No. 743,779. PATENTED NOV. 10, 1903.

R. VARLEY.

PROCESS OF WINDING ELECTRICAL COILS.

APPLICATION FILED MAY 15, 1903.

NO MODEL.

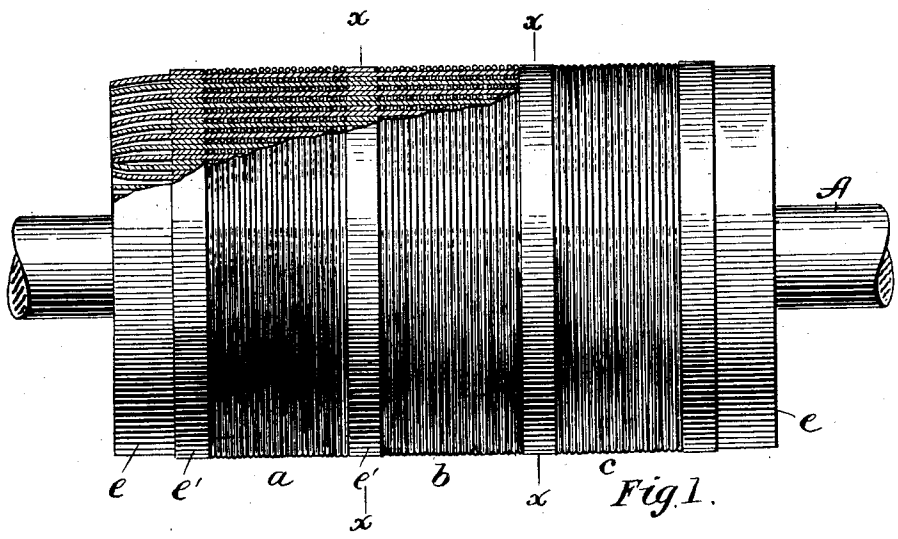


Fig. 1.

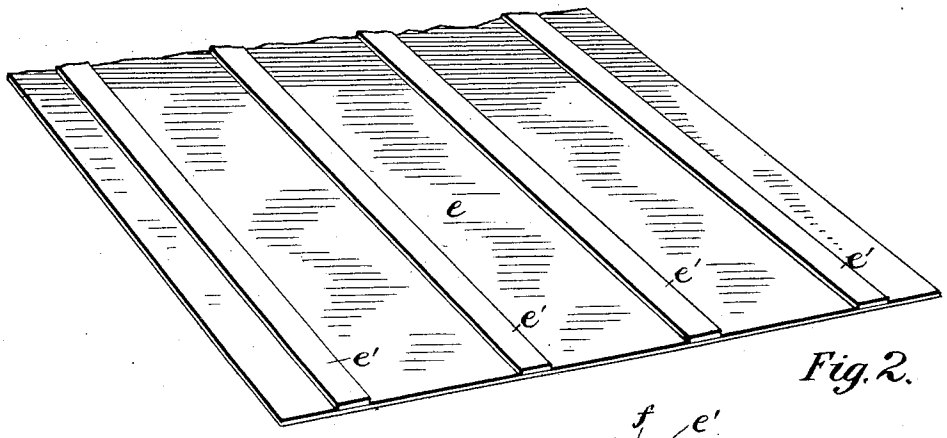


Fig. 2.

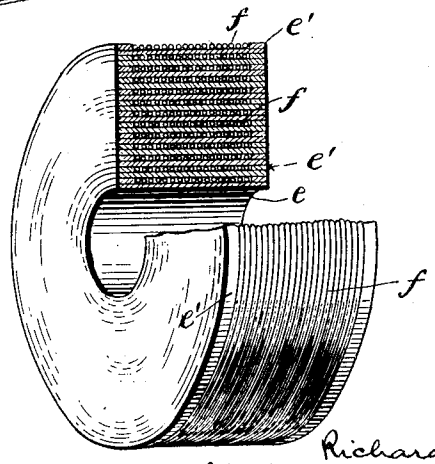


Fig. 3.

Witnesses
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 743,779. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

RICHARD VARLEY, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO VARLEY DUPLEX MAGNET COMPANY, A CORPORATION OF NEW JERSEY.

PROCESS OF WINDING ELECTRICAL COILS.

SPECIFICATION forming part of Letters Patent No. 743,779, dated November 10, 1903.

Application filed May 15, 1903. Serial No. 157,225. (No model.)

To all whom it may concern:

Be it known that I, RICHARD VARLEY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Processes of Winding Electrical Coils, of which the following is a full, clear, and exact description.

This invention relates to the winding of electromagnetic coils, the object being to wind coils without the aid of a spool having end flanges to confine the convolutions and to produce a finished coil in which the convolutions are securely held in proper relation to each other, so that when handled or mounted for use in an apparatus the windings will not become displaced.

In machines for winding coils, especially those adapted to wind a number of coils simultaneously and known as "automatic multiple winding-machines," it is desirable for various reasons to allow the strand-guide which forms the layers to be located quite near the surface of the winding, and as the strand-guide is usually a pulley and occupies considerable space it cannot be used between the flanges of a spool, because its motion is interrupted by the flanges at each end of a layer, with the result that the layers are not finished or at least are roughly finished. To dispense with the flanges and still preserve the integrity of the coil during its winding and after, the practice has been introduced of inserting a sheet of paper between every two layers of the winding, allowing it to extend laterally beyond the end convolutions of the layers and then winding a given number of turns in each layer, while in the multiple machines each sheet of paper thus inserted is wide enough to extend throughout all of the coils on the spindle. The coils thus build up more or less solidly; but it is still found, especially in winding the coils of larger diameter, that the tension of the wire or the jarring of the machine or handling after the coil is finished will cause the end turns of the layers of wire to break or bend down the unsupported projecting portions of the paper, and so loosen from the main body of the coil.

The object therefore of this invention is to introduce a process of winding coils either singly or in multiple and involving the introduction of paper between the layers wherein the end convolutions of each layer will be securely confined and the integrity of the coil maintained throughout the winding operation and afterward when the coil is in use.

To this end the invention consists in building up end flanges for the coil as the diameter of the coil increases by providing each sheet of paper introduced between the layers with thickened or reinforced bands, which form stops for the end turns of the layer wound directly upon the sheet. The thickened bands are obtained by pasting strips or ribbons of paper upon the face of the sheet at a distance apart equal to the width of the layer. In multiple winding each sheet will have a number of the bands, depending upon the number of coils wound at once, and preferably one band between any two coils will serve for both; but it will be of sufficient width to be divided along the middle when the coils are removed from the winding-spindle, allowing one-half to each.

The process will be described in detail with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a winding-spindle with three coils wound thereon in accordance with my improved process, a portion of the coils being broken away to show the internal construction. Fig. 2 is a perspective view of one of the prepared sheets of paper used in the winding operation, and Fig. 3 is perspective view of one of the finished coils with a part broken away.

The general process of winding the layers of a number of coils simultaneously upon one spindle and inserting sheets of paper common to all of the coils between the layers thereof is described in the patents issued to James C. Anderson, February 27, 1900, Nos. 644,311 and 644,312. The present invention is a modification of those inventions.

A indicates a winding-spindle, upon which one or more coils *a b c* are built up in the following manner: There is first wound upon the spindle a sheet of paper *e* of the proper length to make one turn and accurately meet at its edges. This sheet is provided with two or more bands *e'*, consisting of strips or rib-

bons of paper pasted lengthwise on the face of the paper parallel to each other and at the same distance apart as the width of the layers to be wound. If only one coil is to be wound, the sheet will have two of the bands *e'*; but if more than one coil is to be wound at the same time there will be one additional band for each additional coil. Having placed the first sheet around the spindle, a layer of wire *f* is wound thereon in the space between two adjacent bands. If more than one coil is to be wound, layers are at the same time wound in the spaces between the other bands. Having completed the layer, another sheet of the same character is wrapped over the wound layer, so that its bands will come radially opposite the bands on the first sheet. Then another layer of wire is wound in the space between the bands. In like manner sheets of the banded paper and layers of wire are successively wound, one over the other, until the required number of layers is obtained. It will be seen that the bands furnish end stops for the layers and that the end turns of each layer are effectually confined in place. The tension of the wire cannot break down or bend the projecting paper, because the layers of paper rest solidly against each other beyond the winding zone and furnish, in effect, a solid flange for the winding. Furthermore, any tilting or bending of the projecting paper which might take place, due to the fact that the thickness of the bands may be less than that of the wire, would not result in the escape of the wire, because it could not mount the inner shoulders of the bands. When a number of coils are wound simultaneously or in multiple, as shown in Fig. 1, the finished set of windings is removed from the spindle, and by means of a saw they are separated along the lines *x x*. This gives one-half of the intermediate bands to the adjoining coils, and the bands are of course sufficiently wide, so that when thus reduced the support for the end turns will be adequate. A finished single coil is illustrated in Fig. 3.

It will thus be seen that all the advantages of a winding of this general character are obtained without the disadvantages above pointed out of the liability of the end turns in the layers becoming detached either during the winding operation or while the coil is in use. The product is a solid article, cheaply made, and as substantial as if wound upon a spool with end flanges.

Having described my invention, I claim—

The process of winding magnet-coils which consists in wrapping a layer of smooth paper having reinforced or thickened edges around a suitable winding-axis, then winding a layer of wire upon the smooth surface of the paper and filling the space between the thickened edges thereof, then wrapping another and similar sheet of paper over the layer of wire and winding another layer of wire thereon between its thickened edges, and so on alternating the paper with the wire until the required size of coil is obtained, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

RICHARD VARLEY.

Witnesses:
M. M. CROSWELL,
WILLETT CHADWICK.