as the location of a research station for the fundamental researches needed.

In summarising the work done, and being done, on cement and concrete research, attention is directed to the fact that there are two main differences between concrete and steel, which are in themselves sufficient to account for the many anomalies observed by engineers when applying to concrete the standard methods of test to determine the strength of steel. The first of these differences is the normal expansion and contraction of the material as the moisture in the surrounding atmosphere varies, and the second is the gradual flow of concrete under load. Investigations on the measurement of adhesion stresses, and of stresses introduced in the steel of reinforced concrete by the shrinkage of cement, have been undertaken at the Building Research Station and "have already been productive of data of much importance".

Coming to the Department's activities that relate to what is usually called 'pure science', we may note that the grants for researches, research workers, and students for the year ended Mar. 31, 1928, amounted to £31,346 net. The grants made under this head during 1927–28 were in number 186, and the grants refused 118, as compared with 214 and 213 respectively for the previous year. The researches so assisted in the year under review include, among others, the work carried out by Sir William Bragg and his collaborators on the X-ray examination of materials; and investigations on magnetic phenomena by Dr. P. Kapitza and his collaborators.

Age-Hardening of some Aluminium Alloys.

SOME physical properties of five typical aluminium alloys containing copper, magnesium silicide, or both, have been examined by Dr. M. L. V. Gayler and G. D. Preston, and the results were presented at the March meeting of the Institute of Metals. From this experimental work the following conclusions regarding the causes of the age-hardening of such materials are reached.

On prolonged annealing it is known that the precipitation of $CuAl_2$ or Mg_2Si, or both, depending on the composition of the alloy, occurs. The changes of density which occur during ageing, together with the accompanying changes in the lattice parameter, suggest that a similar precipitation from the solid solution takes place during the earlier stages of this process. X-ray analysis shows that, in addition to the change of parameter, the crystals in the aged material are in a disturbed state which is gradually relieved as the heating is continued. This distortion of the space-lattice is accompanied by an increase of the electrical resistance and is believed to be caused by the formation of minute particles of the precipitated compounds. The precipitation of the dissolved substance from the supersaturated solution entails, first the rejection of the atoms of the dissolved metal from the lattice of the solid solution accompanied by the possible formation of molecules, a process which entails a profound disturbance of the lattice. In the second stage, which may follow closely upon the first and probably largely overlaps it, a 'coagulation' of these rejected atoms or molecules takes place, resulting in the formation of minute crystallites. This coagulation process, except perhaps in its earliest stages, by removing the dissolved metal from the matrix, will tend steadily to lessen the distortion of the lattice, and thereby to diminish the hardness and the electrical resistance.

It is interesting to note that if the age-hardening is due to the precipitation of a metal, and not a compound of that metal, the hardening effect is small; for example, the iron-copper alloys. This would be expected on the basis of the theory outlined above, since it would cause less distortion of the lattice, no formation of molecules being required. If the formation of a compound involves the combination of atoms of the solute with those of the matrix, a greater distortion of the lattice will occur and the hardening be greater. When, however, the compound is formed by the combination of two or more different solute atoms, then still greater distortion is to be expected and marked increase of hardness results. Thus the ageing of an alloy with 4·5 per cent of copper due to the formation of $CuAl_2$ is relatively much less than that of one with 1·08 per cent of Mg_2Si.

Although up to the present the existence of lattice distortion has been inferred on general grounds, the new evidence from the X-ray spectra of aged alloys provides complete confirmation and shows, by the broadening of the lines, that this disturbance occurs to a marked extent which varies with the degree of hardness and electrical resistivity attained at the successive stages of the process. In the later stages of the ageing, when 'coagulation' has become appreciable and the precipitated substances have formed small distinct crystallites, the electrical resistance begins to fall again, the hardness diminishes, and the lines in the X-ray spectrum become less diffuse. F. C. T.

University and Educational Intelligence.

CAMBRIDGE.—Dr. A. B. Appleton has been reappointed University lecturer in anatomy, and Mr. G. E. Briggs has been reappointed University lecturer in botany.

Grants have been made from the Gordon Wigan Fund to Prof. J. E. Marr, Prof. J. Stanley Gardiner, Mr. F. T. Brooks, and Prof. J. Barcroft.

Dr. H. R. Dean, professor of pathology in the University, has been elected Master of Trinity Hall.

A Syndicate was appointed in May 1928 to report on the position of mineralogy in the studies of the University. This Syndicate has now reported to the University, and has made the following recommendations:

(1) Two new departments should be created in place of the existing Department of Mineralogy, namely, a Department of Crystallography and a Department of Mineralogy and Petrology; (2) the Department of Mineralogy and Petrology should be closely associated with the Department of Geology, but should also work in co-operation with the Department of Crystallography; (3) the head of each of the new departments should be a professor, and the minimum additional staff of each department should be one lecturer and one demonstrator; (4) a new building should be erected for the Department of Mineralogy and Petrology adjacent to the Sedgwick Museum; (5) the premises of the existing Department of Mineralogy should be assigned to the new Department of Crystallography; (6) crystallography should become a subject in Part I. of the Natural Sciences Tripos, but should carry a smaller maximum of marks than the existing subjects; (7) mineralogy and petrology should form part of the subject of geology in Part I. of the Natural Sciences Tripos, either as an alternative to palæontology or in addition at the candidates' option, and that in the latter case mineralogy and petrology together should carry the same additional maximum of marks as that allotted to crystallography; (8) that both crystallography and mineralogy and petrology should be included in Part II. of the Natural Sciences Tripos, but that their relation to the other subjects, or to possible subdivisions of them, should be determined by the appropriate University bodies; (9) subject to the adoption of the above recommendations, the existing subject of