

**DYNAMO ELECTRIC
MACHINERY; ITS
CONSTRUCTION,
DESIGN, AND OPERATION.
DIRECT CURRENT MACHINES**

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Dynamo Electric Machinery; Its Construction, Design, and Operation. Direct Current Machines
by Samuel Sheldon & Hobart Mason

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BY

SAMUEL SHELDON, A.M., Ph.D.

PROFESSOR OF PHYSICS AND ELECTRICAL ENGINEERING AT THE POLYTECHNIC
INSTITUTE OF BROOKLYN, MEMBER OF THE AMERICAN INSTITUTE
OF ELECTRICAL ENGINEERS, AND FELLOW OF THE AMERICAN
ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

ASSISTED BY

HOBART MASON, B.S.

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PREFACE.

THIS book is intended to be used primarily in connection with instruction on courses of electrical engineering in institutions for technical education. It is laid out on the lines of the lectures and the instruction as given in the Polytechnic Institute of Brooklyn. It is intended equally as much for the general reader, who is seriously looking for information concerning dynamo electrical machinery of the types discussed, as well as a book of reference for engineers.

The first two chapters are devoted to a brief but logical discussion of the electrical and magnetic laws and facts upon which the operation of this class of machinery depends. Calculus methods have been employed in a few places in these chapters, but the results arrived at by use of them are in such a form that they can be utilized by the reader who is unfamiliar with the processes of the calculus.

In the chapter on design it has seemed advisable to express the flux density in lines per square centimeter. Both the square centimeter and the square inch are used in practice. The alteration of the formulas to square inch units is obviously simple.

We wish to express our thanks to the various manufacturing companies who have so courteously given information, and who have kindly loaned electrotypes of their apparatus.

PREFACE TO THE SECOND EDITION.

THE cordial reception accorded this volume upon its appearance has resulted in a rapid exhaustion of the edition. Its adoption as a text-book by many educational institutions has convinced the author that others concur with him in his judgment as to what should be embodied in such a book ; and he is encouraged in the preparation of a second volume which will treat of alternating current machines and which will appear shortly. Such errors as had inadvertently crept into the first edition are here corrected, in so far as they have been brought to the attention of the author.

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DYNAMO ELECTRIC MACHINERY.

CHAPTER I.

ELECTRICAL LAWS AND FACTS.

1. **Mechanical Units.**—*Force* is that which tends to produce, alter, or destroy motion. The units of force are the pound and the dyne. The *dyne* is that force, which acting on one gram for one second, will produce a velocity of one centimeter per second.

Work is the production of motion against resistance. The units of work are the foot-pound and the erg. The *foot-pound* is the work done in lifting a body weighing one pound one foot vertically. The *erg* is the work performed by a force of one dyne in moving a body one centimeter in the direction of its acting. The joule is a larger unit much used, and is equal to 10^7 ergs.

Energy is the capacity to do work. Energy is divided into *Kinetic* energy and *Potential* energy. A body possesses kinetic energy in virtue of its motion, while potential energy is due to the separation or the disarrangement of attracting particles or masses. A wound up spring has potential energy because of the strained positions of the molecules, while a weight raised to a height has potential energy because of the separation of its mass from the