Taveau (2000 francs); the Caméré prize to M. Gisclard; the Jerome Ponti prize to Georges Rouy, for his researches in systematic botany; the Leconte prize between Charles Tellier (8000 francs) and M. Forest (12,000 francs); the prize founded by Mme. la Marquise de Laplace to Jules Adolphe Menj; the prize founded by M. Felix Rivot between J. A. Menj, J F. G. Daval, R. G. R. Mabilleau, and R. E Bollack.

THE TIN MINES OF NEW SOUTH WALES.[1]

THE more rapid growth of the demand for tin than of the supply, and the disappointing failure of aluminium to replace tin for many purposes for which it was hoped to prove an efficient substitute, have led to the more careful study of the tin fields of the world and to an increase in the tin production by about a third in the first decade of this century. Mr. J. E. Carne has added a monograph on the tin mines of New South Wales to the series of valuable monographs with which he has enriched the economic geology of Australia.

The monograph is careful and exhaustive, and shows the author's combined caution and insight. It consists mostly of detailed descriptions of the tin mines and mining fields, and the economic problems naturally receive greater attention than the theoretical. There is, however, an interesting discussion of the genesis of tin ores, and the account of the mines is often enriched with suggestions of general interest. Economic questions are especially important in connection with a metal which is subject to such violent fluctuations in value, for the price of tin on the London market has varied since 1905 between 120*l*. and its present price of 230*l*. per ton. The association of tin with pegmatite veins has led to its being often claimed as one of the metals most likely to be of direct igneous origin; but Mr. Carne rejects the view that the tin in some granites was a primary constituent of the granite, and has been collected into veins as a direct differentiation product. He lays stress on the evidence which points to the deposition of the tin after the complete consolidation of the granite.

The New South Wales tin deposits are, however, not of the kind for which there is most to be said for the igneous theory. Mr. Carne gives a list of seventy-seven tin veins in New South Wales, and in sixty-nine of these the tin is associated with quartz, in twenty-nine with chlorite, in twenty with felspar, and in only three with tourmaline. The rarity of the association with tourmaline suggests that tin in New South Wales is not a pneumatolytic product.

The first record of tin in Australia which Mr. Carne accepts as authentic was in 1824. Actual tin-mining in New South Wales only began in 1872. Since 1875 the largest field—Emmaville—has yielded about 52,000 tons, and the Tingha field has yielded slightly less (45,500 tons). The tin mines in New South Wales include both alluvial deposits and lodes. The lodes belong to a type in which the distribution of the tin is sporadic and the patches of ore become smaller and poorer in depth. The deepest tin mine in Australia is the Vulcan Mine in North Queensland, which has already attained the depth of 1400 ft. The deepest in New South Wales is only 360 ft., and Mr. Carne's account of the lodes renders this fact not surprising.

J. W. G.

---

[1] "The Tin mining Industry and the Distribution of Tin Ores in New South Wales." By J. E. Carne. (New South Wales Department of Mines, Geological Survey, Mineral Resources No. 14.) Pp. 378+xxxiii plates+8 figs.+14 maps and sections+iii maps in portfolio. (Sydney, 1911.)

OSMOTIC PRESSURE AND THE THEORY OF SOLUTIONS.

ATTENTION may be directed to a paper by Prof. A. Findlay on osmotic pressure and the theory of solutions, which has recently been published in *Scientia*. It has sometimes been suggested that the problems of osmotic pressure were solved once for all by van't Hoff's discovery that the gas equation PV=RT could be applied to solutions by substituting "osmotic pressure" for "gas pressure." But the recent exact measurements of the Earl of Berkeley and Mr. Hartley in England and of Morse and his colleagues in America have shown clearly that this simple equation is so restricted that it cannot in practice be applied with any approach to accuracy in the case of any of those solutions of which the osmotic pressures have been exactly measured.

As Prof. Findlay points out, the first limitation to the equation PV=RT, when applied to solutions, is that the method used in deducing it only holds good for very dilute solutions. For stronger solutions the equation $\mathrm{P}=\frac{\mathrm{RT}}{\mathrm{V}}=\frac{\mathrm{RT}}{\mathrm{V}_0}x$ becomes

$$\mathrm{P}=\frac{\mathrm{RT}}{\mathrm{V}_0}\left\{-\log_e(1-x)\right\}=\frac{\mathrm{RT}}{\mathrm{V}}\left\{x+\tfrac{1}{2}x^2+\tfrac{1}{3}x^3,\ \&\mathrm{c.}\right\}$$

where V_0 is the molecular volume of the solute and x is the molar ratio, *i.e.* the ratio of the number of molecules of solute to the total number of molecules present.

This equation assumes that there is no formation of complex molecules, no change of energy or volume on mixing the liquid solvent and solute, and that the solution is incompressible. G. N. Lewis has shown that it holds good in a marvellous way when applied to vapour pressure measurements in mixtures of propylene bromide and ethylene bromide at 85°. But even this equation fails to represent with any approach to accuracy the measured osmotic pressures of cane-sugar solutions. Better results are obtained by assuming the formation of a hydrate of the sugar, but it is abundantly clear that van't Hoff's equation is only the beginning and not the end of the quantitative study of osmotic pressure, and that direct measurements of this property are still of the highest importance in studying the theory of solutions.

ENGINEERING AT THE BRITISH ASSOCIATION.

A GLANCE at the proceedings of the Mechanical Science Section shows that a wide range of subjects was considered by the members, and, indeed, much planning was required to group the papers in such a way that all could be read and adequately discussed, and every moment of the available time was fully occupied in carrying out the longest programme of recent years.

In the course of his presidential address on the Thursday morning, Prof. Barr discussed the relation of the engineer to the public, both from a utilitarian and an æsthetic point of view, and by aid of many illustrations of modern engineering achievements he again and again enforced his main argument that the maintenance of a high ideal in all engineering work was necessary to obtain the highest good for the greatest number.

Such illustrations as the attainment of dustless roads, smokeless factories, ships, and locomotives, and the abandonment of all sham decoration of engineering structures gave point to an address which was free