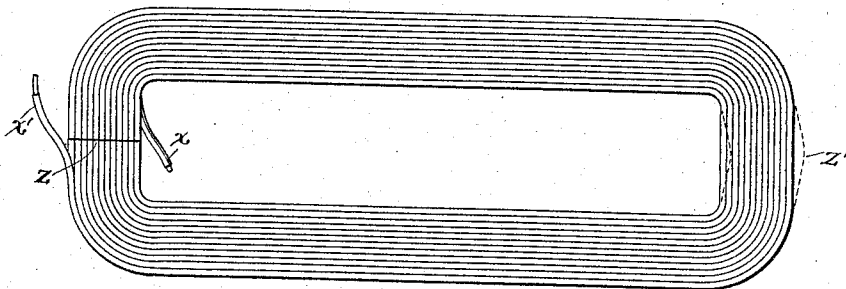


Fig. 7,



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UNITED STATES PATENT OFFICE.

ALBERT L. PARCELLE, OF BOSTON, MASSACHUSETTS.

ARMATURE FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 486,234, dated November 15, 1892.

Application filed November 7, 1891. Serial No. 411,197. (No model.)

To all whom it may concern:

Be it known that I, ALBERT L. PARCELLE, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Armatures for Dynamo-Electric Machines, of which the following is a specification.

My invention relates more especially to that class of machines having iron-clad armatures—i. e., those in which the wire coils are buried below the surface of the iron at the periphery of the armature. Heretofore such armatures have been wound by threading a continuous wire through each aperture or coil-seat formed therein. This method is objectionable, among other reasons, because the wire is necessarily bent back and forth a great number of times, from which both it and the insulation are liable to injury. Aside from this, even with the utmost care the insulation of the wire is apt to be abraded by contact with the walls of the aperture or seat through which it is threaded. The operation is, moreover, a slow and tedious one and is correspondingly expensive.

The object of my invention is to avoid all these objections and provide a simple, practical, and efficient way in which armatures of this class may readily be equipped with coils. To this end I pass through or lay in the aperture or seat for the coil separate lengths of wire, one for each convolution of the coil, that are properly laid around the armature and whose ends are electrically connected to form the desired continuous circuit or circuits through the coil, the free ends forming the terminals being brought out as usual for connection with other coils and with the commutator.

The preferable specific manner of practicing my invention is to first make a cable of properly-insulated wires, there being as many wires as there are to be convolutions in the coil. The cable is preferably formed, shaped, or bent on a former, so that three of its sides will accurately fit the armature, and the fourth side is open, so that one side or leg of the cable may be readily passed through the aperture or seat in the armature. The different layers making up the coil may be of va-

rying lengths of wire, the innermost layer being shortest and the succeeding layers each longer than the preceding one. One wire of the inner layer and one of the outer may be longer than the others and form the terminals of the coil. When one leg or side of such a bent or U-shaped cable is slipped through its aperture in the armature, the free ends of the wires are successively bent toward each other and electrically united in any desired manner, leaving two free ends. The several wires of the cable being joined together end to end, one continuous circuit through the coil is formed. Of course two or any other number of circuits could be similarly formed from the separate wires in a single cable, if, for any reason, such an arrangement should be desired. A cable such as I have mentioned might be formed or built up in a variety of ways, some of which are mentioned hereinafter. By preference it would be incased in an exterior sheath of insulating material that could be made practically water-tight to exclude moisture, and would also serve to protect the wires from mechanical injury. I do not limit myself to any special manner of forming the cables or of any particular way of uniting the ends of the wires.

The invention is primarily applicable to those armatures in which the apertures or seats for the coils are entirely surrounded by the metal of the armature. It may, however, with advantage be applied to other armatures—for instance, those in which the seats for the coils are open at the periphery of the armature and are widest at the bottom; also, to any form of armature having slots, seats, or apertures therein, as well as plain ring and drum armatures.

In the accompanying drawings, Figures 1 and 2 are detail views of portions of a ring-armature with coils, some of which are shown in sections mounted therein. Fig. 3 is a detail sectional view on a larger scale, showing one end of a cable or coil and part of an armature-ring with some of the ends of the wire united and others unconnected. Fig. 4 is a detail view showing interior field-magnets and an exterior ring-armature wound according to my invention. Fig. 5 is a longitudinal section through a cable of wires bent into U

shape and adapted to be inserted through its aperture or seat in the armature-ring. Fig. 6 is a perspective view of such a cable with some of the ends of the wire united. Fig. 7 is a side elevation showing a manner of making a cable by first winding a continuous coil and then cutting through one of its shortest sides. Fig. 8 shows two detail sectional views of coupling-pieces for uniting the ends of the wires.

A represents a section of an armature-ring, which may be composed of magnetically-insulated multiple layers of iron, as is common. Apertures or seats *a* for the reception of the armature-coils are formed therein. These may be of any desired shape, and the cable-coil to be seated therein is of corresponding cross-section. The cable may be formed in the following manner and substantially as illustrated in Fig. 5—that is to say, a sheet of insulating material B may be secured upon a former adapted to give the cable the elongated U shape shown in Fig. 5 or any other desired shape. The first layer of wires *b* is laid upon the insulating material around the former. The next layer *b'* is then put in place; but the wires composing it are longer than those of the first layer, and each succeeding layer is composed of longer wires than the preceding one. When all the wires have been laid in place, the insulating material B, which is of sufficient width, is folded over the bundle of wires and cemented or otherwise secured, except near the ends of the wires. One side or leg of this U-shaped cable may now be inserted through its aperture in the armature-ring in the manner shown, for instance, in Fig. 3 and as indicated by the dotted lines in Fig. 5. The ends of the first layer *b* of wires are successively joined, as indicated, one end *x*, however, being brought out so as to form the inner terminal of the coil, as seen in Fig. 2. The remaining unconnected end of the inner layer may be connected with the first wire of the layer *b'*, and so on, the wires being successively joined, so as to form one continuous circuit through the coil. Of course the joints are properly insulated, and the end of one of the wires of the outside layer may be brought out to form the outer terminal of the coil, as indicated at *x'*, Fig. 1. The cables, however made, are preferably given the proper form adapted to fit and readily be inserted through the apertures in the armature. After all the ends of the coils that are to be joined are properly connected the ends of the sheet of insulating material B may be closed around them, as indicated at *y*, Fig. 1, so that the coil is completely protected. The cable might be wound with tape or cord to firmly secure the wires against displacement during the handling of the cable.

As illustrated in Fig. 7, the cable may be made by winding a continuous wire into a coil and then cutting through the coil at *z* and straightening out the ends of the wire, so

as to obtain approximately the shape shown in Fig. 5, or the coil might be cut at the opposite end, and whichever end is cut I may form it as indicated by the dotted lines *z'*, so that when cut the free ends are of slightly-increased length. If I cut the coil at *z'*, the free terminals might still be, as indicated, at the opposite end of the coil, the ends of the wires at *z'* being properly connected to afford the desired circuit or circuits through the coil. The electrical connection of the ends of the wires may be accomplished in a variety of ways. For instance, they may be soldered in the ordinary manner, or a short tube C, of porcelain or metal or any other suitable substance, may have within it about at the center a small piece of solder *c*, Fig. 8. The ends of the wires to be joined may be inserted into the opposite ends of this tube and heat may be applied by means of a blow-pipe flame or by contact with a heated bar of copper or otherwise, and when the solder melts the ends of the wires may be pressed inwardly into contact with each other, or a sufficient heat for forming the joint by soldering may be developed by passing an electric current through the wires, or a current may be passed transversely across the wires and metal tubes, in which they lie, and in this case the tubes should be in electrical contact with each other, and after the soldering is completed they should be separated and insulating material placed between them, or the ends of the wires may be electrically welded together without the use of solder. Where the ends are soldered the wire should be tipped with a coating of tin and a suitable flux should be placed in the tube with the solder. If the tube be of metal, it will be necessary to envelop it after the joint is made with insulating material, and if the tube be of mica, porcelain, or other insulating material it may remain in place and itself serve as the insulation for the joint. At C' in Fig. 8 I have shown an envelope of insulating material placed around a metal tube C, containing the solder *c*. The ends of the wires could be mechanically united in any suitable manner. If desired, a length of rubber or other insulating tubing could be slipped over the end of one wire, and after it had been connected with another wire the tube could be drawn over the joint to insulate it. Sheets of insulating material O may be placed between the layers or joints, as shown in Fig. 3.

Any suitable means for testing the joints as they are made, and also for indicating the desired succession in which the wires are to be connected, may be adopted. At points S, where the armature-circuit is to be connected to a commutator-strip, a conductor may be connected where the inner end of one coil is connected with the outer end of an adjoining coil, and the conductor is brought down to the commutator-strip in the ordinary manner. That side of the coil where the joints are made will be somewhat more bulky than other

parts; but as the enlargement will be at the end of the armature it will not be objectionable.

Considering the invention in its broadest sense, the wires might be applied to the armature one by one and successively joined to afford the desired circuit or circuits, or they may be applied in groups, each cable or group forming one or more layers of the coil, or otherwise. However applied, they may be connected otherwise than as herein shown. For instance, the circuit may be formed by connecting the wires in vertical or radial layers. Thus in Fig. 1, instead of connecting the wires in the order 1 2 3 4 they may be connected in the order 1' 2' 3' 4'. No insulation when this method is used need be applied to the iron of the armature to insulate the coil therefrom, thus effecting a great saving in labor and at the same time insuring a more perfect insulation of the wires from each other and from the iron than is possible with the ordinary method of winding.

A further advantage of my invention is that the coil cannot only be made waterproof, but the exterior cover may also be fireproof, and fireproof insulating material may also be placed between the layers of wire forming the cable or coils, a construction not possible where the coil is wound in the ordinary way. As the wires are wound on the former each layer may be perfectly insulated from the preceding one, and as the difference of potential between adjoining wires in the same layer is slight there is produced by my method a coil that is practically fireproof.

The invention may be applied with advantage to many styles of armature and the cable-coils formed and insulated in any manner.

I claim as my invention—

1. The combination, substantially as set forth, of an armature having seats or apertures therein for the armature-coils and coils lying in said seats, each coil being composed of a number of independent insulated lengths of wire whose ends are electrically connected to form the desired circuit or circuits through the coil.

2. The combination, substantially as set forth, of an armature-ring having apertures or seats therein for the armature-coils and coils lying in said seats, the coils being each composed of a cable of insulated wires whose ends are electrically connected to form a continuous circuit or circuits through the coil.

3. A coil of an insulated electrical conductor, constructed, substantially as herein described, of a number of superposed insulated conductors, each having free ends that are electrically connected to form a circuit or circuits through the coils, each conductor forming one convolution of the coil.

4. The combination, substantially as set forth, of an armature having apertures or seats therein for the coils, the layers of independent insulated wires, and the coupling-tubes within which the ends of the wires are

electrically connected to form a continuous circuit or circuits through the coil.

5. The combination of a core with a coil composed of a number of independent superposed insulated conductors whose free ends are electrically connected to form a circuit or circuits through the coil, each conductor forming one convolution of the coil, substantially as set forth.

6. The combination of a core having an aperture therein, with a coil lying in said aperture and composed of a number of independent superposed insulated conductors whose free ends are electrically connected to form a circuit or circuits through the coil, each conductor forming one convolution of the coil, substantially as set forth.

7. The combination of a core and a coil consisting of a previously-formed group or cable of superposed insulated electrical conductors whose free ends are electrically connected to form a circuit or circuits through the coil, each conductor forming one convolution of the coil, substantially as set forth.

8. An electric coil consisting of a number of insulated wires whose free ends are introduced into coupling-tubes within which they are electrically connected to form the desired circuit or circuits, substantially as set forth.

9. The combination of a number of insulated wires adapted to form an electric coil and having free ends with coupling-tubes containing a suitable flux, whereby the ends of the wires may be electrically welded together within the tubes or metallicity united by solder to form the desired circuit or circuits, substantially as set forth.

10. The combination of a core, a coil composed of a number of independently-insulated conductors whose ends are electrically connected to form a circuit or circuits through the coil, each conductor forming one convolution of the coil, and insulation exterior to the group of conductors and interposed between it and the core.

11. The combination of an apertured core, a coil composed of a number of independently-insulated conductors whose ends are electrically connected to form a circuit or circuits through the coil, each conductor forming one convolution of the coil, and insulation surrounding the group of conductors and interposed between it and the core.

12. A coil consisting of a group of electrical conductors, each insulated from the others and having their ends electrically connected to form a circuit or circuits through the coil, each conductor forming one convolution of the coil, and an exterior sheath of insulating material surrounding the group of conductors.

In testimony whereof I have hereunto subscribed my name.

ALBERT L. PARCELLE.

Witnesses:

WM. A. MACLEOD,
ROBT. WALLACE.