

pounds has led to an excessive importance being attached to valency phenomena in homopolar compounds, whereas a complete theory should cover the very large class of inorganic heteropolar compounds formed by the majority of the elements.

The second essay is a short review of the work which has been done on X-ray spectra and the origin of X-rays, with particular reference to the partitioning of electrons into shells surrounding the nucleus.

The author's style is somewhat involved, and for a reader who is not a good German scholar the argument is sometimes difficult to follow.

Our Bookshelf.

- (1) *Abridged Callendar Steam Tables, Centigrade Units.* By Prof. H. L. Callendar. Pp. viii. 1s. net.
- (2) *Abridged Callendar Steam Tables, Fahrenheit Units.* By Prof. H. L. Callendar. Pp. 8. 1s. net.
- (3) *Callendar Steam Diagram, Centigrade Units.* 6d. net.
- (4) *Callendar Steam Diagram, Fahrenheit Units.* 6d. net. (London: E. Arnold, n.d.)

THE two sets of abridged tables (1) and (2) will be found to contain all that is required for engineering calculations. Table 1 in each set contains the properties of saturated steam for pressures ranging from 28.98 in. of vacuum up to 535.31 lb. per sq. in. gauge pressure. Table 2 gives the total heat of dry steam (superheated or supersaturated), and table 3 contains the entropy values for dry steam at various degrees of superheat and supersaturation. On the first and last pages will be found notes of the symbols and equations employed. The tables are well arranged and clearly printed, and will be of great service to students and engineers in practice.

(3) The Centigrade steam diagram is also well arranged and has convenient scales. (4) The curves on the Fahrenheit steam diagram are copied from those on the Centigrade diagram; the numerals printed on them are the corresponding Fahrenheit numbers. Hence the scales on the Fahrenheit diagram are not so convenient, and we think it would have been better had this diagram been drawn independently of the Centigrade diagram.

Spot and Arc Welding. By H. A. Hornor. (Griffin's Technological Handbooks.) Pp. vii + 296. (London: Charles Griffin and Co., Ltd., 1920.) 15s.

THE application of electric welding processes to heavy steel construction, such as obtains in ship-building, forms the main topic of this book. The results of extensive tests conducted during the war in the United States with the object of testing the processes are also given. This work was, unfortunately, discontinued at the time of the armistice, but from the results it was shown that trustworthy

electrically welded joints can be made of greater strength than corresponding riveted joints, and that consequently some economy in material can be expected. Special designs for all-welded ships are discussed, and a good deal of interesting information is given on other applications of both spot and arc welding and the training of welders. Small all-welded craft have already been constructed in England, and the author shows that the technical knowledge now available is sufficient for a considerable extension of this method of ship construction.

Handbuch der biologischen Arbeitsmethoden. Edited by Prof. Dr. Emil Abderhalden. Abt. 5, *Methoden zum Studium der Funktionen der einzelnen Organe des tierischen Organismus.* Teil 7, Heft 1, Lieferung 12, *Sinnesorgane.* Pp. 195. (Berlin und Wien: Urban und Schwarzenberg, 1920.) 30 marks.

THE "Handbuch der biologischen Arbeitsmethoden," edited by Prof. Emil Abderhalden, will consist of forty-eight parts, in which chemical, physical, biological, psychological, and many other methods are treated at considerable length. The section under notice, by E. Budde, is devoted to the mathematical theory of audition. The first division of this contains a very full discussion of free and forced small vibrations of a point, followed by systems under non-linear forces, including combination tones. The second division deals with strings and membranes, while the third refers to plane-waves in air. Having thus laid the foundation, the author passes to the detailed treatment of human audition, in which he reviews the interpretations of the phenomena put forward by the chief workers on the subject, but dwells especially on the parts played by the basilar membrane and the endolymph.

Turbines. By A. E. Tompkins. Third edition, entirely revised. Pp. viii + 180. (London: S.P.C.K.; New York: The Macmillan Co., 1921.) 8s. net.

THE early part of this book is taken up with historical notes and some explanations of the principles involved in the working of turbines. This is followed by three chapters on water-wheels, turbine pumps, and water turbines. The remainder of the book deals with steam turbines. For the most part the book is descriptive, and the simple language employed, together with the many excellent drawings, will render the volume of interest to the general reader. The author has had considerable experience in the working of turbines, and his treatise on "Marine Engineering" is well known. It is therefore rather surprising to find on p. 21, in reference to a rotating wheel, that "every particle of the wheel also tends to fly away from the axis in a radial direction, due to centrifugal action or force." This statement is somewhat misleading. There are one or two misprints, and the accepted notation for British thermal unit is B.Th.U., not b.t.u.