ARMATURE WINDINGS OF DIRECT CURRENT DYNAMOS: EXTENSION AND APPLICATION OF A GENERAL WINDING RULE

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E. ARNOLD & FRANCIS B. DE GRESS

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EXTENSION AND APPLICATION OF A GENERAL WINDING RULE

BY

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PREFACE.

WHILE lecturing upon electrotechnics at the Polytechnic in Riga, I experienced the difficulty of presenting to the students in a brief and simple manner the various methods of winding armatures for direct current machines, so as to enable them to solve independently any assumed problem in winding. In consequence of this, I endeavored to establish rules for the various windings, and found that all so called closed-coil windings with either a series or parallel arrangement of the inductors could be embraced under a general rule which applied equally well to ring, drum, and disk armatures. The common as well as the peculiar properties of the various windings can be accurately observed with the aid of this rule.

The relationship between ring, drum, and disk armature windings, is brought into prominence, and the transition from one winding to another can be accomplished without difficulty. This rule not only embraces all known windings, but accomplishes even more, — *a general solution of the winding problem.* By the aid of this rule, and in conjunction with the various methods of connecting inductors treated in the first section, it is possible to design other windings. In the later sections I have shown several designs for connections, which to my knowledge have never been published before. The results which I have obtained appear to be of sufficient interest to be made public, the more so because even in the best text books on electrotechnics, armature windings, especially those of multipolar machines, have been treated somewhat unsatisfactorily.

(SIGNED) E. ARNOLD.

RIGA, *March* 5, 1891.

TRANSLATOR'S PREFACE.

Professor Arnold's "Ankerwicklungen," in which is given his general formula for the design of direct current armature windings, has been considered of sufficient importance to be translated and published in the present form.

Many of the designs shown by him are of historic interest only, but the principle expressed is fundamental, and of value to the enigneer or designer, and no attempt has been made to go beyond the subject as treated in his book.

The translator's thanks are due to Messrs. A. W. K. Peirce and W. F. Crawford, for valuable assistance in preparing the work.

F. B. De GRESS.

New York, *March 5th*, 1902.

CONTENTS.

ARMATURE WINDINGS.

METHODS OF CONNECTING INDUCTORS FOR OBTAINING DIRECT CURRENTS.

If an inductor be moved in a magnetic field in such a manner as to cut the lines of force, an electromotive force will be induced in the inductor.

If the inductor belongs to a closed circuit, maintains its position relative to the direction of the lines of force, and be moved with a constant velocity, a constant electromotive force will be induced, and a current of constant strength will be obtained.

The electromotive force is induced as shown in Fig. 1, perpendicularly to the lines of force and perpendicularly to the direction of motion.

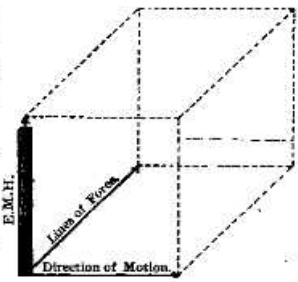

Fig. 1.

Let Fig. 2 represent a magnetic field produced by two poles of opposite sign; let the North pole stand over the paper so that the lines of force pass into the paper from the North to the South pole.

If an inductor be moved in the direction of the double arrow through the given field, an electromotive force will be induced in it in the direction of the single arrow.

To produce a closed circuit, it is assumed that the conductor slides upon two fixed rails, $A—B$ and $C—D$, whose ends are joined by the conductors AmC and BnD. Under these