special theorems accompanying it, is developed in Parts II and III. In Part IV curvilinear coordinates are used in the problems and theorems of space curves and surfaces. Here is also included the application of line coordinates to the general theory of surfaces of the second order.

A list of 136 exercises, to some of which is added the suggestion that they be solved geometrically, is given at the close of the book.

It is to be regretted that the volume does not possess the high typographical tone and finish which characterize Scheffer's text.

ERNEST W. PONZER.

Untersuchungen über die im Schlusswort des Lie'schen Werkes "Geometrie der Berührungstransformationen" angedeuteten Probleme. Von PHILIPP ENGELHARDT (Inaugural-Dissertation, Würzburg). Leipzig, B. G. Teubner, 1910. 65 pp.

THE closing lines of Lie's Geometrie der Berührungstransformationen forecasted that a second volume, which never appeared, would treat the theory of differential equations from the standpoint of contact transformations and continuous groups. One may well hope that this field will soon receive its fair share of attention and be extensively developed beyond the elements established by Lie.

The thesis under review might be classed with fundamental literature having this tendency. The author's methods are, for the most part, those presented by Lie in chapter 14. The integral surfaces of a non-linear partial differential equation of the first order, $F(x, y, z, p, q) = 0$, bear an aggregate of ∞^3 exceptional curves called characteristics (Geometrie der Berührungstransformationen, pages 261, 498). Lie's summary of his last chapter is in the form of statements of six problems which are there solved. These are determinations of differential equations $F = 0$ defined by definite conditions imposed upon the characteristics or upon the normals to integral surfaces. Problem 2 is the determination of the equations $F = 0$ whose characteristics are lines of curvature upon all integral surfaces. Problem 4 is the determination of the equations $F = 0$ whose integral surfaces have for normals precisely lines of a given line complex. This thesis is devoted to twelve problems obtained by combining Lie's six problems. Thus problem (2, 4) of the thesis is the determination of all equations $F = 0$ whose characteristics form lines of curvature upon all integral surfaces and whose integral surfaces have for normals precisely lines of a given line complex. These prove to be equations having integral surfaces for which the complex of normals is the ∞^3 rays through a definite curve k. The characteristics are circles.

Geometrical intuition based upon configurations defined by Monge equations gives direction to the analysis. There is no introductory summary of the principles, although a desirable outline could have been given in a comparatively brief space and would have improved the exposition.

O. E. GLENN.

The Trisection of the Angle by Plane Geometry: Verified by Trigonometry with Concrete Examples. By JAMES WHITEFORD, B.A., M.D. Bowes and Bowes, 1911. 169 pp.

THE book under review is another illustration of how little the logic involved in the impossible construction proofs of Klein and others is appreciated by the ordinary mind. While actually quoting DeMorgan to the effect that the famous trisecting of the angle problem cannot be solved, yet the author claims to present a right line and circle solution of this famous problem. His confidence in his construction and proofs seems to rest upon the fact that they stand the test of trigonometry aided by logarithms in fifty concrete examples laboriously calculated to seven places of decimals. It is hardly necessary to say that he has not solved the famous trisection problem but simply exhibits a rather close approximation method. His construction is not even useful as a practical drawing-room approximation since simpler and more exact angle trisection methods are well known, although of course not euclidean methods. What a pity that so much time, patience, and labor should be wasted in such useless work!

ERNEST B. LYTLE.

Practical Algebra, Second Course. By J. V. COLLINS. American Book Company, 1912. x + 303 pp.

THIS book is intended to meet the needs of a text for a second course in algebra in such schools as offer a second course, often elective, in either the junior or senior year. After a rather rapid review of the usual topics of a first course