

The results obtained in practice during the hardening of steel depend upon the conditions under which the transformations of the metal take place, and particularly on the duration and the temperature of the heating, the energy of the quenching bath, and the size of the pieces quenched. The part played by each of these factors was discussed in a lengthy paper contributed by Mr. L. Demozay (Paris). The last paper on hardened steels, contributed by Mr. Percy Longmuir (Sheffield), was somewhat controversial in character. He stated that no metallographical investigation yet published has been of the least service as a guide to the thermal treatment of high-speed steels, and that comparatively little information has been given on the hardening or tempering of carbon steels. The diversity of structure in normal and abnormal products quenched under unsuitable conditions explains to some extent the attitude of practical men towards the microscope, but instead of leading to condemnation it should rather lead to recognition of the value of microscopical examination. Diversity indicates wasters, whilst uniformity denotes correct hardening conditions. The ideal structure, or lack of structure, of commercially hardened carbon steels is produced only in a certain range of quenching temperature, which varies according to the composition of the steel and the contour of the piece to be hardened. Temperatures outside this range result in more or less crystalline patterns, which in the smallest of sections vary from field to field. Although certain of these patterns may give the appearance of special constituents, they are in reality the product of an abnormal quenching temperature, and steels containing them, although hard, are useless for cutting or resisting abrasion.

A paper was then submitted by Mr. B. H. Thwaite (London) on the economic distribution of electric power from blast furnaces. The scheme he proposed is to pool the waste gases from all the furnaces of an iron-making district and to transmit the electrically transformed energy to a central distributing station.

The last paper submitted was by Mr. F. J. R. Carulla (Derby), who described a new blue-black paint as a protective covering for iron. In the preparation of iron and steel rods for wire drawing and galvanising, as also in the preparation of plates for tinning, the iron is kept for a time in a bath of acid to remove the scale. When hydrochloric acid is used, a solution of chloride of iron is obtained, and many methods have been devised to utilise these solutions. It is now suggested that ammonia might be employed for the precipitation of the oxide of iron, seeing that the value of the ammonium chloride is greater than that of the ammonia employed. The blue-black precipitate is a valuable addition to the list of pigments that can be employed with advantage for the protection of structural ironwork.

During and after the meeting the institute was received with lavish hospitality. The members and the ladies accompanying them were entertained at banquets by the Austrian iron trade and by the Municipality of Vienna; they were taken to luncheon on the top of the Schneeberg, to afternoon tea at the Imperial Palace of Schönbrunn, and to a special performance at the Imperial Opera House. They were honoured with a reception at Court, and the council lunched with the Archduke in his palace. On September 26 and 27 the members were divided into three groups, to visit the iron mines and works in Bohemia, Styria and Moravia, and Silesia respectively. Altogether the meeting was without doubt the most enjoyable and the most instructive recorded in the institute's annals.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MR. ANDREW CARNEGIE has given a donation of 10,000*l.* towards the establishment of a technical college at Aberdeen.

MR. ARTHUR ACLAND is to distribute the medals and prizes of the Royal College of Science in the lecture theatre of the Victoria and Albert Museum this afternoon (October 3) at four o'clock.

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At Oxford on Monday the honorary degree of Doctor of Science was conferred upon Dr. Ludwig Mond, F.R.S., who was nominated for the degree at the last Encænna, but was prevented by ill-health from attending then to receive it.

A COURSE of free lectures to teachers, entitled "The Native Races of the Empire," will be given by Dr. A. C. Haddon, F.R.S., at the Horniman Museum, on Saturday mornings from October, 1907, to May, 1908, beginning on October 12. Admission will be by ticket only, to be obtained from the Clerk of the London County Council, County Hall, Spring Gardens, S.W.

THE mayor of the borough of Bethnal Green appeals for assistance for the Bethnal Green Free Library, which is supported entirely by voluntary subscriptions. The great want of the present time is a new and enlarged building in a more prominent position, to accommodate the increasing number of readers and provide reading-rooms for boys and girls. Mr. G. F. Hilcken, the librarian, will be glad to receive donations or subscriptions.

ANNOUNCEMENTS of the following scholarship awards have reached us:—University of London: University College—Bucknill scholarship of 135 guineas, T. C. Graves; entrance exhibitions of 55 guineas each, P. V. Early and B. Woodhouse. Guy's Hospital Medical School—Senior science scholarships for university students, 50*l.*, J. G. Saner; junior science scholarships, 150*l.*, J. F. Mackenzie; 60*l.*, R. D. Passey. Entrance scholarships, 100*l.*, C. S. L. Roberts; 25*l.*, G. D. Eccles; 25*l.*, G. F. Romer.

THE programme of university extension lectures for the coming session has just been issued by the University Extension Board of the University of London. A three years' course on the evolution of mankind as seen in the development of industries and institutions will be carried on at University College, the first term's work being taken by Prof. Lyde on geographic control of human evolution, while Dr. Slaughter will lecture in the Lent term on forms of primitive society, and Dr. Haddon in the summer term on the distribution of races. The course of work on human evolution as seen in the child and the race, brought to a successful conclusion last session, will be repeated at the Goldsmiths' College, New Cross, Dr. Chalmers Mitchell giving the earlier lectures and Dr. Slaughter and Dr. McDougall taking the later lectures.

AMONG recent developments connected with the Northampton (Polytechnic) Institute, London, E.C., referred to in the calendar for the session 1907-8, particular mention should be made of those in the department of technical optics. The most noteworthy of these developments is a course on the production and measurement of light, which is being given to both day and evening students by the electrical engineering and applied physics department and by the department of technical chemistry jointly. The lectures and laboratory work in the electrical engineering department deal with all the various kinds of electric lamps, glow, arc, and luminescent; with the problems of the production of light, and photometry, and general questions of radiation. In the technical chemistry department the subject is taken up from the chemical side, and the whole subject of incandescent lighting dealt with. The properties of rare metals and rare earths, their production, extraction, and use for all kinds of incandescent lighting, both gas and electric, are fully dealt with, and the production of metallic filaments for electric glow lamps is thoroughly studied. In the technical optics department four new classes especially suitable for artisan students have been started. There are also special classes for the instruction of kinematograph operators, which it is hoped will place this kind of work upon a sound scientific basis.

THE calendar of University College, London, for the session 1907-8, which has just been issued, contains many new features. There is a sketch of the history of University College by Dr. Carey Foster, together with a full

statement of the statutes and regulations under which the college is now governed in its new position as an integral portion of the University of London. It also contains a set of plans that show the uses to which the extension of buildings is being put. It appears that the space now available for university purposes is greater by one-third than it was last session. Among the most striking features of the new developments are the following:—the institution of a new department of geology with geological museum, rock museum, and research room; the enlargement of each of the engineering departments and of the drawing office; the enlargement of the department of applied mathematics, and the provision of special rooms to be known as the Galton research laboratories in connection with the Eugenics Institute founded by Mr. Francis Galton. The calendar also contains a section setting forth in full the arrangements for post-graduate courses of lectures and arrangements for research work. The opportunities for research work are full and ample, and the regulation with regard to admission is such that no one qualified to undertake research work ought to be debarred therefrom. It appears from the summary of students that there were no fewer than 171 post-graduate and research students in the college last session, consisting of 140 men and thirty-one women.

At the annual meeting of the governors of the Glasgow and West of Scotland Technical College on September 24 Mr. G. T. Beilby, F.R.S., was unanimously elected chairman of the governors in succession to the late Sir William Robertson Copland. As a chemical technologist, Mr. Beilby enjoys a world-wide reputation. In industrial circles his name is more particularly associated with the Young and Beilby retort, and with a process for the manufacture of potassium cyanide. The introduction of the former revolutionised the process of shale distillation, and enabled the industry to emerge successfully from the struggle for existence; by means of the latter invention he has been instrumental in retaining an important industry in this country. As an investigator in the regions of pure science, Mr. Beilby has also established his reputation, his valuable researches on the surface structure of metals having attracted widespread attention. The second section of the new buildings for the college is in course of erection, and is expected to be ready for occupation in the session 1908-9; operations on the third section, which will complete the buildings as originally planned, will be undertaken immediately. The accommodation provided in the new buildings has enabled the college to extend its work in various directions. Recognition has been given to the importance, in a large engineering centre, of the study of fuels and their applications, and a very complete equipment has been provided in the department of technical chemistry for valuing fuels and illustrating the methods of controlling their use. This consists of calorimeters of all the various types for use with solid, liquid, and gaseous fuels, all the commonly used forms of pyrometer, and an experimental gas producer. Another feature of this department is the plant which has been installed for giving instruction in the methods of conducting technical experiments. The equipment includes grinding mills, filter and hydraulic presses, a hydro-extractor, a small refrigerating plant, pumps, an air liquefier, a steam-jacketed pan, and a double-effect vacuum evaporator plant. The laboratory in the department of motive-power engineering has been fully equipped, and in designing the equipment the object has been, not merely to provide for the illustration of principles set forth in the lecture course, but also to promote the industries of the district by obtaining information ahead of current practice. In addition to the ordinary steam, gas, and oil engines, there are several pieces of plant of special interest; with one of these engines experiments are being made from which it is hoped that information will be obtained to settle the much disputed points in the initial condensation *versus* valve leakage controversy. In the equipment of the other laboratories equal care has been shown, and every effort has been made to render them suitable for the needs of a great centre of industry.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 20.—"The Fluted Spectrum of Titanium Oxide." By A. Fowler.

The author has previously shown that nearly all the dark flutings which are characteristic of the spectra of Antarian or third-type stars correspond with flutings obtained from compounds of titanium.

The first part of the present paper gives an account of experiments which indicate that the flutings in question are produced by a compound of titanium with oxygen, and not by the vapour of the metal itself. The most conclusive evidence on this point was afforded by titanium chloride, which, in the absence of oxygen, did not show the Antarian flutings, although the occurrence of another group of flutings, attributed to the chloride itself, indicated that the conditions were not unfavourable for their production if their existence depended only upon the presence of titanium. Experiments with metallic titanium also showed that the Antarian flutings were only produced in the presence of oxygen.

The result is of some importance as indicating that the source of the fluted absorption in the Antarian stars is at a temperature low enough to permit the formation of a chemical compound, and also as demonstrating the presence of oxygen, of the existence of which in these stars there is otherwise no direct evidence. The investigation has lately gained additional interest in consequence of Prof. Hale's discovery of some of the less refrangible flutings in the spectra of sun-spots.

The second part of the paper contains a revised and extended table of wave-lengths, based upon photographs taken with much greater dispersion than that previously employed. For the first heads of the more prominent groups of flutings the wave-lengths tabulated are 4584.62, 4761.08, 4954.78, 5167.00, 5448.48, 5597.92, 6158.86, and 7054.5. All of these are strongly marked in the stellar spectra, that in the extreme red having lately been photographed by Slipher and Newall. Two of the stellar bands, however, about wave-lengths 5862 and 6493, do not appear to be sufficiently accounted for by titanium oxide. Photographs of the spectrum are reproduced in the paper.

Received July 4.—"The Effect of Pressure upon Arc Spectra. No. 2. Iron." By W. Geoffrey Duffield.

The first part of the paper contains a description of the mounting and adjustment of the large Rowland concave grating in the physical laboratory of the Manchester University. The feature of this is the stability of the carriages carrying the grating and camera, and the novel construction and attachment of the cross-beam, which secure the absence of any disturbance which might be caused by bending or sagging.

The second part describes experiments made with a pressure cylinder designed by Mr. J. E. Petavel, F.R.S., in which an arc is formed between metal poles opposite a glass window, through which the light is examined by means of the grating spectroscope. A system of mirrors allows the image of the arc, however unsteady it may be, to be kept almost continuously in focus upon the slit.

Two sets of photographs of the iron arc in air have been taken for pressures ranging from 1 to 101 atmospheres (absolute), and the results are given below for wave-lengths $\lambda=4000 \text{ \AA.U.}$ to $\lambda=4500 \text{ \AA.U.}$

I. Broadening.

- (1) With increase of pressure all lines become broader.
- (2) The amount of broadening is different for different lines, some almost becoming bands at high pressures, and others remaining comparatively sharp.
- (3) The broadening may be symmetrical or unsymmetrical; in the latter case the broadening is greater on the red side.

II. Displacement.

- (1) Under pressure the most intense portion of every line is displaced from the position it occupies at a pressure of 1 atmosphere.
- (2) Reversed as well as bright lines are displaced.
- (3) With increase of pressure the displacement is towards the red side of the spectrum.