

The classification according to components and degrees of freedom is known as the phase-rule classification. It is broad enough to include all facts pertaining to equilibrium and yet clearly enough defined so that everything has its own place. It is therefore an ideal classification, or perhaps the ideal classification for chemical equilibrium. It is more comprehensive than the periodic law or constitution formulas, and chemistry as a whole will some day be presented from this point of view. The phase rule is to the science of chemistry what the steel frame is to a building, the periodic law, constitution formulas, the mass law, the laws of electrochemistry, etc., being the brick walls. Just as we can build a small building safely of bricks and wood, while the steel construction is the only wise one for a sky scraper, so we have managed to get along satisfactorily hitherto without the phase-rule classification; but the rapid development of quantitative chemistry necessitates a new arrangement.

The book by Professor Roozeboom does not claim to revolutionize chemistry in the manner just outlined. Our ignorance is still too great to permit such a scheme being carried through to-day, though the direction in which we are tending and must tend is very clear. This book deals chiefly with the qualitative side of equilibrium and this first volume with systems containing one component only. It is, however, a conscious and deliberate step in the direction of the goal I have indicated and no one is better qualified to take this step than Roozeboom. We owe the phase rule to Gibbs; but it was Roozeboom who brought out the significance of it; who changed it from an interesting but apparently unimportant mathematical generalization to the safe guide in all matters of equilibrium and to the future basis of systematic chemistry. In this first volume the author begins with the discussion of the boundary curves for liquid and vapor, solid and vapor, solid and liquid. The triple point at the intersection of these three curves is next considered. We then pass back to the equilibrium between two stable solid phases and to the triple point with solid, solid and vapor in equilibrium. A

chapter on flowing crystals follows, in which it is shown that these are properly to be considered as a solid phase and that the first inversion point is one for solid, solid and vapor. Next comes a chapter on instable triple points in the case of enantiotropic systems, and then one on the behavior of monotropic substances. The volume closes with a chapter on the triple point, solid, solid liquid; one on the triple point, solid, solid, solid; and a final chapter in which the general question of uniform and non-uniform pressure is considered.

WILDER D. BANCROFT.

Die wissenschaftlichen Grundlagen der analytischen Chemie, elementar dargestellt. Von W. OSTWALD. Dritte, vermehrte Auflage. Leipzig, Wilhelm Engelmann. 1901. 13x21 cm. Pp. xi+221. Price, bound, 7 Marks.

The book is divided into two nearly equal parts, the first containing general theory and the second the application. The first chapter deals with the conditions for recognizing a substance and might well have been fuller. When two or more properties of two substances coincide, the other properties usually do and the substances are identical. This is true, but not complete. For instance, the converse does not follow. We can have substances, notably some of the radio-active substances where certain properties can differ markedly and yet the two substances be the same from a chemical point of view. This raises the question as to what properties, if any, are to be considered fundamental.

The second chapter gives the methods of mechanical separation, together with the theory of washing a precipitate. The third chapter treats of separation by distillation or solution. The fourth chapter is devoted to the electrolytic dissociation theory and the fifth to the question of measurement. In the second portion of the book the author takes up the different elements in the usual analytical groups and discusses them. In an appendix are given a number of interesting lecture experiments.

The opinion one forms of this book will depend on one's point of view. If one looks upon it as a book for those beginning analyt-

ical chemistry, it is excellent because it contains many things which every one ought to know, and because one can justify many of the mistakes and omissions on the ground that the beginners should first get hold of the general outlines of the subject, leaving the troublesome exceptions until later.

If one looks upon the book as a work for analytical chemists, for men who know the practical details of their subject and who would like to get a broader and more general view of the theoretical side, the book is not up to standard. Such men will be annoyed by the quantitative application of the mass law to the solubility of strong electrolytes, by the tacit implication that nitrates are not soluble in nitric acid, by the assumption that continued addition of a salt with no common ion will cause continued increase of solubility, by the statement that ion reactions are necessarily more rapid than reactions where ions are supposed not to take part. If they have read the recent work of Kahlenberg on the action of hydrochloric acid on oleates in benzene solution, they may even ask themselves whether the electrolytic dissociation theory is necessary in order to account for results in aqueous solutions which are paralleled in solutions which do not conduct and where the electrolytic dissociation theory therefore does not apply.

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The Engineering Index; Five Years, 1896-1900. Edited by HENRY HARRISON SUPLEE. New York and London, The Engineering Magazine. 1901. 8vo. Pp. 1030. Price, \$7.50.

The first and second volumes of this index to engineering literature, covering the years 1884-1895, were issued under the editorship of Professor J. B. Johnson from notes published monthly in the *Journal of the Association of Engineering Societies*. Since January 1, 1896, this work has been done by the *Engineering Magazine*, and the present third volume of the 'Index' is the gratifying result. It contains about a hundred pages more than the first and second volumes combined, while the amount of matter is more than twice as

much, owing to the arrangement of the page in two columns and to the smaller type. The number of periodicals indexed is about 350, nearly six times as great as in the second volume.

The index is a subject one, the titles of the articles or papers being classified under headings, each of which is subdivided into minor ones. For example, under 'Education' there are found twenty-one titles relating to engineering education in general, these being placed in alphabetic order according to the first word of the title; then follow about eighty special articles classified under sixty subdivisions, beginning with Admission Requirements and ending with Yorkshire College. Cross references are also given under both the general headings and their subdivisions, thus rendering it easy to follow special lines of inquiry in different directions. The styles of type used for the major and minor headings are good ones, although perhaps a little greater clearness might be secured with styles somewhat lighter.

The first volume of this series was called by Professor Johnson 'The Descriptive Index of Engineering Literature,' because there was added to the title of each paper a brief note giving an outline of its contents or an estimate of its value. While the name has unfortunately been changed, this excellent feature of descriptive notes has been retained, and these are of great assistance to the index searcher, for they usually give a clearer idea of the paper than can be obtained from its title. For example, under the heading 'Gas Engine' the title 'A Modern Motor' is somewhat vague, but the added note, 'The advantages of gas engines in points of economy, efficiency, cleanliness and safety,' immediately tells the reader whether or not the article is likely to be of value to him. In this volume the additional useful feature of noting the approximate number of words in each article has been introduced. The articles indexed from periodicals in foreign languages appear to be about ten or fifteen per cent. of the total number; the titles of these are given in English translation, followed by the original in parentheses.