little known form of insurance, pointing out, it would seem, every exigency that could possibly arise.

CHARLES C. GROVE.

Konstructionen und Approximationen. Von THEODOR VAHLEN. Teubner, Leipzig und Berlin, 1911. xii + 349 pp.

ONE who expects to find in this book—Band XXXIII of the Teubner Sammlung—a more or less complete list of constructions and approximations with a strong flavor of applied mathematics will be disappointed, as was the reviewer. According to the author it is intended to help bridge the gap which exists between the mathematics of the German gymnasium and university. The latter does not begin its work where the former ends. Various books, notably those by Klein and Enriques, have been published recently which might be studied by those intending to follow the lectures on higher mathematics. The book under review aims to furnish such preparation by having the student actually come in contact with some concrete facts in mathematics and to know these so well that later when the professor during his lecture has him soaring more or less he may still have a point or two of contact with the earth below.

The class of books having in view preparation for the university is decidedly different for Germany than for the United States. To illustrate this we might mention that the first 75 pages of the book under review are devoted to having the student obtain definite notions concerning the fundamental principles of projective geometry. Special emphasis is placed in all of its phases, both algebraic and geometric, on the interpretation of the cross-ratio. Good drill work, all of it. Of course, it couldn't be included in the lectures given later—that would seem too much like teaching.

Throughout the book the various aspects of the solutions of the three famous problems of antiquity are presented and many references to the literature on the subject given. Interesting metric cubic constructions in which algebra and geometry are closely correlated are cited. Approximate solutions of cubics and biquadratics are obtained geometrically and the limited range of constructions possible with ruler and compass pointed out. In this connection are included several solutions, ancient and modern, of the duplication of the cube and tri-

section of an angle and various pieces of apparatus designed to solve the same problems are described and their theory discussed. Later some interesting constructive approximations are given.

The properties of various transcendental curves are used to obtain approximately an nth root and to divide any angle into n equal parts. The division of the circle and of the arc of the lemniscate into n equal parts for special values of n with the aid of ruler and compass alone is discussed.

A development of attempts to arrive at the value of π from the time of Ahmes to that of Lindemann is presented. This leads naturally to mechanical quadrature and rectification.

Under the heading of analytic approximations are included such titles as Taylor's series, Lagrange's interpolation formula, exponential series with application to the quadrature of the hyperbola, De Moivre's theorem, indeterminate forms, and the determination of π by the use of series.

The discussion of the irrationality of π and π^2 brings out the methods used by famous mathematicians of old. The book closes with the proof of the transcendental nature of e and π.

There is much concrete work in algebra and geometry throughout the book, consequently a chance for errors, many of which have been listed in an appendix of two pages.

Student's mathematical clubs in our universities desiring some interesting material for the rounding out of a course in mathematics would find the volume rich in suggestions.

ERNEST W. PONZER.

NOTES.

THE sixth regular meeting of the Southwestern Section of the American Mathematical Society will be held at the University of Kansas on Saturday, November 30. Titles and abstracts of papers to be presented at this meeting should be in the hands of the chairman of the programme committee, Professor J. N. Van der Vries, University of Kansas, by November 8.

THE annual meeting of the Society will be held this year at Cleveland, Ohio, in affiliation with the American association