

# **THE INDUCTION MOTOR**

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The Induction Motor by Benj. F. Bailey

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**BENJ. F. BAILEY**

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THE  
INDUCTION MOTOR

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## PREFACE

IN presenting a new treatise on the induction motor, the writer is aware that he is entering a field in which there are already many excellent works. In this book, however, an attempt is made to present the subject from a somewhat new standpoint. The endeavor has been to produce a work that will have the greatest possible value for those who wish to inform themselves more fully regarding the theory of the induction motor than they can by studying the elementary text-books, but who at the same time do not care to go too deeply into the theoretical aspects of the question. The writer's aim has, therefore, been to present so much of the theory as is necessary to understand the phenomena of the induction motor, so far as these phenomena relate to the design or operation of these machines.

The student is assumed to have some knowledge of alternating currents, and to understand in a general way the operation of the alternator, the synchronous motor, the induction motor, etc. To this end, he is supposed to have read some of the several elementary texts dealing with these subjects.

Throughout the book, an earnest endeavor has been made to present clearly the physical conception of the actions taking place. It is the writer's belief that nine-tenths of the trouble experienced by many people in studying the action of electrical machinery comes from the lack of a clear idea of the elementary physical actions. An attempt is made to apply mathematical reasoning to the problem before this understanding is obtained, and the result is a mental haze, which is perhaps never dissipated. The reader is therefore strongly urged to study carefully the first two chapters, and make sure that they are fully understood, before going farther.

Several subjects of the greatest practical importance have been only briefly mentioned, if treated at all, by previous writers. Some of these are the variation of the starting torque in different positions of a wound rotor, the disadvantage of too great starting torque in squirrel-cage motors, the iron losses in the rotor teeth, etc. It is also thought that the examples of design given in most of the books

on this subject are not representative of present conditions. This is on account of the fact, well known to designers, that in recent years a marked reduction in the weight and dimensions of induction motors has taken place. It is believed that the examples of design given are fairly representative of average modern motors.

The writer wishes to take this opportunity to acknowledge his indebtedness to those who have preceded him in this field. Every work of an engineering nature is necessarily founded on that of others. An attempt to give original demonstrations of all of the elementary facts in relation to a subject, necessarily leads to a far less simple treatment than the frank use of older methods, when these methods are at least as clear as anything the author has to offer in their stead. In this regard, the present treatise is no exception. Particular mention should be made of the excellent works of Behrend, Boy de la Tour, and McAllister. In particular, the treatise of the last named author has been drawn upon for several simple and lucid demonstrations, notably for the proof of the circle diagram, and for one of the methods of treating the subject of single-phase motors. Credit has been given in the text for contributions of various writers. When this has not been done, the omission is due either to a lack of knowledge on the part of the author, of the work in question, or an uncertainty regarding the author to whom such credit should be given.

Lack of time and space has caused the omission of much material of historical interest. The same reason has caused the omission of the discussion of many ingenious devices designed to improve in various ways the performance of induction motors. Many of these relate to methods of improving the starting performance of induction motors, and present numerous points of theoretical and practical importance. In order to keep the size of the book within reasonable limits, it was thought best to limit the discussion almost entirely to devices in successful operation, and to those of recent introduction which seem most likely to be of permanent value. For the same reason, the treatment has been almost entirely confined to motors built in the United States.

For much of the experimental work mentioned in the text the author is indebted to the careful work of Mr. H. L. Tanner, Instructor in the Department of Electrical Engineering of the University of Michigan, and to Mr. Stanley D. Livingston, assistant in the same.

ANN ARBOR, MICH., September, 1911.

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