

THURSDAY, JUNE 9, 1904.

## AN AMERICAN TREATISE ON NAVAL ARCHITECTURE.

*Naval Architecture.* By Prof. C. H. Peabody. Pp. v+616. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1904.) Price 31s. 6d. net.

SINCE the revival of shipbuilding in the United States and the construction of the "New Navy," courses of instruction in naval architecture have been arranged at several of the universities and technical institutes. The Massachusetts Institute of Technology has taken a leading position in this matter, and has provided classes for those intending to enter the profession of shipbuilding, as well as a post-graduate course in naval architecture especially arranged for assistant constructors whose preliminary training is at the Naval College, Annapolis. For many years the Navy Department of the United States had to send their assistant constructors to Europe for instruction. The first students who so came were entered at the Royal Naval College at Greenwich; in later years many young American naval architects have been students at Glasgow University. Others have been sent to the French School of Naval Architecture. For the future, it would appear that the United States intend to supply their own educational wants in this as in other branches.

The author of the book under review is the professor of naval architecture and marine engineering in the Massachusetts Institute of Technology, and it is obvious that the book has grown largely out of his professorial work. It is also apparent that Prof. Peabody has considerable sympathy with French methods. Indeed, he adopts several French technical terms instead of their usual English equivalents, and in certain sections of the book he gives prominence to French methods as distinguished from English. While this comprehensive treatment is praiseworthy, no sufficient reason is seen for departure from the accepted terminology of English treatises on the subject.

The book is intended "to give, in a consistent and connected form, the commonly accepted theory of Naval Architecture," and it is added, "while this work is intended primarily for students, it is hoped that it may be found useful by Naval Architects and Shipbuilders in general." It is probable that this hope will be realised, so far as those sections of the book are concerned which deal with ordinary ship calculations for displacement and stability, or those illustrating many practical operations connected with the addition, removal, or transfer of weights carried by ships. Herein Prof. Peabody bases his treatment upon the frank adoption, in practice, of mechanical aids to calculation which have been introduced during the last twenty-five years, chiefly by Amsler. Naval architects owe much to that great instrument maker, and can effect with his integrators an enormous economy of labour and a great increase of speed in obtaining im-

portant results. The planimeter for many years stood alone, but when Amsler learned that, in addition to the determination of areas, it was important in the designing of ships to obtain also *moments*, and *moments of inertia*, of areas about assigned axes, he speedily produced ingenious machines which could be used by ordinary draughtsmen. These instruments were first adopted in this country, and are now generally employed.

Prof. Peabody gives a clear account of the principles and methods of use of integrators. Moreover, he furnishes an excellent summary of the latest modes of arranging the actual details of work for ships' calculations. In this department very considerable advances have been made during the last thirty years since calculations for the stability of ships became general. But while, from the draughtsman's point of view, the book is, for the most part, admirable, it does not treat with equal fulness some calculations of considerable importance, particularly those relating to weight and strength. For these his treatment can hardly be described as "up to date," or as giving full and complete information to students or calculators. There is, in fact, a want of due proportion in the space and attention devoted to the various sections. Prof. Peabody, while aiming at giving a consistent and connected account of the whole accepted theory of naval architecture, devotes particular attention to certain portions of the subject, and unduly compresses his treatment of others. Some of his longest chapters, while they are undoubtedly interesting and valuable as compilations of existing treatises on special branches of the science of shipbuilding, have not, as a matter of fact, great practical value. The theory of waves, for example, including an outline of the stream-line theory of resistance, occupies nearly one-eighth of the book, and is treated in some portions with a mathematical detail that appears inappropriate in this work, where the principal conclusions might have been given and reference made to the original authorities for the mathematical proofs.

Again, in dealing with the propulsion of ships, much space is devoted to the practical reproduction of parts of well known books dealing with the design and efficiency of screw-propellers, such as that published in England by Mr. Sidney Barnaby, and that first issued in the United States by Naval Constructor Taylor, who was a graduate of our Royal Naval College. Both these gentlemen based their work chiefly on experiments made, or on methods suggested, by the late Mr. William Froude and Mr. R. E. Froude, and furnished valuable rules for guidance in practice; but as their books are accessible, they need not have been so largely drawn upon. Having done this, Prof. Peabody was practically compelled to abridge very greatly his treatment of other sections of great importance in the current work of ship designing, wherein students might have been greatly assisted if more extended descriptions and investigations had been given.

Another feature in which the volume is not entirely satisfactory is in some of its illustrations of actual practice, and in its allusion to broad general rules

followed by naval architects in endeavouring to secure good qualities in ships. For instance, Prof. Peabody, when dealing with the question of "metacentric heights," which are the measures of the "stiffness" of ships, their power to resist inclination under the action of external forces, states that, in practice, this height "is seldom less than  $1\frac{1}{2}$  feet and seldom more than 5 feet unless it be in special forms," and then remarks that "it appears that the metacentric height for steamships is somewhere near the same for all steamships whatever their size," which is obviously incorrect on his own showing, and might easily lead students to conclude that little importance attaches to the value of the metacentric height within a very wide range; whereas it is absolutely certain, and is elsewhere recognised by Prof. Peabody, that the more moderate the metacentric height the greater is the probability of steadiness in a seaway. He also states that "metacentric height may be controlled by varying the proportion of beam to length," and does not specifically direct attention to the much greater influence of variation in the proportion of beam to draught.

In another passage he refers to the characteristic features in the curves of stability of sailing ships and steamships, and makes the generalisation that this is chiefly due to the greater metacentric height and greater freeboard of sailing ships; whereas it is perfectly well known that other considerations have larger practical effect on the curve of stability. Many sailing ships having great range of stability have only very moderate metacentric heights and moderate freeboard. Few allusions are made to the details of practical shipbuilding, and some of these indicate that the author can have had but little experience in the conduct of actual work.

These criticisms are not intended to indicate any general disapproval of the scope or character of the book. It is no doubt intended to be used as an auxiliary to class-teaching by competent professors, and for this purpose it will be extremely useful. It also compiles and brings together much information appearing in the *Transactions* of the English Institution of Naval Architects or of similar societies in other countries, and practically reproduces the essential parts of standard treatises by other authors on particular branches of the subject. Prof. Peabody makes no claim to originality, and states frankly that free use has been made of numerous works on naval architecture, as well as of original articles and memoirs. His readers have to thank him for the labour he has bestowed upon this task, and, as a compilation, the book will be useful for reference to naval architects generally. But it does not profess to be—nor, indeed, within its compass could it possibly be made—a complete treatise on the modern theory of naval architecture. Such a treatise has yet to be written, and the advances made in recent years in both the theory and practice of ship construction have been so considerable that the work of preparing it would be very heavy. It is wanted, however, and no doubt will eventually be produced.

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#### NEW ELECTRICAL TEXT-BOOKS.

*A Text-book of Static Electricity.* By H. Mason. Pp. vi + 155. (New York: McGraw Publishing Co., 1904.) Price 2 dollars.

*Dynamo, Motor, and Switchboard Circuits.* By W. R. Bowker. Pp. xi + 120. (London: Crosby Lockwood and Son, 1904.) Price 6s. net.

*Testing of Electromagnetic Machinery and Other Apparatus.* By B. V. Swenson and B. Frankenfield. Pp. xxiii + 420. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1904.) Price 12s. 6d. net.

*The Alternating Current Transformer.* By F. G. Baum. Pp. vii + 195. (New York: McGraw Publishing Co., 1903.) Price 1.50 dollars.

*The Induction Motor.* By H. B. de la Tour. Translated by C. O. Mailloux. Pp. xxvii + 200. (New York: McGraw Publishing Co., 1903.) Price 2.5c dollars.

THE subject of electrostatics is not *per se* one of very great importance either to the electrical engineer or the student of electricity, and it is open to question whether a text-book devoted to the elementary principles of the subject is much needed. Still, there is something to be said for having collected together between one pair of covers all the information which is usually only to be found scattered somewhat irregularly throughout the pages of a more comprehensive manual. Mr. Mason opens with a discussion of the general principles of electrostatics, and proceeds to consider in more detail capacity, electrostatic instruments, and static generators. The fact that there is not very much to say and plenty of space in which to say it has enabled the author to make his descriptions very complete and clear, and the further advantages of large type and numerous illustrations should help to make the book a very useful work of reference.

Mr. Bowker's book consists chiefly of diagrams of connections, with short explanatory notes: the number of different cases considered is very large—there are over a hundred diagrams—and these cover practically all the more important circuits with which an electrician is likely to have to deal, whether in direct current, single phase, or polyphase work. We do not doubt that the book will prove useful to those who are concerned rather with connecting up machinery than with electrical engineering, but we should hardly have thought that the matter was of sufficient importance to warrant its treatment as a separate study.

The work on the testing of electromagnetic machinery by Messrs. Swenson and Frankenfield is the first of two volumes, and deals only with direct-current machinery. It is a book which can be thoroughly recommended to all students of electrical engineering who are interested in the design, manufacture, or use of dynamos and motors. After a brief introduction, which contains, incidentally, some excellent advice on the writing of reports (which advice, by the way, the authors themselves transgress in the specimen report which they print), the authors give a series of nearly a hundred tests, which are well chosen and