

**ELECTRO-MOTORS: A TREATISE ON THE
MEANS AND APPARATUS EMPLOYED IN
THE TRANSMISSION OF ELECTRICAL
ENERGY AND ITS CONVERSION INTO
MOTIVE POWER, FOR THE USE OF
ENGINESSRS AND OTHERS**

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Electro-Motors: A Treatise on the Means and Apparatus Employed in the Transmission of Electrical Energy and Its Conversion into Motive Power, for the Use of Engineers and Others
by J. W. Urquhart

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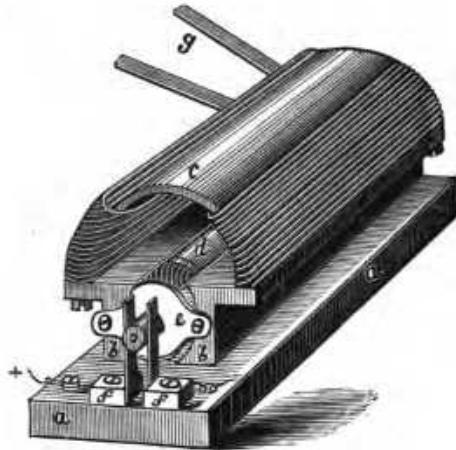
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ELECTRO-MOTORS.

FRONTISPIECE.



THE AUTHOR'S ELECTRO-MOTOR.



TROUVE'S ELECTRO-MOTOR.

ELECTRO-MOTORS:

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TRANSMISSION OF ELECTRICAL ENERGY AND
ITS CONVERSION INTO MOTIVE POWER.

FOR THE USE OF ENGINEERS AND OTHERS.

By J. W. URQUHART, ELECTRICIAN.

Author of "Electro-Plating: a Practical Handbook," "Electric Light,"
"Electro-Typing: a Practical Manual," etc.

WITH NUMEROUS ILLUSTRATIONS.

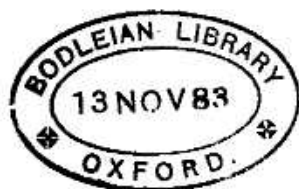
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PREFACE.

THIS work is intended to convey, to engineers and others interested in the subject, an explanation, in conveniently plain terms, of the leading electrical and magnetic principles involved in the transmission of electrical energy and its subsequent conversion into motive power. It also gives examples of the means and apparatus employed in the working of electric railways, and other instances of the electrical translation of power. It is intended further to prepare the way towards a more thorough study of the correlative links between latent or potential energy, electricity, magnetism, and actual or active energy.

The mere question of obtaining motive power from electricity is neither new nor startling; but it is only since the discovery of the means of economically producing powerful currents of electricity that motion by this method became practicable for general purposes and the propulsion of railway vehicles. When currents of electricity were first utilised for practical purposes, and for many years afterwards, the cost of

generating them precluded their application to the production of motion. They were only used for telegraphic signalling and for electro-metallurgical purposes. By the discoveries and developments of the past few years the whole aspect of the question has undergone a great change. The most powerful currents were, by the introduction of the dynamo-electric principle, fourteen years ago, placed at our disposal. The cost of producing these currents was immensely diminished. They could be evolved from the energy of coal in the steam engine, and they could be conveyed to a distance, to be then re-converted into mechanical motion, light, heat, or other required form of active energy. The waste powers of nature, such as waterfalls, could be brought into requisition for the development of powerful currents, and it at once became practicable to produce motion or light by means of these currents. The first might be employed in the propulsion of railway trains, and in moving machinery; the second might be used in the lighting of the highways. The rate of progress so far has been rapid, but more attention was at first paid to electric lighting than to the transmission or distribution of power. Now, however, that several instances of the application of the latter principle exist, in the form of electric railways and otherwise, its utilisation is only a question of time. The first permanent electric railway at Berlin has proved so satisfactory in its

working that it has been considerably extended. The first section was from Berlin to Lichterfelde, and it has since been extended successively to Tetlow and Potsdam, the further extension to Steglitz being at present in course of construction. The German Government have further granted a concession for the formation of an electric railway from Eisenach to Wartburg.

The present volume may therefore be considered as an attempt not only to elucidate the fundamental principles underlying these means of translating power, but to explain the construction of the apparatus employed, with particulars of examples of what has already been accomplished in this direction. It appears necessary to explain that the construction of dynamo-electric machines is only cursorily treated, since it has already received attention in works devoted to electric lighting.

The author is glad to have this opportunity to tender his thanks for the liberal encouragement accorded to his previous endeavours in the domain of electro-metallurgy and electric lighting. He has to acknowledge his indebtedness for valuable assistance and interesting facts in the present instance to Messrs. Siemens Brothers and Co., of London; MM. Trouvé, Fontaine, and Deprez, of Paris; Sir William Armstrong, F.R.S.; and other pioneers of progress in electrical science.

London, January, 1882.