

cutting efficiencies of tungsten-chrome steels with any carbon from 0.8 to 1.8 per cent. (the amount being a matter of indifference), and horizontally the hardening temperatures in degrees Fahrenheit. The short horizontal line "A-B" between 1500° and 1550° F. was alleged to be the range in which, prior to the patent, all tungsten-chrome air-hardening steel had been hardened. The falling line "B-C" between 1550° and 1725° F. was stated to be the breaking-down range discovered by the patentees, along which the cutting power of the steel steadily deteriorated. Then along the rising line "C-D," from 1725° to 2000° F. (the maximum temperature specified in the patent), the quality of the steel improved as the temperature of hardening rose, until in the higher part of this range the turning tools had an efficiency never before achieved in the art, and in effect (to use the words of Coleridge's "Ancient Mariner") the patentees claimed:—

We were the first that ever burst
Into that silent sea.

My late colleague, Dr. A. McWilliam, and I were commissioned to investigate at Sheffield University the accuracy or otherwise of the curve specified in the patent. The results are embodied in Fig. 5. The coordinates are, horizontally hardening temperatures in degrees F., and vertically cutting efficiency numbers obtained by the approximate and relative formula $e = t \times s^2$, where e is an efficiency number, t the time endurance in minutes, and s the cutting speed, *ceteris paribus*, in feet per minute. It will be seen that with a steel containing about 17 per cent. of tungsten, 3 per cent. of chromium, and 1.3 per cent. of carbon, the maximum efficiency number of about 5000 is obtained at the lowest temperature, 830° C., after which the higher the hardening temperature the less the efficiency number, which at 1300° C. or 2400° F. has fallen to 500, or only twice the efficiency of plain carbon steel. In a similar steel, containing, however, only 0.7 per cent. of carbon, the efficiency number at 830° C. is only about 500, but the efficiency steadily rises with the hardening temperature, until at 1300° C. or 2400° F. it reaches the astounding number of about 32,000. In a word, there is no breaking-down range, and so far from the percentage of carbon being immaterial the cutting efficiency is actually a function of the carbon and hardening temperatures.

(To be continued.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The council, in accepting the resignation by Prof. J. H. Poynting of the office of dean of the faculty of science, has passed the following resolution:—"That this council deeply regret the illness which has deprived them of the greatly valued and long-continued services of their former colleague, Dr. Poynting, at their meetings, and earnestly trust that his health, now happily restored, may be preserved for many years."

Prof. Barling has resigned the chair of surgery on his election as Vice-Chancellor.

Dr. Alfred H. Carter has resigned the chair of medicine, and the following resolution has been passed by the council:—"That the council accepts with great regret the resignation of Dr. A. H. Carter of his appointment as professor of medicine in this University. It desires to thank him for his valuable services not only as teacher during the past twenty years, but also for the great assistance he rendered in promoting the union of the medical faculty of

Queen's College with Mason College, a step which materially advanced medical education and the University idea in Birmingham."

CAMBRIDGE.—The following is a summary of benefactions received by the University during the year ended December 31, 1912:—

	£	s.	d.
Gonville and Caius College, towards the maintenance of the new buildings for physiology and experimental psychology	500	0	0
Dr. J. B. Hurry, St. John's College, for the endowment of a research studentship in physiology to be called the Michael Foster research studentship	1100	0	0
Anonymous, for the endowment of the Arthur Balfour professorship of genetics	20,000	0	0
Balfour Library Endowment Fund, subscribers to	2302	3	2
Col. W. Harding, for the endowment of a lectureship in zoology	1100	0	0
St. John's College, towards the equipment of the Solar Physics Laboratory on its installation at Cambridge	500	0	0
Anonymous, for the purpose of increasing the stipend of the director of the Fitzwilliam Museum	100	0	0
	£25,602	3	2

In addition, sums amounting to about 10,000*l.* have been presented to the University. These include 5000*l.* from Mr. Otto Beit, 1000*l.* from the Mercers' Company, 1000*l.* from Messrs. Rothschild and Son, and 200*l.* from Mr. Almeric Paget, M.P., for the new school of physiology.

The Vice-Chancellor gives notice that he has appointed Saturday, April 19, as the day for the election to the Plumian professorship of astronomy and experimental philosophy vacant by the death of Sir George Darwin. Candidates for the professorship are requested to send their names to the Vice-Chancellor on or before Friday, April 11.

The director of the Solar Physics Observatory has, with the consent of the Vice-Chancellor, appointed the following to be members of the staff of the Solar Physics Observatory:—F. J. M. Stratton, to be assistant director; C. T. R. Wilson, to be observer in meteorological physics; F. E. Baxandall, to be first senior observer; C. P. Butler, to be second senior observer; W. E. Rolston, to be first junior observer; W. Moss, to be second junior observer.

LEEDS.—Arrangements are being made for the establishment of a Yorkshire Summer School of Geography to be organised in alternate years by the Universities of Leeds and Sheffield. The course for 1913 will be held at Whitby, from August 4-25, under the auspices of the University of Leeds. The aims of the course are to provide instruction which shall equip students for attacking problems in the regional geography of any area, and to discuss and elucidate problems connected with the teaching of geography. The work of the school will include field work, laboratory work, and lectures on geological, meteorological, economic, and historical aspects of the geography of Yorkshire. The agricultural, mining, textile, and metallurgical industries will be dealt with, as well as questions connected with language and place-names. Further information will be available in June, on application to the secretary, Summer School of Geography, the University, Leeds.

In September next Prof. H. R. Procter will retire

from the chair of applied chemistry (chemistry of leather manufacture) which he has held for the past twenty-two years. Prof. Procter is prepared and desirous to continue in an honorary capacity the researches into the chemistry of the tanning process and the behaviour of colloids, on which he has been engaged. To commemorate the great services he has rendered to leather industries it is therefore proposed to erect and equip an International Research Laboratory, of which he will be honorary director so long as he desires to continue his investigations. The laboratory will be open, without charge, to competent students from every part of the world. The council of the University has provided a site, and an influential committee, representing the scientific and commercial sides of the leather industry, has been formed to appeal for subscriptions. The sum desired is 400*l.* for the establishment of the laboratory, and 300*l.* a year for current expenses and assistance. The honorary treasurer of the committee is Mr. W. J. Rivington, *The Leather Trades Review*, 24 Mark Lane, London, E.C.

The University is to receive a grant of 1000*l.* a year through the Board of Agriculture from the Development Fund for investigations into the subject of animal nutrition. The work is to be carried out in consultation with the existing Research Institution at Cambridge, so that there shall be no unnecessary overlapping between the two schemes.

Science announces that gifts amounting to more than 100,000*l.* to Washington and Lee University, Lexington, Va., are provided for in the will of Mr. R. P. Doremus, who died on February 1.

THE council of the University of Bristol has been informed that the late Mr. Augustus Nash has bequeathed the residue of his estate in trust to pay a near relative the income during life, and afterwards to pay the capital sum to the University in the hope that it may be used to advance natural sciences, particularly chemistry. The sum will be about 18,000*l.*

It will be remembered that, in 1909, the Goldsmiths Company gave 50,000*l.* towards the extension of the engineering department in the Central Technical College. The company has now offered to pay the entire cost of the new building, which means an added gift of 37,000*l.* The Goldsmiths' Company has attached the condition that the portion of the capital belonging to the Imperial College of Science and Technology which will be thus set free shall be added to the endowment fund, the income being used for higher educational and research work.

A MEMORIAL signed by a large number of educationists and others has been presented to the Prime Minister urging the need for an immediate reform of our national education. The petition states that the memorialists "are of opinion that this country has been slow, as compared with some other nations, in recognising how greatly education increases national strength when it permeates every class of the community and makes for the unity of the nation. They, therefore, urge that adequate provision for education in all grades, from the primary school to the university, be made in every defined area of the population; that the artificial barriers between grade and grade should be, so far as possible, broken down, and facilities given to every child, whatever his birth or creed, to proceed unhindered to his appropriate development and towards a national ideal of intellectual, spiritual, and vocational efficiency." The petition urges the Government to undertake forthwith "a comprehensive reform of the national education, making for the good of the nation as a whole.

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THE Admiralty has issued a circular detailing the steps it is proposed to take to supplement the supply of officers for the Navy. The new requirements of the Air and Submarine Services, the establishment of the Dominion Navies, and other causes all make an increased number of naval officers necessary. This greatly augmented demand will be met in part by promotions from the lower deck, by absorption of officers from the R.N.R., and in other ways, but to provide officers available for service in 1920 a new policy is to be adopted in addition to existing plans. The special entry is proposed of a limited number of cadets of about the age of eighteen, who have completed their general education. A number of such cadets not exceeding thirty annually will be admitted by competitive examination of selected candidates. They will be sent to a naval establishment for a course of professional training before being distributed as midshipmen in the fleet. The same subsequent career will be open to them as to officers who have entered through Osborne. They will be free to volunteer for service in any one of the special branches. The entrance examination will be such as to attract candidates who have received at school a good grounding in mathematics, mechanics, and physics. The subjects of examination will be nearly identical with those prescribed for entry to Woolwich, but some weight will be assigned to an elementary knowledge of engineering science in addition to the usual Woolwich subjects. The course of training which these cadets will undergo after admission will consist largely of instruction of a practical kind in naval engineering and in the service applications of electricity. The first special entry under these conditions will take place by competitive examination in June next. An Admiralty Committee will interview each candidate and examine credentials furnished by the headmaster of the school he is attending or last attended. On the report of this committee it will be determined whether the candidate shall be admitted to compete.

DURING the International Kinematograph Exhibition, to be held at Olympia on March 22-29, there will be an educational conference, at which the use and value of the kinematograph as an aid to instruction will be discussed. It would, of course, be absurd to suggest that direct observation, or mental work requiring the individual activity of the pupil, can be replaced as educational factors by the more or less passive contemplation of moving pictures; nevertheless, there are many subjects, which can be illustrated more effectively by the kinematograph than by any other means. Moving pictures representing the peoples, industries, and characteristics of many lands give more accurate impressions than many pages of a geographical reading book; the dry bones of history may be made to live in the minds of pupils by means of some of the historical films available; animals may be seen in their natural haunts; the stages of development of an animal or plant can be followed in quick and orderly sequence; the nature of disease and the value of preventive medicine can be illustrated; and many other points not easily explained can be presented in the most striking manner. At the forthcoming conference the application of the kinematograph to instruction in various branches of the curriculum, and to education generally, will be discussed. Among the speakers will be Dr. Lyttelton (headmaster of Eton), Mr. Stephen Paget, Miss Von Wyss (president of the Nature Study Union), Dr. Walmsley, Mr. F. W. Sanderson (headmaster of Oundle School), Mr. A. P. Graves (late H.M. Chief Inspector of Schools). Messrs. Pathé Freres will show many of their educational films during the conference in illustration of the various subjects brought forward. The

kinematograph may be made such an effective educational instrument that encouragement should be given to all who are endeavouring to discover its best uses and to produce pictures above the penny-dreadful type which is now too common.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 6.—Sir Alfred Kempe, vice-president and treasurer, in the chair.—Prof. J. C. Bosc: An automatic method for the investigation of the velocity of transmission of excitation in *Mimosa*. The research was undertaken to decide the question whether in *Mimosa pudica* stimulus gives rise to a mere passage of hydro-mechanical disturbance or a transmission of true excitation. The results obtained warrant the conclusion that there is transmission of true excitation.—W. K. Spencer: The Evolution of the Cretaceous Asteroidea. An endeavour is made to trace the evolution of the starfish through the whole of the Cretaceous deposits. At the first sight the material appeared to be unpromising, for complete or even fragmentary specimens are rare. It has been found possible, however, to use the isolated marginal plates which are found fairly commonly on weathered chalk surfaces. It is shown that these marginal plates have a shape and ornament characteristic of each distinct species. The species may be arranged in lineages, and the examination of large collections made by English and Continental workers make it feasible to trace the life-history of most of the lineages.—Dr. E. A. Newell Arber: A preliminary note on the fossil plants of the Mount Potts Beds, New Zealand, collected by Mr. D. G. Lillie, biologist to Capt. Scott's Antarctic Expedition in the *Terra Nova*, in 1911. The communication briefly discusses the first results, which have reached this country, of the late Capt. Scott's second Antarctic Expedition. In the winter months of the last two years the *Terra Nova* has been at work in New Zealand waters. During these periods Mr. D. G. Lillie, one of the biologists of the expedition who has been attached throughout to the *Terra Nova*, has been endeavouring to clear up on the evidence of the fossil floras some of the many points which remain unsolved with regard to the stratigraphical geology of New Zealand. In particular, he has made large collections from the Mount Potts Beds, in Ashburton County, Canterbury. Whether these beds contain Glossopteris, as asserted by Hector and others, has long been a matter of dispute, for the whole question whether New Zealand formed part of the great southern Permo-Carboniferous continent of "Gondwanaland" depends entirely on the character and age of the flora of these beds. As it proves, the flora of these beds is thoroughly Mesozoic. The flora as a whole consists chiefly of Rhætic plants, though a few Jurassic types also occur, and thus the age of the beds is either Rhætic or Lower Jurassic. The Mount Potts beds are admittedly the oldest plant-bearing series, in a geological sense, as yet discovered in New Zealand. No Palæozoic plants are known from these islands, and there is thus no evidence that they formed part of "Gondwanaland" in Permo-Carboniferous times.—Sir D. Bruce, Majors D. Harvey and A. E. Hamerton, Dr. J. B. Davey, and Lady Bruce: (1) Trypanosomes found in the blood of wild animals living in the sleeping sickness area, Nyasaland. (2) Trypanosome diseases of domestic animals in Nyasaland. II., *Trypanosoma Caprae* (Kleine). (3) Morphology of various strains of the trypanosome causing disease in man in Nyasaland. I., The human strain.

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Linnean Society, February 20.—Prof. E. B. Poulton, F.R.S. president, in the chair.—Roland H. Deakin: Anatomy of the larva of *Phryganea stricta*.—W. Botting Hemsley: The genera *Radamaea*, Benth., and *Nesogenes*, A. DC. *Radamaea montana* is a shrub from Madagascar, and some imperfect specimens of a similar plant were referred to his *R. prostrata*. On comparing these specimens with some collected on the *Sealark* expedition by Prof. J. Stanley Gardiner and Mr. J. C. F. Fryer, the author found it had to be transferred to its proper genus, *Nesogenes*. Four species of the latter genus are now known, including a new one from Aldabra, named *N. Dupontii*, Hemsley, after the discoverer.—Prof. R. J. Harvey Gibson and Margaret Knight: Marine Algæ collected by Mr. Cyril Crossland in the Red Sea. Part ii. was mainly a list of species, forty-six in number, thirty-five of which are additions to the former list. The authors have observed sexual and asexual organs, not merely on the same plant, but on the same branch, in several species, and consider the phenomenon to be by no means exceptional.

BOOKS RECEIVED.

Problems of Life and Reproduction. By Prof. M. Hartog. Pp. xx+362. (London: J. Murray.) 7s. 6d. net.

Geschichte der deutschen Naturphilosophie. By Dr. C. Siegel. Pp. xv+390. (Leipzig: Akademische Verlagsgesellschaft m.b.H.) 10 marks.

A Foundation Course in Chemistry for Students of Agriculture and Technology. By J. W. Dodgson and J. A. Murray. Pp. x+244. (London: Longmans and Co.) 3s. 6d. net.

An Introduction to Metaphysics. By Prof. H. Bergson. Authorised translation by T. E. Hulme. Pp. vi+79. (London: Macmillan and Co., Ltd.) 2s. net.

The Development of Mathematics in China and Japan. By Y. Mikami. Pp. x+347. (Leipzig: B. G. Teubner; London: Williams and Norgate.) 18 marks.

The Elements of Heating and Ventilation. By Prof. A. M. Greene, jun. Pp. vi+324. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd.) 10s. 6d. net.

Vertebrate Embryology. By Dr. J. W. Jenkinson. Pp. 267. (Oxford: Clarendon Press.) 12s. 6d. net.

Development and Purpose: an Essay towards a Philosophy of Evolution. By Prof. L. T. Hobhouse. Pp. xxix+383. (London: Macmillan and Co., Ltd.) 10s. net.

Aristarchus of Samos. The Ancient Copernicus. A History of Greek Astronomy to Aristarchus, together with Aristarchus's Treatise on the Sizes and Distances of the Sun and Moon. A New Greek Text, with Translation and Notes. By Sir T. Heath. Pp. viii+425. (Oxford: Clarendon Press.) 18s. net.

Materialien für eine wissenschaftliche Biographie von Gauss. By F. Klien and M. Brendel. Heft 2/3. Pp. 143. (Leipzig: B. G. Teubner.) 4.40 marks.

Report of the Thirteenth Meeting of the Australasian Association for the Advancement of Science, held at Sydney, 1911. Pp. xciii+766+48 plates. (Sydney.)

Chloride of Lime in Sanitation. By A. H. Hooker. Pp. v+231. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd.)

The Trades School in the Transvaal. By W. J. Horne. Pp. viii+96. (Johannesburg: Argus Printing and Publishing Co., Ltd.)

Union of South Africa. Department of Agriculture. Report with Appendices for the period May