the rapid growth of the literature, and yet desire to familiarize themselves with the facts brought out by scientific investigation.

HIDEYO NOGUCHI.

BOILER WATERS. BY WILLIAM WALLACE CHRISTIE. D. Van Nostrand Company. pp. 235. Price $3.00.

The appearance of the book is excellent, the type being clear, the lines well spaced, and the illustrations both numerous and well selected. The subject-matter is set forth in ten chapters:—The properties of water; boiler scale; corrosion; feed-water pipes; priming and foaming; oil and grease; hardness; feed-water heaters; water softening and miscellaneous tables.

The chapters on feed-water heaters and on water softening are particularly good. Especial stress is laid upon the point that it is poor economy to use a boiler as a water purifier, the purification being better done elsewhere. The data are plentiful, are often tabulated, and are well chosen.

The book will be found decidedly useful, but it would have been greatly improved had its chemical portions been omitted.

The tests given for water examination are crude, and are very likely to mislead. The table of analyses of sundry waters, beginning on page 33, loses its value by reason of the reader not being informed of how the waters in question acted when used in boilers. W. P. MASON.

HANDBUCH DER GESAMMTEN THONWAARENINDUSTRIE. BRUNO KERL. 3TE. AUFLAGE. BEARBEITET VON EDUARD CRAMER UND DR. HERMANN HECHT. FRIEDRICH VIEWEG UND SOHN, BRAUNSCHWEIG. 1907. s.s 1588. ABBILD. 518. Price M 48.50.

This book bears the imprint of being the third edition of the work of Bruno Kerl, which appeared in a second edition as long ago as 1879, but the author died in 1905 and Messrs. Cramer and Hecht have entirely rewritten it at the present time, increasing its bulk from 733 to 1,551 pages with the introduction of much new matter which was essential for a proper description of the advances in the ceramic industries in the last twenty-five years. It may be regarded, therefore, as essentially a new work and as such is most complete and encyclopaedic in character. It is, in fact, the third volume of the second group of Bolley-Engler's new Handbuch der chemischen Technologie which is being published by Vieweg und Sohn of Braunschweig, the other volumes of which have either received a flattering reception or are looked forward to with pleasure.

In the preface the authors state that they have been engaged in the work of preparing the manuscript for a period of ten years, which is not surprising, considering the amount of material that they have gathered together. With them several well-known authorities have collaborated such as Herr Bartel, Dr. Th. Ludwig and Dr. M. Fiebelkorn, as well as

Herr G. Vogt, Technical Director of the Sevres Establishment, and Dr. M. Ehrlich, Director of the Wachtersbacher Stoneware Factory.

The book opens with an interesting introductory historical chapter with some reference to what has been done in ceramics in America, especially by the Rookwood Pottery in Cincinnati. What follows is divided into three parts, devoted, respectively, to Raw Materials, the Working up of the Clay and the Preparation of Various Ceramic Products, 113 pages to the first subject, 344 to the second and 1,067, or two-thirds of the book, to the last.

Under the first heading the authors state, that, in their opinion, no satisfactory system of classification of clays has been proposed, these being based in some instances on the physical properties, in others on the geological occurrence, or again on their applicability in the clay industries. The transition between one form and another is so gradual as to make this difficult, and at times a geological classification may be necessary, and at others one based on physical properties. They then describe the characteristics of the various kinds of clays and their origin and manner of formation. The winning of the material from its deposit is considered briefly, and, more at length, its physical and chemical properties, plasticity and shrinkage, structure, porosity, homogeneity and behavior at high temperatures, the admixture of impurities, sand, feldspar, mica, pyrites, etc., which it might contain, and their influence on the materials as used in the clay industries. The chemical analysis of clays is described, but, in the light of our knowledge of the difficulties connected with the analyses of silicates as elaborated by Hillebrand in the United States, the methods proposed can hardly be considered as entirely satisfactory, no provision being made for a second evaporation for silica or for reprecipitation of lime and magnesia. The rational analysis of clays is also considered in an interesting way and the necessity of prolonged treatment with strong sulphuric acid for the purpose of dissolving the clay substance is brought out, but the extent to which mica and feldspar are attacked by this treatment is not given sufficient weight. The calculation of the fire-resisting properties of clays from the results of the rational analysis is explained. The methods of sifting and elutriation for determining the physical properties of clay materials are given and the use of Seger cones for their behavior at high temperatures.

A second part of the first section of the book then describes the unplastic substances added to clay in the industries to permit of working it and to impart certain properties to the product, such as quartz, silica, silicates, graphite to reduce the plasticity and permit of molding the clay, and feldspar, which acts as a flux, describing the characteristics which these materials should have to be desirable. A third part tells of the glazes, the object for which they are employed and their various

classes. This section contains many analytical and other data in regard to the materials under consideration which are of value, among which we note determinations of the size of the particles which go to make up the aggregate of clays as given by Seger, viz.: 0.010 m.m. for the clay substance, 0.010 to 0.025 for the less plastic material, 0.025 to rfo.4ooothe fine sand and 0.040 to 0.330 and over for the coarser sand, which are confirmed by the observations of the writer.

The second section of the book deals, as has been said, with the working up of the clays in a proper form for use, including the effects of weathering, sorting at the source, drying, moistening, separation of impurities in various ways, grinding and the use of air separation of the finest material where the clay is not in itself homogeneous, and a description of the various types of machines which are used for these purposes, especially for grinding and separation of the coarser particles, all of which must be of great interest and value to the American potter. The preparation of the materials, such as flint and feldspar for use in the clay industries is also gone into in detail, including crushing, grinding, sieving, and elutriation, together with the processes and machinery employed, ball, tube and Griffin mills, such as are a feature of the Portland cement industry. Kneading and mixing of the clay in preparation for forming it into the shapes which are to be burned, is considered at some length, with descriptions of the mixers employed for the purpose, the drying of slips which contain an excess of water by filter presses and otherwise, and the determination of the water they contain according to the method of Herzog.

Thirty pages are devoted to the consideration of glazes, the object of their use, their properties, their behavior and defects, and the kilns in which they are burned. The authors state that in glazes alumina behaves towards silica as a basic material. While this is true where silica and alumina are alone present, it is, nevertheless, quite the contrary when other bases are present, such as lime and the alkalies. In such cases alumina and lead play an acid not a basic rôle.

In the seventh division of the second section the burning of clay articles is discussed at length, taking up the character and behavior of different fuels, the use of producer gas, and the various forms of kilns employed. An interesting description of the experimental kiln of Seger is given on page 427. The subject is gone into in too great detail to be reviewed within any moderate limits and reference must be made to the work itself for details.

In the third section of the book the preparation of the different classes of clay products is described, the classifications of these products proposed by various authors being given, and the following being used by Messrs. Cramer and Hecht in their treatment of the subject.

1. Clay Wares. (Thongut.) Porous.
Body not translucent.

I. Materials of Construction.		Pottery.	
a) Not burning to a white color.	b) Burning white.	a) Not burning to a white color.	b) Burning white.
Brick products.	Fire-resisting products.	Pottery products.	Stoneware.
Bricks, Face.	Fire Bricks and forms.	Flower Pots.	Clay stoneware and pipes.
Hollow bricks.	Fire-resisting products.	Water coolers.	Lime stoneware.
Porous stoneware.		Ordinary Faience.	Feldspar, or hard stoneware.
Drain tile.		Stone tiles.	
Structural terra cotta.			

II. Clay Wares. (Thonzeug) Not Porous.

A. Body not translucent or only on the edges. (Stoneware).		B. Body translucent (porcelain or white ware).	
1. Construction Material.	2. Pottery	1. Construction Material.	2. Pottery.
a) Not burning to a white color.	a) Not burning white	a) Not burning white	a) Not burning white.
Clinker ware.	Bath tubs.	Nothing in	Nothing in
Vitrified brick, tiles and pipe.	Troughs.	this class.	this class.
	Chem. Utensils.		
b) Burning white.	b) Burning white.	b) Burning white.	b) Burning white.
Acid-resisting products.	Stoneware and artificially colored fine terra-cottas, Wedgewood ware, etc.	Tuyere bosses lining for tube mills of hard porcelain.	b_1) Hard porcelain b_2) Soft, bone and Seger porcelain, fritted porcelain parian.

The remainder of the book is given up to a very thorough treatment of each of these types of clay wares, the methods of producing them, their normal and abnormal characteristics, with a very detailed description of the machinery and plant, and especially the forms of kiln which are in use. It is only possible here to refer in a general way to the subjects which are considered. These include bricks, with an exhaustive description covering more than 100 pages on the various kilns used in burning them, fire-resisting products, including such materials which are highly silicious, something in regard to cements for the same, muffles, crucibles, glass-melting pots and gas retorts. The subject of pottery as used in its more limited sense is taken up at length, both with regard to the colored ware and stone ware of various descriptions. To the subject of white ware and porcelain about 200 pages are devoted, covering the materials used in making these wares, their preparation, burning and glazing, the greater consideration being given to hard porcelain, but with some reference to soft, bone and fritted porcelain, Parian and biscuit porcelain, Asiatic porcelain, the new porcelain of Sëvres, and Seger porcelain.

The book is one which should be in the library of every one interested in ceramics, and it may be said that nothing to compare with it has hitherto appeared in the literature of the subject of which it treats. It would be most desirable if it could be translated into the English language for the benefit of the many potters who may be deprived of the information it contains, owing to a lack of acquaintance with the German language. The clay industry of the United States would certainly benefit largely were the information which Messrs. Cramer and Hecht convey to the public in the volume made available for general use.

CLIFFORD RICHARDSON.

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