

thirds of the cost," and the range is, at the same time, available for cooking. "Gas has its advantages when small quantities of hot water are generated where and when required." "By far the greater part of the waste of fuel used for a hot-water supply is due to loss of heat from uncoated pipes and tanks. Four-fifths of the fuel used may be saved by the use of good non-conductors." "The cost of continuous warming by coal as against gas fires is about one-third or one-quarter, but gas is far the more convenient and economical when a living-room is only occasionally used and required to be ready for occupation in a short time"; moreover, the use of gas fires or other smokeless fuel conserves coal and cleans the skies. In the matter of lighting, Mr. Barker points out the economy of using for passages or as a night-light a lamp of higher voltage than that in the mains. "The use of a 200 volt lamp on a 50 volt circuit would give a night-light probably at about one-twentieth the cost of a paraffin-wax night-light."

Such quotations suffice to show the practical suggestions put in simple and clear language, of which the book is full. In dealing with ventilation and heating in connection with comfort and health—that is, with physiological principles—the author evokes, as so many do, some mysterious influence in addition to the physical qualities of the air. Without adducing a particle of evidence, he writes of "something probably in the nature of ionisation or deionisation or variation of potential." He considers the view that sensations of stuffiness are dependent on temperature and humidity (movement must be added) as "totally inadequate." Well, let him compare the physical conditions of Montana out of doors with those in the room in London best ventilated and warmed by his own methods.

L. H.

Metallurgical Principles and Processes.

- (1) *The Physical Chemistry of the Metals.* By Prof. R. Schenck. Translated and annotated by R. S. Dean. Pp. viii+239. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1920.) 22s. 6d. net.
- (2) *Electric Furnaces in the Iron and Steel Industry.* By W. Rodenhauser, J. Schoenawa, and C. H. Vom Baur. Translated from the original by the latter, and now completely rewritten. Third edition, revised. Pp. xxi+460. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1920.) 24s. net.

(1) **P**ROF. SCHENCK'S course of lectures, delivered to an audience of technical men at Aachen, was first published in 1909, and at once proved of great service to teachers of metallurgy and to students desirous of acquiring

an insight into the scientific principles underlying metallurgical processes. At the same time, it directed the attention of physical chemists to the large mass of intrinsically interesting material for the study of chemical reactions and equilibria which is available from metallurgical sources. The subjects of the lectures were:—The properties of metals; metallic solutions and alloys; carbides, oxides, sulphides, and mattes; the processes of oxidation and reduction; blast-furnace reactions; and the reactions of sulphides. Of these the subject of the constitution and structure of alloys has been treated by many writers, and text-books of metallography are numerous, but the kindred studies of mattes and slags, and of roasting and smelting reactions, have received far less attention. There is, therefore, room for such a work, and a translation is to be welcomed.

In view of the time that has elapsed since the delivery of the original lectures, however, it would have been advisable to subject the text to thorough revision, as many advances have been made in the meantime. A few later data have been incorporated, but the alterations are trivial. The most interesting sections are those concerned with mattes and similar mixtures and with the blast-furnace reactions. These sections will repay study by physical chemists as well as by metallurgists on account of the interest presented by the equilibria involved. It is difficult to obtain absolutely satisfactory data, as the reactions are often slow, especially when solid phases are concerned, and some of the investigations in this field have had to be repeated with additional precautions. The value of the work to the metallurgist would have been increased by the inclusion of a section dealing with silicates, on account of the importance of the slag in most smelting processes. The presence of a liquid mixture of silicates, in which metallic oxides can dissolve, is an essential condition of many operations, both in the ferrous and the non-ferrous industries, and the changes of the slag in an open-hearth steel furnace during the working of the charge, or the relations between the compositions of the slag and the matte in copper smelting, for instance, furnish examples of equilibria which are as interesting theoretically as they are important in practice.

The translation is unfortunately marred by many inaccuracies. Apart from the very numerous and irritating misspellings of proper names the sense of the original is often missed, especially in the section dealing with the electron theory of metals. A revision of this section has been designedly excluded on the ground that the subject deserves a separate treatise, but it would have been well to omit the subject altogether or to revise it in the

light of later work. Students who wish to learn something of the nature of metallography without studying one of the larger works will find a simple account of the subject in the second and third chapters, illustrated by excellent photomicrographs from standard works, but references to original sources are throughout irregular and imperfect.

(2) The well-known treatise on electric steel furnaces by Rodenhauser and Schoenawa has now reached a third edition and has been completely revised by the authors and the translator. During the stress of the war period there was a remarkable increase in the number of electric furnaces employed in the steel industry, but the results obtained have been varied. Opinions strongly in favour of—and others as strongly unfavourable towards—the electric furnace are held by different technical experts. The reason for this diversity appears to be that in many cases the furnace has been improperly handled. A steel smelter who is ignorant of electrical engineering, or an electrical engineer who has little or no acquaintance with the metallurgy of steel, is unlikely to obtain success with this method of manufacture. Where the right combination of engineering with metallurgical knowledge and experience is found, the electric furnace gives most favourable results. The perfect control over the melting conditions which it allows is greatly in its favour, especially when steels containing costly alloy metals are concerned, and its position in the steel industry is assured. This is true even of countries where fuel is abundant, but the advantages are still greater in those countries where water power is available and fuel scarce. This gives importance to the electric blast-furnace, an appliance which can scarcely compete with the highly efficient blast-furnace on its own ground, but which may prove the salvation of iron-ore producing countries which have no coal.

The present work is written mainly from the electrical point of view, and is very full in its treatment of the electrical conditions of construction and working. The metallurgical working is comparatively lightly touched on; in fact, the chemistry of electric steel making still awaits textbook treatment. As might be expected from the associations of the authors, the induction furnace is given greater prominence than is usual in other works on the subject, and the discussion of this type is very full. The Röchling-Rodenhäuser furnace is now in use in 20-ton sizes, a remarkably large capacity for this class, while it is maintained that induction furnaces may be used successfully for the refining of steel, although the

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question of the relatively cold slag is not fully dealt with. The work refers mainly to German and American practice, and the types of furnace most largely employed in this country are rather briefly discussed. The consideration of the electrical conditions and of the thermal balance is very thorough, and many records of actual runs are included. English readers will also be glad to have the detailed account of iron-ore smelting in Sweden and elsewhere, illustrated by clear diagrams and numerical records. An interesting account of experiments on the reduction of ore (a fine magnetite high in sulphur) by means of sulphurous coke breeze in the Röchling-Rodenhäuser furnace is given, liquid metal from a basic Bessemer converter being used to start the charge. A good efficiency was obtained and about half the sulphur was eliminated without the use of lime. Minor criticisms are, of course, possible, but metallurgists who are considering the advantages of this method of manufacture will find the book indispensable.

C. H. DESCH.

Our Bookshelf.

The Year-Book of the Scientific and Learned Societies of Great Britain and Ireland. Compiled from official sources. Thirty-eighth annual issue. Pp. viii+366. (London: C. Griffin and Co., Ltd., 1921.) 15s. net.

WE are glad to extend a welcome to the new issue of this invaluable year-book. The system adopted in previous issues of classifying the societies according to the subjects with which they are concerned is adhered to, and a few pages are devoted to miscellaneous societies particulars of which were received too late for classification.

We notice that, of the twenty-six Research Associations referred to in *NATURE* of December 15, p. 489, which have been approved by the Department of Scientific and Industrial Research, one only—and that, one of those more recently constituted—namely, the British Cast Iron Research Association, appears to have been included. We have also been unable to find any mention of the Association of Economic Biologists. In spite of these omissions the year-book is an indispensable adjunct to every library, society, and similar institution the members of which require accurate official particulars of the learned societies of the British Isles. The publishers perform a national service by providing this annual conspectus of scientific organisations and their work.

Le Mouvement Biologique en Europe. By Georges Bohn. Pp. 144. (Paris: Armand Colin, 1921.) 4 francs.

DURING the summer and autumn of 1913 the author of this pamphlet visited the most active