

**A MANUAL OF
PRACTICAL PHYSICS, FOR
STUDENTS OF SCIENCE
AND ENGINEERING, VOL. I**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649045211

A Manual of Practical Physics, for Students of Science and Engineering, Vol. I by Ervin Sidney Ferry & Arthur Taber Jones

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

ERVIN SIDNEY FERRY & ARTHUR TABER JONES

**A MANUAL OF
PRACTICAL PHYSICS, FOR
STUDENTS OF SCIENCE
AND ENGINEERING, VOL. I**

A MANUAL OF
PRACTICAL PHYSICS

I

A MANUAL OF PRACTICAL PHYSICS

For Students of Science and Engineering

VOLUME I. — Fundamental Measurements and Properties of Matter. — Heat.

By **ERVIN S. FERRY** and **ARTHUR T. JONES**

VOLUME II. — Wave Motion, Sound, and Light.

[In preparation]

VOLUME III. — Electrical Measurements.

[In preparation]

LONGMANS, GREEN, AND CO.

NEW YORK, LONDON, BOMBAY, AND CALCUTTA

A MANUAL
OF
PRACTICAL PHYSICS

FOR STUDENTS OF SCIENCE AND ENGINEERING

BY

ERVIN SIDNEY FERRY

PROFESSOR OF PHYSICS, PURDUE UNIVERSITY

AND

ARTHUR TABER JONES

ASSISTANT PROFESSOR OF PHYSICS, PURDUE UNIVERSITY

VOL. I

**FUNDAMENTAL MEASUREMENTS AND
PROPERTIES OF MATTER
HEAT**



LONGMANS, GREEN, AND CO.

91 AND 93 FIFTH AVENUE, NEW YORK

LONDON, BOMBAY, AND CALCUTTA

1908

0237
F4

~~Handwritten scribble~~
COPYRIGHT, 1908,
BY LONGMANS, GREEN, AND CO.
All rights reserved.

Norwood Press
J. B. Cushing Co. — Berwick & Smith Co.
Norwood, Mass., U.S.A.

PREFACE

THE aim of the present work is to furnish the student of pure or applied science with a self-contained manual of the theory and manipulation of those measurements in physics which bear most directly upon his subsequent work in other departments of study and upon his future professional career.

Only those experimental methods have been included that are strictly scientific and that can be depended upon to give good results in the hands of the average student. Although several pieces of apparatus, experimental methods, and derivations of formulæ that possess some novelty appear, our fixed purpose has been to use the standard forms except in cases where an extended trial in large classes has demonstrated the superiority of the proposed innovation.

It has been assumed that the experiment is rare that should be performed before the student understands the theory involved and the derivation of the formula required. Consequently the theory of each experiment is given in detail and the required formula developed at length. The more important sources of error are pointed out, and means are indicated by which these errors may be minimized or accounted for.

The book is designed to be commenced during the second college year. It presupposes a working knowledge of trigonometry and college algebra, but does not require analytic geometry nor calculus.

Most of the experiments here given were printed privately some years ago and have since been in constant use, under our direction, by classes of from one to two hundred students each semester. They have all been carefully revised for the purposes of this volume.

We are indebted to Mr. G. G. Becknell, Instructor in Physics in Purdue University, for the method we have adopted for solving the equation for the coefficient of expansion of a gas.

E. S. F.

A. T. J.

CONTENTS

PART I

FUNDAMENTAL MEASUREMENTS AND PROPERTIES OF MATTER

CHAPTER I

GENERAL NOTIONS REGARDING PHYSICAL MEASUREMENT

ART.	PAGE
1. Introductory	1
2. Errors	2
3. Methods of expressing Results	8
4. Notation	15

CHAPTER II

METHODS AND APPARATUS FOR THE MEASUREMENT OF FUNDAMENTAL QUANTITIES

1. Measurement of Distance	16
2. Measurement of Mass	25
3. Measurement of Time	32

CHAPTER III

LENGTH, AREA, ANGLE

EXP.	PAGE
1. The Thickness of a Thin Plate by Means of a Spherometer and an Optical Lever	42
2. The Radius of Curvature of a Spherical Surface	45
3. The Radius of Curvature and Sensitiveness of a Spirit Level	49
4. Verification of a Barometer Scale	53
5. The Correction Factor of a Planimeter	54
6. The Correction for Eccentricity in the Mounting of a Divided Circle	61