

book to be the outcome of a course of lectures to graduates intending to enter the teaching profession, in which Prof. Weber brings his long years' experience and profound knowledge to bear upon some of the subjects usually regarded as "elementary."

The first volume contains three parts, *Grundlagen der Arithmetik, Algebra, Analysis*. The remaining two volumes are to deal with geometry, and applications. The contents are what every teacher of elementary mathematics should know and not teach. The authors have found some difficulty in defining the range of subjects of discussion, but no limitation has been imposed upon the methods employed. The first few pages deal with aggregates, and later we come to the logical reasoning upon which the introduction of irrationals and of imaginaries is based. The part on algebra is chiefly concerned with theory of equations and theory of numbers, and the third part with infinite series and products, including the most important examples. Speaking generally, subjects of technical or practical interest are excluded, and only those presenting serious logical difficulties are discussed in detail.

The book is admirably printed and clearly arranged, and should prove a very useful and trustworthy companion to all who care for exact knowledge for its own sake.

R. W. H. T. H.

OUR BOOK SHELF.

Stars and Sextants. By Sprigge, Doak, Hudson and Cox. With an introduction by Lord Ellenborough. Pp. xxv+55. (London: J. D. Potter, 1903.) Price 2s. 6d.

THIS book places in the hands of explorers, navigators, surveyors and others who use the sextant a simple means of finding its centring error. The centring error of a sextant at sea has hitherto been severely left alone on account of the somewhat tedious calculations necessary to find it.

The method of obtaining the total error (and hence the centring error by applying the index error) by observing the distance between two stars when on the same vertical circle is mentioned in "Hydrographical Surveying," by Sir William J. L. Wharton, in the second edition, 1898. The error thus obtained is owing to refraction not strictly accurate, unless the two stars are of equal altitudes at the time of observing. The best time for observing the distance between two stars, so that refraction may have the least possible effect and alter slowest with the time, is when the altitudes of the stars are equal. However, the error due to refraction in observing stars at different altitudes is not great when they are on the same vertical circle, and in finding the error of a sextant at sea it may be neglected, especially if the altitude of the lower star be above 30 degrees.

The centring error can only be found for different points on the arc of a sextant by taking a large number of observations for each point and meaning the results. It is to be hoped this book will induce many to take these observations, so that while learning the principal stars they may also become expert observers.

The book contains (1) ephemeris, 1904, with star pairs of nearly equal magnitude; (2) distances of star pairs; (3) ex-meridian star pairs, with distances for every ten days; (4) semi-diurnal arcs for finding the

time a fictitious star rises and sets; (5) astronomical refraction corrected for barometer and thermometer; (6) notes on the stars. The descriptions and rules for using the tables are clear and simple, the figures are well arranged, and the type is very distinct. The temperature required for correcting the refraction should be taken by a Fahrenheit thermometer in a screen exposed to the open air.

This book might lead a tyro to suppose that correct time for obtaining errors and rating chronometers can only be obtained by equal altitudes of the sun, and only by a sextant of which the centring error is known; such is not the case. Time can be accurately obtained with a faulty sextant by observing sets of single altitudes both A.M. and P.M. of the sun, of stars both east and west of the meridian and meaning the results. By another less known but very valuable method the time is obtained in less than half an hour, if the stars are properly selected, by taking the equal altitudes of two different stars on opposite sides of the meridian.

Nothing must prevent the navigator from finding his position by stars. Take them at other times when possible, but *always* at twilight.

VANSITTART HOWARD.

Engine Tests and Boiler Efficiencies. By J. Buchetti. Pp. xv+255. (Westminster: Constable and Co., Ltd., 1903.) Price 10s. 6d. net.

THE volume before us is a translation, by Mr. Alexander Russell, of M. Buchetti's well-known work "Guide pour l'Essai des Moteurs." The object of the volume is to place before British and American engineers a record of Continental practice so as to render a comparison possible with home practice, and in order to further this comparison the measures and tables have been converted to English units.

The subject-matter is divided into nine chapters, and commences with well illustrated descriptions of the many indicators in use for testing steam and other engines. The important subject of mounting the indicator is then thoroughly dealt with, and this is as it should be, since the accuracy of the results depends entirely on the fitting; and the scientific arrangement of the gear; M. Buchetti appears to have taken infinite pains to treat these details very thoroughly—there are many evidences of this right through the book.

The same can be said of the treatment of the several types of brakes now in use. When dealing with properties of steam, we note on p. 180 one or two clerical errors under the paragraph on saturated steam. The author talks about "If we compress the piston," &c., and further on in the next paragraph he says, "When the piston is allowed to expand"; surely the word piston should read "saturated steam" or "steam"?

The brief chapter on the testing of steam turbines by the Hon. C. A. Parsons, F.R.S., is all too short; we should have welcomed more interesting details from the pen of this able experimenter and engineer.

Taken as a whole, however, this book is full of interest. Students of steam and engineering should lose no time in obtaining a copy, since its contents are of the highest value to them.

N. J. L.

An English Grammar. By the Rev. S. Claude Tickell, A.K.C. Pp. 60. (London: O. Newmann and Co.) Price 2s.

THIS pamphlet of sixty pages is very unlike what is ordinarily understood by an English grammar. It opens with a paragraph of three lines headed "Analysis and Parsing Differentiated." Then comes