

these kinds of iron are all non-magnetic. To make a magnet the steel must be magnetic, and consequently in the Alpha state. It is necessary, therefore, to heat the iron until it is in the Beta or Gamma state, dissolve a quantity of carbide in it, and then by plunging it into cold water make it return quickly to the Alpha state.

Nowadays carbon steel is seldom used for permanent magnets. Tungsten magnet steel is made similarly to carbon magnet steel, but half the carbide of iron is replaced by carbide of tungsten, the total content of carbon remaining unchanged. The effect of replacing part of one solute substance by another is to increase the magnetic coercive force from rather less than 50 to slightly more than 70. When cobalt is used instead of tungsten the coercive force is increased to 180. From the point of view of the manufacturer, tungsten steel is generally the most attractive. Carbon steel is 60 per cent. more costly, and cobalt steel costs three or four times as much. Cobalt steel withstands demagnetising forces much more effectively than tungsten steel. If two permanent straight magnets, one of tungsten steel and the other of cobalt steel, were subjected to demagnetising forces equal to 20 per cent. of their coercive force, the tungsten magnet would lose 14 per cent. of its strength, but the cobalt magnet would only lose 3 per cent.

The author has made many experiments on the loss of the coercive force in all kinds of "permanent" magnets. In a cobalt magnet, for example, the initial coercive force was 180, but after 4.4 years it had fallen to 161.8. The continued falling off in the coercive force of hardened magnet steel is attributed to the passage of carbide molecules out of solution. Immediately after the hardening, the coercive force decreases by about 7 per cent. in the course of the first hundred hours, but after a year the rate of decay seems to settle down to a small steady value. The author calculates that the whole of the surplus carbide in cobalt steel might pass out of solution in about seventy years, the steel then being completely softened. He has noticed, however, a seasonal oscillation in the value of the coercive force, the reason of which is still unexplained.

When manufacturing steel containing tungsten or cobalt for use in making permanent magnets, the greatest attention has to be paid to the heat treatment. The experiments described prove conclusively that if tungsten steel be heated to any temperature between 750° C. and 1214° C., and kept at this temperature for an appreciable time before hardening, its magnetic properties are weakened, the weakening increasing with the length of time the steel has been kept at the high temperature. The deterioration of the steel goes on most rapidly when the temperature is 950° C. At 1200° C. the spoiling of the steel goes on very slowly, the coercive force falling only 0.4 units per hour. At 1240° C., however, which is only 26° above the danger zone, restoration of coercive force takes place at the rate of 15 units a minute. It is obvious, therefore, that great attention has to be paid to the temperature to which the steel is heated, before hardening.

This paper is a sequel to one the author read to the Institution in 1920, and together they give a very complete account of the modern theory and practice of magnet making. The results obtained by the British Scientific Instrument Research Association on the possibility of making magnets of complicated shapes by casting them with molten metal and then subjecting them to a suitable heat treatment are described. The method appears to be very promising and already cast magnets are on the market.

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University and Educational Intelligence.

CAMBRIDGE.—Particulars are now available of the Pinsent-Darwin Studentship in mental pathology, founded in 1924 by Mrs. Pinsent and Sir Horace and Lady Darwin for promoting research into any problem which may have a bearing on mental defects, diseases or disorders. The Studentship is of the annual value of about 200*l.* and is tenable for three years in the first instance. Candidates may be of either sex, and need not be members of the University of Cambridge. Applications must be sent before May 1 to the Secretary, Pinsent-Darwin Studentship, Psychological Laboratory, Cambridge.

EDINBURGH.—The following are among the honorary degrees to be conferred in July:—LL.D.: Brigadier-General the Hon. Charles Granville Bruce, chief of the Mount Everest Expedition; Prof. A. S. Eddington, Plumian professor of astronomy and experimental philosophy in the University of Cambridge; Prof. Robert Muir, professor of pathology in the University of Glasgow; Principal C. G. Robertson, University of Birmingham; Sir Harold J. Stiles, emeritus professor (clinical surgery) in the University of Edinburgh.

LEEDS.—Mr. J. Gordon has been appointed lecturer in bacteriology in succession to Dr. Ross resigned. An honorary demonstratorship has been instituted in the Department of Zoology, and Mrs. H. W. Swift appointed thereto.

LONDON.—In commemoration of the donation of 105,000*l.* made in 1914 by Sir Hildred Carlile, Bart., to the Endowment Fund of Bedford College, it has been resolved that the University chairs of English literature, Latin, botany, and physics tenable at the College shall henceforth be entitled the "Hildred Carlile" chairs.

The following doctorates have been awarded: *Ph.D. (Science)*, Mr. K. C. D. Hickman (Imperial College—Royal College of Science) for a thesis entitled "Studies in Adsorption, with special reference to the Washing of Photographic Products," and other papers, and Mr. D. F. Stedman (University College) for a thesis entitled "The Liquid-vapour Equilibrium of the System Glycerine-water"; *D.Sc. (Physics)*, Mr. F. Simeon (University College) for a thesis entitled "1. The Carbon Arc Spectrum in the Extreme Ultra-violet: 2. Note on the Striking Potential necessary to produce a Persistent Arc in Vacuum," and other papers, and Mr. B. W. Clack (Birkbeck College) for a thesis entitled "On the Study of Diffusion in Liquids by an Optical Method."

ST. ANDREWS.—The Senatus Academicus has resolved to confer the honorary degree of LL.D. on the following, among others: Sir William Bragg, Fullerian professor of chemistry at the Royal Institution, and Director of the Davy-Faraday Research Laboratory; Prof. F. G. Donnan, professor of inorganic and physical chemistry in the University of London; Prof. Etienne Gilson, professor of philosophy of the Middle Ages, Sorbonne, University of Paris; Mr. R. W. T. Gunther, fellow of Magdalen College, Oxford.

A COMPETITIVE examination for two scholarships at the Household and Social Science department of King's College for Women, namely, the Carl Meyer, 80*l.* a year for three years, and the Minor College, 40*l.* a year for three years, will be held on May 21. The latest date for the receipt of entry applications is May 18. They should be sent to the Secretary of the department, Campden Hill Road, W.8.

THE next election to the research scholarships of the Grocers' Company for the prosecution of original research in sanitary science will take place in May, and applications for them are invited until April 14. The scholarships are each of the annual value of 300*l.*, plus an allowance for apparatus and other expenses. They are tenable for a year, with the possibility of renewal for a second or a third year. Applications, upon a form to be provided, should be sent to the Clerk of the Company, Grocers' Hall, E.C.2.

THE second session of the summer school for post-graduate mathematics, organised by the Extra Mural Department of the University of Manchester, will be held at University College, Bangor, on August 24-September 5. The object of the school, which is recognised by the Board of Education, is to afford facilities for advanced study in mathematics to teachers and others who have read mathematics for a university degree. The following three alternative courses are proposed: (a) Atomic structure and the quantum theory, by Prof. Sydney Chapman (Imperial College of Science, London); (b) theory of functions, by Prof. L. J. Mordell (University of Manchester); (c) higher geometry, by Mr. H. W. Richmond (King's College, Cambridge). Particulars may be obtained from Miss D. Withington, The University, Manchester. Application should be made at an early date, as the holding of the courses depends to some extent upon the number of applications received.

IN any college where a large staff is employed, the duties and interests cover a wide variety of subjects, and the results of research work are often scattered over technical journals and the proceedings of many societies, a procedure which fails to provide an adequate view of the work of the college as a whole. The authorities of the Royal Technical College, Glasgow, have been considering this matter, and have resolved to publish an official journal, which will contain records of the research work done in the college, and thus prove an incentive to junior workers in particular. A copy of the first number of the Journal of the college is now before us, and contains records of eleven researches conducted in the college, representing chemistry, metallurgy and engineering. The name of the editor does not appear, but he is to be congratulated upon the production, and especially upon the useful feature of printing a short abstract of each paper immediately under its title. The research activities of the college may be judged by the articles which appear in this issue. These include papers on some acyl derivatives of hydrazine; the formation and constitution of certain double salts with a review and criticism of van 't Hoff's theory; radio-active substances as indicators with a study of the adsorption of lead and bismuth by ferric hydroxide and the adsorption of thorium by basic ferric acetate and by barium sulphate by this method; the hydroferro- and hydroferri-cyanides of the organic bases and some applications; the separation of the components of petroleum with the view of utilising this commodity as a raw material for chemical industries; the iron-carbon diagram; the copper-zinc system; the petrological and chemical examination of slag and metal samples from a basic open-hearth furnace. These papers are followed by two on engineering subjects which occupy nearly one half of the issue; the subjects are the pipe loss in steam nozzles, and turbine wheel friction, on both of which the Royal Technical College has already given authoritative papers. The last paper deals with the structure and mode of life of the sulphur-bacteria and their value as indicators of pollution. The appearance of this Journal will be welcomed alike by science and engineering workers, and cannot fail to be beneficial to research workers in the college itself.

Early Science at Oxford.

April 6, 1686. Mr. Aston communicated amendments of ye Treatise *De Moventibus in Fluido*, and Mr. Ash sent a Demonstration of the 2d and 5th books of Euclide, and ye whole doctrine of proportion done more briefly than heretofore; for both which ye Secretary was ordered to returne ye thanks of ye Society.

April 7, 1685. A very rationall Discourse concerning Weather, written some time since by Dr. Garden (by way of Letter to his Friend Mr. Scougall) was read. The Society ordered their thanks to be returned, both to Dr. Middleton and to Dr. Garden, for the communication of so considerable a piece of Philosophy. One passage in Dr. Garden's discourse deducing the Rise and Fall of Vapours from their weight in respect to that of the Air, (intimating, that ye Vapours arise, when specifically lighter, and fall when specifically heavier, than the Air). Mr. President, not denying this to be true, added hereunto, that Subterranean heats, or other ferments, may bear some part in producing this effect; as impelling upwards those Vapours, which, being specifically heavier than the Air, fall again in a little time: An instance of which he gave in ye boyling of Water, where the vapours are forced upwards by the fire placed under the Vessel, and, having lost that impetus, which raised them, and being intensively heavier than the Air, sink down again.

A Letter from Mr. Aston mentioned a Catalogue of Rarities, brought from Ceylon, by Dr. Heerman of Leyden, and preserved according to a peculiar way known to him. A Transcript of this Catalogue is desired. The remaining half of Mr. Leewenhoeck's Letter concerns the Salts of Wine, Vinegar &c, was read.

April 8, 1684. Mr. Ballard discoursed concerning ye Magnetism of Drills, being by way of answer to a letter of Mr. Aston's on that subject, dated March ye 15th. Six or seven severall Drills were caused to be made before my face; and ye bit, or point, of every one became a North Pole, onely by ye hardning, before they ever came to be workd either in Iron, or any other Matter. That peices of plain Iron in shape like Drills (that is something long, and small,) do always change their Poles, as they are inverted (ye end downward being over ye North Pole) he finds not allways true. Mr. Hunt's experiments on drilling were repeated, but his conclusions were found not to be always confirmed. Mr. Bernard read a letter of his to Dr. Huntingdon, concerning ye place of ye fixed stars, as treated of in severall Arabic authors, given to Merton College Library by ye Doctor.—There being some discourse concerning ye insipid tast of ye Ice of Seawater, it was queried, whether sea-water might not be sweetned, and rendred serviceable.

April 10, 1688. The Standards of the wine, corn, and Ale Gallons, kept at St. Marys, were examined by Dr. Bernard, Mr. Walker and Mr. Caswell. They were filled with Pump-water, and then weighed. The weights compared with a former experiment by this Society of the weight of a cubic foot of water, give the quantitys of these Gallons in cubic Inches, &c.

Wine—Gallon - -	232 : 00	} cubic Inches.
Corn—Gallon - -	270 : 43	
Ale—Gallon - -	280 : 15	

The variation of the Needle at Oxford July 22nd 1687 was found to be 5°20' West.

Dr. Bernard presented the Society with his book *De Ponderibus et Mensuris Antiquis*; for which the Society returned their thanks.