that of divided differences.   This arises from the fact that where the method by divided differences is limited to integral functions, the method of reciprocal differences is limited to the most general form of fractional functions.   To be sure, the application of reciprocal differences is also much more difficult than that of divided differences.

In the fourth chapter interpolation for functions of two or more variables is presented in an interesting and useful manner.

The book, as a whole, is a scholarly and readable presentation of the elements of the calculus of finite differences, and should be found of value not only to those interested in the arithmetical application of interpolation, but also to those interested in a theoretical treatment of the subject.

H. L. RIETZ.

Plane Geometry, with Problems and Applications.   By H. E. SLAUGHT and N. J. LENNES.   Allyn and Bacon, Boston, 1910.   vi + 280 pp.

THIS book has several features that distinguish it from the conventional high school text.   Among these the most noticeable are the gradual introduction of the severely logical forms, and the introduction, for the purpose of making the subject more attractive, of a large number of applications to geometric forms more or less commonly met with in life.

The book is divided into seven chapters, the first five of which correspond in a general way to Books I to V of Euclid, except that certain of the more difficult theorems, and the subject of incommensurable ratios are deferred to the last two chapters.   Chapter I begins as usual with an introduction containing the common definitions.   Numerical equality and geometric equality, or congruence, are sharply distinguished.   The first propositions and problems are then introduced (pages 14–25) in an informal way.   Then a few axioms are stated formally, and a number of theorems are given as "preliminary theorems," some of which are easy consequences, and some of which, for the purposes of the text, are assumed.   A general discussion on the nature of a demonstration follows, after which proofs are given in the usual form.   Aside from the introduction of the applications and the deferring of the matter indicated above, the content of the first five chapters is about that of the usual book.   The algebraic form of the treatment is a decided improvement.   One particularly pleasing feature is the willing-

ness of the authors to introduce assumptions, as such, wherever they deem it desirable. At the same time, they state frankly that the set of axioms given is not complete, and that intuitional inferences concerning such subjects as order and continuity are drawn freely.

Chapter VI contains the treatment of variable geometric magnitudes, the subject being treated from the standpoint of the graph, a new feature which should aid in clearing up this subject.

Chapter VII contains general remarks on the nature of axioms, proofs, definitions, etc., from the strictly logical point of view; problems on loci, proofs of the incommensurable cases in the proportion theorems, mean and extreme ratio, area of a triangle in terms of its sides, and a few problems on maxima and minima. Length of arc and area of a circle are defined as limits.

The applications, which occur in large numbers throughout the book, are usually taken from architectural designs and various ornamental designs for decorative purposes, such as tile patterns, parquet floors, grill work, etc. These exercises are for the most part very simple, but by bringing into play a large number of straight lines and circle arcs in a single problem, they are a valuable aid in the development of geometric imagination. These exercises also bring into bold relief the principle of symmetry, which is thereby given the prominence that it deserves. Other applications are made to the problems of finding the distance between two points on opposite sides of a pond, measuring the height of a tree, finding the distance between two inaccessible points, cutting the braces for a roof, etc. All these applications should be a valuable aid in holding the interest of the numerous pupils who care comparatively little for the logical features of the subject. An ordinary class would probably find more than enough material of this kind in the book, but the omission of a part of it would in no way affect the continuity of the subject.

A novel feature is the introduction of the sine of an angle, with a few exercises in its use (pages 136–139).

The book as a whole appears to be a very teachable text. The typographical work is good, and the figures are clearly drawn. As compared with the ordinary text, the book has lost nothing and gained much by the innovations.

F. W. OWENS.