pressures up to the critical point. But since there are no experimental data for the volume, or the total heat, or the specific heat, or the cooling-effect, at pressures above 8 or 10 atmospheres, it is impossible to decide between different equations satisfactorily at high pressures without further experimental work. It is comparatively easy to calculate values on suitable mathematical assumptions with a fair degree of probability, but it may reasonably be questioned whether it is worth while to risk spoiling the approximation for ordinary purposes for the sake of a doubtful advantage beyond the experimental range.

The expression employed for the variation of the specific heat with temperature gives a minimum in the neighbourhood of 140° C., and the values are nearly constant from 80° to 200° C. The value at 100° C. and atmospheric pressure is nearly the same as that recently found by Brinkworth (*Phil. Trans.*, 1915). The variation with pressure agrees closely with that given by Callendar over the experimental range. The agreement is exact at 70 lb. and 300° F., and also at 200 lb. and 500° F. The increase of S_0 at low temperatures cannot be verified experimentally, and is theoretically improbable. The gradual increase above 200° C. is not improbable in order of magnitude, but the experimental evidence is so conflicting, and the importance of the variation so small for steam engine work, that it may be questioned whether it is worth while to attempt to take account of it. These minor variations, besides being somewhat uncertain, render all the expressions so complicated as to be of little use for practical calculations without reference to tables. The adiabatic equation, in place of being the same as that of a perfect gas, becomes quite unmanageable, and there is no simple relation between the volume and the total heat.

The properties of saturated steam are deduced from an empirical formula for the saturation pressure of the general type,

$$\log p = A + B/T + C \log T + DT + ET^2 + FT^3 + GT^4,$$

which represents very closely the observations on which it is founded. Clapeyron's equation is employed for deducing the latent heat and the heat of the liquid, which serve as a rough verification of the method. The general arrangement of the tables follows familiar lines, but it is to be regretted that they are restricted to British thermal units on the Fahrenheit scale, according to the common practice among American engineers, and that no values are tabulated on the Centigrade scale or expressed in metric units. The only diagram given is that of Mollier, with total heat and entropy as co-ordinates, which is useful for adiabatic expansion, but has the disadvantage of not showing the volume and of having a variable scale of pressure.

The properties of ammonia are developed and tabulated in a similar manner to those of steam, but with less elaboration, owing to the scanty experimental data. The results are noteworthy as the first serious attempt at consistent representation in the case of this vapour. The whole work is admirably lucid, and should do much to advance thermodynamic method in the construction of tables.

OUR BOOKSHELF.

Limes and Cements: Their Nature, Manufacture, and Use. An Elementary Treatise. By E. A. Dancaster. Pp. xii+212. (London: Crosby Lockwood and Son, 1916.) Price 5*s*. net.

THIS is especially suited for students who require an elementary text-book on the subject, containing, as the author justly observes in his preface, very little that will have to be unlearned at a later period. It is sufficiently comprehensive to have some value for many who are not beginners, for though the matter is necessarily compressed in view of the limited space, the ample bibliography of modern publications dealing wholly or partly with the materials under consideration will enable fuller details to be found by such as may need them.

The work is admittedly based on Burnell's "Limes, Cements, Mortars, etc.," but the alterations and additions involved in bringing that treatise up to date render the present volume practically a new production. All the important varieties of lime, artificial and natural cement, mortar, concrete, etc., are noticed, however briefly, including the mode of preparation or occurrence, and the approved manner of using.

A chapter on the chemical analysis of limes and cements gives brief directions for the determination of the principal constituents, and another chapter furnishes descriptions of the physical and mechanical tests applied to some of the substances in question, but chiefly to Portland cement.

It is noteworthy that misprints, though not entirely absent, are commendably rare. Illustrations are not very numerous, but will probably be found sufficient except for special details. The style of the descriptions is clear throughout the book. J. A. A.

Hancock's Applied Mechanics for Engineers. Revised and rewritten by Prof. N. C. Riggs. Pp. xiii+441. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1915.) Price 10*s*. 6*d*. net.

THE first edition of this book appeared in 1909, and was reviewed in NATURE for September 16 of that year. Considerable alterations have been made in the present edition, and graphical methods have been used more freely. About two hundred new problems have been added to the