

should be noted that the best steel of this kind made in Sheffield in 1740 would be absolutely incapable of cutting at all under conditions under which the best modern high-speed steel would remove 700 cubic inches of metal before breaking down.

The advantages of this enormous increase in cutting power are manifold, and an obvious example is the relative rapidity with which huge naval guns may now be turned out.

In January, 1909, I had the honour of suggesting to a Royal Institution audience the coming of a new British steel which would have a cutting power four times as great as the best steel then on the market. The skilful application of vanadium by Sheffield steel-makers has practically fulfilled that forecast, and the world-wide sensation and publicity created by the announcement has left Great Britain supreme in this very important branch of scientific steel metallurgy. An aspect of iron and steel metallurgy already demanding attention is the diminishing quantity of the

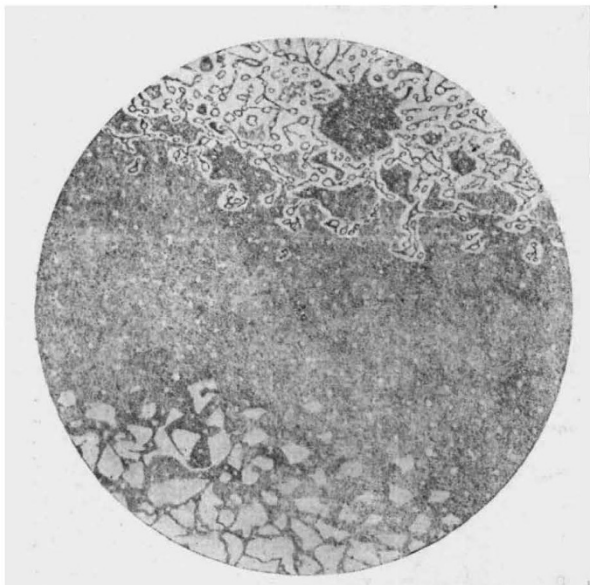


FIG. 8.—Carbon, 1.10 per cent. Vanadium, 13.45 per cent. Transformation stages of vanadium cementite and vanadiferous ferrite into vanadium hardenite. Upper area, mainly vanadiferous ferrite with vanadium cementite nodules, together with a little sorbitic vanadium pearlite. Middle area, ground mass of unsaturated vanadium pearlite, overlaid with undissolved nodules of vanadium cementite. Lower area, mainly structureless vanadium hardenite cells formed from a series of centres and surrounded by walls of the structure described for middle area. Hardening temperature, near 1400° C. Magnified 450 diameters.

world's iron ore supply. To a great extent the latter could be strongly reinforced from the huge deposits of iron sands now lying useless if a simple, economical and direct process of reduction could be devised. That metallurgical science and art will do this eventually seems certain, and I hold an opinion, founded on practical data, that the solution of this hitherto baffling problem is nearer than most metallurgists suppose.

In conclusion, it may be pointed out that the skeleton history of early Sheffield steel metallurgy sketched in this discourse is in some important points in conflict with the somewhat disparaging historical outline written by Lord Macaulay, but in this particular connection there seems to be a modicum of truth in the answer of the schoolboy who, when asked to mention his favourite work of fiction, unhesitatingly replied, "Macaulay's History of England."

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## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

**DURHAM—ARMSTONG COLLEGE.**—The foundation-stone of the new building for the department of agriculture is to be laid on Saturday, April 5. Mr. C. Cochrane has promised the sum of 2,500*l.* towards the equipment of the department, and a Diesel engine has been offered to the college by Mr. G. E. Henderson. The appointment has been approved of Mr. G. D. H. Cole as deputy professor of philosophy, in the absence of Prof. Hoernlé, who is to deliver a course of lectures at Harvard University between October, 1913, and January, 1914.

THE Senate of the University of Dublin has approved the conferment of the honorary degree of doctor of science upon Prof. A. C. Seward, F.R.S., and Prof. the Hon. R. J. Strutt, F.R.S.

By the will of Sir Alfred Jones, 227,100*l.* is left to charitable and educational institutions, and the scheme for carrying out the objects of the will has just been sanctioned by Vice-Chancellor Dudley Stewart-Smith. By the provisions of the will the Liverpool School of Tropical Medicine will receive 40,000*l.*, and a further 40,000*l.* when the annuities payable out of the estate cease. The 40,000*l.* now given is to form a fund to be called the "Sir Alfred Lewis Jones Bequest," and is to be devoted (a) to defraying the cost of a new wing or ward to the Liverpool Royal Infirmary for the reception of persons suffering from tropical diseases, to be called the "Sir Alfred Lewis Jones Tropical Ward"; (b) to the erection of new premises in Liverpool for the study of tropical medicine, to be permanently associated with the name of the testator; (c) to the erection and equipment of a laboratory in Sierra Leone, to be called the "Sir Alfred Lewis Jones Tropical Laboratory"; (d) the residue of the gift is to be used as a permanent endowment. 20,000*l.* is left for the promotion of technical education in British West Africa, and 1000*l.* to Liverpool University.

By the will of Mr. John Fritz, the iron master, says *Science*, his residuary estate, amounting to about 30,000*l.*, is given to Lehigh University primarily as an endowment fund for the maintenance of the Fritz Engineering and Testing Laboratory. It is also announced that Mr. Charles L. Taylor, of Pittsburg, has given Lehigh University a gift for a large gymnasium and a stadium. From the same source we learn that by the will of the late Mr. C. C. Weld, of Newport, R. I., the residuary estate, valued at nearly 800,000*l.*, is, in case his daughter dies without issue, to be divided between the Massachusetts General Hospital and the Massachusetts Institute of Technology.

At the opening of a new technical college and secondary school at Workington last week, Sir John Randles said he desired to commemorate the occasion by a gift of 1000*l.*, to provide a travel scholarship for a student of the college. The gift will yield some 50*l.* or 60*l.* each year to a student to assist him to become proficient in the metallurgy of iron and steel, which is associated with the local industry. The money is to be used by the student, within three years of its being awarded, in visiting some Colonial or foreign metallurgical centre, and may be recreative as well as useful. In this way Sir John Randles hopes some of the pleasure he has enjoyed in life by travel will be secured year by year to a Cumberland youth.

THE President of the Board of Education, Mr. J. A. Pease, spoke at a meeting of the National Union of Teachers at Sheffield on March 15, and referred to the

intentions of the Government with regard to education. He said the Government are not pledging themselves to carry an Education Bill this session; their proposals are to be placed before the House of Commons with a view to their discussion. In the next session of Parliament it is hoped to pass the proposals—with such alteration as may have been thought expedient—into law. It is proposed to add considerably to the powers that local authorities already possess in educational affairs. The Government wish to induce everybody to cooperate so as to make the boy and girl better fitted to render the best possible service to the State. They wish to bring the best brains to the top, and to provide for those not included in that category an education from which they will get most advantage in connection with the factories, or the workshops, or whatever vocation they adopt in after life. Account must be taken of the conditions of youth from the cradle up to the universities, and all the nation's educational energies must be marshalled on a strategic plan. The Government's scheme is not going to be limited to an attempt to solve what Mr. Pease believes to be an insoluble denominational problem. The general principle of the Government's scheme is to secure that the best brains of the whole community should get to the top, and to provide a general diffusion of knowledge, so that we shall possess an educated democracy.

LORD HALDANE is to speak on the educational proposals of the Government at a joint meeting of teachers in secondary and technical schools, to be held at the University of London, South Kensington, on Saturday, March 29. The meeting is organised by the Association of Assistant Masters in Secondary Schools. The headmaster of Eton will preside, supported by Mr. Arthur Acland, and the following resolutions will be submitted:—"That this meeting welcomes the announcement that the Government proposes to deal in the near future with the question of education; hopes that the State will leave to the schools all reasonable freedom in such matters as time-table, curriculum, and careful educational experiments; and, with the object of attracting into the schools a sufficient supply of able and efficient teachers, urges that the increase of salaries and the provision of an adequate pension scheme should be a first charge upon any further grants for secondary and technical education." "That this meeting is of opinion that no pension scheme for secondary and technical teachers in England and Wales can be considered adequate which does not provide benefits approximately equal to those now secured to Scottish teachers."

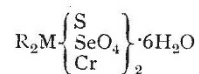
THE Institution of Mechanical Engineers has now established graduateship and associate membership examinations, and has published the rules which will govern the examinations. The institution has in this way decided to cooperate with other engineering societies in the endeavour to define and raise the status of the engineer. The examinations will be held in London twice annually, in April and October. The "graduate" is defined as a person, not under eighteen years of age, who has passed the graduateship examination or reached some exempting standard, and has satisfied the council that he has received or is receiving regular training as a mechanical engineer with the necessary practical and scientific experience. No person is to be elected a graduate after twenty-five years of age. The institution's examination for graduates covers English, elementary mathematics, and scientific knowledge, and matriculation and similar certificates exempt the candidate from the test. The associate membership examination is ordinarily for candidates of from twenty-five to thirty years of age, and covers

general, scientific, and technical knowledge. General knowledge includes an essay on some subject in literature, science, technology, or economics and workshop organisation; scientific knowledge is tested by papers in applied mathematics, physics, and chemistry; and a choice of two technical subjects must be made from seven specified. Several recognised examinations exempt candidates from the institution's associate membership examination, and for candidates over thirty years of age special arrangements are made.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society**, March 13.—Sir Alfred Kempe, vice-president and treasurer, in the chair.—A. Mallock: A simple method of finding the approximate period of stable systems.—Prof. J. S. Townsend and H. T. Tizard: The motion of electrons in gases.—Prof. T. R. Lyle: The self-inductance of circular coils of rectangular section.—Dr. A. E. H. Tutton: Ammonium ferrous sulphate and its alkali-metal isomorphs. The author has added this salt to the thirty-six salts of the series



which he has previously investigated in a detailed manner, both morphologically and optically.—H. Thirkill: The re-combination of the ions produced by Röntgen rays in gases and vapours. Measurements, under widely varying conditions, of the coefficient of re-combination of the ions produced by Röntgen rays in gases and vapours have yielded the following results:—(1) Re-combination seems to take place according to the simple law  $dn_1/dt = dn_2/dt = -an_1n_2$ . (2) For a certain range of pressure, the coefficient of re-combination is proportional to the pressure.—Dr. W. Wahl: Optical investigation of solidified gases. III., The crystal-properties of chlorine and bromine. Crystallised chlorine and crystallised bromine are rhombic. Bromine is strongly pleochroic; chlorine less so. The absorption diminishes strongly when the temperature is lowered. The existence of a complete analogy in the crystalline characters of chlorine, bromine, and iodine has been established.—F. B. Pidduck: The abnormal kinetic energy of an ion in a gas. The abnormal rate of diffusion of negative ions in dry air, investigated by Townsend, would be explained if the negative ions had a velocity of agitation in excess of that of an equal number of molecules of the gas. The present paper investigates this from the point of view of the kinetic theory of gases.

**Geological Society**, February 26.—Dr. Aubrey Strahan, F.R.S., president, in the chair.—Dr. C. A. Matley: The geology of Bardsey Island (Carnarvonshire), with an appendix on the petrography by Dr. J. S. Flett. Bardsey, an island a mile and three-quarters long, lies off the promontory of the Lley (western Carnarvonshire), and forms the isolated extremity of the strip of pre-Cambrian rocks that borders the western coast of the Lley from Nevin south-westwards. The rocks are principally gritty schistose slates, with many thin and some thick bands of grit, quartzite, and limestone; and they contain an horizon of variolitic lava and tuffaceous shale, which indicates that a volcanic episode took place during their formation. Sills of albite-diabase also occur, as well as one or more sills of a crushed granite.—E. B. Bailey: The Loch Awe syncline (Argyllshire). This syncline is a comparatively shallow trough, with well-marked fan-structure due to small-scale isoclinal folding, in which the limbs of the folds are vertical along the axial