

question from another standpoint, if they will only read a little wider into the context than the author allows them to do in his work. We do not wish to impugn Dr. Tebb's absolute honesty in this matter; we are only astonished that, with the materials at his disposal, much of which he has evidently read very carefully, he has arrived at the position indicated in this work.

OUR BOOK SHELF.

The Heat Efficiency of Steam Boilers: Land, Marine, and Locomotive. With tests and experiments on different types, heating value of fuels, analyses of gases, evaporation, and suggestions for testing boilers. By Bryan Donkin, M.Inst.C.E. Pp. xvi + 311. (London: Charles Griffin and Co., Ltd., 1898.)

THE main value of this book will undoubtedly lie in the tables, which fill about 100 of its pages, and give in an admirably complete form the results of no less than 405 tests of the efficiency of steam boilers of almost every type. The labour of collecting the material must have been great, and the author has selected with judgment the information needed, practically everything wanted is to be found in the twenty-six columns of the tables, and no useless matter has been incorporated. The only addition which might have been made with advantage is the temperature of the feed-water, especially in those cases where no economiser was in use. Useful summary tables are given on pp. 116, 117 and 118, and in chapter xiii. the author discusses the general conclusions to be drawn from these trials, but without coming to any definite decision. As pointed out in the book, the wide variations in the efficiency of the same type of boiler when worked under different conditions makes it impossible to lay down any general laws, though the graphic representation on p. 223 of the relationship between efficiency and rates of evaporation per square foot of heating surface per hour, is of much value, and should be of use to the designer.

In reference to the calculation of the heating value of coal by Dulong's formula, there can be no doubt that it gives results which are too small when compared with calorimeter tests; the figures will be found, however, to agree much better when in the calculation no deduction is made from the hydrogen for the portion assumed, apparently without reason, to be chemically united with the oxygen. A valuable chapter is that dealing with the transmission of heat through boiler plates, because Blechynden's and Durston's recent experiments on this important question are given in a very clear and concise fashion for reference.

The author hardly devotes enough space to the description of the instruments for analysing furnace gases and their use, and those unfamiliar with the appliances and their working will find it difficult to teach themselves much by merely reading these paragraphs; they might well have been amplified since, as the author points out, the accurate analysis of the gases is the most important, and certainly the most difficult, point in boiler testing.

In addition to dealing with boiler testing, the author describes many of the important accessories which have been introduced of recent years to reduce the cost of steam generation, such as mechanical stokers, patent grates, economisers, superheaters, &c., and much information as to the value of these devices will be found in the chapters devoted to them. The author may be congratulated, for his book is one which cannot fail to be a standard reference work to all engaged either in boiler construction or in steam generation. An admirable little bibliography finishes up a series of useful appendices which give full directions for carrying out boiler trials.

H. B.

A Text-book of Geodetic Astronomy. By John F. Hayford, C.E. (New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 1898.)

WE must confess that the examination of this book has proved a little disappointing. This disappointment was probably inevitable from the circumstances in which the book has been produced, and the object which it is intended to serve. It appears that in the Cornell University the students of civil engineering devote five hours a week during one term to the study of astronomy. In this short space of time it is found impossible to master the contents of such a book as Chauvenet or other recognised standard work, and to meet this difficulty this book is put forward, not on the ground that it contains as much information as a student should acquire, but as much as he can acquire in the short time at his disposal. The sacrifice of thoroughness and completeness to the necessities of a particular University course can neither meet with general approval nor result in the production of a satisfactory treatise.

The title scarcely describes the character or the purpose of the book, which is mainly devoted to the practical determination of stellar positions by means of portable instruments. Considered from this point of view, and as showing in detail the methods employed in the United States Coast and Geodetic service, the book is not without its interest. On its practical side, we can conceive that it would be of use to those who have carefully read the theoretical; but to regard it as an efficient substitute for Chauvenet, would be to make a great mistake in the training of the student. The mathematical processes are, the author tells us, purposely omitted; but it would seem that other things besides mathematics have been omitted, which one would expect to meet in a work of this description. We should hope to find here a discussion of the figure of the earth, and, as a practical matter of great importance, a description of the method of measuring a base line. These matters are passed over entirely, and other important, but minute, results of observation get a very bare mention. For instance, to the variation of latitude only a page and a half is devoted. Pendulum experiments and their results do not come within the scope of the book. On the other hand, we get a fairly good account of the sextant, the transit, the zenith telescope, of the determination of the errors of these instruments, and the method of combination of observations. Some astronomical tables are added which are likely to prove useful.

Machine Drawing. Book 2. Part i. Machine Tools. By Thomas Jones, M.I.Mech.E., and T. Gilbert Jones, M.Sc. (Vic.). (London and Manchester: John Heywood, 1898.)

THIS work is intended "for the use of engineering students in science and technical schools and colleges." It contains twenty-five lithographed plates, upon which are represented the elevations and details of important machine tools in actual use by expert engineers at the present time. The plates include drawings of a drilling machine, planing machine, stroke slotting machine, stroke shaping machine, and forms of gearing. The complete drawings of the three first-named machines are coloured, and all of them are well executed. With the explanatory text the engineering student will find the work instructive and of real assistance.

A Student of Nature. By R. Menzies Fergusson, M.A. Pp. 246. (London: Alexander Gardner, 1898.)

THE late Rev. Donald Fergusson was many-sided in his pursuits, and among his pleasures was the study of natural history. One of the sections of the present volume contains the papers written by him on rural life and scenes, and they show that he was filled with "deep feeling" by nature and its wild life, but neglected the minute examination of natural objects essential to scientific study.