

gines. It is a practitioner's and student's text-book in that system, as Wood's Thermodynamics is the representative for the same classes of readers of the Rankinian method.

In the new book a considerable addition has been made to the discussion of the gas-engines, which includes the latest information regarding producer-gas and the oil-engines, and closes with a discussion of the Diesel motor, now attracting, deservedly, much attention among members of the engineering profession as having attained unusual results by an exceptionally successful attempt to reproduce ideal thermodynamic conditions in an approximation to the Carnot cycle. Its best work is reported at 223 grms. of petroleum per hour for 19.2 horsepower, equal to three-fourths of a pound of coal per horse-power-hour. The best steam-engines, even of many times this power, consume seldom less than double this figure. The latter half of book is devoted mainly to the subjects of steam-engine testing, compound and other multiple-cylinder engines, the influence of the cooling effect of cylinder-walls and steam-engine economy generally. Considerable new matter appears in these sections. The latest investigations, as those of Hall, and of Callendar and Nicholson, are detailed, with admirable success in condensation. Recent and notable reports on steam-engine trials, as of the famous engines of Leavitt and of Sulzer, of Schmidt and of Rockwood, and of the steam-turbines, are summarized and the data are tabulated. The more elaborate scientific tests of the 'experimental engines' of the Massachusetts Institute of Technology and of Sibley College at Cornell University are presented in their essential details, while the discussions exhibiting the ideal and the real effects of the operations of compounding, of superheating and of jacketing, as influencing efficiency and economy of steam, heat and fuel, are most instructive and valuable. The final chapters are devoted to brief discussions of compressed-air machines and apparatus of refrigeration.

This book is a rarely good work and is excellently published. It is one which no member of the engineering profession dealing with the heat-engines can safely leave out of the list of his working library, and no student desiring

more than a superficial knowledge of its subject should fail to read with special care.

R. H. THURSTON.

Prismoidal Formulæ and Earthwork. By THOMAS U. TAYLOR, Professor of Applied Mathematics in the University of Texas. New York, John Wiley & Sons. 8vo. Pp. 102 and one plate. Price, \$1.50.

The historical and theoretical discussions of this volume will be of especial interest and value to civil engineers on account of the extensive use of the prismoidal formula made by them in earthwork calculations and because the engineering handbooks generally avoid such discussions. There are probably few engineers who know that the prismoidal formula is applicable to the volume of a sphere, or to any segment of a sphere, as also to ellipsoids and paraboloids. The author shows that its application is wider even than this, and that the volume of any prismoid whose sectional area can be expressed by a cubic function of its distance from any reference section is found by adding the areas of the two bases to four times the area of the mid-section and multiplying this sum by one-sixth of the length. He also gives demonstrations of the two-term prismoidal formulas of Koppe, Hirsch and Echols, and discusses their limitations and uses in a very interesting manner. Although these two-term formulas involve but two sections instead of three, it does not appear that they are more convenient in practice than the common formula.

The author attributes to Newton the honor of the discovery of the prismoidal formula, and states that it is given in the *Methodus Differentialis*, 1711. An examination of this paper of Newton fails, however, to substantiate this statement, and it is to be regretted that the author did not quote the words in which he claims that the theorem was announced. His reference to Simpson is also unsatisfactory, although he points out that Simpson's rule for the quadrature of a curve from three ordinates is the same in form as the prismoidal formula. With these exceptions the historical matter of the volume is more complete than can be easily found elsewhere. Over one-half of the book is devoted

to computations for excavations and embankments of railroads and canals, and the method of using the prismoidal formula by means of corrections applied to the volumes as determined from average end areas is developed at length. It is to be regretted that the author uses the Latin word formulæ instead of the English word formulas. M. M.

SCIENTIFIC JOURNALS.

Botanical Gazette, October: Mr. J. H. Schaffner, in a paper on 'Karyokinesis in the root tips of *Allium Cepa*,' states that he finds the root tips of *Allium Cepa* very valuable objects for the study of nuclear division. The details he illustrates upon two handsome plates, because, he says, "accounts and figures of karyokinesis in plant cells are very scarce, and the so-called diagrammatic or schematic figures and descriptions given in most text-books are but a poor guide for the student and young investigator." A student of Mr. Schaffner's, Mr. Edward L. Fulmer, writes on the 'Cell division in pine seedlings,' illustrating the process by two plates. Mrs. Fannie D. Bergen continues, in two installments, her list of 'Popular American Plant Names.' These papers are reprinted from the *Journal of American Folk Lore*. Dr. Byron D. Halsted has a short discussion of the newer aspects of botany, especially the ecological ones. The paper summarizes some remarks before the National Educational Association at Washington. Dr. C. F. Millspaugh contributes 'Notes and new species of the genus *Euphorbia*,' illustrated by his admirable figures. A biography of Joseph F. Joor, with portrait, and a short sketch of the DeCandolle family are written respectively by Mr. J. B. S. Norton, of the Missouri Botanical Garden, and Dr. G. E. Stone, of the Massachusetts Agricultural College. Mr. Clarence J. Elmore has studied the question of polyembryony in certain wild species of *Allium*. He finds the contents of the embryo sac exceedingly variable, the frequent absence of antipodals being especially noteworthy. In Open Letters, Dr. Robinson disavows responsibility for 'The American Botanist,' which was dated without authorization from the Gray herbarium; and Mr. Cockerell has a short letter on the nomenclature of *Eschscholtzia Mexicana*

and *Philibertia heterophylla*. Reviews are given of Barnes's 'Plant Life'; Britton and Brown's 'Illustrated Flora,' volume three; 'The Ninth Report of the Missouri Botanical Garden'; part two of Durand and Schinz's 'Flora of Africa'; Courchet's 'Text-book of Botany,' and Schneider's 'Guide to the Study of Lichens.' Twelve pages of Minor Notices of books and papers, Notes for Students, and News complete an unusually varied number.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON—295TH REGULAR MEETING, SATURDAY, OCT. 22.

DR. T. S. PALMER mentioned the reported occurrence in Patagonia of a living representative of the extinct *Mylodons*.

MR. G. H. HICKS exhibited specimens of *Pinus torreyanus* and spoke of its extremely restricted distribution.

DR. J. N. ROSE presented a paper on his 'Proposed Arrangement of the subfamily Agaveæ,' stating that it was partly based on his four months' study of the group in its home in Mexico. The paper, which was illustrated by specimens, photographs and drawings, was particularly interesting from the fact that living types of all the genera were shown.

MR. F. A. LUCAS spoke on 'The Fossil Bison of North America, with description of a new species' for which the name *Bison occidentalis* was proposed. The horn cores of this species were of moderate size, although much larger than those of the existing species; their circumference at base was equal to, or slightly greater than, length along upper curve; they were sub-cylindrical in section and regularly curved upward and backward. The type from Fort Yukon was No. 4047 of the collections of the U. S. National Museum. The species was readily distinguished from *B. antiquus*, with which it had been confounded by the fact that in *antiquus* the horns stood at right angles to the longitudinal axis of the skull and were not directed backwards.

MR. A. J. PIETERS read a paper on 'Problems of Aquatic Vegetation,' stating that aquatic plants, especially the unicellular algæ, are the primary source of food supply in the lakes. The relation between the higher plants and the low