traces of Co and Ni, is heated to drive off H_2S, and cooled; it is then treated with an excess of KOH, oxidized with Br water or H_2O_2, and filtered. The residue may contain $Fe(OH)_3$, MnO_3H_2, and traces of $Cr(OH)_3$, $Co(OH)_3$, $Ni(OH)_3$. The filtrate may contain K_2CrO_4, AlO_3K_3 and ZnO_2K_2. The Cr is tested for by oxidizing an acidulated portion of the filtrate to perchromic acid by H_2O_2. Another portion of the filtrate is exactly acidulated with HCl, and precipitated by sodium acetate as aluminium basic acetate, thus securing the detection of very small amounts of Al. The filtrate from the oxyacetate contains the Zn which is precipitated as sulphide by H_2S. Iron and manganese are tested for by dissolving one portion of the residue in HCl, and adding KCNS, or $Fe(CN)_6K_4$, and by fusing another portion of the residue with $Na_2CO_3 + KNO_3$. The presence of traces of compounds of Cr, Co, Ni, not interfering with these tests. This method will be found simpler, shorter, and fully as accurate as the barium carbonate method, which is so generally recommended, when Cr, Mn and Fe are all present in the substance analyzed.

In the chapter on solutions the treatment of sulphides and chlorides insoluble in acids is noticeable.

In the chapter on preliminary treatment the introduction of the Hempel reduction methods is praiseworthy.

The phase-rule is entirely omitted; just why it is hard to see. One may say that beginners can not understand it, but this is not a book for beginners. However, as Dr. Böttger is chief assistant in the Leipsic laboratory, he must be credited with due consideration of the theories to be introduced or omitted.

Elementary physical chemistry throws such a flood of light on the problems of analysis that the opponents of its use for this purpose are fewer every year; although among the new manuals are some which practically differ from the older books only in adding the word "ion" to the name of the element, and freely using + and — signs; such books do not illuminate and make no converts.

The present book, it is true, is too large and too detailed for American college students, but any one who intends to write a laboratory manual—and who does not write one?—will do well to read Dr. Böttger's book carefully.

It would be well if the author should arrange with his American translator to publish an abbreviation of this book for college use, containing the theoretical part and experiments without change, but cutting down the remainder to a third of its present size. This is practicable, as much of the present material should be omitted for college use, and as Dr. Böttger's German is extremely diffuse. Such a book would be very valuable for college students in their second laboratory-year.

The book, as it is, should be studied by graduate students, and especially by teachers, who will find in its pages simple explanations of more than one puzzling phenomenon. It is to be hoped that the book will meet with the recognition which it merits.

E. Renouf

A Treatise on Chemistry. By H. E. Roscoe and C. Schorlemmer. Volume II.: The Metals. New Edition, completely revised by H. E. Roscoe and A. Harden. Pp. xii + 1436. New York, The Macmillan Company.

Sir Henry Roscoe is to be congratulated most heartily on the revision of the well-known "Treatise on Chemistry." It is seldom that an author lives to see such an extensive work useful through thirty years and at the end of that time appear entirely fresh with all of the most recent developments in theory and application. The book bears the strong personal impress of the author and is delightful reading on account of the intimate historical presentation of the various subjects. The scientific, practical and historical are so nicely interwoven as to make the book most readable and valuable.

The introduction of material on Werner's valence theory, the phase rule, radio-activity, Thomson's corpuscular theory and other recent developments has added much to the value of the book. In addition to these an account of recent work on alloys has been added, although the treatment is not entirely satisfac-

tory. The brief reference to such an important subject as the constitution of steel is to be regretted.

The subject of crystallography, which was formerly given in the volume of the non-metals, has been transferred to this volume and occupies fifty pages. It is fully believed that such special subjects as this and spectrum analysis (25 pages) might be condensed into much smaller space without injuring the value of the book.

The metallurgical and technical processes, as in previous editions, have been satisfactorily treated, and have been brought up to date.

While the chemists will be pleased to have so excellent a statement of his science as this book, he will regret that the author has not drawn more largely from his long experience and given more attention to criticism and generalization.

HENRY FAY

Lead and Zinc in the United States, Comprising an Economic History of the Mining and Smelting of the Metals, and the Conditions which have affected the Development of the Industries. By WALTER RENTON INGALLS. Pp. x + 368, illustrated. New York, Hill Publishing Co. 1908. $4.

Most publications dealing with the histories of metals have mainly an antiquarian interest. The two leading exceptions to this general rule are found in the great work of Beck on iron, and the more general book of Neumann on the leading industrial metals, as both authors have taken up the statistical, industrial and technical sides, and added them to the usual chronological treatment of the subject.

The present work deals with lead and zinc only, the ores of which frequently occur together and therefore influence each other in treatment. The new departure of this publication lies in the fact that, restricting the field to the United States, it considers the American methods of treatment of the metals from the mine through the smelter to the market of the finished product. The technical processes are given with sufficient details to be clear even to the reader not especially versed in this branch of engineering.

The time of writing such a work is opportune, as some of the founders of the modern American lead-smelting practise are still actively engaged in their profession, and as the fathers of the first industrial production of zinc are still living; nor could the work have fallen into better hands than those of the author, who is well-known to the mining and metallurgical profession as an engineer, as a writer on subjects relating to lead and zinc, and as the editor of one of our leading technical journals and annuals.

The introduction gives a brief and concise review of the history of the two metals in this country. The first part, which deals with lead, is much longer than the second, devoted to zinc. This was to have been expected, as while lead was first mined in the early part of the seventeenth century, zinc was not produced until two centuries later.

The history of lead begins with an account of the occurrence of lead ores. The discussion outlines the leading geological features of the deposits, but dwells more upon the character and grade of the ores, and upon the industrial conditions which governed the mining operations. This is followed by the chronology of the history of lead-mining, which starts from the first record of 1621, when lead was mined and smelted near Falling Creek, Va., and records the leading events down to 1906. Chapter III. gives a valuable résumé of the development of the blast-furnace practise of smelting silver-bearing lead ores, and of the treatment of silver-free lead ores in the ore-hearth and the reverberatory furnace. It shows how blast-furnace smelting developed from crude beginnings into its present unsurpassed excellence by the application of science to art, and by concentration of operations into large, centrally located plants. In the account of the ore-hearth work the increase in yield by the recovery of fumes receives due consideration. While in smelting the work of Arents, Eilers, Hahn, Raht and others is recorded, in the chapter on refining we should have liked to see mentioned the invention of the Steitz siphon,