diagram is given of the complex system of fused quartz springs employed in the Worden gravimeter, including the arrangements by which the effects of variations in temperature are eliminated. The inventor of the instrument has for many years returned evasive answers to inquiries about this temperature compensation and it is pleasant at last to be told, at any rate in outline, how he achieves his remarkable results.

The next three chapters deal with isostasy. The methods of reducing gravity observations are described in some detail, and much numerical information is given about the degree of compensation found in various parts of the world. There has in the past been much controversy about the reality and generality of isostatic compensation. This controversy seems now to have subsided, and it is clear that the major features of the Earth's crust, the ocean basins, the fold mountains and the great plateaux are, taken as a whole, quite closely compensated, but that there are other features, such as the island arcs and the rift valleys that are not.

The last chapters discuss the causes of these deviations from hydrostatic equilibrium. This discussion is much more speculative than the rest of the book and is concerned with the downbuckling of geosynclines and island arcs and with the hypothesis that the driving forces are due to a system of convection currents. It is always difficult to produce conclusive evidence for or against a major geological theory, and it is perhaps unlikely that the theories of orogenesis, convection currents and polar wandering set out in this book will be generally adopted in the near future. It is, however, of great value to have a systematic account of their views by two authors who have done so much both to provide the data and to understand its meaning.　　　　E. C. BULLARD

MECHANICAL VIBRATION

Engineering Vibrations with Applications to Structures and Machinery
By Prof. Lydik S. Jacobsen and Prof. Robert S. Ayre. (McGraw-Hill Series in Mechanical Engineering.) Pp. xii + 564. (London : McGraw-Hill Publishing Company, Ltd., 1958.) 77s. 6d.

THE suppression and control of mechanical vibration have assumed great importance in engineering. One consequence of this is that the number of text-books on the subject is becoming quite large. But, so far as recent books are concerned, this one is unusual in that its authors have something fresh to say and the ability to say it clearly, simply and accurately. The book is meant to be an introductory one for engineers and, as such, it can be measured against the best. In its general layout the book follows the traditional pattern ; the reader is led from the analysis of systems having one degree of freedom to systems with two-, then n-degrees of freedom and finally infinite freedom. Within this all-too-familiar framework, however, the book has some important features of its own.

There are two parts. The first of these deals with systems having one degree of freedom and, right from the start, an unusual degree of emphasis is placed on transient oscillation (in addition to steady-state and free vibration). The treatment of this topic is based mainly on phase-plane constructions and it is as lucid and technically entertaining as it is thorough.

A treatment of energy methods is given in this first part of the book, the single degree of freedom corresponding to motion in a single prescribed mode. It contains an elementary account, not only of Rayleigh's principle, but also of the Dunkerley and Southwell variants of it. It is unfortunate that the fundamentals have here to be dealt with in a rather superficial manner. This is more or less dictated by the academic level of the book, and the authors have therefore chosen to buttress the theoretical treatment with several examples. These are quite well chosen though some are rather complicated for the purposes of introduction. A better result might have been obtained by consigning some of the material to the place where it belongs—in the second part of the book.

The chapter on non-linear vibration is unusually readable. This is largely a result of the fact that the authors do not attempt too much. They firmly limit their treatment to two techniques, namely, graphical methods in the phase plane to cover transient and limit-cycle phenomena and the Ritz–Galerkin method for other steady vibration. The combination is shown to be quite satisfactory for the purposes of this book.

It is the reviewer's belief that writers on non-linear vibration seldom pay proper respect to the linear theory of dynamical instability (a subject which is not dealt with to any extent in this book). Thus, on p. 276 there is the statement that " . . . in a study of self-excited vibrations the non-linearities of the terms in the differential equations describing the motions are of paramount importance and . . . a neglect of them is inadmissible". This comment is partially redeemed in the summary of this chapter, but it is a little misleading since it implies that linear analysis is of no value where self-excitation occurs. This is, however, a minor point since the chapter in question is a first-class piece of writing. If the authors could be persuaded to dispel some of the hocus-pocus from other techniques of analysis in the same way, they would place non-linear vibration theory in a better position than it now occupies.

Part 2 of the book relates to linear multi-freedom systems, and the treatment is fairly simple. The authors do not use the Lagrangian equations, there is no discussion of damping, non-linearity is not introduced and emphasis is no longer placed on transient vibration (principal co-ordinates are not mentioned). Even so it cannot be said that this second part of the book is just a mass of familiar theory. For one thing some unusual topics are introduced—for example, the motions of buildings and the vibration of short beams —and for another the theoretical treatment of some topics is unusual. Thus the vibration of a conservative system with n degrees of freedom is the object of a rather unusual form of analysis.

Every chapter has a summary and a set of excellent examples. Many of the latter have answers given. There are also long lists of references which, so far as the reviewer can see, are mostly (though not always) well chosen from the enormous literature on vibration.

Perhaps the best way to describe this book is to say that it serves the same general purposes and can decently be placed on the same shelf as those of Den Hartog and Timoshenko. In other words, this book must be taken seriously. It has a less practical flavour than the former and has, rather, the more mathematical bias of the latter. But it does not duplicate Timoshenko's book by any means.

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