

quicken interest in the subject. The treatment of indifferent points is especially complete and the reader will also get much profit from the chapters on solid solutions. The cream of the book, however, is to be found in the part on false equilibria and that in spite of one serious blemish. A number of experiments on false equilibria have been made in Duhem's laboratory or under his guidance and most interesting results have been obtained. These results have, however been called in question by Bodenstein who asserts that experimental error and a belief in the theory have led Duhem's scholars astray. This charge has never been met and there is no reference to Bodenstein in the book. This leaves matters in a most unfortunate position. The work of Pélabon, Helier and others is very important, if correct, but not so important otherwise. As matters now stand, many chemists believe that there are reactions which do not start at a given temperature but there are very few who believe that a reaction runs part way and then stops short of a true equilibrium. Duhem's conception of "chemical friction" is a very valuable one, even though the experimental data are not above suspicion. Roloff's work on the cryohydrates appears to have been overlooked.

WILDER D. BANCROFT.

REFRIGERATION, COLD STORAGE, AND ICE-MAKING. BY A. J. WALLIS-TAYLOR, C.E. London: Lockwood & Son; New York. D. Van Nostrand Co. Price, \$4.50 net.

This practical treatise on the art and science of refrigeration is based on and embodies to a large extent the personal experience of the author. English methods and processes are most fully described. The whole subject is handled in a capable manner and the treatise will be found of service to teacher and student, and mainly to the technical engineer and those actually engaged in the various industries using refrigeration. The chemistry of refrigeration is only very superficially mentioned.

In an interesting table of the principal freezing mixtures, the author gives the reduction of temperature for a mixture of snow 3 to potassium 4 (?) as the maximum, 32° F. to -51° F. The lowest temperature obtainable by such mixtures is for snow 8 to dilute sulphuric acid 10 from -68° to -91° F., the materials themselves having been previously cooled. The subject-matter is classified under five principal heads:

I. The chemical processes, wherein the more or less rapid dissolution or liquefaction of solids is used to abstract heat.

II. The vacuum systems, wherein the abstraction of heat is produced by a partial evaporation of the substance, with the use of mechanical devices, such as pumps, etc.

III. The compression processes, wherein the abstraction of heat is effected by mechanical compression and the cooling of a separate agent, more or less volatile.

IV. The absorption system, wherein the abstraction is indirect, effected by direct heat on a separate agent, more or less volatile, which enters into solution with a liquid.

V. The cold air methods, wherein air or gases are compressed and cooled, and expansion takes place while doing work, an application of heat to ultimately produce cold.

The first ten chapters of the treatise, some 200 pages, are devoted to the description of these processes, and the other eleven chapters, 300 pages, being taken up with the application of these processes to refrigeration, classed under the following chapters: Cocks, Valves, Pipe-Joints and Unions; Refrigeration and Cold Storage; Marine Refrigeration; Ice-Making; The Management and Testing of Refrigeration Machinery; Cost of Working; Production of Very Low Temperatures. The sub-division of the chapter on Manufacturing, Industrial and Constructional Applications gives a very good idea of the whole character of this treatise; *viz.*, chocolate manufacture, breweries, paraffin works, artificial butter manufactories, dairies, dynamite factories, manufactories of photographic accessories, wine growers' and wine merchants' establishments, distilleries, sugar factories and refineries, chemical works, India rubber works, glue works, tea factories, and others, also manufacturing and industrial applications, tunnelling, sinking shafts, laying foundations, etc.

The book is profusely illustrated with some 300 wood cuts descriptive of processes and plants. The table of contents and index are complete. An appendix of useful tables and memoranda, and list of illustrations will be found of service. The book is comparatively free from errors. The use of the metric system in place of English weights and measures, and of the centigrade scale in place of the Fahrenheit, would be an improvement. The author has made free use of the literature on the subject, inclusive of

1901, relying for his American data on this completely. Full credit is given to others. The reluctance must be commended with which the author abstains from giving undue or special credit to any special process or machinery, thereby advertising same.

The treatise can be recommended as a useful and up-to-date description of the processes of refrigeration and their application to the arts.

EDWARD GUDEMAN.

MODERN CHEMISTRY, WITH ITS PRACTICAL APPLICATIONS. BY FREDUS N. PETERS, A.M., Instructor in Chemistry in Central High School, Kansas City, Mo. New York: Maynard, Merrill & Co. 1901.

This text-book is intended to be used in secondary schools. As stated in the preface the author has endeavored to avoid giving too great a number of facts, to omit what can never be of interest or value to beginners and has tried to show, wherever possible, the practical applications of the science to every-day life and has emphasized industrial and commercial processes. At the same time the fundamental principles of the science have not been forgotten and due attention has been given to these.

On the whole the author has succeeded very well and this book is much superior to many that are now in use. After two introductory chapters, one on chemical and physical changes and the other on valence, which it would have been better to put later or omit altogether, he begins with water and then takes up hydrogen and oxygen. This is followed by nitrogen, the atmosphere, the halogen elements and carbon and a few of its simpler compounds. Then follows a chapter on the laws of definite and multiple proportions and combining weights. Sulphur, silicon and phosphorus are then considered after which a chapter is given up to Avogadro's law and atomic weights. Before considering the metals a very brief mention is made of the periodic law. The subjects are everywhere treated very briefly and concisely and the references to commercial processes are very elementary. The appendix contains directions for the qualitative analysis of simple substances.

There are a few errors which no doubt will be corrected in the next edition. Thus for example on page 147 the name ethane is given to olefiant gas. On page 224 plaster of Paris is referred to as anhydrous calcium sulphate. On page 226 the statement is made that the hardness of water is either "temporary or perma-