

such a book very satisfactorily, as it covers just such points as the manufacturer and user are most likely to be interested in.

The book deals not only with the chemical questions involved in the manufacture of common alcohol and the various denaturing agents, but includes also various other matters such as the uses of alcohol in lamps, stoves, and engines, with numerous illustrations of types of these appliances employed in this country and in Europe, the relative efficiency with respect to cost, of various fuels and illuminants, the cost of alcohol from different sources in different countries, the laws of this and other countries governing the preparation and sale of different grades of alcohol etc., etc. A book of this character is necessarily a compilation from a great number of sources, and in consequence is somewhat fragmentary. Different sections of such a book are unequally important and reliable, and this is true of the present work. While the real value of much that is presented here may be doubtful, the book as a whole must be pronounced a valuable contribution to our technical literature and will doubtless prove of value to many manufacturers who are ready to embark in new enterprises depending on the use of free alcohol.

J. H. LONG.

BEET-SUGAR MANUFACTURING AND REFINING, VOL. II, EVAPORATION, GRAINING AND FACTORY CONTROL. BY LEWIS S. WARE. First Edition. New York, John Wiley & Sons. London: Chapman & Hall, Limited. 1907, pages VI + 647. Cloth \$5.00 (21/-net).

Until recently the beet-sugar technicist of the United States has had to depend entirely upon German and French treatises for instruction in the science and art of sugar production. The university man has not, in general, been attracted to this line of work, while the student from the public schools has found the whole subject a sealed book, from the fact that he was unable to read a foreign language.

For a matter of ten years the translation of some one of these texts has been eagerly looked for and some private translations exist, but have been withheld from publication.

The want is filled by the present volume, which brings the wealth of information and the pith of the knowledge contained in the leading foreign treatises, built up about the author's evident own large knowledge and experience.

The subject is one of purely physical operations, and while the writer has apparently assumed that the reader has a good general education, the style is marked by extreme simplicity and thoroughness. Credit is unhesitatingly given to the original authority, when the statement is not a matter of general knowledge, and the very numerous original references are commendable. The author frequently refers to the standard work

of Classen, while the no less eminent experts, Horsin-Déon and Dessin, have been freely drawn upon in the treatment of multiple effect evaporation.

The main topics are, Evaporation, Manufacture of Raw Sugar, Working After-Products, Manufacture of White Sugar, Utilization of Residues, Steam Economy and Practical Working.

Under the subject of Evaporation, all those factors that make for economy in working, quality of product and lengthening the life of machinery are treated from a practical standpoint. The various approved modern forms of apparatus are described and illustrated, emphasis being placed upon their distinguishing characteristics and the latter almost invariably given special illustration. The subject of intrainment deserves particular mention, as the author explains its cause very fully, giving authoritative figures as to its extent, and goes intimately into the description of, and comment upon the many remedies applied, including the centrifugal type of catch-all. The various forms and arrangements of heating tubes are discussed, with and without devices for ruisselement.

Among the several multiple effect systems illustrated and described may be mentioned those of Cail, Rillieux, Brunswick, Wellner and Jelinek, Yaryan, Lillie, Moriolle-Pinquet and Witkowicz. The theory and practice of jet-condensers, parallel- and counter-current, under dry and moist pump systems are well illustrated and explained, including the spray-condenser, Jelinek disc and Jelinek "Débourbeur", Greiner's, Schultz's, Kettler's, those of St. Quentin, Schwager, Schiffer, Weiss and Theisen.

The principle of multiple effect evaporation and of multiple re-heating is next developed. As introductory to this problem, explanation is given of the principal multiple systems, such as those of Rillieux, Lexa and Rillieux, Pauly-Greiner, Curin and Weibel-Piccard and emphasizing the economy of the fore-heater. A chapter is devoted to practical considerations, such as the starting, stopping, testing, cleaning and care of the multiple effect; describing normal working, reversing the circulation, frothing, leakages, sugar losses, heavy boiling, economy of juice levels, practical handling of the fore-heater, density regulators and syrup-samplers. The author sounds a warning against the reckless use of acid in the cleaning of the heating surfaces, where the iron is very badly eroded in the misguided zeal to clean well.

Multiples must be cleaned, in the main, by either caustic soda or sodium carbonate. Authentic cases can be cited where the iron walls of multiple units have been reduced from an original thickness of $\frac{3}{4}$ inch to that of $\frac{1}{8}$ inch by excess of acid, constituting a menace to life and meaning the ultimate purchase of a new body. This further accounts for the

frequent leakages in the red-lead joints, which greatly lowers the efficiency, to 30 per cent. or more. While it is true, as the author states, "the efficiency of the multiple effect becomes almost normal when the calcareous deposits are broken up and reduced in thickness". This is short-lived, as the remaining, uneven scale forms a favorable nucleus for fresh scale to more quickly form; the final use of the scraper repays the time and trouble. After cleaning with acid, the operator is cautioned not to "examine . . . until all the air contained in its interior has been removed, as there would be danger of an explosion". It does not explain why the "air" should explode. The work is somewhat ambiguous when touching upon the chemical side of several questions.

Frequently, mathematical and technical terms are used, which may not be known to the general student, but in all cases are explained later in some other connection; such expressions as "g" and "volume of depression", etc. We note the very practical suggestion of quickly cooling the pan by help of water circulation through coils.

Fully 65 pages are devoted to the calculations relating to the efficiency of the heating surface and the principle of the re-heating by the hot vapors, when the steam is drawn off from the fore-evaporator or from any chamber of the system, as the calorific demand indicates. The infrequent and restricted application of this principle, in part accounts for the very large coal consumption in many American factories. A careful study of this author's work should result in closer economy in the practical working of many existing, defective plants.

In many treatises the apparently formidable mathematics have proved a barrier to the average student. In general they are far from being as difficult as they appear, and, in reality the underlying principles may be best developed by their intelligent use.

The author has purposely avoided the purely mathematical mode of presentation, but has succeeded well in elucidating this difficult subject, perhaps increasing its usefulness by an empirical treatment, aided by concrete examples and simple mathematics. Owing to the large diversity of opinion among authorities, he has considered it most expedient to confine himself to the views set forth by Horsin-Déon, Dessin and Clasen. We note the statement under Dessin, "that the evaporation is always the same in each compartment", is not in accord with that of various other experts, who state that it is never the same in each compartment, but progressively increases, while the difference is not great. This point involves a consideration of "self-evaporation", which is a large factor in steam economy and efficiency, in which latter it approaches the ideal.

The advantages of making the heating surfaces the same in all compartments or smallest in the last, are well presented, as is the subject of

film evaporation or working with only partially filled tubes. By increasing the figures for the fall in temperature and for increase in heating surface efficiency, the author shows mathematically that the efficiency can be increased 90 per cent by lowering the level and affirms that this has been obtained in practice.

The chapters on Graining, Manufacture of Raw Sugar, Curing, Transportation and Storage, Working of After-Products, Crystallization in Motion, Graining of After-Products, Epuration and Return of After-Products to the Juices, to the Pan, and to the Crystallizers, cover about 150 pages, and are exhaustive and conservative discussions of subjects that have attracted a large amount of scientific study and experimentation. The art of sugar-boiling cannot be taught from books, but the writer has succeeded in making the main principles clear. The addition of "soda bisulphid to precipitate sulphid of lime" is evidently intended for sodium bisulphite.

In discussing centrifugals driven by hydraulic motors, it is stated that "these centrifugals have exceptional advantages in case there is ample water power at one's disposal". With the Watson Laidlow machine, the head of water is maintained by a double acting pump, and the water, after discharge from the Pelton driving wheel, returns to the pump supply tank, to be again used. The many factors affecting the successful exhaustion of the original beet-syrup of perhaps 88 to 90 purity until a final molasses of about 60 results, are described in detail. The discussion is interspersed with practical hints and many interesting and important data show the wide field of reading covered. A chapter follows on the manufacture of white sugar, subdivided into granulated, loaf-sugar, cakes and bars, and the sawing and breaking into the various forms.

Under Utilization of Residues is described the recovery of sugar from waste molasses, by Osmosis and by the use of the de-sugarizing chemicals, the hydroxides of calcium, strontium, barium and lead. It is doubtful if these subjects have even been better or more succinctly discussed. While regarding Osmosis favorably the writer does not hesitate to point out its disadvantages.

The process of lime separation is the main feature of the chapter and is thoroughly up to date. Partisans of this process can scarcely take exception to the statement that peculiar effects are said to be produced on the boiling house products by the presence of the saccharate syrup; this is caused largely by mismanagement, as pointed out. In well conducted refineries, so well do the boiling house products work, with saccharate syrup, that for whole seasons nothing but standard white granulated sugar has been produced, from "thick-juice" to final molasses, no raw sugar appearing at any stage. The statement that the Raymond mills,

with cyclone attachment and tangential wings, produce a powder, "all of it passing through a sieve of 200 meshes per square centimeter", very much understates the quality of the truly impalpable dust that can be made; 99 per cent. of the powder is much finer and makes possible the use of the 90 per cent. lime on the sugar mentioned.

With proper working in the coolers, no device is needed to beat down the foam, as none is formed.

This book should be at the right hand of every factory superintendent as an ever-ready store of the latest and best in sugar technology, it may constitute the nucleus of a course of study for the beginner in the practical operation of a plant and is an excellent text-book for the student in school or university. The field covered makes it almost equally useful in tropical cane-sugar work.

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