

students. One thing that might have been done to improve its detail would have been the collaboration of a scientifically trained engineer, who would have introduced a greater conformity with the language of technology, so that the ideas may be more easily grasped by a technical student. Nevertheless, the author's work is very suggestive in forming fundamental treatments of physical phenomena for students specializing in applied science rather than in science itself.

L. E. C. H.

#### Motion Picture Sound Engineering

A Series of Lectures presented to the Classes enrolled in the Courses in Sound Engineering given by the Research Council of the Academy of Motion Picture Arts and Sciences, Hollywood, California. Pp. xviii+547. (London: Chapman and Hall, Ltd., 1938.) 30s. net.

THIS text is the successor to "Recording Sound for Motion Pictures", compiled by some twenty authors and edited by Lester Cowan. In the distant days of 1931, the pioneer technicians of a new industry, that of adding sound to scene, had a great deal of what was new to say; their effort in print was by no means perfect, but it gave the impression of vitality and freshness. In the present publication we do not get a complete view either of the industry or of studio technique. The latter has changed extensively in the last decade, but we cannot judge what in the older book is now obsolete and what is now of primary importance. That is not to say that the first 175 pages are not valuable. They deal lucidly with technical solutions of many difficult practical problems which confront the recording engineer.

In a highly competitive industry, research has in recent years been on a co-operative basis, directed by the Research Council of the Academy of Motion Picture Arts and Sciences, which, through committees of experts, has sorted out the problems and used the best resources of the industry; the description of the results obtained gives an air of finality to the attainable criteria prevailing at the present time and that there is not much more to be done until there is another upheaval in the industry, such as the adoption of stereophony.

From the general acoustic point of view, great importance must be attached to the specification and realization of a standard of radiated sound reproduction, against which commercial systems can be compared and assessed in respect to their defects. The radiating system comprises two parts, one a cellular horn covering the range 300 c.p.s., to 10,000 c.p.s., driven by a phase-adjusted duralumin diaphragm, the other a set of large cone diaphragms operating through a horn terminated with a large baffle. The response results in a fluctuation within two decibels over the range 50 to 8,000 c.p.s., over a horizontal angle of nearly 110 degrees and a vertical angle of 60 degrees, with a maximum electro-acoustic efficiency approaching 50 per cent. The amplitude distortion and flutter specified in the reproducing machine and radiator set new standards for sound

reproduction. The new types of push-pull recording on film, the control of the noise-level, microphones, and the new types of photo-electric cell which are required to reproduce the push-pull sound-tracks are very well treated. Film processing is rather less well done than before.

The remaining three hundred pages do not carry the subject much further, because attention is diverted to details of electrical circuits, such as transformers and filters and elementary circuit theory, which appear to have been included solely because they happened to fall into a series of lectures to film technicians as a part of their education. The only part which is not done better elsewhere by specialists is the section on properly designed equalizers; the dividing networks are new, and have been forced into reproducing circuits by the necessity of operating loudspeaking receivers in series or parallel without overloading them with currents of frequencies for which they are not intended to have appreciable response. One concludes that there is good material in the present text, but it has been made expensive by the inclusion of much extraneous elementary matter.

L. E. C. HUGHES.

#### Textbook of Heat

By Dr. R. Wallace Stewart and Dr. John Satterly. Revised by C. T. Archer. Second edition. Pp. vii+410. (London: University Tutorial Press, Ltd., 1939.) 7s. 6d.

THIS is a book on the theory of heat written for students of the standard of the intermediate university examinations. It appears to fulfil its function admirably, and should afford an excellent introduction to the more advanced works on thermodynamics. There is no great originality of treatment, but all the usual branches of heat are dealt with in an adequate manner. The type used is clear, and the text is well illustrated by more than two hundred bold diagrams. The large selection of questions taken from recent examination papers of the University of London should prove useful to students.

#### Ions, Electrons and Ionizing Radiations

By Prof. J. A. Crowther. Seventh edition. Pp. xii+348+7 plates. (London: Edward Arnold and Co., 1938.) 12s. 6d. net.

THE seventh edition of this well-known book is to be welcomed, for in it the author has been enabled to give an account of some of the more recent developments of the rapidly changing subject of atomic physics. Experiments on the structure and disintegration of the nucleus are described, including those made by means of the cyclotron, and there is also a discussion of the production of the artificial radio-elements such as radio-sodium and radio-phosphorus. The section on cosmic radiation has also been rewritten and enlarged. Prof. Crowther possesses the gift of lucid explanation, and it suffices to say that the additions now made reach the same high standard as the remainder of the work.