

The book bears ample evidence of great care in preparation. It is not too much to say of it that it contains one of the most carefully constructed and logical arguments from chemical fact to chemical theory that has ever been written.

In plan the idea is comprehensive. It is to teach the elements of all phases of chemical science. Nothing is shirked, and every point is clearly and sufficiently explained. Each day's work consists of two parts: Laboratory work which comes first and establishes the facts, and the lecture which follows, explains, systematizes, and enlarges on them. While the sequence of treatment is largely in accordance with the periodic law the author by no means binds himself to this order, considering the needs of the student of first importance.

The book contains a few slips in statement of facts, fortunately of small importance, and some infelicities of expression. These will doubtless be remedied in subsequent editions. Every teacher can learn something from Professor Torrey, and all should read his book.

E. H.

THE MINERAL INDUSTRY: ITS STATISTICS, TECHNOLOGY AND TRADE IN THE UNITED STATES AND OTHER COUNTRIES TO THE END OF 1898. EDITED BY R. P. ROTHWELL. VOLUME VII. New York and London: The Scientific Publishing Co. 1899. 4to. xxviii+982 pp. Price, \$5.00.

To the chemist and technologist the annual volumes of this series are of great interest and value, embodying as they do the latest progress in the different departments of metallurgy and mining. Much of the information is original and cannot be found elsewhere. Among the items of interest contained, it may be noted that the production of aluminum in the United States was 5,200,000 pounds. Ferromolybdenum was produced to the extent of 2,100 pounds, valued nominally at 50 cents per pound. Molybdenum was first produced in the United States to the amount of 9,550 pounds, worth about \$1.25 per pound. 33,200 pounds of metallic tungsten, 1,594,152 pounds of carborundum, 3,584,586 barrels of Portland cement of 400 pounds each, 185,647 pounds of artificial graphite, and 8 tons of molybdenite were produced in this year.

The volume contains a vast amount of information, of which it is impossible to give even a digest in the space available. There are articles, for instance, upon the manufacture of con-

centrated alum, asphaltum refining, the hydraulic cement industry, firebrick manufacture, kaolin, the electrolysis and refining of copper, the identification of gems, the technology of gypsum, lime and lime-burning, manufacture of acid phosphate of lime, occurrence and recovery of sodium carbonate in the great basin, manufacture of chamber sulphuric acid, and numerous articles on progress in metallurgy written by specialists.

E. H.

THE RISE AND DEVELOPMENT OF THE LIQUEFACTION OF GASES. BY WILLETT L. HARDIN, Ph.D. New York and London: The Macmillan Company. 1899. 244 pp. Price, \$1.50.

The recent achievements in the liquefaction of gases, and the very general interest which of late has been manifested in this line of investigation has naturally led to the publication of several works on this subject. One of the best of these is the volume by Dr. Hardin. In the preface the author states that "while the book has been written in a popular-science style, an effort has been made to make it of value to those who are especially interested in the subject by giving the references to the original literature." This latter feature might be adopted with great advantage in all books of a similar nature.

The author devotes about one-third of the volume to an account of the results obtained by the earlier experiments up to about 1860, including the work of Faraday, Thilorier, Natterer, and others. Then follows a chapter on critical constants, the continuity of the gaseous and liquid states of matter, and a statement of the equation of Van der Waals.

The second half of the book is devoted to the liquefaction of the so-called permanent gases, commencing with the methods employed and the results obtained by Cailletet and by Pictet in 1877. A section is devoted to the experiments of Wroblewski and Olszewski, and those of Dewar. Several pages are given to the so-called regenerative method which has been employed by Linde and by Tripler in the liquefaction of air on a large scale. Another section is devoted to the liquefaction of argon and helium, and to the method employed by Dewar in the production of liquid hydrogen in a static condition. A table of physical constants is given, and in conclusion the author discusses briefly the three states of matter, some of the applications of liquefied