

*Darstellende Geometrie.* Vol. II. By Theodor Schmid. Berlin and Leipzig, Vereinigung wissenschaftlicher Verleger, 1921. (Sammlung Schubert, XVI.) 315 pp., 156 figures.

The first volume of this work appeared in 1912, and was reviewed in this *BULLETIN*, vol. 21 (1914), pp. 204-205. A second edition appeared in 1919, containing slight changes (mentioned in the *BULLETIN*, vol. 27 (1921), p. 285). The second volume preserves the same general arrangement; the text is frequently interrupted by lists of unsolved exercises, and a useful historical and bibliographical note is added at the end of each chapter. The figures are well drawn and are usually clear, but in some of the more complicated ones, as numbers 107, 112, 118, 124, 126, the wealth of detail makes them difficult to follow.

The book begins with cavalier perspective, or oblique axonometry, and a shorter treatment of orthogonal axonometry. Besides a fairly full treatment of polyhedral figures, a shorter one on circles, spheres, cylinders and cones is added. The proofs are largely geometric, but footnotes use methods of analytic geometry and the calculus. The second chapter, that on central perspective, is particularly well written. The reader is introduced to the various steps and purposes of this method in a very attractive and easy manner. It might be hinted that the author became somewhat ambitious in treating singularities of plane and space curves, but there was a real temptation to complete the argument, and after all, the more complicated formulas appear only in the footnotes. In other respects the development is elementary. A wealth of important applications, including theater perspective, are treated in the sixty pages of this chapter.

The chapter on surfaces of revolution and on tubular surfaces is necessarily more mathematical. Contour, tangent planes, normal planes, parallel sections and principal meridians are treated. The application to quadrics of revolution is first to obtain the proper algebraic result, and then to interpret it graphically. But when shades and shadows are considered, the apparent contours from oblique infinite sources, or from a finite center, are too complicated to be interpreted from the equations, and here the method of the preceding chapter is extensively employed. In the discussion of cyclides of revolution both the algebraic and graphic methods of central perspective are employed. Later, more general tubular surfaces, together with their intersections, and their shadows, are considered.

The fourth chapter, of eighty-three pages, is devoted to helicoids and to non-developable ruled surfaces. It begins with an algebraic discussion of the simple helix, then of the ordinary helicoid, followed by certain graphic representations, such as tangent, indicatrix, and the intersection with a cone of revolution, each result being first derived analytically and then interpreted graphically. After a short discussion of parallel illumination, the more complicated problem of oblique generators is taken up, the surface generated being a quasi helicoid of high pitch. To this surface the same questions are applied as to the ordinary helicoid, and the results compared. Then comes the drawing of cylindrical and conical screws, with contours and plane projections. Finally, a number of particular