analytical methods are not presented, though the discrete space techniques seem readily translatable to numerical methods. The ubiquity of mathematical abstraction, nomenclature, and rigor, whose presence separately would be praiseworthy, tends to obscure otherwise clear discussions.

THEORY AND DESIGN PRACTICE

POWER TRAVELLING-WAVE TUBES. By J. F. Gittins. 276 pp. American Elsevier, New York, 1965. $10.00.

by Hans J. Hagger

Since the publication of Pierce's famous book on travelling-wave tubes, which cleared up the interaction mechanism between an electron beam and a waveguide structure from a theoretical point of view, a large number of papers has appeared, but a book disclosing theory and design practice was missing. Gittins, a British expert in this field, aimed to write a treatise on travelling-wave tube design that would give practical advice for construction and the theory that rules the design parameters, for both conventional and crossed-field devices.

The introductory chapter gives a brief survey of travelling-wave tube history and indicates, by describing some typical tubes, the topics of the book. Chapter 2 deals with the basic interaction theory of both forward and backward waves from the point of view of vector addition of the circuit voltages. Summaries of Pierce's small signal theory and of Slater's large signal approach and some remarks on velocity tapers are included. In chapter 3 slow-wave structures, such as the helix, the cross-wound helix, and periodically loaded waveguide structures, as well as coupled-cavity systems are explained by using the ω-β diagram or by the filter theory. The clover-leaf structure by Chodorow—a very important circuit for power travelling-wave tubes—is described but, unfortunately, not analysed. This is a pity because the British specialists have done excellent work on this

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structure. The behavior of the electron beam in its focusing field, both constant and periodic, is considered in chapter 4, including the peculiar instabilities in hollow beams. In chapter 5 the production and collection of the electron beam outside the interaction space are dealt with. In the next section the author considers interaction and electron guns in crossed-field devices; for the appropriate large signal theory he refers to the original papers on this subject. In chapter 7 the feedback mechanism and the prevention of backward-wave oscillations are dealt with. The next chapter is devoted to the design of input and output transformers coupled to different slow-wave structures (including windows) and to some technological possibilities of their design. Chapter 9 deals with technology and materials of tube construction, cathode construction, and pumping techniques. In the last chapter measurement techniques related to the determination of cold- and hot-tube parameters are considered.

To a microwave tube engineer this book will fill an open space between Pierce's book and the wide-spread publications in different periodicals. This book will not be a textbook, but a workbook. It can be recommended to every microwave-tube engineer.

GASES IN VARIOUS PHASES

PHYSICS OF HIGH PRESSURES AND THE CONDENSED PHASE. A. Van Itterbeek, ed. 598 pp. (North-Holland, Amsterdam) John Wiley, New York, 1965. $22.50

by Carl W. Garland

The title of this collection of chapters by 21 different authors is quite a bit more general than its contents. The first ten chapters (about 75 percent of the material) are mostly concerned with the equilibrium properties of simple, liquified, and solidified gases at low temperatures and moderate pressures. Very little is said about more typical solids except for two chapters (65 pages) concerning the effect of pressure on superconductivity and the electrical properties of metals and semiconductors. In addition, some spectroscopic work is covered in two chapters (70 pages), which review the effect of pressure on electronic, infrared, and Raman spectra, primarily of gases. The most interesting aspect of that coverage is a good review of induced infrared absorption (with emphasis on hydrogen). These four chapters, at the end of the book, are only vaguely related to the initial material.

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The quality of the first ten chapters is extremely variable. Chapters 1–3 (which deal with various experimental aspects of high pressure work) are all disappointing. More than half of chapter 1 is devoted to the "theory and practice . . . of a thick-walled cylinder submitted to pressure"; chapter 2 contains a summary of empirical engineering data on many alloys used in "modern hardware programs such as cryogenic fueled missiles"; chapter 3 involves a survey of all the various methods of determining pVT data, arranged according to the ten principal laboratories in which this work has been done during the past 60 years. Chapters 4, 5, and 7 contain concise and critical reviews of pVT data, velocities of sound, and phase-equilibrium data for liquified and solidified gases. These chapters are well written and useful. There are also special chapters (8 and 9) on helium: a brief survey of liquid ^{3}He and ^{4}He under pressure, and an excellent presentation of the properties of solid ^{3}He and ^{4}He. Finally, there are chapter 6, which gives a brief but clear review of various theories of the liquid state, and chapter 10, which gives a superficial review of experimental methods of determining transport properties.

Why has this book been written and published? Some of the material is readily available elsewhere; some is unrelated to the general theme, and some does not merit special attention. The four or five best chapters would have made a more coherent and less expensive monograph with considerable appeal. Furthermore the book has been poorly edited. There is an annoying repetition of material on experimental pVT methods in chapters 1, 3, and 4; and there