# PRINCIPLES OF DYNAMO-ELECTRIC MACHINES: AND PRACTICAL DIRECTIONS FOR DESIGNING AND CONSTRUCTING DYNAMOS

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Principles of Dynamo-Electric Machines: And Practical Directions for Designing and Constructing Dynamos by Carl Hering

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CARL HERING

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OF

# DYNAMO-ELECTRIC MACHINES

AND

## PRACTICAL DIRECTIONS FOR DESIGNING AND CONSTRUCTING DYNAMOS.

With an Appendix containing several Articles on Allied Subjects and a Table of Equivalents of Units of Measurement.

BY

CARL HERING.

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# PREFACE.

ENGINEERS and machinists practically engaged in designing, constructing and repairing dynamos, as well as amateurs, students of electrical engineering and electrical artisans, frequently find it difficult either to understand the true principles of the dynamo or to deduce the proper proportions, from the information contained in existing text-books. This arises chiefly from the fact that much of the valuable information given by physicists unfortunately is not always in the form in which it may be practically applied by the engineer. No doubt also many lack that knowledge which is not usually found in text-books, and which is obtained only from actual experience with dynamos.

To meet these needs, the author has endeavored to give in a concise and simple form the information most required by those using, building or repairing dynamos. In doing so it has not been thought necessary to preface the book with an elementary treatise on electricity in general, as this is already contained in numerous text-books; the author pre-supposes, on the part of the reader, a general knowledge of the subject of electricity and its applications, that which is contained in this book being limited chiefly to details of the practical application of these principles to the designing, construction and care of dynamos. The book is therefore intended more particularly for builders and attendants of dynamos, amateurs and students. It is needless to say that it is not intended for experts, physicists or theorists, nor for those who have the facilities and time to search for such information in the more advanced publications.

Abstruse theories of dynamos have been entirely omitted as being of little use to the practical engineer. Until such theo-

ries have been thoroughly tested by repeated and varied applications in practice, and are reduced to such a form that they may be readily applied, the constructor of dynamos is recommended to use the well tried but less direct methods. Probably the best among the newer methods of designing magnets for dynamos, and one which appears to be an important improvement in the right direction, is that proposed by Mr. Gisbert Kapp, in the *Proceedings of the Society of Telegraphic Engineers*, November 11th, 1886, and subsequent papers, to which the more advanced readers are referred.

It is assumed, in this book, that the reader has a knowledge of arithmetic and understands the application of simple formulæ. All formulæ, laws and relations are given in as simple forms as are consistent with clearness, but it is possible that in doing this the author may sometimes have sacrificed strict scientific accuracy; it was thought, however, that as the calculation of the parts of dynamos does not admit of absolute precision, this would not be objectionable.

The subject matter of this volume first appeared as a serial in the *Electrician and Electrical Engineer*, of New York, but it has been revised in numerous parts. The Appendices contain several papers by the author on allied subjects (Appendix IV being only an abstract of the original), which were also published in the above Journal, and which it is thought might be of use to the readers of this book. To the table of equivalents have been added those of work, power and heat, besides numerous others, making it more nearly complete.

CARL HERING.

University of Pennsylvania,
*February*, 1888.

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