the vector can be expressed as the sum of three parts, but cannot be distributed with respect to these parts, has no meaning. A non-distributive operator is in no sense a quaternion, since it does not obey the laws of quaternions (which are associative and distributive), and since no operational meaning can here be attached to the quadrinomial form so important in quaternions.

The reader who studies out the problems of the remaining 20 pages will do well to avoid an increasing sense of irritation. Very little use is made of the principles first laid down; but a great deal of a mysterious looking but trivial notation for loci, in no way a necessary part of the system. The problem work has no advantage in compactness of reasoning over the usual analytic geometry. In this respect it endures no comparison with the pages of Hamilton or Grassmann, of Heaviside or Gibbs. No doubt it is too much to expect such a test of a brief monograph, but one naturally assumes the problems to have been chosen so as to show the method at its best.

FRANK L. HITCHCOCK.

Mechanics of Particles and Rigid Bodies. By J. PRESCOTT. London, Longmans, Green, and Company, 1913. viii+535 pp.

THIS book has been designed to meet the needs of students aiming for a pass degree at a British university and contains all that they require in the subject of applied mechanics except hydrostatics.

Practically all English texts on mechanics include long lists of problems; many of them consist principally of illustrative examples and problems. This volume, however, presents a systematic development of the theory in which no pains have been spared to make the proofs rigorous enough for pure science, while the practical side of the subject has not been neglected. The problems following each chapter have evidently been chosen with great care and cover a wide range. Some of them demand merely substitution in formulas and numerical calculation, while others offer considerable theoretical difficulty. A special feature is that the answer is given to nearly every question.

An elementary course in the calculus is presupposed for the study of this text and the author appreciates the fact that the student who is applying the calculus for the first time to

physical problems has great difficulty in turning his formulas into numbers. Accordingly the examples worked in the text include several numerical ones, and some attention is given to putting results of theory in a form convenient for calculation. The book has a utilitarian bias which should make it useful to the engineering student, as well as interesting and live to the student of pure science. This attitude is emphasized throughout and is especially noticeable in the chapter on motion in two dimensions, where practical numerical applications are made of almost every topic treated, and in the applications to problems of astronomy.

The book begins with the subject of statics and, in addition to usual topics under this head, Part I contains chapters on graphical methods, moments of inertia, potential and attraction, and an extensive chapter on elasticity including strength of materials. Part II is devoted to the dynamics of a particle and the usual special types of motion are treated in excellent style. Besides a fairly complete chapter on central forces there is one on the problem of two or more bodies. The dynamics of a rigid body forms Part III and this is concerned principally with motion parallel to a fixed plane. There is also a chapter on motion in three dimensions of a rigid body with a symmetrical axis. The last chapter is on units and dimensions. If the student is to use the idea of dimensions as a check on his equations, it seems better to place this subject in the earlier part of the book.

W. R. LONGLEY.

Annuaire pour l'An 1915. Publié par le Bureau des Longitudes. Paris, Gauthier-Villars, 1914.

THE Annuaire bears no signs of the struggle which is taking place in Europe. It arrived about the usual time and contains the usual information brought up to date. The astronomical part is increased by a descriptive note, with maps, of the constellations and with the names and positions of the stars which form these groups. The editors frequently find it necessary to add new information and, in order to keep the volume within reasonable limits, to omit less needed tables and articles, publishing the latter only occasionally. This year the geographical positions of the principal towns on the earth are omitted as well as the long table of magnetic elements in France.