

"Trial Data" from the same source. Further, no place is found for a reference to the comprehensive work of the Carnegie Institution of Washington on coloured minerals, fundamental for our knowledge of the optical characteristics of pigments.

These researches have become international, the common property of artists and designers. But that Dr. Morrell's manual should receive the warmest of welcomes, there can be no doubt.

F. IAN G. RAWLINS.

PURE AND APPLIED THERMODYNAMICS

(1) A Textbook of Thermodynamics

By Dr. F. E. Hoare. Second edition. Pp. xii+307. (London: Edward Arnold and Co., 1938.) 15s. net.

(2) Applied Thermodynamics

By Prof. Virgil Moring Faires. (Engineering Science Series.) Pp. xvii+374. (New York: The Macmillan Company, 1938.) 17s. net.

(3) Elementary Thermodynamics

By Prof. Virgil Moring Faires. (Engineering Science Series.) Pp. xiii+225. (New York: The Macmillan Company, 1938.) 12s. net.

(1) DR. HOARE'S book, which deals with pure thermodynamics, is one of the most readable treatises yet published on a subject which is too frequently dealt with in a somewhat formidable manner. No attempt is made to evade difficulties, since although starting with comparatively elementary work, the final chapters work up to the use of the quantum theory and statistical mechanics. As an instance of the human touch, the author allows himself in connexion with Callendar's equations for steam the use of the word "surprising" when conducting the reader along the interlocking paths of this fascinating piece of work. A little more of this spirit in the past might have shortened the twenty years which elapsed between its enunciation and acceptance.

Rather more than the first half of the book is taken up with the development of the usual theorems, including change of phase, equilibrium of systems, and the Nernst heat theorem. The kinetic theory first appears in a formal manner in Chapter vi, necessitating a reference forward from Chapter ii to some of its results. Though rarely adopted, a more logical procedure would seem to be to introduce it at an early stage: an additional advantage would be that it renders so much elementary work self-evident.

The applications which follow, to solutions, electrical phenomena including the magneto-caloric effect, radiation and specific heats according to the quantum theory, at times naturally make rather heavier reading. Numerous very recent references to original work are supplied for those who wish to go into each subject more deeply than is possible in the 300 pages of this book.

That this, a second edition, has been called for is an indication of the usefulness of the book, the value of which has been enhanced by a collection of examples at the end, with hints on working them out.

(2) As its title implies, the second book is of a very different type, and while not neglecting theory, deals largely with applications to machines. Half-tone illustrations form a feature comprising nearly a quarter of the 200 figures, but with the exception of the section giving examples of boilers and their auxiliaries, which is up to date and fairly comprehensive, in a few other instances better choice might perhaps have been made, even allowing for differences in practice between America and Great Britain.

The theoretical side is by no means of an elementary character and includes such points as variable specific heats in internal combustion engines, regenerative heating (or bleeding) in steam plant with a section on the use of mercury vapour, and various types of refrigerators, while heat transmission is not neglected.

In addition, it is difficult to think of any auxiliary apparatus connected with these branches of engineering which is not mentioned, sometimes in the form of a short piece of analytical work, at others as a practical note. Here and there one may not agree with the author; for example, a statement concerning the possible efficiency of the Still engine is certainly open to question.

A number of examples are worked out in the text. Altogether a useful book, linking theory and practice.

(3) Prof. Faires' other book is shorter, on the lines of (2) above, but with less application to practice: for example, most of the half-tone blocks have disappeared, and the reader will look in vain for details of boilers and turbines, the only feature of the latter dealt with being the flow through nozzles.

The author has resisted the temptation to condense his larger book, and has had the courage to deal with a few subjects chosen from it in as complete a form as possible: in fact, some of the chapters are transferred *en bloc*. Curiously enough, it includes at the end a set of examples which are not included in the larger book.

A. L. B.