REVIEWS.

ANNUAL REPORTS OF THE SOCIETY OF CHEMICAL INDUSTRY ON THE PROGRESS OF APPLIED CHEMISTRY. Vol. I., 315 pp. and Indices. 1917. Price 3s. 6d.

The custom of issuing annual reports on the progress of the various sciences is one of such obvious utility that it is not surprising to find that the Society of Chemical Industry has followed the example of similar institutions.

In applied chemistry a special case may easily be made out for the appearance of a report such as this. It is given to few to be personally and practically familiar with more than one or two of its branches, while there are many to whom a general knowledge of them is desirable and necessary, but on whose time the constant stream of literature dealing with pure chemistry or with their own special department of the science makes only too ample a demand.

The present report does not cover all the sections dealt with in the Society's journal, partly because those on fibres, dyeing, metallurgy, electro-chemistry, and sugar were not completed in time, and partly because agricultural and analytical chemistry and the chemistry of food and drugs, having been dealt with in the Annual Report issued by the Chemical Society, were purposely omitted. In refraining from

issuing a separate report of its own on these subjects, the Society of Chemical Industry has set an excellent example, which it is to be hoped will ere long be taken to heart by similar societies, so that the waste of labour involved in the translation, abstracting, and printing, by three or four different scientific bodies, of the same set of papers will no longer be a reproach to the common sense of scientific men.

Nominally the Report for the year 1916, the volume before us, actually deals with 1914 and 1915 as well, thus covering the whole period since the commencement of the war.

The following fifteen sections, as classified in the Society's journals, are dealt with: Fuel and Heating (J. W. Cobb); Gas, Destructive Distillation, Tar Products (E. V. Evans); Mineral Oils (J. W. Cobb); Colouring Matters and Dyes (G. T. Morgan); Acids, Alkalis, and Salts (H. A. Auden); Glass and Ceramics (J. A. Audley); Building Materials (J. A. Audley); Oils, Fats, and Waxes (G. H. Warburton); Paints, Varnishes, and Resins (R. S. Morrell); Indiarubber (H. P. Stevens); Leather and Glue (J. T. Wood); Fermentation Industries (A. R. Ling); Water Purification, etc. (F. R. O'Shaughnessy); Fine Chemicals (F. L. Pyman); Photographic Materials and Processes (B. V. Storr).

In a series of articles by different authors, and on such widely different subjects, uniformity of treatment is hardly to be expected, but, taking these facts into account, it may be said that this new undertaking has been very successfully carried out. One or two of the articles are unnecessarily diffuse, but most of them are models of what such reports should be, and give in the minimum of space a clear and comprehensive statement of the progress of each branch during the period under review; and the copious references to original papers and to patent specifications render it easy for the reader to refer to the original sources. These references are conveniently placed at the bottom of each page, except in the case of the article on indiarubber, where they are at the end of the article—a plan of which the advantage is not apparent.

Printer's errors and similar oversights are remarkably few. On page 25 we note that the new form of bolometer is in the text attributed to Callender, whereas we believe it was the joint production of Bone, Callender, and Yates, to whose paper on the subject reference is made.

The type and paper are excellent, and the volume is very conveniently of the same size as those of the Annual Reports of the Chemical Society. The Society of Chemical Industry is to be congratulated on having initiated a new and valuable departure, and one which is especially opportune at the present time.

CECIL H. CRIBB.

BAYLEY'S CHEMISTS' POCKET BOOK. Eighth Edition, edited by R. ENSOLLO, E. and F. N. SPON, 1917. Price 7s. 6d. net.

The publication of this useful little volume in the form of a handbook has afforded an opportunity for the recasting of the whole work and the inclusion of many new tables. The International atomic weights for 1915 and 1916 have been used for the factors and tables in Sections V. and VI., which deal with gravimetric

and volumetric analysis, while other sections include valuable data referring to Weights and Measures, Physics, Mathematics, General Analysis, Photography, and numerous other branches of Chemistry. In some few cases the author's name is appended to the tables quoted, but it would have been no more trouble and distinctly more useful if, in addition, the place and date of publication had been indicated. Thus the present Official Original Gravity Tables, which have superseded those contained in the first schedule of the Inland Revenue Act of 1880, are quite rightly given in the section on Beer, but are simply headed "Thorpe and Brown," while a table giving the "divisors" or solution factors for certain sugars is credited to "Brown and Jones"; both of these tables are to be found in the *Journal of the Institute of Brewing*, 1914, vol. 20. The printing and general get-up of the book is good, and considering the amount of matter compressed into its 420 pages, and the obvious care which has been given to insure accuracy, the price (7s. 6d.) is certainly not excessive.

H. F. E. HULTON.

LABORATORY MANUAL OF BITUMINOUS MATERIALS FOR THE USE OF STUDENTS IN HIGHWAY ENGINEERING. By PRÉVOST HUBBARD. Pp. 153. New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 1916. Price 7s. net.

The progressive spirit of American Universities is shown by the fact that several have inaugurated courses of instruction in Highway Engineering, and the author of this excellent little manual, who is chief of that section of the U.S. Department of Agriculture which deals with Road Material Tests and Research, is lecturer in the graduate course of Highway Engineering in Colombia University.

The book is entirely American, and describes American products and American testing methods exclusively. There is no reference in it to the work or specifications of the English Road Board, or to the methods of testing used here. It is arranged in three parts. The first, occupying twenty-seven pages, gives a list of definitions of materials and tests which have become standard in the United States, and describes the various types of bituminous materials used by American highway engineers. The second part, occupying the major portion of the work, is devoted to a description of methods of testing, and the third part shows how these tests are applied and their results interpreted. Many of the testing methods are taken verbatim from the U.S. Department of Agriculture bulletins and other American publications, and represent the standard methods which have come into use in the States. As a rule they are good and well described, some of them perhaps rather more delicate and elaborate than appears necessary for the purpose. Specific gravity is determined by hydrometer at the standard temperature of 25° C., the Westphal balance and Sprengel tube methods being given as alternatives. Hubbard's specially designed pycnometer is used for very viscous and semi-solid bitumens, and the displacement method for solid materials and mineral aggregates. Having described all which methods, the author then shows the use to be made of the determination for identifying a material, and how by means of it the coefficient of expansion is determined. This plan is followed throughout the book. Under consistency tests, viscosity is measured by the Engler viscometer, which the author

admits is "far from ideal" for the wide range of bituminous materials used. Presumably it is only used for the more fluid types. A "float test" is next described, which appears to be a weird combination of melting-point, fluidity, and heat-conductivity tests, and is certainly not a viscosity test. The penetration tests which follow seem much more useful. Then follow methods of determining melting and softening points, ductility, flash and burning points, volatility, methods for estimation of water, distillation and solubility tests for estimating total bitumen and separating this into asphaltenes and carbenes, etc., methods for ash, fixed carbon, paraffin scale, and for the analysis of emulsions, creosote oils, and bituminous aggregates. In the third section of the book complete series of tests of fluid petroleum products, emulsions, asphalts, asphalt cements and fillers, refined tars and wood preservatives and bituminous aggregates, are arranged in tables, with copious notes showing how the results are to be interpreted. This section of the book is interleaved with blank pages for notes. There is a fairly complete table of contents, but no index. Notwithstanding the absence of any reference to English practice, the book should prove extremely useful to all analysts who have to advise on highway matters. If, in a future edition, English practice and testing methods were also described and an index added, the general usefulness of the book to English chemists and engineers would be greatly enhanced.

L. ARCHBUTT.

'EXPLOSIVES," Vol. II., by ARTHUR MARSHALL. Second Edition in Two Volumes. Churchill, 1917. Price £3 3s. 0d. (*Cf. ANALYST*, 1917, 259.)

The second volume of the above work, which has just appeared in the new edition, is of special interest to analytical chemists, as it deals very fully with the analysis of explosives. To those occupied in explosive work the chapters on the physical properties and tests, the stability tests, and the ballistic properties, will also be found useful. Many advances have been made in these directions in recent years, and the appearance of this comprehensive review of the subject is very opportune at present, as the attention of most chemists has been directed to the study of explosives. Whilst recognising the importance of naval and military explosives, however, Mr. Marshall has dealt also very fully with industrial explosives, which play a most important part in mining, road construction, etc. The safety precautions necessary in the construction of buildings, the transport and handling of explosives, the gases evolved, and the special dangers of coal-mines, are of the greatest importance in the explosives industry, and the information given by Mr. Marshall will be found very useful to any chemists who are concerned with this branch of the subject.

The section on "Materials and their Analysis" will be of chief interest to analytical chemists. Explosives form a specialised branch which has in the past remained in the hands of comparatively few chemists, as the handling of such compounds requires very special care. The textbooks on the subject have remained somewhat scanty, and have not kept pace with the developments in explosive research. For this reason the collection of information on the analytical methods used in explosive work meets a distinct want. Information is given as to sampling, and the chemical reactions are given for a large number of explosives and their

ingredients. It may, perhaps, be criticised that propellants and their ingredients have received more than their share of notice. Thus, ten pages are allotted to nitro-cellulose, whilst such important materials as trinitrotoluene, perchlorates, aluminium, and others, receive little or no notice.

A systematic scheme for the analysis of unknown mixtures might with advantage have been added, and the methods for the quantitative analysis of cordite and similar mixtures would be helpful to many chemists. The whole compilation cannot, however, fail to be very useful for reference, and will undoubtedly lighten the labour of many analysts.

R. C. FARMER.

INTRODUCTION TO THE RARER ELEMENTS. By PHILIP E. BROWNING. Fourth Edition. London: Chapman and Hall, Ltd., 1917. Price 7s. net.

The author states in his preface "that this little work is intended not to treat exhaustively the subject of the rarer elements, but rather to serve as an introduction to the study of an interesting group which the chemist in the inorganic field cannot afford to neglect. When one considers that more than fifty elements are included under the heading "Rarer Elements," and that of these a number such as the elements of the platinum group, vanadium, molybdenum, and tungsten form more numerous and complex series of compounds than the more common elements, it is clear that anything approaching an exhaustive treatment is impossible in a work of this size, and much must necessarily be omitted. For this reason discrimination is most important in the compilation of a work of this kind; unfortunately there is not sufficient evidence of the exercise of this quality on the part of the author. Lists of methods of estimation and separation are given, which include some that are standard methods and in general use, others that have been merely described or suggested, and others, again, that are known to contain sources of error, without a word or sign to assist the student in his selection. As an example of the brevity of treatment one may mention the gravimetric estimation of gold, which is disposed of in four lines, yet considerably more space is devoted to the estimation of tellurium. These defects notwithstanding, the book has its value: it contains a surprising amount of information in a very condensed form, with comparatively few errors. The experienced reader will realise its limitations, but will find it of service as a small book of reference before having recourse to larger works.

The book, however, was written for students, and prepared from material used by the author in a course of lectures at Yale University. Regarded from the educational point of view, the book possesses a peculiar interest, and some reference may be made to the purely tutorial chapters dealing with experimental work and review questions. With the exception of those elements which are unavailable because of their scarcity, lists of experiments are given beginning with the extraction of the salts of the element from a mineral and followed by a series of experiments illustrating the qualitative analytical reactions. In no case is a quantitative exercise set, an omission which seems questionable in an experimental course for students. A similar attitude is also noticeable in the review questions; to answer these the student must have committed to memory almost all the reactions mentioned in the text, for questions are to be found such as, "How may Ru and Os be detected when

present together ?” “How does a mixture of H_2O_2 and HCl act upon Nb_2O_5 and Ta_2O_5 ?” yet no question is set on the quantitative estimation of even the more common amongst the rarer elements such as titanium, lithium, or thorium. While agreeing with the author as to the importance of the rarer elements, one may yet doubt whether it is wise to ask a student to burden his memory with such a huge collection of facts regarding substances which he may never meet in practice. If inquiry be made of the experience of successful analysts, it will be found that they have been able to detect these rare elements when necessary, and even the much more troublesome and evasive organic substances, without having memorised all their reactions; analysts have even discovered and characterised new substances in the course of their analytical practice, as instance the recent discovery of spinacene in fish oils, an achievement which evidently cannot be attributed to a knowledge of the reactions of the substance discovered. The secret of such success appears to depend less upon an extensive knowledge of the rare than upon a more profound knowledge of, and familiar acquaintance with, the common, by means of which any abnormality is recognised and the presence of the rare inferred. This stage having been reached, it is more usual to refer to books than to rely upon memory. If this experience can serve as a guide to teachers, it would point to the practice of giving rare substances for analysis to advanced students, but permitting the use of books rather than attempting to impose a tax upon the memory which but few could endure.

E. WECHSLER.