The first volume of Professor Müller's book was reviewed in the BULLETIN, volume 16, page 136. This first instalment of the second volume maintains the same standard and vigor as the first volume, and furnishes a comprehensive compendium as well as a text-book on the subject.

The volume begins with horizontal projection, and applies it to topography, roof construction, and excavations, the scope and treatment being rather similar to that given by Professor Low. Then follows a chapter on axonometry, with application to the representation of curve surfaces, including a number of metrical problems. An interesting feature is the extensive historical development, given in the form of footnotes.

In this set of four books, one American, and three European, we find a good representation of the relative states of the science, as viewed by the different countries. When shall we be able to regard descriptive geometry as a science coextensive with projective and analytic geometry?

VIRGIL SNYDER.

CORNELL UNIVERSITY,
August, 1913.

SHORTER NOTICES.

Zahlentheorie. By KURT HENSEL. Berlin and Leipzig, G. J. Göschen, 1913. 356+xii pp.

As a knowledge of the elements of the theory of congruence of integers is essential in many branches of mathematics, and as the higher parts of the theory of numbers have enthusiastic devotees, it is not surprising that there are published yearly several books treating the theory of numbers from various standpoints. The usual topics on congruences, including the reciprocity law for quadratic residues, are treated in the present book, but at widely separated intervals, the interspersed material being of quite a different nature described below. Consequently, a reader desirous of acquiring rather quickly a knowledge of the classical theory of congruences will not find the present book so well adapted to his needs as most of the texts available. However, there will be readers who appreciate the opportunity of being able to pick up incidentally this useful information while enjoying

Hensel's new and powerful method for number-theoretic questions, a method analogous to that of power series in the theory of analytic functions. This new method in number theory is that of p-adic numbers described in detail in my extensive review, BULLETIN, volume 17 (1910), pages 23–36, of Hensel's Theorie der algebraischen Zahlen. The newer book treats also of the similar, but more general, g-adic numbers, where g is any integer, whereas p was a prime. The g-adic numbers are, however, compounded in a very simple manner of p_i-adic numbers, where p_1, p_2, $\cdots$ are the prime factors of g, so that the matter finally rests upon the case treated in the former book. The new book is however an essentially new contribution to this subject. It gives also an exposition of series of p-adic numbers and of g-adic numbers; as well as of power series in which the variable and the coefficients are p-adic or g-adic numbers, with a detailed treatment of the exponential and logarithmic functions of a g-adic argument. The final chapter (sixty pages) obtains from the point of view of p-adic numbers the more fundamental properties of binary and ternary quadratic forms.

It is certainly instructive to see the theory of congruences developed by the side of, and largely by means of, the theory of p-adic numbers, a theory shown in Hensel's former book to be a powerful instrument for the investigation of algebraic numbers.

L. E. DICKSON.

Leçons sur les Equations intégrales et les Equations intégro-différentielles. Professées à la Faculté des Sciences de Rome en 1910, par VITO VOLTERRA, et publiées par M. TOMASSETTI et F. S. ZARLATTI. Paris, Gauthier-Villars, 1913. vi+164 pp.

THE subject of integral equations is rapidly coming to the front as one of the most important branches of mathematics. Several books on this subject have been published recently, but the book in question, being the published lectures of one of the founders of the theory of integral equations, will no doubt be received with an especially hearty welcome by mathematicians. As stated in the preface, the book is based on the course of lectures given by Volterra at the University of Rome in 1909–1910. The plan of the lectures, however, has been somewhat changed, partly by adding some interesting investiga-