whole the work has been carefully edited and produced, and is a credit to the general editor of the series and to the publishers.

PHILIP SCHIDROWITZ.

THE CHEMICAL ANALYSIS OF STEEL-WORKS' MATERIALS. By F. IBBOTSON. Pp. viii+296. (London: Longmans, Green and Co. 1920.) Price 21s. net.

The reappearance of this classic work on the analysis of steel-works' materials and products will be heartily welcomed by everyone interested in the analytical side of ferrous metallurgy. For reasons stated in the preface, the voluminous bibliography and sections on pyrometry and microscopy, which were included in the earlier edition, have been omitted in the new. The author is to be congratulated on the manner in which he has arranged the subject matter; the introductory chapter dealing with general processes is followed by sections on the analysis of steel and pig iron, steel-making alloys, ores, refractories, slags, fuels, and boiler water, scales, etc. The various problems treated are first discussed from the theoretical point of view, and then the practical details of the various methods are given in the section following. Procedure is expressed concisely yet without the omission of essential detail, full reference is made to the influence of other elements, and almost all well-known methods are mentioned, including those for the determination of uranium, zirconium, etc.

In view of its great importance, sampling should have received greater attention; very few sections of iron or steel are entirely homogeneous, and not enough stress has been laid upon the care needed in taking representative samples. In the determination of carbon (p. 29) it is not good laboratory practice to use only drillings caught between 30- and 60-mesh sieves and to reject the remainder. Nor can the volumetric method for determining sulphur in pig iron and alloy steels (pp. 74, 75) be termed "quite satisfactory" without qualification. The passage on p. 67 dealing with the acidity of the ferric solution in the gravimetric estimation of sulphur is badly expressed and would be clearer if carefully paraphrased.

The author has a peculiar liking for the "acetate" separation of iron, and also the "lead molybdate" precipitation, these procedures being recommended wherever possible. An alternative method might have been given for the determination of cobalt, e.g., the separation of nickel and cobalt from iron by Rothe's method, with the subsequent separation of cobalt from chromium by caustic soda and bromine; or the precipitation of iron from sulphate solution by pouring into a large excess of ammonia. The section on ferro-alloys is extremely valuable. Arsenic, copper and zinc are neither rare nor unimportant impurities in iron ores (p. 221), and bichromate is preferably standardised against pure iron and against an ore of known iron content. Such well-known and frequently used methods for the determination of manganese as those of Volhard and Pattinson are omitted, and, contrary to the experience of many chemists, the author regards as satisfactory the determination of tin by iodine, after reduction with powdered antimony. The very accurate gas-testing apparatus of Bone and Wheeler, and that of Hempel, are described in detail, but no mention is made of the Orsat apparatus, or of that of Stönd which is used in most ironworks. The position of the delivery tube in the determination of nitrogen in coal (p. 271) calls for comment; and "ferric chloride" should read "ferrous" on p. 230, line 4.

Apart from the comparatively unimportant points referred to, it is not possible to praise this

work too highly. Very great care has been taken in selecting and correlating the really important methods of analysis from a huge mass of material, and the arrangement of the book as a whole is excellent. It is far ahead of any published work dealing with the analysis of steel-works' materials, and should be in the possession of every iron- and steel-works' chemist.

ERNEST W. JACKSON.

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