

REVIEWS OF BOOKS.

Practical Electrochemistry. By BERTRAM BLOUNT. Second Edition. (London, 1906: Archibald Constable & Co., Ltd. Price 15s. net.)

In reviewing the second edition of a book, one naturally compares it with the previous one, in order to see whether any great or striking changes have been made. Further, when a branch of science is advancing so rapidly as is electrochemistry, considerable changes, or at any rate additions, are expected. Let us say at once, then, that in the book before us there are very considerable additions, notably in connection with the production by electro-thermic methods of iron and steel—in fact, this section of the book is new. Illustrations and brief descriptions of the Keller, Héroult, Kjellin, and Gin Furnaces are given. The author does not expect the electric furnace to take the place of the blast furnace for ore smelting, except in very exceptional cases. Since the book has been published the case where it can be used appears to have arisen. In Canada, Dr. Haanel seems to have had very considerable success in smelting ores with a modification of the Héroult furnace.

In the interesting section on electrotyping and electroplating we think that the current density given for electrotype work is much too low. The author says that a current density of 10 amperes per square foot will generally be found suitable. In electrotyping for printing purposes, where time is an important factor, currents up to 100 or 125 amperes per square foot are frequently employed. We are in full agreement with the author's remarks anent cookery receipts and nostrums in the electroplating trade. Generally speaking, if half the ingredients are left out of the plating bath, which this or that operator employs, equally as good, if not better, results are obtained, than if they had all been left in. Mr. Blount gives an example of a receipt in general use, in which a cupric salt is reduced by sulphurous acid before the addition of the cyanide; we wonder whether this is really necessary, seeing that a cuprous salt invariably results from the addition of potassium cyanide to a cupric salt, cyanogen being liberated. Perhaps it is to prevent the liberation of cyanogen that the salt is first reduced. We do not desire to make a carping criticism; the author will most certainly agree that if it is possible to simplify a process it is a step in the right direction.

In the section treating of alkali, chlorine, and their products, we notice an account of the Acker process for manufacturing caustic alkali; this process was not described in the old edition.

The book has been brought up to date, and we expect it will obtain an even better reception than the first edition, which had to be reprinted while the second edition was in preparation.

Analyse des Métaux par Électrolyse. By A. HOLLARD et L. BERTIAUX. (Paris, 1906: H. Dunod et E. Pinat. Price 5 francs.)

Hollard and Bertiaux are so well known in the world of electrochemical analysis that one welcomes a book by these collaborators with interest. It is

chiefly in connection with the separations of the metals that Hollard and Bertiaux are so well known, and one therefore naturally first turns to this part of the book.

The separation of the metals and the analysis of commercial alloys and commercial metals such as brass, aluminium bronze, tin foil, and lead sheet, is treated of in the third part of the book. If this part of the book alone had been written, it would have been of value without the other parts which lead up to it. The methods given, a great many of which have been devised or perfected in the authors' laboratory, show that with care a very large number of separations can be carried out by purely electrolytic methods. Personally, we consider that a good many of the separations given could be far better and more readily carried out by a combination of electrolytic and chemical methods of procedure. At the same time considerable ingenuity is shown in the ways which are employed for getting over some of the difficulties insuperable in purely electrolytical separations.

The first part of the book is devoted to a description of the apparatus employed in electrochemical analysis. Basin electrodes and various cylindrical electrodes are described, but the only one of the cylindrical electrodes described which we would care to use is Hollard's own gauge electrode. At the same time, we think the author might have made some reference to rotating electrodes, which are now coming so very much to the fore, and about which within the last three or four years a good deal of literature has been published.

There are not many diagrams in the book, but those which are given, with the exception of those of the electrodes, are extremely poor.

We are glad to notice that—in contradistinction to most French writers—the authors have supplied an index. It is not a very full index, but still it seems adequate.

The book on the whole is to be recommended, and is certainly a useful addition to the literature upon the subject.

Monographien über angewandte Elektrochemie: Elektrolytische Alkalichloridzerlegung mit flüssigen Metallelektroden.

By DR. R. LUCIAN. (Halle, 1906: Wilhelm Knapp. Pp. viii. + 206
Price 7 M.)

This monograph is a very careful and useful compilation, the author having evidently very thoroughly searched the literature upon the subject. Perhaps he has gone rather too fully into the patent literature, as we do not see that there is much use in carefully describing all the patents when the processes described have never passed the experimental stage, if they have even got so far.

The monograph commences with a short discussion upon the electrolysis of alkali chlorides with mercury cathodes, and the theoretical principles of the Castner process are very clearly stated. The practical difficulties of the process are then referred to at considerable length—for example, the purification and prevention of oxidation of the mercury cathode; the difficulties insuperable with the employment of carbon anodes; the durability of the electrolysing cells, and so on. One of the chief difficulties met with in dealing with the mercury cathode is that if an amalgam containing more than 0.5 per cent. of sodium is produced the mercury ceases to flow, and in practice it is found better not to exceed a concentration of more than 0.2 per cent. It is therefore obvious that in order to produce any quantity of sodium hydroxide a very large amount of mercury must be circulated through the

electrolysing vessel in the course of the day. Chapter III., which occupies the greater portion of the monograph, is devoted to a description, in alphabetical order, of the various patents which have been taken out in connection with the electrolysis of aqueous solutions of chlorides when a mercury cathode is employed. Some of the methods employed for overcoming the great difficulties met with in the commercial working of the process are extremely ingenious, but unfortunately those which are most beautiful on paper are often much too complicated when tried in actual practice.

Why the author describes the United States Patent No. 652,761 we are at a loss to know. He himself says:—

"This patent . . . consists in bringing a powerful magnetic field to bear upon the amalgam, and thus to cause the mercury to be agitated. Unfortunately mercury has not the power of being affected by a magnetic field . . . there is therefore nothing in the patent."

Chapter IV. is historical; it is also very interesting, and has some good diagrams of plant. The last portion of the book is devoted to the electrolysis of fused alkali chlorides and fused metallic cathodes. As the Acker process is the only one of proved commercial success, naturally it is more fully described than the other methods. Other processes are, however, not ignored, and those of Vautin, Ashcroft, and Hulin are somewhat fully dealt with.

The diagrams in the book are exceedingly good and clear, and the author's descriptions are also well expressed. This book is of undoubted value, and from it we get a good insight into the great amount of work which has been done upon the subject.

Chemistry of Proteids. By GUSTAV MANN. (London, 1906: Macmillan & Co., Ltd. Pp. xviii. + 606. Price 10s. net.)

In writing this book, Dr. Mann, as he states in his preface, at first intended to translate Dr. Otto Cohnheim's *Chemie der Eiweisskörper*, but he found that the work would require extension, and furthermore he did not in all matters see eye to eye with Dr. Cohnheim. As a consequence we have the present volume, which, although based upon the work of Dr. Cohnheim, is not a translation of his book, and therefore has an individuality which would have been missed in a mere translation.

The book commences with a brief introduction as to the position of the proteids in nature and their relationship to other chemical compounds. Chapter I. gives a useful, interesting, and lucid account of the reactions of albuminous substances, and the way in which the reactions have been brought together is sure to be found useful to workers on the subject.

When we come (in Chapter II.) to the dissociation products of the albuminous substances the decomposition products are roughly divided up into primary dissociation products which include such bodies as the albumoses, the peptones, and the peptids, and these by further decomposition break down into groups which are quite non-albuminous—that is to say, those which do not show the biuret reaction are called "simple dissociation products." From the historical account one sees the great influence which the work of Emil Fischer upon the amino acids has had upon the chemistry of the subject, more especially in connection with the peptones. The primary dissociation products are first described, commencing with the comparatively simple glycocoll $C_2H_5NO_2$, and ending with cystin $C_6H_{12}O_4N_2S_2$, of which there are two—A-cystin, or protein cystin, and B-cystin, or stone cystin. Unclassified dissociation products are then dealt with; these are substances

about which there is a doubt as to whether they are directly formed from albumen or only secondarily out of the primary decomposition products.

We then come to the secondary dissociation products derived from the amino acids. These are referred to under the different methods which are employed to disintegrate the albumens, such, for example, as disintegration by means of boiling alkalis, with superheated steam, by means of oxidising media, and so on.

Chapter III. treats of the synthesis of albumens. If the biuret reaction is to be taken as characteristic of the albumens, then apparently we are to consider that synthesis of the albumens is produced when by some condensation of substances which do not give the biuret reaction an end product which does give it is obtained. Thus, for example, Schaal in 1871, by condensing aspartic acid chloride in a stream of carbon dioxide, obtained a substance which showed the biuret reaction, and this must be looked upon as being the first synthesis of an albumen.

In Chapter IV. we come to the constitution of albumens and to the linking up of amino acids. Here it is shown that the cause of the great similarity of the albumens is to be traced to the imine linking, and this explains why the albumen dissociation is so regular in character, and why they can be dissociated by trypsin.

Chapter VIII., upon the general physical properties of the albumens, is interesting and suggestive. It deals with the properties of solution, an explanation of the theory of which the author considers necessary in order to pave the way for those who have not studied the question. In the diffusion of non-electrolytes such as sugars the author believes that when diffusion takes place the solvent has one electrical charge while the solute has the opposite charge. The mixture thus being a binary system, it is impossible for an electrical current to pass through it, as this would mean moving both the solvent and solute. We notice that the cation is written H^+ or K^+ as if it were degrees; the established custom is to write it with a dot (H^{\cdot}). The author also writes anion and kation in the usual way in some parts of the book, and in another place (page 301 for instance) with a hyphen, as kat-ion and an-ion. Apparently this is to accentuate which ion is referred to, but really this is hardly necessary. On page 301, line 13, we notice a misprint—Na B in place of Na Br—and on page 304, line 12, preferred where it obviously should be prepared. Physical chemists will undoubtedly be much interested with Chapter VIII. here referred to, as it also deals with the salting out of albumens, heat coagulation, heat of combustion and rotatory power, and other physico-chemical problems.

The book is one which all chemists will desire to have on their book-shelf. The subject is not treated entirely from the chemical standpoint, the physiological aspect being continually referred to. If there are places where the chemistry is rather curtailed, the literature is so fully given that the chemist can always refer to the original work on the subject. Certainly if any one desires to take up the subject from the point of view of research we think he could not do better than first to study this work and then to read up the portion of the original literature which deals with the subject he desires to investigate. This book shows what a large amount of work has been done on this very difficult branch of the subject, and also draws attention to the enormous scope for fresh investigation, and we congratulate the author upon the way in which he has performed his task.

The Elements of Chemical Engineering. By J. GROSSMAN, M.A., Ph.D. (London, 1906: Charles Griffin & Co., Ltd. Pp. viii. + 152. Price 3s. 6d. net.)

On first taking up this little book one is inclined to think that it is absurd to endeavour to write upon the subject of chemical engineering in so circumscribed a space, but a careful perusal of the contents leads one to the conclusion that the student who carefully studies the little work will have learned a good deal. The first chapter treats of the "beaker and its technical equivalents," the second chapter "distilling flasks . . . and their technical equivalents." We do not think that this style of heading is any help; it is all very well to refer to the beaker as a piece of apparatus for holding liquids and in which certain operations are carried on in the laboratory. But the first technical equivalent, a cube or oblong box of iron or lead, could be quite as easily explained without talking about beakers at all. And similar remarks apply to drying ovens, &c. There is no actual objection to this style of writing, but we venture to think that a great deal of the laboratory apparatus has been evolved from the technical equivalent, rather than that the technical apparatus has been evolved from the laboratory.

Although we have made the above general criticism, the remarks must not be supposed to be directed against the general contents of the book. The remarks about steam-jacketed pans will be found very useful, and also the description of the principle of the Galloway boiler in Chapter V. In Chapter IX., which deals with measuring instruments, the portion devoted to technical gas analysis is inadequate, at the least, and when the author refers to the "Orsat" apparatus he might surely have given a diagram and a description as to how it is used. The most remarkable thing in the book is the devotion of seven pages to the current prices of chemicals and materials; the author remarks that chemicals and other commodities are liable to frequent fluctuations . . . "but it is better that the student should have some idea of prices than none at all." All one can say is that if the student desires to know prices—and certainly it is as well he should know something about them—he can get accurate and up-to-date information in the trade journals.

The book is lucidly written, and, we are sure, will be found of considerable value to students who desire to study chemical technology. We should like to ask the author, however, where the student is to find—in this country—a laboratory where he can carry out technological research work on the scale of several hundredweights.

Systematic Inorganic Chemistry. By R. M. CAVEN, D.Sc., and G. D. LANDER, D.Sc. (London, 1906: Blackie & Son, 50, Old Bailey, E.C. Pp. 374. Price 6s. net.)

Dr. Caven and Dr. Lander, in supplying the chemical public with this book, have placed, at any rate, teachers of chemistry under an obligation. The remark has often been made that in this country no good and comprehensive book is to be had on the subject of inorganic chemistry; that is to say, no book which can be recommended to the ordinary student whose purse is probably not too long, and who is unable to have access to the monumental and splendid work of Roscoe and his collaborators. We venture to think that now we have a book which we can put into the hands of our more advanced students, and that both they and those who have to direct their studies will be the gainers.

The book is not a practical one, and does not deal with practical methods or manufacturing processes. Its basis is purely theoretical, and the theory is

put in such a manner that the student who carefully studies the book will have a thoroughly sound knowledge of the theoretical principles upon which the vast fabric of chemical science has been erected.

The first chapter deals with "The Atomic and Molecular Theories," and commences with the Law of Definite and Reciprocal Proportions. A very useful section of this chapter is devoted to Valency, which is treated both chemically and physically. This section of itself would be too short, but the authors adopt a better method than enlarging it and thus shutting up the different parts of the subject into watertight compartments, by continually bringing the matter forward at appropriate parts of the work.

Chapter IV. treats of Oxidation and Reduction, a subject which is always fully, if not thoroughly, handled in books on organic chemistry, but is as a rule not sufficiently studied in works upon inorganic chemistry. In Chapter V. we come more to details, the various metals being treated of in the order in which they are found in the Periodic Classification of the Elements.

On one point we must dissent from the authors. On page 6, in dealing with Dalton's atomic hypothesis, they say: "As a practical unit, the relative atomic mass or weight of hydrogen, specifically the lightest substance known, is taken." And then in a footnote: "Consequently the atomic weights used in this book are referred to hydrogen as unity."

This we consider to be a mistake. Surely the comparison is the same whether hydrogen is taken as unity and oxygen as 15.96, or whether oxygen is arbitrarily fixed at 16 when hydrogen becomes 1.008. In any case, it is quite as arbitrary to fix $H = 1$ as $O = 16$. Furthermore, nearly all chemists are now agreed to employ the atomic weights obtained by fixing the weight of $O = 16$. The Germans, for example, have now left off printing the dual columns and, writing from memory, we believe that the same recommendation was made this year by the British Association Committee.

With this one exception we have nothing but praise for the book, which we hope will find a large public.

Elementary Practical Metallurgy: Iron and Steel. By PERCY LONGMUIR. (London, 1905: Longmans, Green & Co. Price 5s. net.)

Another addition to the many volumes on the elements of metallurgy. The author's excuse is that he attempts to fit in theory with practice and thus overcome the objections of practical men to much of what has hitherto been written on the subject. In some measure he has been successful, and what he has written will awaken interest in many who have given up as hopeless the attempt to follow what appears to them too theoretical for practical minds.

Such rapid progress has been made in the iron and steel industry during the past few years that what is considered "theoretical" and "scientific" to-day must be looked upon as practical to-morrow, or the essentially practical man will be left behind.

Readable chapters are devoted to furnace-lining materials and fuel. A chapter on iron ores is very scant, and might with advantage have given much more information on the actual mixtures used in producing various classes of iron in the several smelting districts with the effect of the various impurities and means adopted for minimising their effect. In a small volume this is somewhat difficult, but it might have been written along with the chapter on metallic products of blast furnaces, so as to have given the reader an intelligent idea of what is actually employed to produce the metals of which the composition and properties are given. The chapters on the

various processes for the production of steel and on its heat treatment are most instructive, and the latter chapter is well illustrated with photo-micrographs. We recommend this volume to those wishing to acquaint themselves with the elements of iron and steel manufacture, and feel sure that it will serve as a useful stepping-stone to the assimilation of more highly specialised work.

Elements of Quantitative Analysis. By S. H. BAILEY, D.Sc. (Lond.), Ph.D. (Heidelberg). (London, 1905: Macmillan & Co. Pp. 246. Price 4s. 6d.)

A most useful little volume, divided into four equally interesting parts. Part I. is devoted to the general principles of chemical analysis. Parts II. and III. deal with volumetric and gravimetric processes respectively, and Part IV. with technical analysis. The aim of the author is thoroughly to ground the student in the principles underlying quantitative analysis, and the subject is dealt with in a manner sure to appeal to the workers for whom it is primarily intended, and will likewise be of great assistance to the teacher. A reason is given for every step, and a careful study of the book, with experiments on the lines indicated, will put the student in the happy position of being able to determine the most suitable method to employ for a given purpose and to take all the necessary precautions without which failure is bound to follow. As a result he will become a thoughtful worker, realising to the full the educational value of an analytical process already worked out for him, instead of developing into a mere analytical machine likely to go wrong when something out of the common comes his way.

Elementary Experimental Magnetism and Electricity. By WILLIAM ALLANACH, B.Sc. (London, 1906: Longmans, Green & Co. Price 3s. 6d.)

This book is written as a combined lecture and laboratory course suitable for secondary day schools and evening science schools, and is divided into the usual three parts—magnetism, electrostatics, and current electricity.

It presents nothing new either in matter or method, and for a book of its size too much is attempted, making the matter treated too brief and scrappy to be of much use. We are inclined to think that half a page devoted to the electromagnetic system of units and one page to secondary cells will give the beginner anything but a clear understanding of these subjects.

Again, the few mathematical examples given are not sufficiently clear: a formula is arrived at, but the deduction is decidedly vague. In one case the student is advised to commit a formula to memory, the manner in which it is obtained being left until he has made considerable progress with mechanics. This system of teaching does not tend to encourage a student to study intelligently, and we think that greater space might have been devoted to more thorough explanations even at the expense of the scope of the book.

Throughout the book experiments are plentiful, and these as illustrations are excellent, but it would scarcely fulfil the requirements of a laboratory companion such as might be safely placed in the hands of a student who knew nothing of the subject. In every case the student is told what he ought to get, and he is not encouraged to think for himself by deducing his own conclusions.

For private students who are preparing for elementary examinations and have no desire to really learn the subject in an intelligent manner the book will be found useful and may perhaps have many admirers.

The Metallurgy of Gold. By T. KIRKE ROSE, D.Sc., A.R.S.M. Fifth Edition. (London, 1906: Charles Griffin & Co., Ltd., Exeter Street, Strand. Pp. 534. Price 21s.)

Dr. Kirke Rose's standard work on gold is too well known all over the world to need any further description, apart from the mere calling attention to the issue of a new edition, considerably enlarged, and, of course, brought up to date. There is a new chapter on "Re-grinding," which naturally contains some reference to the results of the introduction of tube mills into the Transvaal.

The electrometallurgist will gather little comfort from this book; the record in electrical methods of precipitating gold points to decay rather than to progress. Indeed, although not expressly mentioned by the author, there is at present no electrical treatment of any kind being used commercially on the Rand. On the other hand, electrolytic methods of parting are making noticeable headway both in Europe and America. There is a bibliography of principal books and articles at the end of the volume.

Practical Methods of Inorganic Chemistry. By DR. F. MOLLWO PERKIN. (London, 1906: Archibald Constable & Co., Ltd. 2s. 6d. net.)

Although the fundamental principles of the science of chemistry were founded on a basis derived from the study of inorganic compounds, to-day progress is slow. The neglect of inorganic chemistry commenced with the rise of organic chemistry about seventy years ago, and the position was not improved when chemists became specialised physicists. Some few years ago a stimulus was given to the further study of the parent science by the introduction of electrochemical considerations, and it is to be hoped that the volume now before our notice will keep up this interest. To a large extent the student of to-day is encouraged in the use of the test-tube, and after certain proficiency has been gained, in this almost rule-of-thumb method, the study of organic chemistry commences and the flask is introduced. As a consequence, inorganic chemistry is regarded, more or less, as a feat of memory instead of a systematic study. This new book, therefore, supplies a long-felt want, and great thanks are due to Dr. F. M. Perkin for the trouble he has taken in its preparation. With regard to the book itself, the author has evidently endeavoured to preserve system and develop the study gradually. Thus at the commencement very simple preparations are detailed, care being taken to explain these fully with equations and graphical formulæ. Technical processes are by no means neglected, and these are imitated, as far as it is possible, on a small scale. The properties of different elements and compounds are compared and contrasted by carefully and well-chosen experiments. The latest method of producing pure metals by means of aluminium and calcium has found a place in the book, although this work is quite new, and in this section especially are introduced many ingenious devices for the convenience of the young student. This small book cannot be too strongly recommended, and we can only hope that it will meet with the success it deserves.