

unknowns is given) inequalities, complicated complex fractions.

Judged as a whole, these books are the best texts on high school algebra we have seen, and their use will produce stronger students than we are now receiving from the high schools.

ERNEST B. LYTLE.

*Einführung in die Hauptgesetze der zeichnerischen Darstellungsmethoden.* By Professor ARTUR SCHOENFLIES. B. G. Teubner, Leipzig and Berlin, 1908. iv + 92 pages. 98 figures.

DURING the last few years the need for more systematic and comprehensive instruction in geometric drawing has become much more keenly felt among school and college teachers. While the courses in descriptive geometry for technical students are frequently sufficiently extensive to claim nearly half the time of the student for a year or more, the corresponding training for prospective teachers is usually very inadequate. Among the attempts to supply this need, numerous recent publications of the firm of B. G. Teubner are worthy of careful consideration. The question may be fairly put, whether the emphasis should be placed on the technical details or on the geometric principles underlying them. The little book of Schütte\* is of the first kind; that of Müller and Presler† and also that of Schüssler‡ are much more comprehensive and combine considerable instruction in geometry with the explanations of the constructions. But the book under review puts most of the emphasis on the geometric principles. It is meant for much more mature students than the other books mentioned. The aim is frequently not so much the acquisition of sufficient knowledge or skill to introduce all the geometric details into a figure, but rather the power of making a good illustration by means of a few lines drawn free hand.

After a good discussion of the principles of plane perspective the theorem that any two projective pencils have one right angle formed by corresponding lines is proved in great detail. This theorem is used later. The treatment of the methods of descriptive geometry is brief, but clear. A reader of fair ability and much patience could read these parts profitably

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\* See review in BULLETIN, vol. 14, p. 294.

† See BULLETIN, vol. 10, p. 207.

‡ Reviewed in BULLETIN, vol. 12, p. 361.

without a teacher, though too few exercises are given to prove his interpretations or measure his skill. Now follow in rapid review the outlines of four important methods, though much too brief to be of maximum service. The treatment of axonometry is confined almost entirely to the proof, elegant in itself, of Polke's theorem that any plane quadrilateral is similar to some plane (parallel) projection of a given tetrahedron. Nine interesting applications are hastily sketched. The determination of apparent contour is the most interesting part of the book; the applications to the anchor ring and hyperboloid of revolution could hardly be followed by a reader to whom these figures are new. Stereographic projection is theoretically discussed, the invariant property of circles and angles being established. The depiction of the edges of a cube on a plane perpendicular to a diagonal is the only illustration. Finally, a few pages are devoted to relief perspective, generalizing for three dimensions what was done earlier in the book for two. A number of instructive notes are added, more fully explaining various points in the text.

The only typographical errors that would cause confusion are on page 23, where regions II, III should be interchanged, and on pages 32, 33, where the letters  $F_0, F_2$  in the text refer to  $P_0, P_2$  respectively in the figures.

VIRGIL SNYDER.

*La Géométrie Analytique Générale.* Par H. LAURENT. Paris, A. Hermann, 1906. vii + 151 pp.

MANY text-books, chiefly on analysis and algebra, have been written by M. Laurent during the last twenty-five years. The present little volume, with its far-reaching title, suggests that the author is turning his attention, for the moment, to the field of geometry. One soon finds that the underlying thought is that geometry is merely a branch of the theory of numbers. The author has certainly succeeded admirably in emphasizing the fact that geometry may be considered as a purely abstract subject capable of treatment by analytical methods without reference to space perceptions. However, the work is not, as a whole, just what one would desire as a brief first book on the subject of "General analytical geometry." For instance, one feels that much of the strength of the book has been lost by spending an undue amount of time on the one topic of orthogonal substitutions and by delaying the definition of a group too long.