The chapters on damping of vibration show that even when the usual drastic assumptions are made about the quantitative characteristics of damping, it is a seriously complicating circumstance in analysing any but the simplest vibrating systems. Abandonment of those assumptions leaves difficulties that cause the authors to remark that "The assessment of damping is a subject in which research is needed". This describes with great delicacy the present state of knowledge of this particular subject.

In the last chapter the authors introduce the subjects of "Non-harmonic Vibration and Transient Vibration" and show them to present much more formidable analytical problems than any solved by the authors or others in the subject of harmonic vibration. Reflexion on this helps one to understand why some practical problems in vibration are analytically refractory and perhaps analytically insoluble.

Any mechanical science graduate who studies this book and works through its numerous and excellent examples ensures for himself a thorough grounding in the theory of mechanical vibrations.

W. A. TUPLIN

INDUCTANCE COILS

The Theory and Design of Inductance Coils

By Dr. V. G. Welsby. Second edition. Pp. 232. (London: Macdonald and Co. (Publishers), Ltd., 1960.) 30*s*. net.

DR. WELSBY'S book on the design of inductance coils, first published in 1950, has now reappeared as a revised second edition. Those who are familiar with the first edition will know that the book contains very extensive formulæ for the calculation not only of the inductance of coils but also of the effective resistance and the effective shunt capacitance. The coils considered are air cored with solid and stranded wire, and those with laminated ferro-magnetic cores, with dust cores, and with ferrite cores. The theoretical treatment given is not always as detailed as in the original papers but references are given for those who wish to study the theory fully, while the theory and formulæ given in the book are fully adequate for all whose main concern is to design and make efficient coils.

The author is careful to explain the limitations of theoretical formulæ for coils with magnetic cores, but a slight amplification of the parts of the book covering experimental results and methods of correlating theoretical formulæ with these results would add to the practical value of the book.

The two principal changes in the present edition are the use of M.K.S. units and the use of the principles of electromagnetic wave propagation to derive some of the formulæ. Both changes represent an improvement, but in both cases the new material is not entirely happily welded into the old. It is difficult to justify the author's use of the symbol η in place of μ_0 for the magnetic constant of space, the use of μ in place of μ_r for relative permeability, and the use of μ_0 for initial permeability, except on the basis of preserving inviolate some of the formulæ given in the first edition. The factor 10^{-9} is also to be seen in many of the formulæ instead of the factor 10^{-7} more usually associated with M.K.S. formulæ.

The theoretical treatment tends to be most detailed for the simpler parts and to be uncomfortably condensed for the difficult parts. In particular, clearer and more detailed explanations of the method of applying field theory to the solution of coil problems would be advantageous. It is rather surprising also, in view of the author's liking for field theory, that capacitance is treated as if it were in shunt across the coil terminals and not as a distributed effect.

These minor defects should not be allowed to obscure the real value of the book, covering in the space of 230 small pages a great quantity of most useful information not readily found elsewhere.

A. H. M. ARNOLD

DIFFUSION AND HEAT FLOW IN LIQUIDS

Diffusion and Heat Flow in Liquids

By H. J. V. Tyrrell. Pp. xii + 329. (London : Butterworth and Co. (Publishers), Ltd., 1961.) 65*s*.

THOUGH somewhat uneven in its treatment of various themes, this book is a valuable and scholarly addition to texts dealing with certain irreversible phenomena in liquids. Chapters on the principles of non-equilibrium thermodynamics, on concentration diffusion, and on thermal diffusion are informative and well balanced. Descriptions of experimental methods for investigating various kinds of diffusion processes cover present practice in a very useful way; by comparison, a chapter on thermal conductivity measurements seems much less extensive. Interpretation of the phenomena observed is presented in the form of discussions. This part of the book will probably need revision soonest, since experimental information in the fields examined is growing rapidly.

One chief difficulty in discussing the interpretation of transport processes in liquids stems from their correlation with viscosity. At present, there seems to be no widely applicable treatment for linking viscosity with diffusion, despite the great convenience of viscosity coefficients for describing certain types of relaxation in liquids. For liquids of very simple structure, viscosity coefficients for relaxation of simple macroscopic shear have been related theoretically with mass migration, for example in the theories of Eyring. However, Eyring's models do not deal with the variety of specialized micro-relaxation processes which can occur in liquids containing polyatomic molecules, and in ionic solutions and melts. Viscosity coefficients tend to be injected quite generally into interpretations of transport processes without adequate recognition or description of their limitations. This book does not avoid the difficulty. The author's discussion of liquid viscosities is very incomplete. This unavoidably restricts the assessment of various molecular models devised to represent transport processes in liquids, in terms of their structure.

Despite this gap in the discussion of transport processes in liquids, the present book can be commended to research workers and libraries, particularly those concerned with diffusion phenomena. Scientific interest in diffusion is widening. The author's discussions of work on the separation of components by thermal diffusion should help to promote technical advances in this field.

A. R. UBBELOHDE