ALTERNATING CURRENTS: THEIR ELEMENTS EXPLAINED, AND THEIR CALCULATION EFFECTED WITHOUT THE USE OF HYPERBOLIC FUNCTIONS

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Alternating Currents: Their Elements Explained, and Their Calculation Effected Without the Use of Hyperbolic Functions by H. R. Kempe

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Trieste

Alternating Currents

Their Elements Explained, and their Calculation Effected without the Use of Hyperbolic Functions

BY

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PREFACE

In the Preface to the First Edition of my "Handbook of Electrical Testing" (published in 1876) I wrote as follows:—

"My aim has been not only to explain the practical application of formulæ given in existing text-books, but also to show by what processes they may be obtained. When an amateur in electrical science, I had experienced considerable difficulty in satisfying myself upon this point, and I know that others have been, and are, similarly in need of information and guidance. With the view, therefore, of doing something to aid students and those who may be concerned or interested in the inquiry, the present treatise is offered."

These words have again and again recurred to me in the course of my career, and I have several times been asked whether I could not bring out a treatise on the lines of the book above referred to, but dealing with "alternating" instead of with "continuous" currents. This is a task which my professional duties have, so far, prevented my undertaking. With the view, however, of doing *something* towards helping students, I have put together in the present handbook some notes which I had made from time to time dealing with certain problems which had interested me, and in reference to which I had been unable to find any sufficient explanations. The fact that a calculating machine

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gives unerring results, and that in certain problems the application of "complex quantities" enables correct formulæ to be obtained, may be considered by some to be all-sufficient explanation. It has not, however, satisfied me, and I know that it has not satisfied many others.

It has been stated* that "problems in which the current has a continually changing value in consecutive sections of the line, due either to leakage between the two sides of the line or to the capacity of the line, can be accurately solved *only* by the use of hyperbolic trigonometry." I think that I have shown in the following pages that this is hardly a correct statement.

As far as possible the international symbols agreed upon by the International Electrotechnical Commission are used throughout the book. Also the symbols in the letterpress have been made to correspond in style with the lettering on the figures, a practice which, for no apparent reason, is seldom followed.

H. R. KEMPE.

BROCKHAM,
BETCHWORTH,
SURREY.

* See "Hyperbolic Functions and their application to Problems in Electrical Engineering," by J. H. Morecroft, Assist. Prof. of Electrical Engineering, Columbia University.

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ALTERNATING CURRENTS

CHAPTER I

GENERAL

Nomenclature.

Name of Unit.	Sign.	Name of Unit.	Sign.
Ampere	A	Farad	F
Milliampere	mA	Microfarad	μF
Volt	V	Henry	H
Ohm	O	Millihenry	mH
Megohm	MO		

1. If an electromotive force E (Fig. 1) produces a steady current I from A to B through a resistance r in

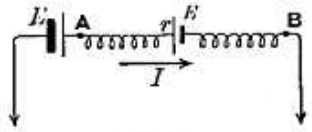

Fig. 1.

which a back electromotive force E exists, then we have—

$$I=\frac{E-E}{r}.$$