

THE METALLURGY OF STEEL. BY F. W. HARBORD, Assoc. R.S.M., F.I.C., with the collaboration of J. W. HALL. First edition, 758 pages, illustrated. London: Chas. Griffin & Co., Ltd. 1904. Philadelphia: J. B. Lippincott Co. Price, \$9.00.

Until this work appeared, the only recent treatise that could lay claim to other than a general or abridged account of the metallurgy of steel was the classic work of Howe, a volume indispensable to one who would become conversant with our present knowledge of the constitution, varieties and uses of steel and the chemical and physical changes involved in its manufacture; but, unfortunately, his treatment of the subject is so exhaustive and detailed that the reader must have at least a fair acquaintance with chemistry and metallurgy to follow the often intricate theories and discussions. Hence the need of a work describing in a manner intelligible to the general reader, as well as the student, the various processes of steel-making and the changes in composition and structure undergone by the raw material in its transformation to the finished product. The want is excellently met by Harbord and Hall, who have treated the subject in as simple phraseology as practicable, and by judicious arrangement and condensation have managed to present a very complete account of the metallurgy in the compass of a single volume.

In the introduction, contrary to the usual custom, the author declines to frame a general definition for the word steel, asserting that it is almost impossible to include in one phrase the various products known to the arts as "steel," but instead, contents himself with defining the metal produced by the Bessemer and Siemens processes only.

The first five chapters are devoted to the acid and basic Bessemer manufacture, including a very clear description of the ponderous machinery for its production, and the reactions during the blow and recarburization. The question of the advantages and disadvantages of small converters of the Roberts type is considered briefly and impartially.

Chapters 6 to 8 discuss the open-hearth acid and basic processes beginning with the gas-producer. It is gratifying to note how well are described the many radical advances in furnaces and accessories that have been made in recent times. Following Holley, the author predicts that eventually the basic open-hearth process will supplant both the acid and basic Bessemer for rail

and structural steel. The next three chapters treat of the production of steel castings, shear and crucible steel and armor-plate, and the direct processes of making steel.

The second part of the volume is devoted entirely to the reheating of cold ingots and blooms preparatory to rolling and forging and the furnaces and machinery for charging and withdrawing the ingots.

The third part takes up the mechanical treatment of steel with detailed descriptions of rolling mills for sections and plates, and their accessory engines, tables, tongs, etc. As might be supposed, English and Continental types are given the most prominence, but the important American inventions and improvements have not been slighted. Incidentally Harbord notes a "tendency among Americans to unduly multiply mechanical appliances."

The fourth part takes up the mechanical testing of steel, with numerous examples, describing, in detail, a hydraulic and a lever testing machine. The last part gives a condensed account of the microscopic examination of slightly etched surfaces of steel, with many micro-photographs reproduced in half-tone. Due credit is given to several American workers in this field and their efforts toward the interpretation of microscopic structure and its application to metallurgical problems. A note is made of the relation of the Gibbs phase rule to the constitution of steel, but a brief outline of the application of the law in this particular instance would not have been out of place.

A good index is provided, and several useful tables.

FRANK JULIAN.

**ELEMENTS OF WATER BACTERIOLOGY, WITH SPECIAL REFERENCE TO WATER ANALYSIS.** BY SAMUEL CATE PRESCOTT AND CHARLES-EDWARD AMORY WINSLOW. New York: John Wiley & Sons. 1904. 162 pp. Price, \$1.25.

This little book is evidently the outgrowth of considerable practical experience in the line of water examination by culture methods. The authors are connected with the Biological Laboratories of the Massachusetts Institute of Technology, which, as every sanitarian knows, have contributed so largely to the development of the theory and practice of water analysis. The book is intended for the use of chemists and sanitary engineers who have already had experience in general bacteriology. No