and forester will also object to the curious alphabetical sequence in which the timbers are arranged; vernacular, trade and botanical names having been used quite indiscriminately. The separate indexes of botanical and other names at the end of the book help to overcome this defect. In many instances the botanical names are not recorded at all, which is to be deplored in a work of reference. This curious arrangement is similar to that previously adopted in "A Manual of the Timbers of the World".

It is rather surprising in a book on timber identification to find that the only text, apart from the preface, consists of some forty pages describing the conversion and seasoning of timber. This, however, provides a useful and authoritative summary.

Taken as a whole, the book will be found helpful in identifying timbers, especially by those who are casually interested or to whom a collection of authentic specimens is not easily accessible. It also enables a rapid preliminary comparison to be made whenever a specimen is received for identification. It will, however, be desirable to consult other sources of information when precise and accurate identifications are required; for example, when settling legal disputes.

If Mr. Howard had taken some of his many scientific friends more fully into his confidence before publishing this book, a notable addition to our applied botanical literature might have been achieved. A book based on his long practical knowledge of the trade, combined with that of an experienced botanist or forester, would have been well worth while.

C. R. METCALFE.

HYDROGEN IONS IN PURE AND INDUSTRIAL CHEMISTRY

Hydrogen Ions

Their Determination and Importance in Pure and Industrial Chemistry. By Prof. Hubert T. S. Britton. (Monographs on Applied Chemistry, Vol. 3.) Third edition, thoroughly revised and enlarged. Vol. 1. Pp. xix+420. 36s. net. Vol. 2. Pp. xix+443. 36s. net. (London: Chapman and Hall, Ltd., 1942.)

THE appearance of a third edition of Prof. Britton's well-known text-book on "Hydrogen Ions" will be welcomed by those physical chemists who are concerned with the control of analytical and industrial processes by means of *pH* measurements. The ten years which have elapsed since the publication of the second edition have seen a large increase in the original literature of the subject and this has necessitated a considerable increase (some 274 pages) in the size of the book and its division into two volumes. The book is well printed on good paper and shows few signs of war-time austerity, with the exception of the price, which has increased nearly 200 per cent: perhaps this is only the shape of things to come.

The importance of *pH* measurements in analytical operations, electro-deposition and tanning processes, in the sugar, paper, brewing, dairy and explosive industries, in baking, water purification and sewage disposal, in agriculture and the textile and dyeing industries, in ore flotation, etc., fully justifies the appearance of this new edition, for it is a valuable contribution to our technical sinews of war. The book is a mine of information particularly concerning the practical aspects of *pH* measurement, and the

author draws freely on his extensive practical experience in his critical assessment of the experimental methods described. The numerous tables of information and practical notes make the book a valuable *vade mecum* for all concerned with *pH* measurement.

Besides the more technical aspects of hydrogen ion measurements, the author discusses subjects of more academic interest; for example, the ionization of dibasic and poly-basic acids, the Lowry-Bronsted theory of acids and bases, etc. The new edition also includes a chapter on oxidation-reduction processes, including the use of redox indicators.

The book has been written primarily for those concerned with the industrial aspects of physical chemistry. Those concerned with the more theoretical aspects of the electrochemistry of solutions will find in the book much to interest and instruct them, but some will perhaps be a little dissatisfied with the treatment of the more modern aspects of the subject. At what stage in his course should a student be introduced to the newer theories of electrolytic dissociation? This question, no doubt, exercises the minds of many teachers. Prof. Britton has adopted in his book, what is the common practice, of first tentatively applying the Arrhenius theory to strong electrolytes and only at a much later stage, half-way through the first volume, introducing the activity concept. This procedure is not altogether satisfactory as it necessitates frequent qualification of statements in the earlier part of the book, a procedure which must cause confusion to a reader not already familiar with the subject.

So much has already been written of *pH* and buffer solutions which is based on the erroneous assumption of Arrhenius concerning the dissociation of strong electrolytes that considerable confusion would be caused by changing to the more satisfactory thermodynamic basis. The standard of reference of any potentiometric scale is an arbitrary one, so why change it, even if the older definition of the standard hydrogen electrode is not satisfactory? The author gives these reasons (pp. 292-294) for his retention of the original definition of *pH*, and many would agree on grounds of expediency. The criticism of the modern theory given as an additional reason for retention of the older concepts will not meet with such wide agreement, for the statement concerning the impossibility of determining single ion activity coefficients is perhaps a little unfair; a very similar criticism can be made against the concept of the single electrode potential used by the author.

The chapter on the Debye-Hückel theory has been largely re-written, but room has not been found to include an account of the success which has attended the application and extension of these ideas to the interpretation of the electrical conductivity of strong electrolytes and the effect of high potentials and high frequencies on the conductivity. No mention is made of the interesting work of Wien and of Onsager on the effect of high potentials on the dissociation of weak acids, nor is the heavy hydrogen ion discussed. Reasons of space, no doubt, made it necessary for the author to circumscribe his field.

Another edition of this book will certainly be called for in the not too distant future, and it will no doubt be necessary for Prof. Britton to put the chemical community more in his debt by enlarging his book still further.

H. L. RILEY.