

the lorry and the general transport costs will be considerably reduced. The new roadways will open up many new picturesque places which will attract foreign visitors. According to the law of June 27, 1933, the German State railways have been authorised to create a subsidiary company to build and manage an efficient network of super highways as a monopoly.

#### Ceralumin

MESSERS. J. STONE AND CO., LTD., of Deptford, have introduced a new light alloy to which they have given the name of "Ceralumin C". This alloy contains copper 2.5, nickel 1.5, magnesium 0.8, iron 1.2, silicon 1.2 and cerium 0.15 per cent. It thus belongs to a well-known class of light alloys, but contains cerium in addition to the more usual elements. It is claimed that cerium refines the microstructure, and also suppresses the formation of the brittle iron-aluminium constituent. The alloy is used in the heat-treated condition, being heated to 515°–535° C. for four to six hours in order to bring the constituents into solid solution, and then quenched. Ageing is effected in 16 hours at 175°, after which the alloy is again quenched. Chill castings after heat treatment have a tensile strength of 23–27 tons/in.<sup>2</sup>, a proof stress of 21–24 tons/in.<sup>2</sup>, an elongation of 1 per cent, and a Brinell hardness of 130–140. A fatigue range at 20 million reversals of  $\pm 8.25$  tons/in.<sup>2</sup> has been obtained, which is high for alloys of this class. When the ageing at 175° is replaced by ageing at room temperature for five days, the tensile strength is lowered, but an elongation of 4–6 per cent has been obtained. This modified alloy is called "Ceralumin D". Sand castings give rather lower figures. The new alloy is claimed to give smooth castings, and to be suitable for many kinds of aeronautical and automobile purposes.

#### A 'Perfect' Musical Scale

IN Chap. viii of his forthcoming work on "Some Questions of Musical Theory" ("From Seven to Seventeen". Pp. 137–166. Cambridge: W. Heffer and Sons, Ltd., 1934. 2s. 6d. net), Dr. W. Perrett divides the octave into 171 intervals which he calls 'hepts'. One sixth of a hept is the least difference of pitch which can be detected by a trained ear and Dr. Perrett shows that if the eleventh, thirteenth and nineteenth harmonics can be dispensed with, 50 of the intervals best known in music can be represented by integral numbers of hepts with errors of less than one seventh of a hept. Thus the fifth is 100, the fourth 71, the major third 55, the minor third 45. With an instrument constructed on these lines, modulation into any key would be possible, but if it were played by hand four players would be necessary. As an instrument with Bosanquet's 84 keys per octave was constructed at a moderate price half a century ago, the author considers that one with 171 is quite within the bounds of possibility at the present time.

#### Land Utilisation Survey

THE third annual report of this survey of Great Britain shows a growing rate of progress towards the

completion of the work. With a total of 15,000 finished six-inch sheets, three-quarters of the field work has now been accomplished. Thirty-six counties are completed and twenty-five more are nearly complete. Parts of Norfolk, West Suffolk, the West Riding, Westmoreland, Cornwall, Carmarthen and Somerset still call for more workers. In southern Scotland there are large areas still to be done. A year ago two sheets, reduced to a one-inch scale from the six-inch sheets, were published by the Ordnance Survey. Eight sheets in all have now been published and four more are in the press. Work is proceeding on the reduction and preparation for press of twenty-nine further sheets. It is proposed to publish a series of explanatory memoirs on certain of the sheets and several of these are now in preparation. The report summarises the extent of work done in each county and contains a map of Great Britain showing completed areas.

#### The Imperial Institute

THE annual report of the Imperial Institute contains the last report of the retiring director of the Institute, Lieut.-Gen. Sir William Furse, to the Board of Governors. Sir William there affirms his belief that the threefold activities of the Institute—(1) intelligence, (2) investigations and (3) education—are of immense importance and essential to the economic development of the Empire. He adds that the Imperial Institute is still not sufficiently known and is left overmuch to carry on as best it can. It has never been financed adequately, but from time to time an outside Committee is appointed to investigate the Institute, usually when bankruptcy appears to be impending. Its own resources, from its original endowment and from the letting of rooms, amount to less than £10,000 per annum: Sir William estimates that it requires an income four to five times this figure. He points out that the Institute has only been kept alive for the past ten years by the munificence of private donors and adds: "In no spirit of ingratitude to these gentlemen, I venture to suggest that this method of carrying on our essential Imperial service is unworthy of our great Empire."

#### The Cooling of Boulder Dam

THE Boulder Dam forms a huge concrete plug between the walls of the Black Canyon on the Colorado river. According to Science Service of Washington, D.C., it weighs six million five hundred thousand tons. As this concrete sets, the slow chemical reaction that takes place gives off heat. Researches by the U.S. Bureau of Reclamation have shown that in the Boulder Dam sufficient heat would be generated to melt a cube of ice as high as a 24-story building. If no means were adopted to keep cool this great block much damage might be done, as during the protracted cooling and shrinking period there would be a serious risk of dangerous cracks occurring. To obviate this risk, as each section of the concrete is poured it is riddled with coils of pipe. About 560 miles of tubing will be used, and this will be kept in place permanently as the cement hardens.