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 points belonging to the attracting mass are developed, and the discontinuity of the second derivatives as the point goes through a bounding surface is shown and the values of the saltus determined. Following this, like problems are taken up for surface distributions. The closing chapter of the section is devoted to proving that the properties enumerated for the potential as necessary are also sufficient, hence characteristic.

The second section considers the function for other laws than that of the inverse square of the distance. It is shown in particular that the Newtonian is the only law which gives a constant potential inside a spherical shell whose density is a function of the distance from the center. It is not however the only law for which the attraction on an external point due to the shell is equal to that of an equal mass concentrated at the center of the shell. The shape of the "solid of greatest attraction" is considered. The logarithmic potential and the potential due to a double distribution, as a Leyden jar, are each given a chapter.

The book would seem to be quite teachable. Gauss's, Green's, and Stokes's theorems are not dragged in, but show up naturally when needed to further the development. The student sees clearly all the time the drift of the development and why it proceeds as it is does. He learns how to attack such problems, but he also becomes acquainted with a class of point functions particularly useful in mathematical physics. Difficult questions of higher analysis are passed over, yet the treatment is careful and tends to inspire to further research.

JAMES BYRNIE SHAW.

Geometrie der Kräfte. By H. E. TIMERDING. Leipzig and Berlin, Teubner, 1908. 8vo. xi + 381 pages.

In this book the author has developed the geometry of forces as an independent discipline, a branch of pure mathematics. While the word force (Kraft) has been retained in preference to stroke or vector, great pains have been taken to free it from the "physiological, physical, and metaphysical" attributes which belong to it originally. A force is a matter of definition, being defined as a vector with which is associated a numerical factor. The resulting theory is then applicable to any quantity which satisfies the definition, for example to momentum quite as well as to force in the ordinary physical sense. The subject matter is not new. In different forms and