science which have to be adduced to solve the problems that arise.

The twelve books represent the accumulated work of more than a hundred physicists, chemists, engineers and mathematicians. A programme as vast as this needs powerful sponsors, much financial support and considerable organizing ability. In fact, the series was sponsored and assisted by many departments of the United States Air Force, Navy and Army, and the administration and editorial functions of the undertaking were centred at Princeton University. Apart from this, the University contributed financially to the support of the project. Truly a 'combined operation'.

The opening section of the volume is on the fundamentals of thermodynamics and is a very interesting account covering 110 pages. The second section, covering about 130 pages, deals with quantum mechanics and application to molecular structure, and then there is a section on thermodynamic properties of real gases and mixtures of real gases, and one devoted to the properties of gases and gaseous mixtures. These are followed by sections on critical phenomena; the properties of liquids and liquid solutions; the properties of solids and solid solutions; relaxation phenomena in gases; gases at low densities; and the thermodynamics of irreversible processes. Each section is effectively a brief summary of much of the present knowledge in its own field; the expositions are not unduly discursive and are clearly written. The different parts of the publication are self-contained reviews which could easily serve as texts in fields other than that of high-speed flow and jet propulsion. A detailed scientific review of each of the sections would involve a width of knowledge covering vast fields of modern theoretical and experimental physics; but there is no doubt that the excellence of the books so far published matches that of the original conception.

Sheer size, however, sometimes appals, and the Princeton series may well oppress the spirit of a young engineer or scientist who comes fresh to high-speed flight and who searches for understanding. To any such person it should be emphasized that the books are really Goliath volumes of reference, and are not intended to replace, for example, the two smaller David volumes on "High Speed Flow", edited by Howarth, and the two ancillary volumes of "Tables" and "Graphs" edited by myself. There is no doubt, however, that, in the long run, the Princeton series will have beneficial effects on the development of the aeronautical sciences, and that they will act as a springboard for still further discoveries in high-speed aerodynamics and jet propulsion. In spite of this, Dædalus might well have groaned had he realized that his rudimentary experiments in flying would some day lead to the massive volumes of the Princeton series. L. ROSENHEAD

ELECTRIC TRACTION ENGINEERING

Electric Traction Engineering

An Introduction. By E. A. Binney. (Cleaver-Hume Electrical Series—No. 10.) Pp. 224+7 plates. (London: Cleaver-Hume Press, Ltd., 1955.) 15*s*. net.

THE design of electric traction equipment does not attract the attention of authors to the same extent as do the spectacular developments that have taken place recently in other fields. Progress has for a number of years been chiefly in the direction of steady improvements to established practice rather than in any major advance. The development of the diesel-electric system, together with the recent use, on the Continent of Europe, of industrial frequency supply to the contact line, have resulted, however, in a re-orientation of thought. This and recent proposals in Britain have stimulated interest in the subject, and it seems probable that the near future will see considerable expansion of the industry. The present time, therefore, is opportune for the introduction of a book such as the one under review, written especially for the student and the young engineer starting a career in this field.

The history and development of the various systems are first traced briefly, and there is an outline of the work involved in the choice and design of rolling-stock equipment. The major part of the work is devoted to the design of traction motors and their gearing. The modern d.c. traction motor is a highly specialized machine owing to strict limitations of space and exacting conditions of performance, and the author very rightly devotes a considerable part of the book to it. There are also chapters on the single-phase a.c. motor, with its own special problems, and on the diesel-electric generator, another machine of special characteristics. On the mechanical side a section is devoted to gear calculations and a chapter to mechanical drives.

A further chapter is given to d.c. control systems. Power and control diagrams are dealt with, and the principles of interlocks and automatic acceleration explained in detail. The use of rotary amplifiers is briefly dealt with. The final chapter outlines project work, including the preparation of speed–time diagrams.

The book is adequately illustrated with diagrams and half-tone blocks and includes useful appendixes of symbols, mathematical expressions, and calculations on gears. G. H. PLATT

'PROJECT 6' OF THE AMERICAN PETROLEUM INSTITUTE

Hydrocarbons from Petroleum

The Fractionation, Analysis, Isolation, Purification, and Properties of Petroleum Hydrocarbons. (An account of the Work of the American Petroleum Institute Research Project 6, at the Carnegie Institute of Technology, Pittsburgh, Penn.) By Prof. Frederick D. Rossini, Beveridge J. Mair, and Anton J. Streiff. (American Chemical Society: Monograph Series—No. 121.) Pp. xvi+556. (New York: Reinhold Publishing Corporation; London: Chapman and Hall, Ltd., 1953.) 148*s*. net.

THE sponsorship of fundamental research has been an activity of the American Petroleum Institute since 1926. One of its earliest projects was that established at the National Bureau of Standards under Edward W. Washburn's direction, which has since become widely known as "Project 6". The aim set before the first small group of chemists in 1927 was, quite simply, "the separation, identification and determination of the chemical constituents of commercial petroleum fractions", and yet, at the