

of the free negative charge as an electron. It is true that two chapters are devoted to the subject of radio-activity, concerning which we read in the preface:—

“ Sur la radioactivité de la matière . . . nous avons dit que des généralités. Le domaine des faits dans cet ordre d'idées est si vaste et surtout si mobile, qu'il est encore très difficile de s'y orienter.”

Ideas at the present time in radio-activity are more definite and well-grounded than in any other branch of physical chemistry, but it is clear the author's lack of knowledge in the recent and even the older work of the subject is responsible for his views. In subsequent editions this part of the work might be omitted. It follows, no doubt, the precedent set by Sir J. J. Thomson's well-known book on the conduction of electricity through gases; but what was natural enough when that book was written does not apply to a book published in 1909.

In the ground covered, the work does not differ materially from the one just quoted and many similar which have since appeared, but the treatment is interesting and lucid, and the critical examination and selection of the material chosen for presentation has been done impartially and well. The lack of any conspicuous originality is compensated for by clearness of exposition. In one respect, in that this is a French work dealing with a scientific movement which, if we exclude radio-activity, has proceeded mainly from this country and from Germany, the author is at an advantage, for the whole territory is surveyed in better perspective in consequence.

Both in the first part, which is of a general elementary character, and in the second, which deals for the most part with the mathematical theory of ions in physical phenomena, the author introduces his subject with an excellent account of the older work on the passage of electricity through ionised liquids before passing on to the newer ideas which followed the study of the discharge of electricity, first in high vacua and later, after the discovery of X-rays and other ionising agencies, in gases at various pressures. We are thankful for this juxtaposition of subjects which are usually regarded as independent owing to the fact that the one has been largely developed by chemists and the other by physicists; but at the same time it brings out the difficulties that arise when we seek to apply the newer views to the case of liquid electrolytes. The two subjects have surprisingly little connection with one another at the present time, and anyone who has to teach both must be painfully aware of the difficulties of harmonising them. In this book the newer work on gaseous ions and their properties, the various means of producing ionisation by cathode-rays, X-rays, flames, &c., the re-combination and diffusion of ions are discussed very thoroughly from the physical point of view along regular lines. In the second part an account of the electronic theories of metallic conduction and of magneto-optical phenomena is given, while the more metaphysical developments connected with the electronic constitution of matter, and the entanglement of ether by moving masses

are properly left to the end of the two parts respectively. The book has no index, and is marred by an extraordinary number of misprints, the rectification of which occupies many pages of errata at the end.

OUR BOOK SHELF.

Problemi grafici di Trazione Ferroviaria. By P. Oppizzi. Pp. viii+204. (Milan: Ulrico Hoepli, 1909.) Price 3.50 lire.

In the preface the author tells us that although graphic methods are often used by the general mechanical engineer, they have up to now been neglected by the railway engineer. This book is intended to show how such methods may be applied to the solution of nearly all problems in connection with the working of trains on railways. In this object the author has well succeeded, and it may safely be predicted that any reader who has once used graphics in the very easy and simple manner represented in this book will never again have recourse to analytical methods. Indeed, there are cases where analysis becomes so complicated that its use by a busy engineer, even if he has the required mathematical ability, is out of the question; as an example may be cited the acceleration diagram of a train drawn by a steam locomotive. Tractive effort and resistance vary in a very complicated manner with the speed, and this, again, being the time integral of acceleration, which in turn depends on the difference between tractive effort and resistance, it is easy to see that a purely analytical treatment leads to almost hopelessly involved formulæ. Yet the author is able to solve this and many other problems by his graphics in a comparatively easy way, and with a degree of accuracy quite sufficient for practical purposes.

The book contains eight chapters, in which the following subjects are treated:—train resistance as a function of speed, weight, and type of coach and locomotive; tractive effort of locomotives of various types at various speeds, gradients, and curvature of line; speed-time-distance diagrams during acceleration; possibility of making up for lost time; running down long gradients and action of brakes; total time required for a given run; consumption of fuel or electrical energy and conditions of greatest economy; efficiency of service. In all cases the author gives numerous examples to show the application of his methods to cases which are taken from practical work, and thus even a reader whose mathematical knowledge is only elementary is able to profit by this book.

This work should prove most useful to railway engineers, and an English translation would be welcome to many. There is only one fault to find with the book, and that is the very untidy appearance of the diagrams. They have all been drawn on squared paper, the divisions being in millimetres. A page covered closely with such lines is very tiring to the eyes, and if, in addition to the multiplicity of lines, there is some writing added to the curves and the whole is reduced in rather a coarse way by photography, the effect is by no means pleasing. It would have been better if the author had omitted the millimetre divisions and retained only the lines placed a centimetre apart.

GISBERT KAPP.

General Treatise of Meteorology. Part i., Statical Meteorology. By Prof. A. Klossovsky. (In Russian.) Pp. xii+642. (Odessa, 1908.)

The complete work will comprise four parts. The two first—statical meteorology and dynamical meteorology—will not necessitate a knowledge of higher mathematics; they will form the course of meteor-