

REVIEWS

Alternating Current Electrical Engineering. By Philip Kemp. (Macmillan & Co., Ltd., London), 1947. Seventh Edition. Pp. ix + 659, with 450 figures. Price 25*sh.* net.

The applications of electricity to human needs and comfort are so great and growing that it has become indispensable to the daily life of the community and of the individual. It is difficult to imagine to-day a world without electricity. Inevitably, electrical engineering, specially alternating current electrical engineering, continues to develop unceasingly in every direction. No text-book even of the size of the one under review can, therefore, deal with more than the essential principles of carefully selected aspects of the subject. This is what Prof. Kemp seeks to do in this book on alternating current electrical engineering, and he is an author and teacher of long standing well known in his field. Of the quality of the book and its popularity, it is enough to note that since it was first published in 1918, it has run through seven editions and been reprinted twice.

This is not a specialist's book nor is it addressed to the designer of alternating current machinery and equipment. It is meant for the student of electrical engineering preparing for his bachelor's degree or its equivalent, and for the "engineers whose student-days are over" and who may wish to "use it to refresh their memories when called upon to solve problems which are out of their normal course of work".

An adequate grasp of the general theory of alternating currents is an indispensable requisite to a study of this branch of electrical engineering; it is, therefore, satisfactory that a quarter of the book is devoted to a discussion of it in the first thirteen chapters; the ground covered includes the vectorial and the symbolic methods of representing alternating quantities, inductance and capacity as circuit elements, resonance, power and power factor, polyphase currents and rotating fields. In addition, there are chapters on Transients and Oscillatory Circuits at the end of the book; but a more suitable place for these would be after Chapter VIII.

These provide the basis for the succeeding chapters, 14 to 32, on the different types of alternating current machinery, starting with the transformer and ending with three-phase commutator motors and power factor control. The treatment is more detailed and comprehensive in the cases of the transformer, the alternator and the induction motor. There is a separate chapter on the principles of design in each of these three cases. The author takes care, and very rightly, to point out in the Preface that these chapters "do not constitute a design manual" and that design "can only be learned by experience in actual practice".

In revising the book for the present edition, the author has endeavoured to bring the book up-to-date not only in the treatment of the

different aspects of the subject, but in including within its pages a number of important developments of recent years. The selsyn principle, for example, which is being applied so increasingly during and since the war is explained under Induction Motors (p. 369). The chapter on Rectifiers includes a discussion of the phase and bias control of ignition and a brief mention of the copper oxide rectifier. Chapter 32 on the Three-Phase Commutator Motor mostly deals with the Schrage Motor along with a brief explanation of the No-Lag Motor. Lead oxide and Thyrite Arrestors are discussed under Protection of A.C. Systems.

The role of electronics and electron tubes in every branch of electrical engineering is so great and increasing so rapidly that no electrical engineer can now-a-days do without a study of it. It is a part of his professional equipment. It is, therefore, surprising that it should have been deliberately omitted from the scope of the book; the omission is all the more notable as the author has included subjects like the mercury arc rectifier, the cathode-ray oscillograph, oscillatory and coupled circuits and even the obsolete spark method of producing oscillatory currents. By including a brief exposition of electronics, the book would have gained in value without any serious increase in its size and cost.

The printing and the general get up of the book leave little to be wished for. But a special word of praise is due to the 450 figures that illustrate the text. At the end of each chapter there are a selected number of examples, the solutions for which are given towards the end of the book. The explanation is everywhere clear and concise and the mathematical treatment adequate and within reach of the student for whom the book is intended. No errors were noticed in the text. No references are given to original papers; this in many ways is an advantage to the beginner.

One or two matters, however, call for comment. On page 11, what the author means by Ohm's Law is not very clear; nor is the explanation on pages 58 and 59 on the current in a condenser. Why not follow Maxwell's explanation that a changing electric field constitutes an electric current the value of which is proportional to the rate of change of the field? This, every time is the simplest and the best explanation. On page 16, it is stated that the induced e.m.f. in an inductance opposes the applied e.m.f. producing the current. This surely is not right. The induced e.m.f. adds to or opposes the applied e.m.f. according as the current in the inductance is either decreasing or increasing. Another matter of some importance is the definition of the phase of an alternating quantity and the difference of phase between two such quantities. The book is certain to serve as a valuable guide to students of electrical engineering.

R. E.

The Growth of Physical Science. By Sir James Jeans. (Cambridge University Press), 1947. Pp. 364. Price 12sh. 6d.

The book under review is the last one written by Sir James Jeans before his death in September 1946. The late Sir James Jeans was known throughout the world for his lucid exposition of science in books intended for the general public. The present volume forms yet another example giving testimony to the author's wide range of interest and knowledge and also to his splendid gift of exposition.

The history of science is truly the story of the great originators. In keeping with this, the author traces the life-histories of the prominent men of science and their contributions to physics including mathematics and astronomy. The arrangement is such that we get a coherent account of the growth of modern physical science and the steps by which it has attained its present state and importance. The author has also given an account of the progress of mathematics which, as is well known, is intimately connected with the progress of physical science.

The book is divided into eight chapters, each one dealing with the growth of science during a specific period. Chapter I contains an account of the remote beginnings during the three millennia of Babylon and Egypt starting from the earliest evidence of the systematic interest in science coming from the civilisation which existed in the river basins of the Euphrates and the Nile in the new-stone age. The second chapter refers to the period covering the first three centuries (600-320 B.C.) of scientific progress in Greece which was almost entirely mathematical, forming a sort of intellectual golden age. The next chapter deals with science in Alexandria which became the intellectual centre of the world for many generations (322 B.C.-A.D. 642). Chapter IV deals with the causes for the stagnation of scientific progress during the next eight hundred years. Jeans has aptly described this period as the dark age as far as science was concerned. The spread of Christianity and Islam during this period was largely responsible for strangling the growth of science and bringing about ultimately the decline of Alexandria, the great city of learning. During this era, education and scientific knowledge were almost the exclusive prerogative of the church. The renaissance of the scientific spirit which followed the invention of the printing press in Europe is described in Chapter V. This period (1452-1600) started with the birth of Leonardo da Vinci who was the first to approach the study of nature in a truly modern spirit. With Leonardo science began to adopt modern aims and methods. The noteworthy advances made in astronomy, mechanics and mathematics respectively by Copernicus, Stevinus, Galileo and Fontanna in the sixteenth century are detailed in the same chapter. The progress of science in the seventeenth century (described as the "Century of Genius") is contained in Chapter VI. A detailed account is given of the many valuable contributions made to astronomy notably by Kepler, Galileo and Newton, to optics by New-

ton, Hooke, Huygens and Snell, to the knowledge of the structure of matter by Boyle, and to mathematics by Descartes, Fermat, Cavalieri and Leibnitz. Chapter VII refers to the period covering two centuries after Newton (1701-1897). This period, if not so strikingly brilliant as its great predecessor, was at least one of solid progress. It provided an abundance of first class investigators like Lagrange, Hamilton, Laplace, Bradley, Herschel, Young, Fresnel, Fizeau, Lavoisier, Dalton, Kelvin, Faraday and Maxwell, to mention only a few. Finally the era of modern physics which commenced with the famous Michelson-Morley experiment (1887) is dealt with in the last chapter. The tremendous progress made during the last sixty years has been beautifully summarised in about seventy pages.

Although detailed reference has been made in the book to the contributions made to the progress of physics and astronomy by numerous investigators in various countries of the world, one looks in vain for adequate reference either to ancient Hindu astronomy or to the important contributions of Indian scientists especially in the field of physics and astronomy in recent years. Except for this omission, the story of the growth of physical science starting with the Babylonian system of counting and ending with the recent ramifications into the mystery of the sub-atomic structure, is told in a fascinating manner in this volume. The book has been written in a simple and elegant style so as to interest even the layman. The book will be extremely informative not only to students of physics but also to the general reader who wishes to enrich himself with the knowledge of the growth, achievements and potentialities of physical science.

R. S. K.

High Polymers, Vol. VII.—Phenoplasts. By T. S. Carswell. (Interscience Publishers Inc., New York), 1947. Pp. 267. Price \$ 5.50.

This handsome book on Phenoplasts, their structure, properties and technology, is a welcome addition to the library of the plastic chemist. The book deals with the recent developments in the study of phenoplasts. Subdivided into several sections with brief introductions for most of them the book gives a good account of the general reactions of phenols and aldehydes, the physical structure of the resins, the various types of fillers used in molding compositions, the mechanical, electrical and thermal properties of the phenoplasts. In the concluding sections are briefly given the technical manufacture, the molding technique and the miscellaneous technical applications of the phenoplasts, intended for the research chemist, as the author rightly points out in the preface to the book. Emphasis has been laid on the recent developments of the study of phenoplasts, and the book gives considerable data on present trends in the development of the phenoplastics.

The book is well indexed, nicely got up and deserves a place in any scientific library.

M. S. MUTHANNA.

Annual Report of the Public Health Commissioner with the Government of India for 1945. (Manager of Publications, New Delhi.) Pp. 84 + vi, with 2 maps and 5 charts. As. 14.

The detailed Annual Report of the health activities in British India which was temporarily suspended during the years 1941 to 1944 has been resumed from the year 1945. The year under review saw the termination of the global war first in the European and then in the Pacific theatre. The world was left with war-weary, under-nourished population on a scale not previously encountered. The pandemic of influenza of the type which swept countries after World War I was feared, and special watch was maintained at ports to check immediately any importation of influenza into the country. Another notable feature is the vigilance with which the air-port authorities at Karachi worked for effectively stemming the introduction of yellow fever into India as the aerial traffic to India, especially through North Africa was greatly increased owing to war conditions.

India continues to be the largest reservoir of the infections of smallpox, cholera and plague, the reason being the low level of the environmental sanitation and the absence of a controlled and protected water supply for the vast rural population and the chronic malnutrition aggravated by war conditions. Lack of medical and sanitary personnel with the civilian administration of the provinces and in some cases inadequate supply of drugs and disinfectants hampered control of infectious diseases. The control of epidemic diseases at fairs and festivals has improved considerably, and this measure has materially reduced the danger of spread of epidemics by pilgrims. The *Ardh Kumbh Mela* in the United Provinces had always been followed by a heavy incidence of cholera in the Punjab during April. It is gratifying that this year no case of cholera was reported. The death rate for British India decreased from 24.1 per million in 1944 to 21.5 in 1945. With the exception of Central Provinces and Orissa the death rates in 1945 were on the same level as in pre-war years. On the other hand, birth rate increased from 25.4 per million in 1944 to 27.3 per million although the pre-war birth rate of 34.5 per million has not been touched. There was no abnormal incidence of malaria anywhere except in Orissa, Central Provinces and in some parts of Madras. The usual activities for the distribution of quinine or its substitutes and the adoption of anti-larval and anti-adult mosquito measures were carried out throughout British India. Useful work continued to be done by the Department as regards anti-tuberculosis work. Inadequacy of institutional arrangements to deal with actual cases and their contacts remains the same as before.

The unique event in the history of Health Planning in India was the completion of the report of the Health Survey and Development Committee under the chairmanship of Sir Joseph Bhore. This Committee, in consultation with the distinguished workers in the field of health from the U.S.A.,

U.S.S.R., and Australia, has given a comprehensive survey of existing Indian conditions together with recommendations and plans which, if successfully put into operation, goes a long way in improving the health of the rural and urban population of India.

Medical Research in India has shown considerable progress extending over a wide field—problems relating to the control of malaria, cholera, plague and leprosy. Nutrition Research has taken a prominent place, and a number of useful inquiries regarding the role of vitamins especially vitamins B, C and D, and proteins in health and disease were in progress. Experimental trials on Monkey malaria were carried out with Palludrine and the drug promises to be superior to Mapacrine. Welfare work by voluntary organisations such as the Indian Red Cross Society, Tuberculosis Association of India, British Empire Relief Association (Indian Council) and International Health Division of the Rockefeller Foundation in India and others have contributed a great deal towards the improvement of public health in the various provinces and Indian States.

There are two maps and several interesting and explanatory charts which enhance the value of the Report.

A. S. RAMASWAMY.

Records and Research in Engineering and Industrial Science, By J. Edwin Holmstrom. (Chapman & Hall, Ltd.), 1947. Pp. xii + 366. Price 21sh. net.

The progress of scientific and technical research in any subject cannot flourish in isolation; it must be collated at all times for the use and guidance of all scientific workers. To compile such information, to serve as a ready guide to all those interested, is a difficult task, and Dr. Holmstrom's book shows how to overcome these difficulties. The book can be broadly divided into three parts. In the first part the author emphasizes the importance of collation of fundamental research in relation to engineering industry, and of statistical examinations providing the key to questions of technical design so vital to the progress of the industry. That the pace of advancement in technical fields quickens through a properly divided team-work is clearly set out by the author who quotes appropriate examples. In the other part of the book he gives an outline of the British Collations and International Organisations for the promotion of Scientific Research and makes a passing reference to Indian National and other organisations. In the third part he deals with the recording and circulation of technical information, indexing, photographic reproduction, microphotography, translation of foreign languages and other allied subjects; the author also presents his own system of classifications. On the surface of it, organisation and administration of a technical library appears an easy affair. To provide a research worker exactly and expeditiously material he wants at the moment, is not very simple. This book shows in a very clear style librarianship in recording all the valuable information about research on technological subjects. It is hoped that every librarian will be greatly benefited by a study of this very useful book.

M. S. T.

Surveying of Existing Information and Data on Radio Noise over the Frequency Range 1-30 Mc/s. (Published by the Department of Scientific and Industrial Research.) RADIO Research Special Report, No. 15.

This report is probably the first of its kind to supply information on most of the available published literature dealing with all types of noise, whether of man-made, atmospheric or extraterrestrial origin encountered in radio reception, in the frequency range 1 to 30 mc/s. The present report has been prepared and presented in as coherent a form as possible, before embarking upon a long-term research in order to supplement our existing knowledge of the nature, origin, prevalence, intensity of different types of noise that affect radio reception in the frequency range mentioned.

Noises that can spoil satisfactory reception have been classified as receiver, thermal, cosmic, atmospheric and man-made. It has been shown how a thorough theoretical and practical consideration lead to a proper assessment of noise levels at various locations.

The report, consisting mainly of nine sections, deals with receiver noise both internal and external, and thermal noise in sections 2 and 3 respectively.

The fourth section discusses noise due to cosmic radiation. This has the characteristics of fluctuation noise and affects the reception within 15 to 30 mc/s. It is recommended in this connection that further experimental information should be collected from all parts of the world with more refined equipment in order to assist in the eventual development of a satisfactory explanation which will prove to be a valuable contribution to the domain of both radio communication and astrophysics. The fifth section deals with atmospheric noise which produces clicks, crackles or crashes in radio reception. Information regarding the diurnal, seasonal and annual variation of noise level at various locations are recorded. Consideration is given to the theories of charge separation and initiation of discharge and also the manner in which the intensity is affected by effects of earth curvature, sky-wave reflections, etc.

Section six deals with various types of man-made noise. It is suggested that, with suitable precautions at the source and the receiver end, the effect of this interference can be made inappreciable.

Section seven discusses amplitude and frequency characteristics of both fluctuation and impulsive noise. Section eight describes various methods of noise measurement and suggest that the existing methods need much improvement before any satisfactory conclusions can be arrived at from such measurements.

The report ends with certain valuable recommendations in Section nine for increasing our existing knowledge. Many new problems have been suggested so that the report is valuable not only as scientific information but also as guide to the workers in this field.

Nutrition in Relation to Cancer. *Annals of the New York Academy of Sciences*, Vol. XLIX, Article 1, pages 1-140. (Published by the Academy), September 1947.

It is generally believed that in spite of a large number of persons working on cancer, no really worth-while discoveries have been made relating to either the causation or the treatment of malignant disease. This belief is only partly true, because cancer research is dependent on our knowledge of fundamental life processes in tissues and their cells, and our ignorance of these processes is still abysmal. However there is an effort from several directions for arriving at a clearer understanding of the biological phenomenon of growth and also of abnormal growth of cancer. A good deal of very valuable knowledge has accumulated as a result of the patient study by "meticulous plodders", medical men, biochemists, physicists and biologists and it appears that gradually this knowledge is taking shape like pieces of a jigsaw puzzle.

One of the recent observations relates to the important role which nutrition plays in development of tumours in mice and men. The New York Academy of Sciences is, therefore, to be congratulated in bringing together men working on different aspects of the problem of *Nutrition in Relation to Cancer* and publishing a resumé of their observations in the form of a booklet. It is a compilation of papers read by recognised workers in the field of cancer research in U.S.A. at a conference organised by the New York Academy of Sciences and Panel on Nutrition, Committee on Growth, National Research Council in December, 1946. The papers deal with the researches carried out on the effects of varying caloric intake upon tumours, the mechanism of effects of increased intake of fats, carbohydrates and other dietary factors on carcinogenesis, the role of vitamin B complex, the milk-borne mammary-tumour producing agent in mice, etc. The workers in medical institutions will be particularly interested in a new orientation to the problem from a study of plants (Robbins), chemically induced mutations (Tatum) and nutrition of moncellular organisms (Kidder), which are fields of investigation usually outside their purview.

The paper on caloric intake is important, as data are presented which show that caloric restricted diet inhibits the production of several types of mouse tumours. Miller reviews a phase of studies by the Wisconsin group on the carcinogenic azo dyes and the remarkable effect that diet exerts in the production of liver tumours. His findings on the incidence of these tumours agree with those observed by workers in this country in the laboratories of the Tata Memorial Hospital. White and his associates have observed a reduction in the incidence of leukemia from 92.1 to 55 per cent. in a group of animals kept on cystine-restricted diet. It might have been better if the sex of the animals in the two groups had been mentioned. Tatum has dealt very ably with the mutation theory of cancer, which is attracting much attention at the present moment and has stated the present-day position as "many of the known facts regarding the changes taking place during carcinogenesis seem to support this theory, and

perhaps none are in actual disagreement". One of the important contributions is by the Alabama group (*Copeland et al.*) who have demonstrated the occurrence of neoplasms in 40 out of 69 rats with diets deficient in choline and related nutrients. The choline-deficient diet gave rise to neoplasms in lung, liver, pancreas, bladder in these animals. The number of animals is probably too small for the number of diets used and it is necessary to extend these remarkable findings. The work by Kensler on the demethylation of the dye, *p*-dimethyl amino-azobenzene, and his experiments on the inhibition of succinoxidase activity of rat liver slices is already well known, and has opened up a new field for future work.

The booklet is recommended for careful study by all persons interested in problems dealing with cancer or nutrition.

V. S. WARAVDEKAR.

The Terpenes. Vol. I.—The Simpler Acyclic and Monocyclic Terpenes and Their Derivatives. By J. L. Simonsen. Second Edition, revised and reset by J. L. Simonsen and L. N. Owen. (Cambridge University Press), 1947. Pp. 479. 30sh. net.

The first edition of this valuable contribution to the chemistry of terpenes was published in 1931. The plan and scope of this edition remains unaltered, but much new material has been added: Angustione, dehydroangustione, leptospermane, cryptone, piperitenone, isopiperitenone and greater information concerning a large number of other substances are included. The elucidation of the extremely difficult problem of preparing purified specimens of the isomeric menthones, menthols, etc., has engaged the attention of a number of workers for a large number of years, and in recent years Read and his collaborators have paid much attention to this question. Menthol contains three asymmetric carbon atoms, and the problem of the configuration of Menthol, neo-Menthol, iso-Menthol and neo-iso-Menthol and their relationship to Menthone and iso-Menthone, discussed in detail, is one of the outstanding developments since the publication of the first edition. The relationship of the optically active menthols to 1-Piperitone is also now clear.

The formula originally assigned to irone by Tiemann and Kruger has undergone revision at the hands of Ruzicka and his collaborators. A study of the ozonolysis followed by oxidation with chromic acid led to the isolation of tri-substituted pimelic, adipic and glutaric acids, which leave no doubt that irone has a seven-carbon-atom ring structure. The carbon skeletons of the acyclic and alicyclic substances may be considered to be built up by the fusion of isoprene nuclei, and this has proved a greatly reliable working hypothesis for the elucidation of structure. It should, however, be regarded only as a working hypothesis since several exceptions are known. No very satisfactory conclusion has yet been arrived at concerning the origin and function of terpenes and their oxygenated derivatives produced by plants.

In this edition, as in the previous one, the development of the views on the constitution of the various terpenes has been traced in a very clear manner; and indications of further research necessary to settle outstanding questions

have been pleasantly treated so that the student of terpene chemistry will find no difficulty in following the trend of thought.

The book is an outstanding contribution in the field of organic chemistry in general, and terpene chemistry in particular. K. N. M.

Modern Gas Turbines. By Arthur W. Judge. (Messrs. Chapman & Hall, Ltd., London), 1947. Pp. xii + 311. Price 28sh.

The gas turbine has already proved itself to be a serious rival to the reciprocating engine in some important fields of use. Granted the requisite knowledge and facilities, it can be cheaper to make than corresponding reciprocating engines; moreover, moderate metallurgical advances in certain directions will greatly increase the extent to which the gas turbine can outrival reciprocating engines. Thus, it may be good policy for India not to contemplate eventual manufacture of certain larger and more difficult types of reciprocating internal combustion engines but, instead, to go direct to gas turbines. It is thus patent that the subject of the book under review has a special interest for India.

To those who require to assess the possibilities and limitations of gas turbines for various fields of application, Mr. Judge's clear exposition will be of considerable help at the present stage. The author gives a brief history of the development of gas turbines and follows this with some general considerations. He then outlines the fundamentals of gas turbine thermodynamics and discusses gas turbine efficiencies and how to improve them. There follows a chapter on closed-cycle gas turbines and another on exhaust-gas turbines for supercharged engines. The next chapter deals with gas turbines for aircraft. This relates mainly to jet-engines as more experience has been gained with these engines than with those which deliver power through shafting. The concluding two chapters concern typical applications and performances of gas turbines, and materials for gas turbines. There are two short appendices which comprise notes on turbine-blade design and a description of some blade-fixing methods.

A considerable bibliography is given for the guidance of those who need to study particular aspects of the subject more fully. Important further contributions continue to appear in technical literature but the references given extend into 1946.

The book is not a design manual. It is largely descriptive, but fundamental principles and facts are stated thus forming an excellent introduction to the subject.

Little is given concerning dynamical aspects of gas-turbine design, such as balance, whirling, vibration of turbine discs and blades centrifugal and temperature stresses, high-speed bearings, and so forth. To a large extent these are covered by manuals on steam turbine design, but the gas turbine has its own special dynamical and stress problems. Again, heat interchangers for gas turbines are referred to only diagrammatically. However, it is to be realised that there is limitation to information released.

The book is clearly printed and is well-illustrated by numerous graphs, drawings and photographs. B. C. CARTER,