MARINE AND NAVAL BOILERS
PREFACE.

The "Text-Book on Naval Boilers," by the late Captain F. C. Bieg, U. S. N., has been in continuous use at the United States Naval Academy for the instruction of midshipmen since 1903. This book was one of the best, for its purpose, ever produced at the Academy. The advances in the last few years, however, both in the art of boiler construction and management and in the use of liquid fuel, made imperative either a very thorough revision of Bieg or a new textbook giving the latest information on the subject. It was unfortunate for the midshipmen and for the naval service that the death of Captain Bieg caused the work of revision of the boiler text-book to fall on the shoulders of others.

Early in the fall of 1910, at the request of the head of Department of Marine Engineering and Naval Construction, United States Naval Academy, the revision of Bieg was undertaken by Lieutenant Commander Frank Lyon, United States Navy, who was later joined in the work by Lieutenant Commander A. W. Hinds, United States Navy.

As the revision progressed it was found that, while about one-fourth of the old text could be used, the rearrangement and different methods of handling the chapters would make the new edition very different in appearance and in contents from the book under revision. For the above reasons, and due to the fact that some of the theories herein advanced may be disputed, it was decided by the revisers to accept the responsibility and publish the new book under their own names. This decision was referred to and concurred in by the Board of Control of the United States Naval Institute, the owner of the copyrights of the old book.

The chapter on "Corrosion" is the result of studies and experiments conducted by Lieutenant Commander Lyon during 1909, 1910 and 1911.

Sincere thanks are extended to Rear Admiral H. I. Cone, Engineer-in-Chief, United States Navy, and to his assistants, as well as to the manufacturers of the various types of boilers, fittings and accessories, for their uniform courtesy and valuable help.
Grateful acknowledgment is made to the American Society of Naval Engineers, and to Commander U. T. Holmes, United States Navy, author of "Experimental Engineering," for their generosity in allowing the use of both subject matter and cuts.

Thanks are due to Commander M. E. Reed, United States Navy, head of the School of Marine Engineering, and to the students at that school for assistance given by criticising the manuscript before sending it to print.

FRANK LYNON,
A. W. HINDS,

UNITED STATES NAVAL ACADEMY,
ANNAPOLES, MD., JANUARY, 1912.

In the preparation of this book many other text-books and publications have been consulted, among which are:

Text-Book on Naval Boilers. F. C. Bieg.
Steam Boiler Economy. Kent.
Journal of the American Society of Naval Engineers.
Machinery Specifications for U. S. Naval Vessels.
Journal of the American Society of Mechanical Engineers.
Report of the Liquid Fuel Board.
Steam Boilers. C. H. Peabody and E. F. Miller.
Marine Steam by the Babcock & Wilcox Co.
Steam Boiler. Fowler.
Power and the Engineer.
Steamship.
Jones' Physical Chemistry.
Circulars of Makers of Boiler Fittings and Accessories.
PREFACE TO SECOND EDITION.

The work of revision of the excellent book on Marine and Naval Boilers, by Lieutenant Commanders Frank Lyons and A. W. Hinds, was undertaken at the request of the U. S. Naval Institute, because the original edition was sold out and it was deemed advisable to take advantage of the opportunity to bring the book up to date in every respect. The largest part of the work of revision consisted in the elimination of those types of boilers and accessories which have become obsolete, and the substitution of the latest designs and types installed in the U. S. Navy.

As this book is intended primarily for the use of midshipmen at the Naval Academy, a large part of it is necessarily devoted to details of construction, to the exclusion of the theory of boiler design. The theory of heat transfer, while of the utmost importance in the intelligent operation and management of boilers, is treated in a very general way because of lack of space, and on account of the omission of the study of technical thermodynamics from the curriculum. The discussion of combustion is also necessarily brief for the same reasons.

The chapter on "Corrosion" as originally written by Commander Lyon was found to be too involved for the use of midshipmen, and it was considered necessary to omit most of the theory of corrosion and to substitute therefor a short discussion of experimental results, and of the practical methods of preventing corrosion. The elimination of the theory does not indicate that a knowledge of such theory is undesirable and for a thorough knowledge of this subject the student is referred to the many good treatises recently published.

The revisers desire to express their sincere thanks to Lieutenant G. S. Bryan, U. S. N., for assistance in the preparation of the chapter on "Corrosion"; to the officers of the Bureau of Steam Engineering, Navy Department, for their kind assistance in furnishing information and blue prints; to the J. A. S. N. E. for the use of subject matter and of the plate of "Temperature—Viscosity Curves"; to Mr. F. H. Rittenour for the tracings used in making
some of the plates, and to the several manufacturers who furnished subject matter and blue prints for some of the cuts and plates.

Special thanks are due to Commander H. B. Price, U. S. Navy, Head of the Department of M. E. & N. C., for his helpful suggestions and criticisms, while supervising the work of revision.

W. P. BEHRLER,

_Lieutenant, U. S. Navy_,

JOHN S. BARLEON,

_Lieutenant (J. G.), U. S. Navy_.

PREFACE TO THIRD EDITION.

The revision of this book was undertaken at the request of the U. S. Naval Institute. The second edition having been sold out, it was deemed advisable to take advantage of the opportunity presented to revise the book before printing another edition.

This revision consists primarily in eliminating obsolete types and substituting more modern ones in their place. A few corrections have been made.

The reviser desires to express his thanks to the officers and instructors of the Department of Marine Engineering and Naval Construction for their assistance with helpful suggestions and criticisms.

W. L. FRIEDELL,

_Commander, U. S. Navy._
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