LIQUEFACTION OF GASES

The Separation of Gases

By M. Ruhemann. (International Series of Monographs on Physics.) Pp. xiii+284. (Oxford: Clarendon Press; London: Oxford University Press, 1940.) 21*s*. net.

IN the preface to this book it is stated that "it is high time that deep refrigeration received adequate attention in this country". Dr. Ruhemann has therefore written a volume to remedy this lack of knowledge on the part of British men of science, in order that the subject may be taught in the universities. Certainly the average text-book of physical chemistry does not deal in much detail with the working of liquid air and similar types of plant. The reason is quite obvious. The principles of the subject were worked out many years ago. They are expounded in all works dealing with the equilibria of vapour - liquid systems. But their application has become a matter of very specialized engineering practice, naturally confined to those concerns whose job it is to build and operate low-temperature refrigerating plants. It is not the function of the average university lecturer in physics or in chemistry to teach engineering practice to his students. The author's crusade for courses on "deep refrigeration" is therefore unlikely to be taken up with any great enthusiasm in Great Britain. None the less, the book provides a great deal of information which has not hitherto been dealt with in any connected manner. In this respect it is welcome to chemists and physicists alike.

The early chapters deal with the principles of the subject, first with the vapour - liquid equilibria of two-component systems, next with systems of three components. Much recent data are presented in convenient graphical form. There is a chapter on the thermodynamics of gas separation, particular attention being paid to the types of diagram most useful for discussing equilibria in this field. As might be expected, there are full descriptions of the various types of liquefiers, with estimates of the efficiencies reckoned in gallons of the desired liquid per kilowatt-hour expended. Unfortunately from a practical point of view, the capital cost and maintenance of the plant are left out of consideration. While the scientific efficiency is of great interest, the over-all cost of running a plant is the determining factor in its adoption in practice.

Several chapters are rightly devoted to the separation of air into oxygen and nitrogen in either liquid or gaseous form. The isolation of the rare gases is described, but as a matter of interest the details of the method of separation and purification would have been welcomed by the average reader, who would like to know just how the pure samples, now available commercially, are prepared. There is here no mention of the use of charcoal in manipulating and purifying rare gases. Such a method is, of course, unlikely to be used on a large scale, but knowledge of this kind is undoubtedly useful to those working with these gases. It must be mentioned that there is a chapter on the separation of helium from natural gases.

The liquefaction of hydrogen and of helium are unfortunately left out of account. Admittedly, only the favoured few now handle these liquids, but the technique developed for their production, manipulation and use is of the utmost interest to anyone likely to read a book on the liquefaction of gases.

The production of hydrogen and even of methane from coke oven gas receives great prominence, and cogent arguments are brought forward to show that hydrogen so produced for use in synthetic ammonia plants is an economic proposition. The plant, however, is so complicated that it seems unlikely that it would compete with alternative methods of making hydrogen - nitrogen mixtures of the required composition and purity. The isolation of the constituents of cracked gases in the petroleum industry is described in the last chapter of the book. This is a subject upon which much work will be done, but the paucity of published results makes it difficult for the author to give more than an outline of what has so far been accomplished.

Much of the more recent data and statements of fact given in the book are derived from Russian sources, although a certain amount is culled from the United States. There is, however, often a lack of references to the source of information. This makes it very difficult to assess the value of such statements. In a scientific book of this character, it is not sufficient to say that in the U.S.S.R. such a plant is working at a certain efficiency, unless the figures are backed by reference to a detailed description of the plant in some journal of repute.

The volume is produced in the customary excellent style of the Clarendon Press.

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