sums up what has been done to determine the length of the meter in terms of wave lengths of light, and M. Renaud writes of the life and work of the hydrographic engineer, Ph. Hatt, who died in October, 1915.

The body of the volume contains a few changes which are mainly minor additions to and improvements in the astronomical portions which fill over half its pages in the odd years. No lessening of the care which has always been bestowed in making the *Annuaire* useful and up to date is apparent.

ERNEST W. BROWN.

Theory of Errors and Least Squares. By LEROY D. WELD. New York, Macmillan, 1916.

PROFESSOR WELD'S volume is mainly intended for those research workers who wish to use the method of least squares in dealing with their observations, but who have little knowledge of mathematics. With this end in view, he has attempted to give the necessary formulas in the simplest possible form and has added numerous examples drawn from problems in chemistry, physics, astronomy, geodesy, statistics, etc. Recognizing, however, that the competent observer is rarely willing to use a formula without knowing the basis on which it is constructed, the author devotes the earlier part to a detailed and simple explanation of the principles on which the theory is constructed.

He has attained considerable success in this effort. Nevertheless there is one point of view on which more explanation seems to be advisable. The theory of errors of observation, based on the least square principle, has become so standardized that those who use it much rarely need to remember that its results and technical terms rest on a set of assumptions which, it is true, are founded on experience, but which have not the definite character of a physical law deduced from observations. The beginner, whether an observer or a student learning the subject, needs to have the fact impressed on his mind that the whole theory with its technical terms such as "probable error of an observation," "most probable value" very largely form a language through which an observer may communicate briefly the results of his work and the degree of consistency of his observations. The theory gives no assurance that physical laws are correctly represented. This

is perhaps rather a point of view than a criticism, but it is one which frequently creates difficulties and its absence from most of the published treatments of the theory of errors is partly responsible for the unwillingness of many observers to use the methods of least squares.

A useful feature of the book is the Appendix, which contains some of the mathematical deductions which, placed in the body of the work, would perhaps have repelled or frightened the student. The various technical terms, rules and formulas are also gathered together ready for use.

ERNEST W. BROWN.

CARSLAW'S NON-EUCLIDEAN GEOMETRY.

I SHOULD like to point out that Professor Coolidge has quite misunderstood the definition of "nominal length" to which he refers on page 466 of his review of my little book on Non-Euclidean Geometry in the July BULLETIN; and he has failed to notice the indication I give at the beginning of § 94 of "just how a nominal line *corresponds* to a rectilinear segment."

As a matter of fact the full discussion of the euclidean case was given in my paper in the *Proceedings of the Edinburgh Mathematical Society*, and in Appendix V to the English translation of Bonola's book, both of which are mentioned in the footnote to page 156 of the book under review. It seemed unnecessary to repeat this introductory passage in full. In giving an abstract of it, the process of condensation has obviously been carried too far.

But a glance at one or other of the passages referred to will show that I am not guilty of the "lamentable" error with which your reviewer credits me.

H. S. CARSLAW.

THE UNIVERSITY OF SYDNEY,
August 10, 1917.