

that this typifies all other throughout the country; while this is true broadly speaking, one is surprised at the lack of information on current Californian practice, for example, considering the enormous amount of oil refined within that State and the wonderful progress there made in refining technique during the last few years. The paragraphs on reservoir storage of oil could with advantage be brought up-to-date: a 750,000 barrel capacity reservoir (quoted on page 308) is small compared with the two- to three-million barrel reservoirs now in use in Southern California.

H. B. MILNER.

Elementary Thermodynamics of Automobile Engines.

By E. H. Hamilton. Pp. xi+287. (New York and London: McGraw-Hill Book Co. Inc., 1923.) 15s.

IN a country where every alternate household owns an automobile, it may be natural for the study of thermodynamics to be entered by this gateway, but to English readers—at present—it comes with something of a shock. We have grown accustomed to the plan of studying general principles first and their application later, but it is interesting to find that in this product of the labours of a member of New York University it is thought they may with advantage be combined.

Much the most interesting chapter is that on detonation; it contains the first discussion which we have seen in book form of the recent anti-detonation research work by certain American automobile builders. On the scientific aspect of detonation the book is far from representing the most recent information on the subject, but the space given to the topic shows the growing realisation that the future development of the engine depends upon a solution of this difficult but fascinating problem. The author considers that the tetra-ethyl lead, used in the United States in the formation of the so-called "ethyl gas," is the most promising anti-knock compound yet found, but he does not give any account of its mode of action.

An attempt is made in the final chapter to foreshadow the future of the engine. Supercharging, as originally proposed by Sir Dugald Clerk, is one of the improvements prophesied; also the adaptation to the automobile engine of compression ignition.

Practical Bee Anatomy: with Notes on the Embryology, Metamorphoses and Physiology of the Honey Bee.

By Annie D. Betts. (The Apis Club Library, vol. 1.) Pp. 88. (Benson, Oxon.: The Apis Club, 1923.) n.p.

THE aim in this series is to provide a library on the science and practice of bee culture in all its important phases. This first volume is a manual of the anatomy, both gross and minute, and a practical guide to the methods of dissecting and setting up microscopical preparations. Little, if any, knowledge is assumed in the reader; yet the author does not hesitate to deal with advanced topics in insect anatomy and in general cytology; and successfully. The commonly accepted view of the respiratory mechanism of insects does not, at any rate as regards the honey bee, satisfy Miss Betts; and she advances and supports with strong evidence a new theory that deserves the attention of entomologists. Briefly, she is of opinion that the prothoracic spiracles serve for the escape of air that enters but is prevented from escaping at the abdominal

spiracles. Some of the illustrations on the twelve plates are difficult to make out, but with this reservation the book can be commended to the student of apiculture as a trustworthy and up-to-date guide.

Smith's General Chemistry for Colleges. Revised and rewritten by Prof. James Kendall. Pp. xiii+747+8 plates. (London: G. Bell and Sons, Ltd., 1923.) 10s. 6d. net.

ALTHOUGH Prof. Kendall has much improved this book, the peculiar tendency to dogmatise which was noticeable in earlier editions still persists in many places. The discussion on the discovery of oxygen (p. 28) and that on osmotic pressure (p. 523) are cases in point. Several errors present in earlier editions remain, e.g. the statement (p. 286) that ozone is formed by passing "electric waves" through oxygen, that osmic acid is reduced in staining tissues to "metallic osmium" (p. 630), that the first reaction of HCl on MnO₂ is "undoubtedly" the formation of MnCl₄, etc. The peculiar method of presenting the molecular theory, although modified by the reviser, is still, probably, less attractive than the usual procedure. Apart from these minor defects the book is excellent. The printing and illustration are good, and a wide range of subjects is treated in a clear and interesting manner. The brief account of atomic structure and the Lewis-Langmuir theory is particularly well done—and not overdone.

Technical Arithmetic. By R. W. M. Gibbs. Pp. viii+168. (London, Glasgow and Bombay: Blackie and Son, Ltd., 1923.) 3s. 6d. net.

THE special features of this book are: a full treatment of logarithms and the slide rule; graphical solution of algebraic equations and numerical trigonometry up to the solution of triangles; arithmetical chemistry, and the treatment of variation and limits of approximation. The course is intended for those who, being acquainted with the methods of ordinary school arithmetic up to middle form standard, wish to deal mainly with the application of arithmetic to the elementary problems of science and engineering. Each of the ten chapters consists of a few reference notes followed by examples, some of which are fully worked out. Answers are given at the end. The book should be quite useful for the purpose for which it is designed. There is an error in the formula of Ex. 30 on p. 120.

Electrical Measuring Instruments and Supply Meters.

By D. J. Bolton. (Directly-Useful Technical Series.) Pp. xvi+328. (London: Chapman and Hall, Ltd., 1923.) 12s. 6d. net.

THIS book gives descriptions of practically every electrical measuring instrument and meter used in practice. The instruments are grouped well together in the various chapters under such headings as electrostatic voltmeters, induction instruments, alternating current galvanometers and oscillographs, etc. The principles on which the various instruments act can be understood without much difficulty from the descriptions given. The book concludes with 29 questions of examination type on electrical instruments; the answers are provided, and complete solutions are also given to the more difficult questions. These will prove a help to students. The book will be useful to the electrician as a work of reference.