BASIC OPEN-HEARTH STEEL-MAKING.

The Basic Open-hearth Steel Process. By Carl Dichmann. Translated and edited by Alleyne Reynolds. Pp. xii+334. (London: Constable and Co., Ltd., 1911.) Price 10*s.* 6*d.* net.

NEARLY half this work is an elaborate chemical treatise on gas-producer practice, and the next ninety pages deal with the chemistry of slag-making and the heat equivalents of the oxidisable constituents charged into the furnace. The remaining portion treats of the various basic methods adopted, from the scrap and carbon to the ore and molten pig-iron processes.

Judging from the tables on German practice the author has been very fortunate in having to deal with pig-irons only slightly inferior in quality to our ordinary hematite varieties, instead of the varied classes of basic pig-iron available in this country; hence the large outputs obtained. Tables on pp. 190, 191, 216, 271, 277, 281, 284, 287, 292, show the character of the practice quoted, which is mainly washing metal and running down to the mildest steel; hence the method of sampling the bath mentioned on p. 230, and the tapping of the bath by the judgment of a sample breaker, even if successful under the very favourable conditions assumed, is entirely unsatisfactory where the sulphur and phosphorus contents are so different, these factors necessitating rapid chemical analysis combined with the malleability test made by subjecting a sample to forging. When the metal in the bath has passed the required malleability test, an addition of ferro-manganese is made to the bath, and, after allowing it time to settle down again, the heat is tapped.

This German and American type of practice with comparatively low phosphorus irons is entirely unsatisfactory with English pig-irons, a return of phosphorus to the metal being the general result, when the phosphoric acid in the slag exceeds 5 per cent. and the silica is fairly high. Additions of hematite pig-iron, containing over 1½ per cent. of silicon or of silico-spiegel, give similar uncertain results. As a consequence the addition of ferro-manganese and other alloys for special steels is made in the ladle, great care being taken that the last of the additions is added well before the slag comes. The percentage loss of manganese in the furnace or in the ladle is given at 40, as per H. H. Campbell's acid practice. This is a mistaken idea as regards ladle practice, as advantage is taken of this even in the acid process to save ferro-manganese, whilst in basic work, with slags low in iron oxide, the loss of manganese is very small with 0·05 per cent. of phosphorus in the metal; about 15 per cent. when the phosphorus is between 0·025 and 0·045 per cent.; and may reach 35 per cent. when the metal has been taken down to 0·01 per cent. phosphorus with 0·07 to 0·12 per cent. of carbon.

The paragraph on recarburisation on p. 239 is very interesting. With skill and experience it is possible with regularity to "catch the carbon" that is to work the process, so that the bath is in a suitable condition for tapping when the desired carbon percentage is reached, instead of running down to a dead mild or almost carbonless bath and then recarburising. The difficulty spoken of in the molten pig and ore process, the impossibility of regulating the slags so as to stop at the desired carbon content, is due to the ore charged having a curious action of its own, a sudden drop of 0·30 to 0·40 per cent. of carbon in the sample in a few minutes even if the slag is practically ore-free. This action is very noticeable when a tapping temperature is attained. If the slag is not in a fit condition for tapping when the required carbon has been reached, it is not good practice to add large quantities of low-silicon hematite or spiegel to increase the carbon. It is much better and more economical to go down for a lower carbon.

The removal of sulphur, that bugbear of the basic steel melter, is discussed on pp. 167–171, and dismissed with the conclusion that it is more profitable to take care that sulphurous materials are not charged into the furnace. This is what everyone would do if he could always get nearly sulphur-free materials to use, but much of the English basic material some of us have to use contains 0·08 and occasionally even up to 0·3 per cent. of sulphur; hence one may easily with such material have 0·2 per cent. of sulphur in the charge when melted. This can be quickly reduced by the combination of heat and lime whilst the carbon is above 0·3 per cent., the trouble with regard to desulphurisation coming when a charge melts out with a low carbon content (p. 194). The sulphur problem is intensified by the fact that materials averaging 0·03 per cent. of sulphur may be charged into a basic furnace and melt out at 0·1 per cent. sulphur even when melting rapidly, owing to sulphur being taken up from the gas when one had to use a coal containing more than 2·5 per cent. sulphur. It is very good work to finish with 0·05 per cent. sulphur in the ingot in such circumstances. Although there is not very much clear guidance on practical working, the book as a whole gives a large number of interesting calculations on matters connected with the reactions directly or indirectly bearing on the general working of the basic open-hearth steel process.

THE GEOLOGY OF NEW ZEALAND.

The Geology of New Zealand: an Introduction to the Historical, Structural, and Economic Geology. By Prof. J. Park. Pp. xx+488+xvi plates, 140 figures, 6 maps. (London: Whitcombe and Tombs, Ltd., 1910.) Price 10*s.* 6*d.* net.

THE geology of New Zealand is of exceptional variety and interest. The literature is very scattered, and the valuable reports published by the Geological Survey and Mines Department of New Zealand are often troublesome to those who are not well acquainted with New Zealand topography. Prof. James Park has therefore undertaken a most useful work in compiling a guide to the geology of the dominion; and his book will be an indispensable work of reference owing to its clear account of the stratigraphical and economic geology, the detailed bibliography of fifty-eight pages, and the many beautiful plates of New Zealand fossils. The book is well