

eliminated eddy current loss without lowering appreciably the permeability of the core. The extension of the usefulness of the cable by means of 'phantom' circuits can only be obtained by almost perfect balancing of the various circuits. It was discovered in American research laboratories that an alloy of nickel and iron containing more than 30 per cent. of nickel has remarkable magnetic properties. Permalloy has a composition of nearly 80 per cent. of nickel and 20 per cent. of iron. At vanishingly small magnetising forces permalloy may have a permeability of 13,000, which is more than thirty times as large as that of the best soft iron. Permalloy may even be saturated when subjected to the earth's magnetic field.

It is found that when a submarine cable is suitably covered with permalloy tape, the speed of transmission of the messages can be increased ten times. A brief mention is made of the structure and mode of using thermionic repeaters, the use of which has greatly increased the range of telephony and greatly reduced the cost of the conductors. The development of carrier wave multiple telephony is also described. By its means several independent conversations can be conducted simultaneously on one line. It is satisfactory to note that practically all these inventions are the immediate outcome of the application of theory. To the student especially this book will be of great value.

*Die seltenen Erden vom Standpunkte des Atombaus.* Von Prof. Dr. Georg v. Hevesy. (Struktur der Materie in Einzeldarstellungen, herausgegeben von M. Born und J. Franck, Heft 5.) Pp. viii + 140. (Berlin: Julius Springer, 1927.) 9 gold marks.

THE discovery by Johann Gadolin in 1794 of the mineral gadolinite opened up a new and difficult field of investigation, which has had an important bearing on the theory of atomic structure. The problem of fitting the rare-earth elements into the periodic system was only partly solved when Moseley's work revealed the total number as well as the positions of members of the cluster. Hevesy shows how Bohr's theory of atomic structure provides a key to their mysterious behaviour, and the well-known fact that, chemically, yttrium lies in the midst of its higher homologues becomes intelligible; for whilst the valency-electrons of tervalent lanthanum are more remote from the nucleus than those of yttrium, and are therefore less firmly bound, other conditions prevail in higher members, where valency-electrons lie at a deeper quantum level.

Amongst other physical properties the paramagnetism of ions is discussed at length, and is shown to exist only where the distribution of valency-electrons is anomalous, but the latter are unusually deep-seated between cerium and lutecium. This is held to account both for chemical similarities and chemical irregularities in the cluster. Now since no satisfactory data are as yet available of ionisation potentials with which to judge the firmness with which these electrons are held, one has to draw conclusions from the molecular volumes of analogous compounds. Though apparently

irregular, the results are in agreement with the requirements of Bohr's distribution. Thus a steep rise in value in passing from scandium to lanthanum is followed by a gentle fall from lanthanum to lutecium.

The second part contains a useful account of the chemical properties of compounds and concludes with a historical survey of the subject.

*Directing Mental Energy.* By Dr. Francis Aveling. Pp. x + 276. (London: University of London Press, Ltd., 1927.) 8s. 6d. net.

THIS is a peculiarly constructed book. The author seeks to show how we may economise our expenditure of energy, of which we possess only a limited stock, as a partial solution of the problem 'How to make the most out of life'; as if a conscientious application of the proverbial injunction 'to take care of the pence' were an important secret of happiness. Yet, fundamentally, Dr. Aveling is more concerned with the problem of spending wisely than with the rather negative emphasis on economy and on the avoidance of waste from which he starts.

The title and the introduction suggest a much more profound and philosophical treatise than the author has given us. Consequently, in parts, the treatment seems somewhat inadequate; some of the topics, especially those on industrial and vocational psychology, are dealt with too broadly for a work of this kind. Dr. Aveling, however, sees unity in the diversity of our daily life and invokes the laws of energy to explain it. Even such a spontaneous expression of human impulses as is found in play is regarded as having its 'why and wherefore' in the constancy of human energy. The book is decidedly interesting, though the author's thesis will not be acceptable to all psychologists.

*Mexican Architecture of the Vice-Regal Period.* By Walter H. Kilham. Pp. 223 + 84 plates. (New York and London: Longmans, Green and Co., Ltd., 1927.) 21s. net.

HISPANO-AMERICAN architecture is not likely to be a subject with which very many European readers are familiar. It is, however, well worth study, on account of its innate beauty and form. Its period of development extends from the middle of the sixteenth century to the beginning of the nineteenth, when Spanish domination came to an end. Mexican architecture in its main lines followed that of Spain at a time when the Renaissance style was developing in the mother country. It presents, however, a course of independent development of its own, which comes out in many features, but especially in the use of coloured tiles. Of its peculiarities, many are due to the employment of native workmen, Indians, who themselves had an architectural tradition behind them, and considerable artistic taste of their own. It is this which gives Spanish-American architecture an individual interest as a subject of study. Mr. Kilham's informative sketch of its history is clear in its description and exceedingly well illustrated.