

**THE RELATIVE MERITS OF
SIMPLE AND COMPOUND
ENGINES AS APPLIED TO
SHIPS OF WAR. PRIZE ESSAY**

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by Niel McDougall

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Prize Essay,

BY
NIEL M^C DOUGALL,

ASSOCIATE OF THE INSTITUTION OF CIVIL ENGINEERS, AND MEMBER OF THE
INSTITUTION OF NAVAL ARCHITECTS; OF THE DEPARTMENT OF THE
CONTROLLER OF THE NAVY, ADMIRALTY, WHITEHALL.

With an Appendix by the Author.

CONTAINING PARTICULARS AND ANALYSES OF RECENT EXPERIMENTS.

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"INSCIENS SCIENTIA."

TO the writer of this Essay was awarded the prize of £20, offered in the early part of last year by the JUNIOR NAVAL PROFESSIONAL ASSOCIATION, for the best Essay on "The Relative Merits of Simple and Compound Engines as applied to Ships of War." The following were the terms upon which competition was invited:—

I.—Competition is open to all.

II.—The Essays must be rendered to the Hon. Sec., care of Messrs. GRIFFIN & Co., Portsea, before the 1st August, 1874.

III.—The Essays to be strictly anonymous, but each to have a motto and to be accompanied by a sealed envelope, with the motto outside and the name of the competitor inside. It is desirable that the Essay should not exceed 100 pages of the size of the "Proceedings" of the Association.

IV.—The Essays will be submitted for decision to Professor COTTERILL, M.A., Professor of Applied Mechanics, Royal Naval College, Greenwich; Chief Inspector WILLIAM EAMES, R.N., the Chief-Engineer of H.M. Dockyard, Chatham; and JOHN PENN, Esq., F.R.S., Greenwich.

V.—The Essays will become the property of the Association, to publish if desirable.



PREFACE.

IN competing for the Prize which this Essay has secured, the writer was not in a position to use data connected with the Navy other than might be accessible to competitors not in the Admiralty service. Particulars of interest not before published have, however, by permission, now been added.

There are conclusions to be drawn from a study of the history of the compound engine in the Navy upon which it is obviously impossible for a servant of the Admiralty to speak with perfect freedom. There is one however which may here with propriety be indicated. The dangerous lengths to which purely theoretical views may be carried in the pursuit of a chimerical perfection in some single direction in the treatment of mechanical questions was remarkably exemplified in the late Professor RANKINE'S advocacy of the complicated six-cylinder compound engines of the *Constance*, as examples of successful Naval engineering. As compared with other machinery, space, weight, simplicity, facility of handling, and facility for repair had been sacrificed in these engines, but a nearly perfect "balance of driving forces" had been secured, a possible saving of fuel had thus been effected, and the engines were therefore models in the estimation of Professor RANKINE, undoubtedly the greatest master of abstract science as applied to constructive art, in the Committee on Admiralty Designs.

It is pretty certain that if a Commander took a ship engined in this way into an action, such as all experience gained since the date of the *Constance* teaches us must be expected in any future war, he would be as likely to prove dangerous to a friend as to an enemy, and the probabilities of his ever bringing her out again would certainly not be great.

The broad practical view which the most eminent English mechanicians as a rule have taken in selecting means to attain special ends has placed their work in point of trustworthiness

and general fitness far above that of the engineers of other countries. It is the conviction that a departure of considerable moment from our traditional practice has been made in the adaptation of commercial machinery to our fighting ships which has chiefly weighed with the writer in penning this essay, and he has endeavoured to treat his subject in such a manner as to make it intelligible as far as possible to non-technical readers.

The term "commercial" is applied throughout to that form of the compound engine having inter-dependent cylinders of unequal diameter. It is the form which, arranged in various ways, has been in general use for a number of years in the Commercial Marine and for some time back adopted for ships of all classes in the Navy. The term is used in order to distinguish this type of engine from the compound engines of the French Navy, and from engines of the "composite" form capable of being worked either as simple expansive engines or as compound engines, a set of engines of which type, as will be seen in the appendix, the eminent firm of Messrs. JOHN PENN & SON have now in hand.

The writer has much pleasure in taking this opportunity of thanking the many Engineers in the Admiralty Service and outside it, who have kindly furnished him with valuable information; and of expressing especially his gratitude to his friends in the French and American Navies for the freedom with which they have favoured him with their opinions and for the courtesy with which they have supplied information.

It is hoped that the conclusions arrived at, and the facts and figures by which they are supported, may help to the solution of a question which is of importance to all interested in the use of steam.

