few horses, one day, 12,000; same place, one and a half days, 18,800 flies.

The writer would be very glad to mail illustrated leaflet describing this trap to any one desiring the same.

F. L. WASHBURN
MINNESOTA EXPERIMENT STATION,
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August 19, 1912

SCIENTIFIC BOOKS

Technical Methods of Chemical Analysis. Edited by GEORGE LUNGE, Ph.D., Dr. Ing., Emeritus Professor of Technical Chemistry, Federal Polytechnic School, Zürich. English Translation from the latest German Edition, adapted to English conditions of manufacture. Edited by CHARLES ALEXANDER KEANE, D.Sc., Ph.D., Principal and Head of the Chemistry Department, The Sir John Cass Technical Institute, London. Volume II., 2 parts, pp. xxvii + 1,252. New York, D. Van Nostrand Company. 1911. Price $18.00 net.

The Manufacture of Sulphuric Acid and Alkali with the Collateral Branches. A Theoretical and Practical Treatise. By GEORGE LUNGE, Ph.D. Third Edition. Volume III., Ammonia-Soda, Various Processes of Alkali Making and the Chlorin Industry, pp. xix + 764. New York, D. Van Nostrand Company. 1911. Price $10.00 net.

It is gratifying to know that such substantial progress has been made on the English translation of these two standard and almost indispensable works, and that only one volume of each remains to be published. It is indeed unfortunate that English translations should be needed, but the fact can not be ignored that a large proportion of our technical men do not read German, and that no work is really accessible to them unless it is printed in English. Even the younger generation, who have been compelled in their technical school training to use both German and French, seem in a great hurry to drop their knowledge of these languages as soon as they get out at work.

One general criticism may be passed on both of these books. They have been prepared and edited largely from an English standpoint, and American practise has been to far too great an extent ignored. There has been great development in recent years, both along the line of rapid methods of technical analysis and also in standardizing analytical methods, and along both these lines American chemists have been by no means backward, yet under Iron and Steel there are but 19 footnote references to American literature against more than 100 to English and more than 130 to German sources, and under Illuminating Gas and Ammonia but five out of 140 references are to American publications or apparatus. We also note that under Copper no reference is made to the use of a platinum gauze kathode in electrolytic deposition, nor under Lead to Low's modification of Alexander's method in the presence of calcium. It would have given a broader value to the first book had it not been quite so exclusively "adapted to English methods of manufacture."

Aside from this criticism the reviewer has nothing but favorable comment for both these books. In this second volume of Technical Methods, the following subjects are treated: Iron, by Dr. P. Aulich; Metals other than Iron, and Metallic Salts, by Professor O. Pufahl; Artificial Manures, by Professor O. Böttcher; Feeding Stuffs, by Dr. F. Barnstein; Explosives, by Oscar Guttmann; Matches and Fireworks, by Dr. A. Bujard; Calcium Carbide and Acetylene, by Professor Lunge himself and Dr. E. Berl; Illuminating Gas and Ammonia, by Dr. O. Pfeiffer; Coal Tar, by Dr. H. Köhler, and Organic Dyes, by Professor R. Gnehm. These comprise the subjects included in the second and third volumes of the new German edition, together with the section on Organic Dyes from the fourth and last volume. Under each head are given quite fully the standard methods of analysis of all the products connected with the industry, and at least an outline of other methods which promise to be improvements. In each case references are given to the orig-

inal sources. The book is brought well down to date, and is conspicuous by the absence of descriptions of antiquated methods which have only a historical interest. Covering, as it does with the other volumes, the whole field of the analytical chemistry of technical products, the book is indispensable to the library of every analytical chemist.

The other book under review has since the publication of its first edition been recognized as the standard work on the manufacture of sulfuric acid and alkali. This third volume was in earlier editions the concluding volume, but, so great has been the development of electrolytic methods of manufacture in recent years, it has been found necessary to add a fourth volume, which is shortly to appear, and which is to include the electrolytic manufacture of alkali and chlorin. This will be prepared by Professor Askenasy and Professor Haber, recognized authorities on the subject. The work of Dr. Lunge is concluded with this third volume, which is devoted to the ammonia-soda process, processes for the manufacture of soda other than the LeBlanc and the ammonia-soda, and to the manufacture and utilization of chlorin. This last section includes bleaching powder and other bleaching liquors and compounds, and the chlorates.

It is rather striking that in as important industry as the manufacture of soda, the methods all but exclusively used throughout the nineteenth century were the LeBlanc, first put in operation before the century opened, and the ammonia process, suggested at least early in the century. Further, while the mechanical details, of course, were greatly improved, there was practically no change in the chemical principles involved. Curiously the first suggestion of the ammonia process seems to have come from Fresnel in 1811, but "the invention soon sank into oblivion, and Fresnel himself, whose thoughts were later fully occupied by his magnificent reforms in the domain of optics, did not give any more time to it." John Thom, a chemist in the factory of Turnbull and Ramsay in Scotland, actually worked the process, including the ammonia recovery in 1836, but it was later abandoned, though his other practise of utilizing the ammonia residues as manure won for Thom the merit of founding the industry of artificial fertilizers. In 1838 the first patents on the process were taken out by Dyar and Hemming, and various manufacturers experimented with it, but in the hands of none did it prove a commercial competitor with the LeBlanc. The mechanical difficulties were great, and then, owing to the recovery of the chlorin by-products, the LeBlanc process has always been able to compete with the ammonia method. It was not till 1861 that the Belgian Solvay began independently the development of the ammonia process, now perhaps more commonly known as the Solvay process, and soon placed it on a commercial basis. Since that time the output has steadily increased, passing that of the LeBlanc process about 1888, and from that time the production by the latter process has constantly declined. In this country the LeBlanc process has never been worked, while the ammonia process has had considerable development. Both these processes are now threatened, especially in this country, by the recent rapid development of electrolytic processes, which will in the near future probably drive the LeBlanc process to the wall.

The hundred or so pages of the book devoted to the description of "other processes" is interesting reading, but somewhat painful, representing as it does so many futile hopes. Not less than a hundred different methods, most of them represented by sometimes several patents, are referred to, and not one of them (excepting the cryolite process) is of appreciable commercial value at present. The same may be said of most of the suggested processes of chlorin manufacture, for it is hardly a rash prediction that these will all soon give way to the electrolytic manufacture. In the statistical tables at the end of the book we note that in 1904 half of the chlorin products the world over were from electrolytic chlorin, and that only in Great Britain and France was LeBlanc chlorin predominant. We also note that in 1895 the United States

produced 166,562 tons of alkali, less than was imported, while in 1900 the production was 539,541 tons and in 1905, 734,209 tons. In the last two periods the importation of bleaching-powder into the United States had decreased from 136,403 tons to 96,110 tons. Unfortunately this statistical portion is the only part of the book not brought well down to date.

J. L. H.

The Elements of Statistical Method. By WILLFORD I. KING, M.A. New York, The Macmillan Company. 1912. Pp. xvi + 250.

It is "the purpose of this book to furnish a simple text in statistical method for the benefit of those students, economists, administrative officials, writers, or other members of the educated public who desire a general knowledge of the more elementary processes involved in the scientific study, analysis and use of large masses of numerical data."

With this purpose in mind, the author presents only the most simple of the mathematical theorems on which the statistical method is based. The book is arranged so as to treat the subject in four main parts: (1) The historical development and general characteristics of statistics; (2) the gathering of material; (3) analysis of material collected; (4) comparison of variables. The great variety of topics dealt with under these general headings indicates the breadth of view desirable for an adequate treatment of statistical problems, and suggests the many pitfalls that endanger the certainty of conclusions drawn from some kinds of statistical data. The book is to be commended for the clearness with which it brings a large number of topics concerning statistics to the attention of the educated public. This is surely a matter of the highest importance.

It seems desirable to criticize the treatment of the notion of "the probable error." On p. 78, we find the following statement: "If $E =$ the possible error of the arithmetical average, the probable error of the same is approximately $E/\sqrt{n}$." For proof, we are referred to Bowley, "Elements of Statistics," pp. 303–315. I fail to find that Bowley attempts to obtain a relation between probable and possible errors. He does show, within the limits of this reference, that the probable error of the arithmetic mean of n variates is $E/\sqrt{n}$, where E is the probable error of a single variate. It seems to the reviewer that the book is not clear on the notion of a probable error, and even presents an incorrect conception of this subject. On pp. 213–214, the statement is made that the probable error of a coefficient of correlation varies inversely both with the number of pairs of items and with the size of the coefficient. Then the well known formula

$$\frac{0.67(1-r^2)}{\sqrt{u}}$$

is given for this probable error. It is therefore obvious that the author does not use the expression "varies inversely" in its usual meaning in mathematical sciences. Later, on p. 214, is the statement that the probable error indicates that the chances are that r actually lies between

$$r + \frac{0.67(1-r^2)}{\sqrt{n}} \quad \text{and} \quad r + \frac{0.67(1-r^2)}{\sqrt{n}}.$$

This statement is obvious but useless when taken in one sense. It tends to give an incorrect conception of the meaning of a probable error, when taken in another and important sense.

To summarize, it seems to the reviewer that the strength and usefulness of the book lies in its popular presentation of some of the leading ideas of the best statistical method of the present day. The weakness of the book lies in its presentation of a vague and even incorrect conception of the meaning of the probable error of a statistical result.

H. L. RIETZ

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POPULAR AND TECHNICAL BOOKS ON HEREDITY

Einführung in die Vererbungswissenschaft. By RICHARD GOLDSCHMIDT. Leipzig, Wilhelm Engelmann. 1911. Pp. x + 502. Price, 12.25 M., paper, 11 M.