

taining chromium, tungsten, and vanadium; this has been rewritten and re-set. Otherwise, the third edition is given unchanged.

The book is essentially a laboratory handbook; the methods are described in very great detail, necessitating, therefore, considerable repetition and reference to methods which are not given in full until later in the book, the pages for reference not always being given. Considerable space is occupied by descriptions of apparatus designed by the author, such as electric furnaces, rheostats, and carbon dioxide absorption 'bulbs', which can be made in the laboratory. The methods are described as rapid methods; but it is rather surprising to find that more use is not made of the electrolytic process for the determination of copper, as this method, although not 'rapid' in itself, can be carried out while the determination of the other constituents in, for example, a bearing metal is taking place.

The last three appendices are devoted to details in the preparation of steel for microscopical examination and the results to be observed in normal and abnormal specimens. In a work of this description, such details must be of necessity rather scanty, but, coupled with references to original papers, they serve as a useful introduction to the subject.

*Articulated Locomotives.* By Prof. Lionel Wiener. Pp. xv+628. (London: Constable and Co., Ltd., 1930.) 42s. net.

An articulated locomotive is a locomotive in which one or more of the driven axles are able to take up positions where they do not remain parallel to the others and may take angular positions in curves. Such locomotives, once rarely seen, are now found on many railways. The causes for this are the need for more powerful locomotives, the need for using heavy locomotives on lines with permanent way of insufficient strength, and the demand for locomotives of sufficient flexibility to negotiate curves of small radius. Well-known forms of articulated locomotives include the Fairlie, the Mallet, and the Garratt.

One landmark in locomotive history was the Semmering Contest in 1857, for it was then that most systems of locomotive articulation first appeared. Since then makers in all countries have produced articulated locomotives, and of these a great deal of information is given in the book under notice. One of Prof. Wiener's objects was to establish a clear system of classification of types. In addition to the descriptions, sketches, and illustrations of the engines, the book contains alphabetical lists of locomotives, railways and builders, and a chronological sequence of inventions connected with articulated locomotives.

*Mechanics of the Gyroscope.* By Prof. Richard F. Deimel. (Engineering Science Series.) Pp. x+192. (New York: The Macmillan Co., 1929.) 17s. net.

THIS book is intended primarily for engineering students, but will be found of use also by students of applied mathematics and physics who are

interested in the practical applications of the gyroscope. As regards scope and standard it occupies a position between the exhaustive treatises of Gray and of Klein and Sommerfeld on one hand, and Crabtree's elementary book on "Spinning Tops and Gyroscopic Motion" on the other. About thirty pages of the book are devoted to a rapid survey of dynamical principles, though this would scarcely seem to be necessary in view of the existence of a sufficiency of good text-books on this part of the subject. Then follow chapters on rotation under no forces (the free gyro), and on the spinning top and its motion on a plane and under constraint.

The book concludes with a discussion of applications to various types of gyro-compass and stabilisers used in ships and mono-rail cars. This discussion occupies about a third of the available space, and deals very fully with such topics as the stability of the gyroscopic apparatus and the methods used for controlling its oscillations and diminishing the errors to which it is liable. The free use of illustrations and tables taken from actual practice has enabled the author to produce a most interesting and instructive introduction to the theory and practice of gyroscopic motion.

*Positivismus und reale Aussenwelt: Vortrag, gehalten am 12. November 1930 im Harnack-Haus der Kaiser Wilhelm-Gesellschaft für Förderung der Wissenschaften.* Von Max Planck. Pp. iii+35. (Leipzig: Akademische Verlagsgesellschaft m.b.H., 1931.) 1.80 gold marks.

THIS is a striking addition to the much-discussed pronouncements of physicists on the philosophical bearings of their new theories. Prof. Planck reveals himself as an idealist, having many beliefs in common with Sir Arthur Eddington and Sir James Jeans. His exposition of scientific method, and his views on the principle of causality and on the problem of free-will are a penetrating analysis of certain fundamental questions which are still a puzzle to the philosopher. Though Prof. Planck's message is hopeful, it is doubtful whether it should be taken as the final explanation of modern physics. T. G.

*The World Mapped: being a Short History of Attempts to Map the World from Antiquity to the Twentieth Century.* By Dr. I. J. Curnow. Pp. vi+104+10 plates. (London: Sifton Praed and Co., Ltd., 1930.) 5s.

THIS is little more than an essay on an important and vast subject, nor indeed does its author make any further claim. It succeeds, however, in giving an outline of the subject, in which the principal developments are traced and illustrated by reproductions of early maps. The map-makers of antiquity have most notice, and perhaps the monks of the Dark Ages, and their fantastic maps merit a little less attention than they receive in Miss Curnow's allotment of space. This restricts a little the treatment of more enlightened ages. As a whole, however, the work is useful and may be recommended. It contains a short bibliography.