considerable detail the principles and operations involved in qualitative analysis, but it does not include the consideration of the dissociation theory." For this, in the opinion of the writer, the authors are to be distinctly commended. Although the presentation of the ionization theory may accompany not unsuitably the subject of qualitative analysis, yet to base instruction upon it, to translate the statements of fact in so eminently practical a subject into the terms of a theory so hypothetical and still so controverted is, to say the least, not in the interest of sane teaching. The book is commended as one of the best of its class. A. V. E. YOUNG.

THE ELEMENTS OF PHYSICS. BY EDWARD L. NICHOLS AND WILLIAM S. FRANKLIN, in three volumes. New York: The Macmillan Company, reprinted 1901. Vol. I, MECHANICS AND HEAT, pp. 220; price, $1.50 (electrotyped 1898.) Vol. II, ELECTRICITY AND MAGNETISM, pp. 272; price, $1.90 (electrotyped 1896).

This work is not intended to include all the aspects of physical instruction. It contains only, as the preface indicates, "concise statements of physical laws, and a systematic development of principles." Without demonstrations of phenomena and an additional course of physical measurements, its excellence must be largely lost upon the student of physics. On the other hand within the compass of its contemplated field, and considering its real date, the work is unusually well balanced and adequate.

The mathematical method is sufficiently modern, and the lucid explanations of vector calculation and distributed quantity will be helpful to those not already familiar with these concepts. A knowledge of the calculus is of course presupposed. The treatment of physical dimension (in the technical sense) is important and not often so adequately emphasized. In view of this fact it is surprising to find occasionally such an equation as the following, (properly applied, of course, to unit volume): Work = Pressure (Vol. I, p. 117). This type of equation, by ignoring one dimension, seems to indicate the equality of two radically different dimensions. The data are less modern than the treatment. For example the weight of a cubic centimeter of hydrogen is recorded as 0.00008954 gram (Vol. I, p. 179). On page 8 the definition of *mass* does not seem to be convincing, and the importance of Newton's and Bessel's pendulum experiments in showing

the relation between mass and weight seems to have been overlooked.

The second volume of the book is merely a reprint of the edition of 1896; hence, it does not contain descriptions of the Nernst lamp, the Rowland system of telegraphy, or the various practical systems of wireless electrical communication. It is much to be regretted that so good a book should not have been modernized in these respects in the new edition; unless indeed, the real date of the work were made obvious on the title page. Diplex, duplex and quadruplex telegraphy, the telephone, electric furnace, and ordinary electric lighting, are clearly treated. The modern electrochemist will find the treatment of the phenomena with which he is concerned quite inadequate, however.

In general, the work may be characterized as one very useful to him who, already possessing considerable physical knowledge, wishes a more thorough mathematical grasp of those generalizations which have stood the test of time.

THEODORE WILLIAM RICHARDS.