

charts. In the same way, a more detailed analysis could have been given of the attempted *quantitative* methods, if any, for correlating sunspot activity with F<sub>2</sub> layer critical frequencies and also the methods adopted for forecasting the latter quantity for various months and *latitudes* and for various distances.

There are practically no mistakes in the text except on page 231, line 4, where 'Principal' should be read as 'Principle'.

The new edition, as its predecessors, gives a number of very useful and recent references and there is no doubt that the book will be highly welcomed and valued by those interested in "Wireless".

K. V.

**Science for the Prosecution.** By Julius Grant, M.Sc., Ph.D., F.I.C. (Chapman and Hall, Ltd., London,) Pp. 302. Price 15sh. nett.

It is refreshing to turn to the part played by Science in the investigation of Crime at a time when what is uppermost in one's mind is the part it has played in the prosecution of wars. The book is not meant to be a treatise for reference by persons engaged in scientific work connected with unravelling of crimes nor is it meant merely to provide material for spending a few pleasant hours reading about the sensational discoveries resulting from the application of science to criminal investigation. The book strikes a happy mean between providing an adequate theoretical treatment to enable the reader to follow the principles on which such scientific work is based, and a narration of actual cases to the investigation of which the scientific method has made such valuable contribution. The book opens with a general chapter on the scientific approach to crime in which the author makes a powerful plea for the establishment of an independent medico-legal institute. The application of science to criminal investigation is then classified as consisting of (1) optical methods; (2) chemical methods and (3) blood group tests. The book closes with a chapter on Psychology and Crime.

The author himself is a distinguished worker in the field of fluorescence analysis and brings his long experience to bear upon his treatment of the subject. The brilliant work of Mitchell in regard to the age and classification of paper and writing materials, the work of Carter and Pollard on classification of paper and that of Professor Laurie in regard to finding the ages of works of art is referred to.

The cases mentioned make interesting reading. Questions pertaining to food adulteration are dealt with and it is indicated how in England the legislative measures "now constitute a true chapter of public food safety". The book will be altogether invaluable not only to scientific workers in the criminological field and to the Police Services, but also to the legal profession who can get an extremely adequate idea of the background of scientific work bearing upon criminal investigation.

One word may be said about the title of the book. The book is no doubt named *Science for the Prosecution* and in the race between the criminal and the forces of law and order

there can be no doubt that scientific knowledge is an invaluable weapon in the hands with the latter. But in a country like India where, owing to various circumstances, scientific evidence adduced in courts is mostly on the prosecution side, the knowledge and guidance provided by the book of this kind will prove invaluable to the defence also.

A list of specialised treatises pertaining to the field increases the value of the book and greatly facilitates pursuit of any particular branch of scientific criminal investigation.

N. S. R.

**High Frequency Thermionic Tubes.** By A. F. Harvey, with a Foreword by Dr. E. B. Moullin. (Chapman & Hall Ltd., London), 1943. Pp. 235. Price 18sh. net.

The last few years have witnessed a phenomenal increase of interest in the application of ultra high frequencies to practical services such as television, frequency modulation, etc. This has stimulated invention, development and refinement of electronic tubes and circuits suitable for the several applications, of which the book under review gives a short account in six chapters.

After a brief general introduction in Chapter I on the function of electronic tubes as rectifiers, amplifiers, etc., and their feed-back characteristics, the author discusses in Chapter II the influence of the frequency of operation on the tube properties such as input and output impedances and mutual conductance. The limitation in their performance imposed by the finite transit time of electrons at frequencies above 20 megacycles per second and the consequent refinements introduced in tubes of the conventional types, are next discussed and various commercial receiving and transmitting tubes exhibiting a good performance beyond 20 mc./s. are described and illustrated. These include a comprehensive range, from the well-known 'acorn' type of miniature receiving tubes to the water-cooled transmitting tube RCA 888 giving an output of 300 watts at 200 mc./s. The latter half of the same chapter is very usefully devoted to the measurements of tube parameters at U.H.F. by the method developed by M. J. O. Strutt.

This effect of electron inertia has made possible the production of U.H.F. by an unconventional use of existing tubes or by the invention of tubes utilising different principles altogether. To the former category belongs the retarding field or positive grid generator discovered by Barkhausen and Kurz which is dealt with in some detail in the first half of Chapter III; the second half describes "the use of positive ion tubes as a means of studying conveniently effects which are appreciable with electrons only at frequencies so high as to preclude accurate measurements."

The second category includes the magnetron tube described in all its aspects in chapters IV and V which comprise a little under half of the book. Here the author has collected and organised in a thorough and well-balanced manner the fundamental and practical information regarding the magnetron such as the cut-off characteristics, oscillations in the

dynatron regime, the resonance regime and the electronic regime. This is only appropriate since for frequencies higher than 600 mc./s. the magnetron provides larger outputs than those so far reported (except by Klystron described later) and has been used at frequencies upto 30,000 mc./s. ( $\lambda = 1$  cm.) a value well above that reported for any vacuum tube. In view of its comparatively simple electrode structure the magnetron would seem to lend itself easily to theoretical treatment, but it has always behaved in an unexpected manner and defied all explanations offered so far.

The demand for larger power outputs at U.H.F. resulted in 1939 in the development of the Klystron based on principles of electric resonators and velocity modulation of cathode-ray stream which form the subject-matter of the first part of Chapter VI. The reviewer cannot help feeling that it would have been more helpful for an understanding of these principles had the author devoted more space to develop and discuss these at a greater length instead of giving rather concise accounts of various publications. In the latter part of this chapter a readable account is given of the work of Barrow, Brillouin, Southworth and others on wave-guides and horn radiators for providing directional beams at U.H.F.

An important feature of the book is the bibliography at the end of each chapter, the total number of references being 517; a welcome change, in the opinion of the reviewer, is the use throughout of the word 'tube' in place of 'valve' in an English publication. The brevity of Chapter I has not contributed to the clarity of the statements with regard to the feed-back principle.

It will be sometime before we will be in a position to appraise the stimulus given to this vital subject by the present war conditions. We have heard of the Radio Locator and the Radar. In the meantime Dr. Harvey has done a great service by making an exhaustive and disinterested survey of a field in which developments have been so rapid that critical judgment must necessarily be held in abeyance for the present.

The volume contributes an important book of reference for every worker in this most fascinating branch of electron physics and communication.

N. B. BHATT.

**High Speed Diesel Engines.** By A. W. Judge. Fourth Edition. Revised and Enlarged. (Messrs. Chapman and Hall, London), 1941. Pp. viii + 535. Price 25sh. net.

This book on "High Speed Diesel Engines" by A. W. Judge has run through another edition now, the fourth, and the author has taken advantage of this to make the book more up to date. This has resulted in an addition of 100 pages of more matter and a large number of diagrams. In recent years this book has come to be regarded as a text-book covering the entire field of the compression Ignition Engine in all its various applications and its value has been enhanced by these additions. The results of recent researches on fuel injection systems, the methods of cooling the

nozzle and protecting it and recent methods of engine governing have been incorporated. New types of automobile and aircraft engines and two cycle engines have been added. Under engines of the Railway type details have been given of the latest railcar and locomotive types of C.I. engines and an account of the performance of the railcar or locomotive to which they are fitted has been given. The subjects of supercharging and altitude performance and the ratings of fuels have been considerably enlarged. One other noteworthy feature of the book is that some of the accounts of earlier engines and the fuel injection systems which are now obsolete, have been retained so as to make them available to the student and designer.

The treatment is on the whole excellent considered from all aspects, theoretical, practical or descriptive.

**Lessons in Elementary Analysis.** By G. S. Mahajani. Third Edition. (Aryabhushana Press, Poona), 1942. Pp. viii + 298. Price Rs. 6-4-0.

This well-known book by Prof. Mahajani, which has now run into a third edition, is a very well-thought-out one, and forms an excellent introduction to the subject of elementary analysis as taught in Indian colleges. The standard reached may perhaps be correctly described as lying between the Pass and Honours courses in the several universities. We are glad to note that several deficiencies that occurred in the previous edition (like Balakram's problem) have been omitted in the latest edition. The other changes like the proof of the second mean value theorem on integrals, the note on Frullani's integrals, a more careful treatment of uniform convergence, and the addition of a larger number of exercises have all enhanced the value of the book.

The chief merits of Prof. Mahajani's book are the extreme clarity and coherence achieved in the development of the subject. The author has modelled his book on that excellent "Cours d'Analyse" of De la Vallée Poussin, and succeeded admirably in imbibing its spirit, and following its methods. But this book is no mere copy of Vallée Poussin's, for the field and range of topics are different as also the outlook, and a lot of care, ingenuity and discretion have been used in writing a book with limited objectives but of the high standard indicated by Vallée Poussin's course of analysis. Special mention might be made of the excellent treatment of mean value theorems, Taylor's theorem and uniform convergence. The several notes and exercises have been carefully chosen and serve to illustrate clearly the difficult points involved in the immediately preceding theory. There is plenty of rigour but not such as to spoil the clarity of presentation at the elementary stage, nor is the book made too easy at the cost of rigour. A fine balance has been achieved, and the result is an extremely valuable elementary introduction to analysis.

There are, however, one or two points on which improvement is desirable. The introduction to integration through the notion of an area appears incongruous in a book which