translator of Bonola's work into German) in his own Nichteuklidische Geometrie, namely, one in which non-euclidean lines and planes are represented by euclidean circles and spheres, respectively.

Two supplementary chapters, one on non-euclidean statics and one on Clifford parallels, Clifford surfaces, and the Clifford-Klein problem, and in the German edition another supplementary chapter on the construction of Lobachevsky parallels, add considerably to the value of the book. There is an index of authors cited, but no general index.

It would be fortunate if we could have an English translation of so valuable and interesting a work; for in English there is nothing covering even approximately the same ground except possibly the scattered papers of G. B. Halsted.

ARTHUR RANUM.

Analytic Geometry. Revised Edition. By E. W. NICHOLS. D. C. Heath and Company, 1908. xi + 282 pp.

THE general scope of this book is the same as that of the first edition which appeared fifteen years earlier. In the first edition the last chapter — a discussion of surfaces — was written by Professor A. L. Nelson and in the new edition this chapter has been entirely rewritten. Otherwise comparatively few changes in the subject matter have been made. The revised edition is very neatly bound in flexible covers — the style so largely used by D. C. Heath and Company lately. The printing, too, is distinctly better than in the former edition.

"The aim of the author has been to prepare a work for beginners, and at the same time to make it sufficiently comprehensive for the requirements of the usual undergraduate course." The first part of this aim has been more successfully carried out than the second. The book is written clearly and contains numerous, well-chosen problems. The conventional order of topics is followed — the conic sections being discussed separately with little emphasis upon their relation to each other. Probably the book is more elementary than would be acceptable in the best engineering schools.

G. H. SCOTT.

Complete Arithmetic. By GEORGE WENTWORTH and DAVID EUGENE SMITH. Boston, Ginn and Company, 1909. v + 474 pp.

THIS book preserves and combines most of the strong features of two well-known series of arithmetics — the Wentworth and the more modern Smith texts. Briefly, it embodies the spirit of the newer series in the forms of the older. It is "thoroughly modern in spirit and in material" but is free from all traces of "fad-ism" found in so many texts of recent years. The book is strictly topical, although the authors frankly admit, in the preface, that under certain conditions the recurrent treatment of topics may be preferable. The problem material is carefully chosen and is given in great abundance. And, at frequent intervals, under the heading "Problems without Numbers" are given sets of questions that combine review and generalization very effectively. It might have been well to present the metric system earlier and then give practical problems in it through a longer interval.

G. H. SCOTT.

Theorie des Potentials und der Kugelfunktionen. Von DR. A. WANGERIN. I. Band., Leipzig, Göschen (Sammlung Schubert. Band LVIII.), 1909. 8 + 255 pp. M. 6.60.

THIS is the first of two volumes dealing in an elementary way with the subject indicated by the title. The second volume will treat of spherical harmonics and their applications to the potential of the sphere. The present volume is confined to the derivation of the characteristic properties of the potential. The treatment follows Gauss for the potential due to solids, Weingarten for that due to surfaces. The potential function for other laws than the Newtonian is briefly considered. The last section gives in some detail the problems of potential and attraction of a homogeneous ellipsoid.

The development is very skilfully handled. The text begins with very elementary data, and builds up the integrals for the attractions of solids and surfaces, with applications to circular arcs, straight segments, and surface of circle and sphere. It is thus made to connect easily with an ordinary course in integral calculus. The potential function noticed by Lagrange is then introduced as a point function whose three partial derivatives are the three components of the attraction. The conceptions of equipotential surface and lines of force follow. The next chapter derives the usual characteristic properties of the potential function, as a function of a position in space, for points outside the attracting mass. The holomorphism of the function and its derivative as to x, y, or z, its order at infinity, and the vanishing of its concentration are shown. Next the characteristics for