be made ice-cold by immersing a beaker of it in a larger beaker of ice and water for some time; it must be added all at once, and, instead of simply having the test-tube stand in cold water, it must be moved rapidly and vigorously around in a large beaker of ice-water for a minute after the addition of the acid, and before standing in the water-bath filled with cold (not necessarily ice-cold) water.[1] Dissolving in this way, no violent action takes place; loss of hydrocarbon gas is avoided—or if there is loss, it is a uniform one; and reasonable accuracy for practical purposes is insured. Results, however, are still not so reliably accurate as by combustion, for the reason that even in the same kind of steels the proportion of hardening carbon (which gives no color in the color test) to carbide carbon is not always the same. Fifty consecutive heats of high-carbon open-hearth steel, tested in the manner above described, and also by combustion, showed forty-eight fairly good results by the color method (mostly within 0.03 per cent. of the truth—a few to 0.04 per cent.), and two results (duplicated by both methods) 0.06 per cent. wide of the truth. The standard should be made up of drillings from many different heats mixed together, as was the case here. Crucible steel would show less variation in proportion of hardening to carbide carbon.

GEORGE AUCHY.

NEW BOOKS.

DES INDUSTRIES CHIMIQUES ET PHARMACEUTIQUES. PAR ALBIN HALLER, Membre de l'Institut, Professeur à la Faculté des Sciences de Paris, Rapporteur du Jury de la Classe 87 à l'Exposition Universelle de 1900. Paris: Gauthier-Villars, 1903. 2 vols. quarto. Vol. I, lxxxix + 405 pp. Vol. II, 544 pp. Price, 20 francs.

Perhaps nothing more strikingly illustrates the enormous development of technical chemistry in the last generation than does a comparison of this work of Haller with the famous *Bericht* of A. W. Hofmann, published after the Vienna exposition of 1873. The work of Hofmann was a masterpiece in its way and is still the authority which must be studied in any discussion of the development of chemical manufactures. The number of exhibitors of chemical products at Vienna was not great, but, in discussing the things there shown, opportunity was taken to give a pretty full

[1] If the violent action be prevented at the very start it does not occur at all.

survey of the state of all important chemical industries at the time. Hofmann's *Bericht* is made up really of a series of short monographs by competent authorities.

The work of Haller is also a masterpiece, although in detail it is very different from the book of the Berlin professor. While information is drawn from many sources, the composition appears to be the work of the industrious author alone. At the outset, one is impressed with the great increase of exhibitors in 1900 over 1873, and with the enormous expansion of the industries described.

The Haller report opens with a lengthy general introduction in which is discussed, and very fairly too, the condition of chemical industry in the several countries represented at the exposition. Recognizing the peculiar advanced position occupied by Germany in this field, the author addresses himself to the solution of the question which has attracted so much attention in France, and especiallly in England in the last ten or fifteen years: Why is the German chemical industry so much in advance of that of other nations? Like the English writers before him, Haller reaches the conclusion that the extraordinary development of the German higher education in the universities and technical schools is the most potent factor in explaining German ascendancy in chemical manufacture. Interesting figures are quoted showing the large sums which have been spent in developing certain of the German laboratories, and on the subject of salaries also something is said which appears surprising to the American reader, who has been so often told that the German professors are very poorly paid for their services.

With respect to the higher chemical education in the United States the remarks of Haller are appreciative and sympathetic. He quotes, at length, from a letter to the *Chemiker Zeitung*, written by Dr. Schneider, at one time professor at the University of Chicago, in which some of our institutions are described in rather dark colors, but explains further that Schneider's picture is somewhat overdrawn. Haller spent some months in this country at the time of the Chicago exposition and wrote a valuable report to his government on his return in which he discussed educational as well as technical matters. He visited several of our larger schools while here, and his observations are of value. "That more is not accomplished with the colossal resources at the disposition of the universities, is the other side of the problem, but each

country must have its own standards, and work things out in its own time." Part of the trouble here, the author very truly says, is found in the condition of our secondary education.

In this introduction, finally, fourteen pages are devoted to the topic "Instruction in Chemistry in France." This will be found instructive reading, since the author has had himself much to do with the awakening now discernible in his country. Throughout there is a comparison with German conditions and methods which cannot fail to incite his countrymen to greater efforts.

The body of the work is made up of ten chapters dealing with different lines of chemical industry. The first and longest of these is devoted to the so-called heavy chemicals, the common acids, alkalies, bleaching-powder, phosphates, nitrates, Stassfurt salts, etc., while the following chapters deal with special fields of work—colors, varnishes, soaps, medicinal chemicals, crude colonial products and so on. Everything from artificial silk to the ozone purification of water seems to be considered, and the discussion is not confined to things exhibited at Paris, but is made complete with much matter drawn from other sources. The author discusses very satisfactorily the great advances which have been made in most of the important chemical industries in the ten years following the earlier French exposition of 1889, and gives for reference numerous bibliographical tables, by the aid of which further information may be obtained. Unusually full statistical information is given regarding such great enterprises as the "Badische Anilin und Soda Fabrik," the "Farbenfabriken vorm. Friedrich Bayer und Co.," the "Farbwerke vorm. Meister, Lucius und Brüning," and others.

Apparently but few chemical exhibits were sent from the United States and some of these were not to our credit or in any way a proper measure of our industry. Haller calls attention to the last and explains that in many directions chemical manufacturers have made colossal advances in this country, that indeed in some important lines we are becoming exporters instead of importers. The development of the electrochemical industries is especially mentioned.

J. H. LONG.