

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

gases, and the effect of low temperatures upon physiological action. The volume is a clear, well considered, and reasonably full statement of our present knowledge on the liquefaction of gases.

E. G. LOVE.

QUALITATIVE ANALYSIS FOR SECONDARY SCHOOLS. BY CYRUS W. IRISH, A.B. New York: American Book Company. 100 pp.

The usual college course in qualitative analysis is simplified by omitting oxalates and phosphates, and determinations other than spectroscopic for sodium and potassium. The test for chromium is made more striking by oxidation with hydrogen dioxide and subsequent precipitation as lead chromate; the alternative method by fusion is also given. Preliminary experiments on bases are the customary ones, all bearing directly on qualitative separations, but they hardly carry out the author's prefatory claim of a study of descriptive chemistry of bases by laboratory methods. A praiseworthy effort is made to keep alive the student's interest in general descriptive chemistry by a considerable number of questions on that subject. Questions are put also on the experiments performed. Uniformly these call into play only the student's power of observation, and it would seem well to ask some questions beginning with "why"; questions to bring out reasons for steps taken. Observations of the form of precipitate, whether flocculent, crystalline, etc., are omitted. Likewise omitted, are directions for careful manipulation. An unsatisfactory condition of mind and knowledge must result from this statement regarding the solubility of freshly precipitated zinc sulphide in hydrochloric acid: "To confirm the presence of Zn add conc. HCl, when ZnS, if present, will be dissolved, but S in suspension will not dissolve. A partial solution, on addition of conc. HCl, also indicates ZnS." This should be a satisfactory manual in the hands of a good teacher. It will not compel good teaching.

H. M. ULLMANN.

THE ELEMENTS OF BLOWPIPE ANALYSIS. BY FREDERICK HUTTON GETMAN, F.C.S. New York: The Macmillan Company. 1899. Small 12mo. 77 pp. Price, 60 cents.

The book begins with cuts of blowpipe apparatus, poorly executed, some important ones omitted, while that of the blowpipe itself shows an antiquated form very seldom used.