because the reader is faced simultaneously with an entirely new method, and with somewhat specialized problems of stressing, vibrations, etc. What is really required is an introductory chapter explaining the essence of the relaxation method, a chapter which should be entirely abstract and mathematical and unencumbered by the details of practical problems.

The possibility of writing such an introduction arises from the fact that, to the eye of the mathematician, most of the early problems tackled by relaxation methods reduce in the last analysis to the solution of a set of linear simultaneous equations, while the practical difficulty of computation is due to the fact that the number of independent unknown variables is large, for example, a dozen or more.

Various methods of successive approximation have been devised for the solution of this type of problem, such as the powerful iteration methods due to Morris. Many (if not most methods) including the relaxation methods, require the system of linear equations to be "prepared" for computation by being reduced to the "normal" form. In this form the equations represent the conditions that a quadratic form in the unknowns should be an absolute minimum. This simple remark leads to a geometrical interpretation of the relaxation method, which is most easily visualized in the simplest case when there are only two unknowns.

The quadratic form to be minimized then represents the contour of a valley, the unknown variables being interpreted as latitude and longitude, and the numerical value of the quadratic form as height above sea-level. To minimize the quadratic form is to reach the lowest point in the valley in a thick mist, with no map, but having a compass. Southwell's relaxation method directs the lost explorer to walk downhill due north (or south) until the track he is following becomes momentarily level. Then to walk downhill due east (or west) until his track again becomes momentarily level; and thus to zig-zag down the valley sides until he is sufficiently near the absolute bottom part of the valley.

The method is delightfully simple and it suggests an obvious alternative. Instead of taking the direction of each walk to be due north or east, the explorer can take each walk in the direction of the line of steepest descent at the starting-point of each walk, and can continue the walk until the track he is pursuing becomes momentarily level. This procedure smooths out the zig-zags of the relaxation method, and for some time I thought that the method of steepest descent was an improvement upon the original relaxation method. A direct comparison of the two methods on the same problem soon showed, however, that the original relaxation method is much easier to apply and slightly more rapid.

An introduction on some such lines as these would, I think, be a great help to the novice—and most of us are novices when confronted with the type of problem discussed in this book. But, apart from this suggestion, the present work is above criticism, and Prof. Southwell has made us all his debtors by making his pioneer researches on relaxation methods available in such a convenient and delightful form. G. TEMPLE.

TORSIONAL VIBRATION PROBLEMS

Practical Solution of Torsional Vibration Problems With Examples from Marine, Electrical, Aeronautical and Automobile Engineering Practice. By Dr. W. Ker Wilson. Second edition. Vol. 2. Pp. xxi+694. (London: Chapman and Hall, Ltd., 1941.) 42*s*. net.

THE objective treatment of the subject of torsional vibration which has been adopted by Dr. W. Ker Wilson leads inevitably to the call for more and yet more examples of the practical solution of problems such as arise in this increasingly important branch of the designer's work. The original single-volume treatise has now been enlarged to two very substantial volumes which greatly increase the scope of the work. This at the same time gives opportunity for the re-writing of sections such as that dealing with damping devices, which has been brought up to date and now includes a separate chapter on the rotating pendulum vibration absorber.

The second of the two volumes has recently been published, and the main feature of the presentation of the subject lies in the solution of problems met with in practice. It is, however, very far from being a fortuitous assortment of examples of this class of work, as there is a logical sequence of development of the subject. The volume opens with the determination of stresses due to torsional vibration at resonant speeds, and proceeds to the measurement of amplitudes, analysis of torsiograph records, damping and absorbing devices and dynamic characteristics of direct-coupled electrical generating sets.

There are some thirty worked examples which appear in their natural sequence in this order of treatment. The examples showing the harmonic analysis of vibration records, using 24 and 48 ordinates, provide a valuable guide to the solution of such problems when a mechanical analyser is not available. It may be confidently stated that Dr. Wilson's book will do much to simplify the application of vibration study to modern needs.