

*Les Méthodes Actuelles de la Balistique Extérieure.* By Dufrenois, Risser, and Rousier, with a preface by P. Appell. Paris, Gauthier-Villars, 1921. vii + 237 pp.

In striking contrast to the books on ballistics written by Vahlen and by Hoar, the book under review on present-day methods in exterior ballistics will be a joy to the ordnance engineer or the artillery officer who is interested not only in the theoretical aspects of firing large guns but in making a comparative study of the magnitudes of the quantities involved. The authors are content to confine themselves to the movement of the center of gravity of the projectile; the movement of the projectile about its center of gravity is regarded as such a special and advanced phase of ballistics that it does not belong properly in a manual on present-day methods.

The following features of the book will be of special interest to American readers: (1) a very thorough mathematical treatment of the analytic form of the law of resistance, which has been based upon the work of Langevin; (2) the use of the fact, which is clearly established, that, after the projectile reaches the point on its trajectory where the radius of curvature is a minimum, the path of the projectile will lie between the velocity parabola and the osculating circle; (3) the presence of numerical tables.

Two methods of calculating trajectories by short arcs are described in detail; the method of Gavre, and the method of Rousier-Dufrenois. These methods are similar and may be called with propriety "short arc" methods. In the same sense it would be better, in the reviewer's opinion, to call the method developed in this country during the World War the "short interval" method. The fictitious-velocity method, developed by Sugot, is quite interesting; it consists in calculating the trajectory by a successive approximation of velocities.

A table of comparison of the elements of a large number of trajectories, calculated by the Rousier-Dufrenois and by the Sugot methods, is given. It would be interesting to compare this table with results obtained from our ballistic tables when the same initial conditions are given. Probably this should not be done without the consent or the knowledge of the proper military authorities as such information is regarded as confidential.

The methods employed in correcting for non-standard conditions are about as efficacious as any corrections of this kind can be; until guns and projectiles can be manufactured with greater uniformity such corrections do not deserve the emphasis that usually has been given to them. To anyone who is interested in ballistics the first five chapters of the book will prove to be especially worth-while reading.