plined pen; he gives us a balanced and therefore convincing portrait of Brunel, as a man of exceptional talent and courage, the over-ambitious author of the broad-gauge railway and the premature giant steamship of the nineteenth century, a man whose outstanding achievements and failures alike bore the stamp of greatness.

H. P. SPRATT

COMPUTERS

Digital Computer Components and Circuits

By Dr. R. K. Richards. Pp. vii+511. (Princeton, N.J., D. Van Nostrand Company, Inc.; London: D. Van Nostrand Company, Ltd., 1957.) 64*s*.

Digital Computer Programming

By D. D. McCracken. (General Electric Series.) Pp. viii+253. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1957.) 62*s*. net.

Mathematics and Computers

By George R. Stibitz and Prof. Jules A. Larrivee. Pp. viii+228. (London: McGraw-Hill Publishing Company, Ltd., 1957.) 37*s*. 6*d*.

THE above books, although all relating to digital computers, are very different in subject-matter and interest. "Digital Computer Components and Circuits" is a companion to a well-known book by the same author, entitled "Arithmetic Operations in Digital Computers", which deals with the logical design of the switching circuits used for various purposes in digital computers. The new book covers a much wider field, and the treatment is sufficiently detailed and comprehensive to make the book useful to engineers established in the field as well as to newcomers. It is notoriously difficult to write a good book on electronic circuits but the author has succeeded in doing so. He has brought together a great deal of design information otherwise only obtainable from scattered papers and has included much original discussion and comment. Subjects treated in the various chapters are as follows: switching circuits using diodes, vacuum tubes, transistors, and magnetic cores; magnetic and other forms of storage; circuits and tubes for decimal counting; analogue-digital conversion.

The second book is intended to provide a basic course in digital computer programming, and is of interest in that it is based on a hypothetical machine with an order code so chosen that all the basic techniques used in programming for any machine of the single-address type can be illustrated. The use of such an order code enables some of the stumbling blocks inherent in programming for a real machine to be avoided. No one, of course, can become a qualified programmer without experience in the practical running of problems, but the book is realistic in its approach, and should be useful to those who do not have access to a machine or who wish to make a preliminary study of programming before beginning work in earnest with a particular machine.

The third book, by Stibitz and Larrivee, is addressed to laymen. The authors set out "to present the computers as sober, unintelligent, but useful tools in the increasingly important applications of mathematics to science, technology, and business, and not as the weird and superhuman intelligence of science fiction, the popular press and, less forgivably, of some scientific writers who should know better". In this they have succeeded, although the technical level of the book is uneven, and in places the approach to the subject strikes one as being dated. The treatment of programming for modern digital computers is weak, and suggests that the authors have had little experience in this field. In the years just before and during the War, Dr. Stibitz was at the Bell Telephone Laboratories, and was a pioneer in the design of digital computers using telephone relays. Some sections of the book reflect his experience although, as is to be expected in a book intended for laymen, the information given does not add anything to what is obtainable elsewhere. Although the authors have, in general, been cautious about what they say, in their short section on language translation they may convey to some readers the idea that the use of digital computers in this field is more advanced than it actually is.

M. V. WILKES

FOUNDATIONS OF THERMODYNAMICS

Elements of Classical Thermodynamics for Advanced Students of Physics

By Dr. A. B. Pippard. Pp. vii+165. (Cambridge: At the University Press, 1957.) 25*s*. net. Clothbound; 15*s*. net. Paper covers.

THE first introduction of the fundamentals of thermodynamics to a student is necessarily of a brief and dogmatic nature and often he has attained no more than a facility for manipulating thermodynamic relations before he is diverted to other studies. Thus the re-examination of the fundamentals in the light of greater knowledge does not take place, and there is a growing need for this deficiency to be supplied. It is therefore a pleasure to welcome Dr. Pippard's book, which is concerned with the task of propagating a firm understanding of the bases of thermodynamics among students with a moderate acquaintance of the structure.

The first four chapters are devoted to establishing the zeroth, first and second laws of thermodynamics. While familiar enough in outline, the argument is very detailed, and every likely cause of confusion or ambiguity is carefully exposed and discussed. In most cases, the argument is presented in several different ways; thus reversible work is considered in detail not only in the standard case of a fluid under pressure, but also in the case of a body in a magnetic field; while the second law is developed both by consideration of Carnot cycles and of Carathéodory's law, the complementary nature of the two arguments being clearly brought out. The following chapters introduce the temperature scale, the thermodynamic functions and their derivatives, and their applications to simple systems. There follows a discussion of the thermodynamic inequalities in which the relations between entropy, availability, and energy functions are carefully explored and lead to the conditions for equilibrium. The consideration of phase equilibria in a simple substance follows, the last example, superconductivity, leading into the final chapter on high-order transitions, where order is introduced into this rather confused subject with a firm hand.

The book forms a nodal point, at which is drawn together the basic ideas the final-year student may be expected to know, their validity and limitations