

which are necessary to consider in the design of a stable aeroplane, especially as regards the tail-plane.

The cost of electric cooking was discussed by Prof. Morris, with reference to the result of one year's working in a flat within the London area. A paper by Mr. A. E. Bawtree on bank-note engraving was illustrated by a number of photographs describing various methods in general use for the prevention of forgery. The author showed examples of a new system of a geometrical character, which cannot be imitated by repetition work, or by mechanical devices such as the pantagraph. The system which was not described was stated to allow the incorporation of a design which could only be made visible by a special screen. The concluding paper at this meeting was read by Mr. C. H. Lander on the frictional loss in steam pipes, and described experiments which agree with a dimensional formula due to Osborne Reynolds.

A joint meeting of Sections A and G took place on the Monday morning to discuss the report of the committee, appointed last year, to consider certain of the more complex stress distributions in engineering materials. The principal results of modern investigations on combined stress were discussed by Mr. W. A. Scoble, while alternating stress was similarly dealt with by Messrs. Mason, Rogers, and Eden, and a special report on the resistance of tubes to collapse was contributed by Mr. G. Cook. The discussion upon the report was opened by Prof. Perry, the chairman of the committee, who urged the importance of coming to a definite agreement as to the criterion of failure in a material subjected to stress. The discussion on the various sections was continued by Mr. Stoney and other engineers, and covered a wide range of subjects connected with the experimental investigation of stress distribution in engineering materials.

A Section A paper by Prof. Coker was, for the convenience of the meeting, read immediately after the termination of the joint discussion; it described the construction of polariscopes for examining the stress distribution in large models of engineering structures built up of transparent materials. A second paper by the same author described the preliminary results of an investigation upon the stress distribution in rings subjected to internal or external pressure, with apparatus which leaves every part of the ring free for measurement except the surface exposed to fluid pressure.

A paper contributed by Mr. T. Reid, described some experiments on the flow of solids based on the well-known experiments of Tresca. Lead cylinders divided in halves by a diametral plane are grooved to receive tin wires, which latter serve to map out the flow produced when pressure is applied to the cylinders. The experimental results appear to show that a very slow flow is stable, and that above a certain limit there is a condition resembling turbulence in a fluid.

A paper by Mr. A. Robertson described experiments on the strength of free-ended struts, in which Euler's formula is shown to hold good down to the length for which the stress given by this law is equal to the stress at yield, and, below this limit collapse occurs, when the load per square inch is equal to the yield stress. A concluding paper by Mr. A. T. Walmisley described the properties of non-ferrous metals which are of importance in structural engineering.

On the Tuesday morning the first paper on an engineering theory of the gyroscope was read by Mr. J. W. Gordon, who pointed out that when a gyroscope is precessing freely it is absorbing power, while in forced precession it is transmitting. By the application of suitable constraining devices many important practical instruments can be constructed, of small size, for the steering of ships, the prevention of rolling and pitching of aeroplanes, and the like. A short note by

Prof. Wilson on tests of metals and alloys, directed especial attention to the increased brittleness and rise of electrical resistance of duralumin on prolonged exposure to the atmosphere.

Papers dealing with various matters connected with wireless telegraphy were also read by Prof. Howe, who described the nature of the electromagnetic waves employed in radio-telegraphy, and the mode of their propagation. Dr. Eccles discussed atmospheric refraction and absorption as affecting transmission, and Prof. Marchant, the effect of atmospheric conditions on the strength of signals received at Liverpool from Paris and other wireless stations of great power. The final paper on Tuesday morning was read by Mr. W. R. Cooper, and described some practical suggestions for shortening the tests of temperature rise in electrical machines under working loads.

As in previous years, a meeting on the Wednesday was necessary for the consideration of several important papers, and a programme on civil engineering subjects was followed with much interest by a large audience. Dr. Vaughan Cornish described the landslides in the Culebra Cutting of the Panama Canal, especially those in which subsidence of the banks has caused numerous upheavals of the canal bottom.

A paper on the reconstruction of the station at Snow Hill, Birmingham, was read by Messrs. Gleadow and Shackle, in which the structural steel work was very fully described. The effect of harbour projections was discussed by Mr E. R. Matthews, and he advocated the use of piers inclined at such an angle to the shore that moving sand and shingle tends to sweep past the end of the pier and settle on the lee side. The transport and settlement of sand in water was also described, with many experimental illustrations, by Dr. J. S. Owens. An apparatus was also exhibited for exploring sand bars and river beds. It consisted of two concentric tubes closed above and open below, and provided with stop-cocks so that water under pressure can be forced through the inner tube to sink the apparatus in the sand or other material. When the desired level is reached a stop-cock communicating with the annular space is opened to allow a return passage for the water under pressure, and this carries with it a sample of the material at the base of the apparatus, and delivers it at the outlet.

These interesting experiments concluded a very successful programme of the Engineering Section at the Birmingham Meeting.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BRISTOL.—The degree of D.Sc. in engineering will be conferred on Mr. Charles F. Smith, who has submitted to the University records of his research work and publications in connection with electrical engineering.

LONDON.—The degree of doctor of science in chemistry has been conferred upon Mr. F. G. Pope, an external student, of East London College. In addition to a thesis entitled, "The Fluorine Group," Mr. Pope submitted a list of printed contributions to the advancement of science, published independently or conjointly.

The degree of doctor of science in geology has been conferred upon Mr. E. H. Pascoe, external student, of University College. Mr. Pascoe presented a published thesis entitled, "The Oil Fields of Burma," together with some further contributions to the advancement of science, published independently.

The following lectures to advanced students of the University, and to others interested in the subjects

dealt with, are to be given. Admission is free, without ticket:—Eight lectures on recent studies on the phenomena of soil fertility, Royal College of Science, Dr. E. J. Russell, on Wednesdays, beginning on January 28. Five lectures on the Devonian flora, University College, Dr. D. H. Scott, F.R.S., on Wednesdays, beginning on May 6. Two lectures on plant pigments, University College, probably on May 4 and 5, Dr. R. Willstätter, professor of chemistry in the University of Berlin. Two lectures on "La catalyse, et mes divers travaux sur la catalyse," King's College, probably on May 14 and 15, Prof. Paul Sabatier, of the University of Toulouse. Four lectures on the theory of wave-motion, with special reference to earthquake waves, the University, Dr. Horace Lamb, F.R.S., on Fridays, February 20, 27, March 6 and 13. Nine lectures on the theory of heat in relation to atmospheric changes, the Meteorological Office, South Kensington, Dr. W. N. Shaw, F.R.S., on Fridays, beginning on January 23. The fortnightly meetings at the Meteorological Office for discussion of important contributions to meteorology, chiefly in Colonial or foreign journals, will be resumed on Monday, January 19, and will be continued on alternate Mondays until March 30. Four advanced lectures in physics will be given during the third term by M. Jean Perrin, professor of physical chemistry at the Sorbonne. Further particulars will be published at a later date. Four lectures on carbohydrate fermentation, King's College, Dr. A. Harden, F.R.S., on Mondays, January 26, February 2, 9, and 16. Eight lectures on physiological effects of anaesthetics and narcotics, Guy's Hospital, Dr. M. S. Pembrey and J. H. Ryffel, on Thursdays, January 22, 29, February 5, 12, 19, 26, March 5 and 12. Twelve lectures on the Protozoa parasitic in man, the Lister Institute, Prof. E. A. Minchin, F.R.S., on Tuesdays and Fridays during the second term, beginning on Tuesday, January 27. Eight or nine University lectures on anaphylaxis, King's College, department of bacteriology, Dr. L. Rajchman, on Thursdays, beginning on January 15. Three lectures on the place of instinct in evolution," Prof. C. Lloyd Morgan, F.R.S., have been arranged for the second term. During the third term a course of three lectures on the morphology of the cranial muscles in vertebrates will be given by Prof. F. H. Edgeworth. A course of lectures on the Assouan Dam will be given by Mr. J. S. Wilson, on Wednesdays during March.

A lecture, open to the public, on the æther of space, will be given by Sir Oliver Lodge, F.R.S., at Bedford College, on Tuesday January 27. Other free lectures at the college are:—January 22, "Minerals Used as Gem Stones," Dr. C. A. Raisin; February 5, "The Optical Characters of Minerals," Dr. A. Hutchinson; February 19, "Corundum and Spinel," H. H. Thomas; January 19, "Geology of the British Isles," Dr. C. A. Raisin.

Mr. H. J. Crawford, formerly principal clerk for higher education under the Glamorgan County Council, has been appointed secretary to the Appointments Board of the University of London in succession to Dr. A. D. Denning.

MR. J. C. JOHNSON has been appointed to the chair of general biology, botany, and zoology at Auckland University College, in succession to Prof. A. P. W. Thomas, who recently resigned.

By the will of the late Miss Emily M. Easton, who died a few days ago, a legacy of 10,000*l.* is bequeathed to the Durham College of Medicine, Newcastle, and one of 5000*l.* to Armstrong College.

NO. 2306, VOL. 92]

THERE is much interesting reading in the December issue of the *Reading University College Review*. The principal of the college, Mr. W. M. Childs, contributes an obituary notice of the late Mr. George W. Palmer, to whose munificent generosity the college owes much of its success. The college lecturer in geology writes on the charm of palæontology, and the college lecturer in education and master of method on an outdoor school. The leading article deals with the University library, and has already been referred to in these columns.

THE general meeting of the Association of Public School Science Masters will be held at the Imperial College of Science and Technology, South Kensington, on Tuesday and Wednesday, January 13 and 14. The president, Prof. H. B. Baker, F.R.S., will deliver an address, and the following papers will be read and discussed:—"Agricultural Experiments in Public Schools," H. O. Hale; "Present Conditions of Science Teaching in Public Schools," E. H. Tripp, G. H. Martin, and J. R. Eccles; "The Place of Acoustics in a School Course of Physics," D. Rintoul; and "The Relative Value of Physics, Chemistry, and Biology," H. A. Wootton.

THE sixth annual dinner of old students of the Royal College of Science, London, will be held at the Criterion Restaurant, Piccadilly Circus, W., on Saturday, January 31, 1914. The president of the Old Students Association (Dr. A. E. H. Tutton, F.R.S.) will preside, and the guests will include Mrs. Ayrton, Prof. W. Bateson, F.R.S., Sir John Rose Bradford, K.C.M.G., F.R.S., Dr. H. Frank Heath, C.B., Dr. W. P. Herringham, Sir Alfred Keogh, K.C.B., Sir William Ramsay, K.C.B., F.R.S., and Sir Amherst Selby-Bigge, K.C.B. Tickets may be obtained on application to the secretary of the association, 3 Selwood Place, S.W.

AN international kinematograph exhibition and conference will take place in the Zoo Buildings, Glasgow, on February 17-26, 1914, and will be opened by the Lord Provost. Special films will be shown dealing with natural history, medicine, industries, travel, geography, and an entirely new series will deal with a complete survey of the British Isles. Conferences will be held dealing with secular and religious education, emigration, and business. In connection with the education conferences an advisory committee has been formed consisting of prominent Scottish educationists and representatives of school boards and educational associations. All communications and inquiries should be addressed to Mr. H. D. Cotton, 140 West George Street, Glasgow.

THE prime necessity that adolescents should be encouraged to continue their education beyond the stage represented by the primary school was abundantly illustrated at the great public meeting of employers inaugurated by the London County Council, and held on January 5, at the Mansion House. Very many firms had expressed their support of the proposal that employers should aid the council in obtaining the best results from the reorganised system of evening institutes established this year in London, and many prominent business men supported the principal speakers, Mr. J. A. Pease, President of the Board of Education, and Lord Salisbury, by their presence on the platform. There was no lack of evidence that the old scheme of evening schools was inefficient, since but 25 per cent. of the possible students enrolled, and 33 per cent. of the actual students attended badly; and it was demonstrated that wherever employers had given facilities for their young people to acquire additional knowledge under a scheme which allowed the students time for study

in working hours without loss of wages, there had been keenness and improved efficiency among the staff. Mr. Pease pointed out that the problem was of national importance, and that while there might be immediate loss to the employers there would be ultimate gain not only for the employers and the employees, but for the nation at large. He suggested that no employment was beneficial that did not allow reasonable time off for continued education, and charged the business community with the responsibility of a national duty to effect some improvement, which he was sure the London County Council would facilitate.

THE annual report of President Butler on the work of Columbia University, New York, for the year ending June 30, 1913, has now been published. We find that during the year the sum of 123,600*l.* was given to the University to establish permanent funds or to add to existing resources; 67,500*l.* to purchase land or to erect and equip buildings, and 93,300*l.* to be expended for specific purposes, making a total of 284,400*l.*; and yet President Butler says "it is still necessary to repeat words that were used eleven years ago: 'Columbia University as now organised and equipped, may be likened to a giant in bonds. Strength, power, zeal for service, are all at hand, but the bonds of insufficient funds hold them in on every side.'" The unparalleled growth and expansion of the University have far more than kept pace with the new resources that have been provided. The enrolment of students as compared with that for the year 1911-12 shows an increase of 1016, the net total of regular students in every subject reaching 9379. If to the regular students be added those receiving extension teaching and those studying in evening technical classes, the grand total receiving instruction is 13,120. The teaching staff in 1913 numbered 847, as compared with 781 in 1912. President Butler, commenting on these very large numbers, says:—We should deplore growth in numbers unless it were accompanied by a steady increase in the quality of the students. The fact that a rigid examination is insisted upon for admission . . . and that all credentials offered by those who seek advanced standing or who wish to enter the graduate and professional schools are subjected to the closest scrutiny, and the further fact that no student is allowed to shirk his work and to remain long upon the rolls of the University, are an indication of the spirit with which the several faculties, administrative boards, and administrative officers view their responsibilities."

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, December 17, 1913.—Dr. Aubrey Strahan, F.R.S., president, in the chair.—C. Dawson and Dr. A. Smith Woodward, with an appendix by Prof. G. Elliot Smith: Supplementary note on the discovery of a Palæolithic human skull and mandible at Piltown (Sussex). The gravel at Piltown (Sussex) below the surface-soil is divided into three distinct beds. The first, or uppermost, contains sub-angular flints and "eoliths," and one palæolith was discovered there *in situ*. The second is a very dark bed, composed of ironstone and subangular flints. All the fossils so far found in the pit have been discovered in, or traced to, this bed, with the exception of the remains of deer. A cast of a Chalk fossil, *Echinocorys vulgaris*, from the zone of *Micraster cor-testudinarium*, occurred as a pebble. The third bed was recognised only in 1913, and consists of reconstructed material from the underlying Wealden rock (Hastings

Series). It is only about 8 in. thick, and contains very big flints (8 to 15 in. long) which have been little rolled, and are not striated. They are saturated with iron, and have undergone considerable chemical change. They differ very markedly in appearance from the smaller flints in the upper strata. No implements, "eoliths," or fossil bones have been met with in this bed. The floor of the gravel, where the remains of *Eoanthropus* were discovered, has been carefully exposed, and many irregularities and depressions have been found to exist. In some of these depressions small patches of the dark overlying bed remained, and new specimens were discovered. The method adopted in excavation is described. The finds made in 1913 are few but important, and include the nasal bones, and a canine tooth of *Eoanthropus* discovered by Father P. Teilhard de Chardin; also a fragment of a molar of *Stegodon* and another of *Rhinoceros*; an incisor and broken ramus of *Beaver (Castor fiber)*; a worked flint from the dark bed; and a Palæolithic implement from the débris in the pit. It will be noted that the remains are those of a land fauna only. The further occurrence of bedded flint-bearing gravels in the vicinity of the pit is noted. The authors' former conclusions, as to the Pliocene forms having been derived, are maintained. A further study of the cranium of *Eoanthropus* shows that the occipital and right parietal bones need slight readjustment in the reconstruction, but the result does not alter essentially any of the conclusions already published. The nasal bones, now described, are typically human, but relatively small and broad, resembling those of some of the existing Melanesian and African races.—In a note appended to the paper Prof. Elliot Smith points out that the presence of the anterior extremity of the sagittal suture, which hitherto had escaped attention, had enabled him to identify a ridge upon the cranial aspect of the frontal bone as the metopic crest, and thus to determine beyond all question the true median plane. It is 21 mm. from the point of the large fragment (in the frontal region). The backward prolongation of the frontal median crest cuts the parietal fragment precisely along the line determined by Dr. Smith Woodward on other grounds.

Institution of Mining and Metallurgy, December 18.—Mr. Bedford McNeill, president, in the chair.—C. O. Bannister and G. Patchin: Cupellation experiments: a simple method for the detection of the platinum metals in cupellation beads. Following up previous investigations, the authors presented in this paper, and by means of a series of fine lantern slides, illustrations of the method they submit for the detection of platinum and its kindred metals in cupellation beads composed of gold and/or silver. The method consists in transferring the beads, after cooling, and without any squeezing, hammering, or brushing, direct from the cupel on to a plasticine mount attached to a microscopic slide, and examining it with a low-power objective, with vertical illumination preferably. This method possesses the marked advantage that no preparation of the bead by polishing, etching, &c., is necessary before examination, the only precaution advisable being the prevention of undue spitting. The results of the authors' investigations and experiments with gold and silver beads containing varying quantities of platinum, iridium, rhodium, ruthenium, and palladium were to show that, by a simple microscopic examination it is possible to detect platinum in cupellation beads when present below 1.6 per cent.; that is to say, when present below the amount necessary to cause crystallisation visible to the naked eye; the presence of iridium in small quantities may be detected in silver beads; that rhodium and ruthenium