

**SHORT LECTURES TO ELECTRICAL
ARTISANS: BEING A COURSE OF
EXPERIMENTAL LECTURES
DELIVERED TO A PRACTICAL
AUDIENCE**

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Short Lectures to Electrical Artisans: Being a Course of Experimental Lectures Delivered to a Practical Audience by J. A. Fleming

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BEING A
COURSE OF EXPERIMENTAL LECTURES DELIVERED
TO A PRACTICAL AUDIENCE.

BY

*San John
J. A. Fleming*

J. A. FLEMING, M.A., D.Sc. (LOND.),

FELLOW AND LATE SCHOLAR OF ST. JOHN'S COLLEGE, CAMBRIDGE;
FELLOW OF AND PROFESSOR OF ELECTRICAL TECHNOLOGY IN UNIVERSITY COLLEGE, LONDON;
MEMBER OF THE SOCIETY OF TELEGRAPH ENGINEERS AND ELECTRICIANS;
MEMBER OF THE PHYSICAL SOCIETY OF LONDON;
EXAMINER IN ELECTRICAL ENGINEERING TO THE CITY AND GUILDS OF LONDON
INSTITUTE FOR THE ADVANCEMENT OF TECHNICAL EDUCATION.

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PREFACE.

THESE short Lectures require a word, by way of preface, to explain that they were not in any way intended as a connected exposition of even elementary principles of electro-technics. Being desirous that practical training should be supplemented by some attention to theory, Mr. R. E. B. Crompton requested me to give during the past winter some Lectures on subjects connected with the principles underlying modern electrical engineering to the pupils and workmen associated with his firm, and the following pages contain the transcript of these Lectures delivered at Chelmsford. Confident that the right direction for technical training is to bring home to the craftsman the scientific principles involved in daily work which passes under his hands, the subjects which most naturally claimed attention were those involved in everyday experience of the audience addressed. It is with the hope that the elementary explanations here given may be useful to other similar practical students, and as introductory to larger treatises, that they are here reprinted.

J. A. F.

September, 1886.

PREFACE
TO THE SECOND EDITION.

THE call for a second edition has afforded the opportunity to erase several typographical errors, and to remove some other blemishes which had escaped notice and correction in the first edition of this little book, but which courteous critics in the technical journals have pointed out. It has not been deemed desirable to enlarge the scope of these elementary expositions, since to do this effectually would have altered the character of the book. At the same time many paragraphs have been re-worded, in the hope that clearness might thereby be gained.

J. A. F.

UNIVERSITY COLLEGE, LONDON.
January, 1888.

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SHORT LECTURES
TO
ELECTRICAL ARTISANS.

LECTURE I.

§ 1. I HOLD in my hand a large fragment of a certain iron ore, found in various parts of the world. It is a combination of iron and oxygen, similar in nature to, but not exactly the same as the rust or scale which forms on iron which has been exposed to the fire. This native oxide of iron has however two properties not possessed by a fragment of ordinary iron scale. If it is placed in iron filings, these are attracted to it and stick to it, adhering mostly at two points on nearly opposite sides; also if a properly-shaped fragment is hung up by a fine silk thread, it will take up a definite position with respect to the north and south direction. This iron ore is called a lodestone, or *natural magnet*. These properties of it were known from very early times, both to the Greeks and to the Chinese. If we take a steel knitting-needle and stroke it always one way with that corner of a lodestone which most attracts iron filings it is found that the lodestone imparts its peculiar property to the steel, and the steel needle then possesses the power of picking up filings by its ends, and of turning round to point nearly