

**STANDARD POLYPHASE
APPARATUS
AND SYSTEMS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649253944

Standard polyphase apparatus and systems by Maurice A. Oudin

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

MAURICE A. OUDIN

**STANDARD POLYPHASE
APPARATUS
AND SYSTEMS**

STANDARD POLYPHASE APPARATUS AND SYSTEMS

BY
MAURICE A. OUDIN, M. S.
Mem. Am. Ins. E. E.



*WITH MANY PHOTO-REPRODUCTIONS,
DIAGRAMS AND TABLES*

NEW YORK
D. VAN NOSTRAND COMPANY
23 MURRAY AND 27 WARREN STREETS

LONDON
SAMPSON LOW, MARSTON & COMPANY
LIMITED

St. Dunstan's House
FETTER LANE, FLEET STREET, E.C.

1899

TK 1161
09

COPYRIGHT, 1899
BY
D. VAN NOSTRAND COMPANY.
78680

C. J. PETERS & SON, TYPOGRAPHERS,
BOSTON.

PLIMPTON PRESS,
H. M. PLIMPTON & CO., PRINTERS & BINDERS,
NORWOOD, MASS., U.S.A.



PREFACE.

THE development of polyphase apparatus and the application of polyphase systems to the solution of engineering problems, have been so rapid and varied of late, that there is no available literature on the subject which is at once practical and up-to-date. The excuse for this little book is the demand for information, in a convenient form, on the characteristics and uses of the various types of polyphase apparatus, and on the actual working of the several polyphase systems now sanctioned by the best practice.

These notes are intended for electrical engineers, central station men, and others who talk about, operate, or are interested in polyphase machinery. While a certain general acquaintance with alternating-current apparatus is presupposed on the part of the reader, the author believes that the reader whose experience has been confined to direct-current machinery, will, nevertheless, experience no great difficulty in reading and understanding this book.

In view of the amazing increase in number and magnitude of installations for the transmission of power by polyphase currents, this book has been written with special reference to the problems that belong to this class of engineering work.

The author desires to acknowledge his indebtedness to many electrical manufacturing concerns for the use of much special and valuable information, and to the electrical press for the use of a number of plates.

NEW YORK, *June*, 1899.



CONTENTS.

CHAPTER	PAGE
I. DEFINITIONS OF ALTERNATING-CURRENT TERMS . . .	1
II. GENERATORS	17
III. GENERATORS (<i>Concluded</i>)	38
IV. INDUCTION MOTORS	60
V. SYNCHRONOUS MOTORS	92
VI. ROTARY CONVERTERS	106
VII. STATIC TRANSFORMERS	120
VIII. STATION EQUIPMENT AND GENERAL APPARATUS . .	140
IX. TWO-PHASE SYSTEM	166
X. THREE-PHASE SYSTEM	180
XI. MONOCYCLIC SYSTEM	194
XII. CHOICE OF FREQUENCY	207
XIII. RELATIVE WEIGHTS OF COPPER FOR VARIOUS SYSTEMS,	214
XIV. CALCULATION OF TRANSMISSION LINES	221

STANDARD POLYPHASE APPARATUS AND SYSTEMS.

CHAPTER I.

INTRODUCTORY.

DEFINITIONS OF ALTERNATING-CURRENT TERMS.

Alternating Currents. — On account of the limitation imposed by the space of this book, mathematical demonstrations of alternating-current phenomena have been omitted in the following pages, and the chapter will be found to consist mainly of elementary explanations and statements which partake of the nature of definitions. It is hoped that these definitions will be found useful in aiding the uninformed reader to obtain a clearer understanding of the principles underlying polyphase apparatus and methods. For a more comprehensive treatment of alternating-current phenomena, the reader is referred to the many works on the subject.

The alternating-current generator was one of the earliest applications of the principles of induction. Unlike the current from the direct-current generator, which came at a later date, the alternating current rapidly changes its value and direction, the fluctuations being periodical. Such a current reaches a maximum in one sense, de-

