

The entire work is a most valuable contribution to the reference books on Organic Chemistry and no laboratory can well afford to be without a copy.

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UNIVERSITY OF NORTH CAROLINA,
September 30, 1899.

The Rise and Development of the Liquefaction of Gases. By WILLETT L. HARDIN, PH.D. Macmillans, 1899. 8vo. 250 pp.

Written from a historical point of view and with an ample command of the subject, this book of Dr. Hardin's is really a very satisfactory compilation. It is prepared with evident care and industry, and is finely illustrated. Why a 'popular-science style,' in which it professes to be written, should differ at times from good English, is not plain to the reviewer: but this is the severest criticism that need be made.

The author limits himself to a record of the statements of others, and he is therefore responsible chiefly for the selection and arrangement of his material. Here we might wish that the researches upon the more readily condensable gases, preceding the achievements of Cailletet and Pictet, had been treated more concisely, in order that more room had been found, toward the end of the book, for the discussion of the utilization of liquid air, etc., as at present proposed. The treatment of the latter topic is very scanty, in view of the fact that probably four out of five of the prospective purchasers of the book are interested in the uses of liquefied gases, rather than in the methods of their production. Two chapters, involving thermodynamics, would seem forbidding to the non-technical reader, while they bring no new information to the chemist or physicist. If they could be made the basis of a new chapter, discussing the economic value of gas-liquefaction, for commercial refrigeration and for the intensification of the potential energy of engines, they would serve a most useful purpose.

MORRIS LOEB.

BOOKS RECEIVED.

The Compendious Manual of Qualitative Chemical Analysis. C. W. ELIOT and F. H. STORER. Newly revised by W. B. LINDSAY and F. H. STORER. New York, D. Van Nostrand Company. 1899. Pp. vii + 202. \$1.25.

The Evolution of General Ideas. TH. RIBOT. Translated by FRANCES A. WELBY. Chicago, Open Court Publishing Company. 1899. Pp. xi + 231. \$1.25.

Wabeno, the Magician. MABEL OSGOOD WRIGHT. New York and London, The Macmillan Company. 1899. Pp. xi + 346. \$1.50.

SOCIETIES AND ACADEMIES.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science at St. Louis, held on the evening of October 16th, a paper by Dr. T. J. J. See, on the temperature of the sun and the relative ages of the stars and nebulae, was presented in abstract by Professor Nipher.

The author reviews the work of Helmholtz on the condensation of a homogeneous sun and finds that the heat developed in gravitational condensation from an infinite volume to its present size would be sufficient to heat an equal mass of water about 27 million degrees. In condensing to a mass whose radius was equal to the radius of Neptune's orbit, only about 1/6600 part was produced as has been produced since. Nearly all of the heat has been developed since the primitive nebula has reached the dimensions of the solar system. The heat developed before the nebula came within the orbit of Mercury, is only about 1/85 part of the total heat produced up to the present time. If the sun should contract 1/10000 part of its present radius, 69,700 M., assuming it to be homogeneous, the heat would raise the temperature of an equal mass of water 2,725 degrees. The effect of the various planets is considered, and is shown to be insignificant. An annual shrinkage of 35 meters a year would account for the present heat and would effect the radius less than 1/10'' in 1,000 years. The fact that ancient and modern eclipses are sensibly of the same duration, in connection with the substantial constancy of the moon's mean distance, shows that no considerable alteration of the sun's diameter has occurred in historical time. The essential constancy of solar radiation during the last 2,000 years is well established by the agreement of plant distribution now with that described by Pliny and Theophrastus.

Dr. See then takes up the case of a hetero-