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METALLURGICAL ABSTRACTS

(GENERAL AND NON-FERROUS)

Volume 13

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Part 10

I.—PROPERTIES OF METALS

*Investigations Into the Rapid Deformation of Aluminium. W. Kistler (Schweiz. Arch. angew. Wiss. Techn., 1946, 12, (6), 169–176).—[In German]. X-ray examination of aluminium tubes produced by impact extrusion failed to provide evidence that the type of deformation taking place as the result of a sudden blow is in any way different in kind from that obtaining in slow methods of working. The deformation is by slip along the same planes and in the same directions in both cases. A large part of the paper is devoted to a mathematical consideration of the process of deformation in impact extrusion, based mainly on Kochendörfer's theories of plasticity. This showed that any difference in the plastic behaviour of aluminium in slow and in rapid deformation can be adequately explained by the temp. increase which occurs in the latter case.—N. B. V.

*Blister Formation in Semi-Fabricated Parts of Aluminium or Aluminium Alloys. András Domony (Bányászati és Kohászati Lapok, 1941, 74, 455–460; Chem. Zentr., 1942, 113, (II), 453; C. Abs., 1943, 37, 6230).—It is shown by experiment that the cause of surface blisters, apart from such well known factors as insufficient deoxidation or faulty casting and fabricating procedures, can be segregation in the casting. To obtain a sound structure, the castings should be cooled quickly and uniformly.

*Diffusion of the Stable Isotopes of Nickel in Copper. William A. Johnson (Metals Technol., 1946, 13, (4); A.I.M.M.E. Tech. Publ. No. 2007, 13 pp.).—A layer of nickel was plated on to a copper cylinder and diffusion was made to occur by annealing for 3-4 days at 1053° C. in "Ammogas." Successive layers were then turned off and were analysed for copper. The residue of nickel sulphate was then converted into nickel carbonyl which was examined in a mass spectrometer. The relative abundance of the different isotopes is altered by diffusion, and the results are best explained by assuming that the isotopes diffuse at rates inversely proportional to the square roots of their masses.—W. H.-R.

Lithium : Extraction, Recovery, and Industrial Uses. A. G. Arend (Indust. Chemist, 1944, 20, (235), 423-426).—A short account is given of the occurrence and extraction of lithium. The uses of the metal have developed greatly since 1939 : it is now added to lead (with calcium) to produce a bearing metal, and (usually with beryllium) to aluminium as a hardening and strengthening ingredient. It is also used in the deoxidation of copper and for the removal of such impurities as phosphorus, sulphur, and carbon from other metals; its ready combination with occluded gases suggests a use in the fixation of nitrogen.—P. R.

*Rates of High-Temperature Oxidation of Magnesium and Magnesium Alloys. (Leontis and Rhines). See p. 350.

*The Vapour Pressure of Tellurium. A. Schneider and K. Schupp (Z. Elektrochem., 1944, 50, (6/7), 163-167).—The vapour pressure of molten tellurium was determined and found to obey the law :

$$\log p_{(600^{\circ}-750^{\circ} \text{ C.})} = -\frac{5130}{T} + 6.78,$$

- * Denotes a paper describing the results of original research.
- † Denotes a first-class critical review.

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where p is the pressure in c.g.s. units and T is the temp. in ° abs. The latent heat of vaporization per mol. Te₂ at 900° abs. was found to be $23\cdot8\pm0\cdot3$ kg.-cal. From this value and that of the critical temp., 2260° abs., the calculated latent heat of vaporization λ_{1} at the b.p. is approx. 18-22 kg.-cal., and Trouton's const. lies between 11 and 13.—E. N.

*Anomalous Dependence of the Resistance of Zinc on the Magnetic Field. N. M. Nakhimovich (Zhur. Eksper. Teoret. Fiziki, 1942, 12, (11/12), 539– 541).—[In Russian]. N. measured the electrical resistance of a single crystal of zinc at the temp. of liquid helium in an alternating transverse magnetic field (up to 22.7×10^3 oersteds).—D. A.

Notch Brittleness and the Strength of Metals. E. Orowan (Trans. Inst. Eng. Ship. Scotland, 1946, 89, 165–196; discussion, 196–215).—Present-day conceptions regarding the physical basis of the strength properties of metals are reviewed with regard to mechanical testing and engineering design and the types of fracture which occur in practice, particular attention being paid to brittle fracture and the fibrous type of ductile fracture. Brittle fracture is considered with reference to molecular and technical strength, the experimental verification of the crack theory of brittle strength, and the fracture condition for brittle fracture. The Ludwik theory of notch brittleness is dealt with, and the plastic-constraint factor of the ideal notch and elastic super-stressing discussed as a possible cause of brittle notch fracture. The relationships between notch brittleness and velocity of crack propagation, and between notch brittleness and low-temp. brittleness are also considered, and a criterion given for the mechanism of brittle fracture. Reference is also made to Kuntze's method of "cohesive strength" and to fatigue fracture.—J. W. D. Resistance-Temperature Coefficients of Metals and Semi-Conductors.

Resistance-Temperature Coefficients of Metals and Semi-Conductors. F. Ashworth and E. D. Taylor (J. Inst. Elect. Eng., 1945, 92, [I], (59), 412-413).—An elementary account of the subject is given.—E. V. W.

*The Mutual Displacement of Metals from Vapours of Their Salts and the Application of These Processes to the Protection of Metals. (Izgaryshev). See p. 355.

*On the Relation Between the Liquid and Gaseous States in Metals. Ya. Zcl'dovich and L. Landau (Zhur. Eksper. Teoret. Fiziki, 1944, 14, (1/2), 32-34).—[In Russian]. General considerations regarding the transition of a substance from the metallic to the dielectric state lead to the conclusion that such a transition takes place as an ordinary phase change up to very high temp. Consequently the existence may be expected, in a certain range, of two distinct transitions (at different temp. and pressures), from the metallic to the non-metallic state and from the liquid to the gaseous state.—N. A.

[†]The Physico-Chemical Problem of the State of Metallic Surfaces. (Bastien). See p. 352.

On the Evaluation of the Static Plasticity of Metals. Ya. B. Fridman (Zavod. Lab., 1940, 9, (7), 761–775).—[In Russian]. The fundamental characteristics of static plasticity (elongation and reduction of area) are reviewed, and the significance of these properties in the practical testing of materials is discussed. —N. A.

*Change in Thermal Conductivity of Metals in a Magnetic Field at Low Temperatures (T < 0). V. Rudnitsky (*Zhur. Eksper. Teoret. Fiziki*, 1941, 11, (4), 463-466).—[In Russian]. Mathematical treatment of the dependence of the change of thermal conductivity on the magnetic field and temp.—D. A.

On the Thermoelectric Phenomena in Supraconductors. \hat{V} . Ginzburg (*Zhur. Eksper. Teoret. Fiziki*, 1944, 14, (6), 175–183).—[In Russian]. Theoretical. In the presence of a temp. gradient the normal current in a supraconductor must increase; in an isotropic supraconductor, however, this current is compensated by the supraconducting current and hence is not detected. In supraconducting crystals the resulting c.d. is not zero and the

Observations on the Theory of Supraconductivity. V. Ginzburg (Zhur. Eksper. Teoret. Fiziki, 1944, 14, (5), 134-151).—[In Russian]. The general state of the theory of supraconductivity and a number of questions relating to it are discussed in the light of the latest experimental and theoretical investigations.—N. A.

On the Theory of the Intermediate State of Supraconductors. L. Landau (*Zhur. Eksper. Teoret. Fiziki*, 1943, 13, (11/12), 377-387).—[In Russian]. Theoretical. A quantitative theory of the layer structure of supraconductors in the intermediate state has been evolved. Cf. L. Landau, J. Physics (U.S.S.R.), 1943, 7, 99-107; Met. Abs., 1944, 11, 247.—N. A.

On the Theory of Ferromagnetism. B. T. Geylikman (Zhur. Eksper. Teoret. Fiziki, 1943, 13, (11/12), 399-410).-[In Russian]. Sce Met. Abs., 1945, 12, 76.-N. A.

Energy Levels of Strongly Bound Electrons in Metals. B. T. Geylikman (Zhur. Eksper. Teoret. Fiziki, 1943, 13, (5), 168–180).—[In Russian]. Theoretical calculation of energy levels.—D. A.

*The Absorption of High-Frequency Sound by Metals. L. Gurevich (Zhur. Eksper. Teoret. Fiziki, 1944, 14, (6), 202-204).—[In Russian]. It is shown that sound of high frequency (exceeding the inverse time of the free propagation of Debye waves) is absorbed by metals for a time of the order of the period of the sound, *i.e.*, it is impossible in practice for the sound to be propagated in metals.—N. A.

II.—**PROPERTIES OF ALLOYS**

†Results of Microscopic and X-Ray Investigations of the Process of Age-Hardening in Aluminium Alloys. G. Wassermann (*Metallwirtschaft*, 1944, 23, (44/47), 387-391).—A critical review, with references, of recent work on the phenomena associated with the age-hardening of aluminium alloys.—E. N.

*On the Tendency of Aluminium Alloys to Cracking Under Shrinkage Stresses. A. A. Bochvar and M. K. Khakimdzhanova (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota (Collected Scientific Works of the Moscow Institute for Non-Ferrous Metals and Gold), 1940, (8), 39-45).-[In Russian]. By a method developed by B. and K., aluminium-silicon alloys containing 2, 4, 6, 8, 10, and 12% silicon, and aluminium-copper alloys containing 4, 8, and 12% copper, and pure aluminium (99.5%) were investigated. The effect of the modification treatment of Silumin and the effect of iron on shrinkage cracking were also studied. The tendency of the aluminium-silicon alloys towards shrinkage cracking sharply decreases with an increasing silicon content. Modification by salts has no effect, while modification by sodium increases the tendency to shrinkage cracks. Iron markedly increases the tendency to shrinkage cracking in low-silicon alloys, has less effect on mediumsilicon alloys, and no effect on eutectic alloys. In aluminium-copper alloys, copper slightly reduces the tendency to shrinkage cracking .--- N. A.

*Blister Formation in Semi-Fabricated Parts of Aluminium or Aluminium Alloys. (Domony), See p. 345.

*On Press and Forging Alloys of the Aluminium-Zinc-Magnesium-Copper Type. W. Bungardt and H. Grober (*Metallwirtschaft*, 1944, 23, (44/47), 392-397).—A study was made of the mechanical and stress-corrosion properties of aluminium alloys containing zinc $4\cdot5$, magnesium $0\cdot5-3\cdot5$, copper $0\cdot5-2\cdot5$, manganese $0\cdot5-0\cdot7$, and silicon $0\cdot2-0\cdot8\%$; these alloys correspond to the R.R. 77 series. Samples were tested after solution-treatment and quenching, with and without cold and warm ageing for periods up to 6 months. The results show that: (i) there is an improvement in properties as the magnesium and copper contents increase, the effect of the magnesium being greater than that of the copper; (ii) cold ageing is only complete after about 6 months; (iii) for every temperature of warm ageing there is a critical time, after which reversion phenomena occur, and the time should not exceed 14 hr. at the maximum temperature of 150° C.; (iv) there is an increase in mechanical properties but a decrease in stress-corrosion-resistance on increasing the solution-treatment temperature from 470° to 500° C.; (v) increasing the silicon content to 0.8% causes a decrease in the properties, owing to the formation of Mg₂Si. The alloy containing 3.5% magnesium and 2.5% copper after solutiontreatment at 470° C., quenching, and cold ageing for 6 months had a 0.2% proof stress of 45 kg./sq. mm., a tensile strength of 60 kg./sq. mm., and an elongation of 8-9%. It is concluded that these alloys with their high tensile and corrosion-resistance properties are capable of replacing Duralumin in many press and forging applications.—E. N.

*Segregation of Iron, Manganese, and Titanium in Aluminium Piston Alloys. E. Meyer-Rassler and Lore Laurs (Metallwirtschaft, 1944, 23, (44/47), 398-404) .- A spectrographic investigation of the segregation of iron, manganese, and titanium in aluminium piston alloys is reported. Results are given for the following alloys : aluminium with 11.5-13% of silicon, 1% each of copper, nickel, and magnesium, and less than 0.8% of iron and titanium, with and without manganese ; alloys of the R.R. 53-59 series ; "Y" alloy ; and aluminium with 5-7% magnesium. Little difference was found between chill- and continuously cast billets, but casting in thick-walled moulds with slow rates of cooling led to the formation of a brittle, coarse macrostructure. There was a gradual increase of iron, manganese, and titanium from the top to the bottom of the ingots and the extreme butt often contained three to four times the specified content. "Y" alloy showed little segregation so long as the iron was kept below 0.5%, and segregation was greatest in the aluminium-magnesium alloys. Further additions of manganese caused a pronounced widening of the segregation range. It is concluded that for all alloys the alloying constituents must be kept within the specified range, the molten metal must not be overheated, and pouring must take place at the correct temp.-E. N.

*Aluminium Bronze Parts with High Mechanical Properties. — (Fonderie, 1946, 1, (4), 159-161; also (translation) Found. Trade J., 1946, 79, (1559), 245-246).—[In French]. An "aluminium bronze" containing copper 83, aluminium 10, and iron 7% has a tensile strength of 65.5 kg./sq. mm. (41.6 tons/sq. in.); an elongation of 19.5%, and a reduction of area of 21.2%. The function of each of the three main constituents is discussed. In addition, manganese up to 0.2-0.3% can be used as a deoxidizer. Tin increases the solidification interval and breaking stress, but appreciably decreases the elongation. The addition of 1-2% lead is recommended only if extra machinability is required; the addition of nickel is justified only if increase the breaking stress, it considerably complicates the casting problems.—J. H. W.

On the Second-Order Transformation of β -Brass. P. E. Stepanov (Zhur. Eksper. Teoret. Fiziki, 1940, 10, (1), 103-114).—[In Russian]. Thermodynamic treatment of the ordering process.—D. A.

On the Influence of the State of Ordering on the Elastic Constants of β -Brass. A. Samoylovich (Zhur. Eksper. Teoret. Fiziki, 1944, 14, (6), 205–220).—[In Russian]. Electrostatic forces play practically no part in the increase in the elastic moduli of β -brass which occurs during disordering. The principal factors are apparently the overlapping electron envelopes of the ions and the relation between the oscillatory levels of the lattice and the state of ordering.—N. A.

*The Effect of Phosphorus on the Properties of Gun-Metal. Robert A. Colton and Blake M. Loring (Metals Technol., 1946, 13, (4); A.I.M.M.E. Tech. Publ. No. 1974, 13 pp.).—A study of the effect of phosphorus on the

properties of Navy G gun-metal (copper 88, tin 8, zinc 4%). Chemical analysis showed that under the melting conditions employed most of the phosphorus added was retained by the alloy. This makes it questionable whether the phosphorus really acts as a deoxidizer, particularly when it is remembered that zine itself is a strong deoxidizer. Small amounts of residual phosphorus of the order 0.01-0.02% increase the sp. gr. of the alloys and improve the mechanical properties, but larger proportions are harmful. Phosphorus also improves the running qualities of the molten alloys.—W. H.-R.

*Study of the $K\alpha_1\alpha_2$ Spectrum Lines of Copper in Its Alloys. A. Z. Zhmudsky (*Zhur. Eksper. Tcoret. Fiziki*, 1941, 11, (5), 565-572).—[In Russian]. Z. studied the wave lengths of the $K\alpha_1\alpha_2$ lines of copper in its binary alloys with zine, aluminium, magnesium, bismuth, tin, and silver; in its ternary alloys with antimony and bismuth; and in the quaternary alloys with aluminium, manganese, and iron, and silicon, manganese, and iron. It was found that in alloys consisting of solid solutions the wave lengths were displaced in the long-wave direction, while in alloys containing intermetallic compounds the wave lengths were displaced in the short-wave direction. The magnitude of the displacement was from 0.05 to 0.20 kX. In the copper–bismuth eutectic alloy no displacement was observed.—D. A.

*Coppered-Tungsten Seals Through Hard Glass. A. L. Reimann (J. Sci. Instruments, 1946, 23, (6), 121-124).—When tungsten leads are sealed through glass, slow leakage may occur in vacuum apparatus owing to fine, longitudinal cracks in the tungsten. This difficulty may be overcome by plating copper, or copper plus nickel, on to the tungsten. This first electroplated layer is then fused in hydrogen in order to fill the cracks, after which a second layer is deposited. Details of beading and sealing-in are given, and the optimum coeff. of expansion of the glass is discussed.—W. H.-R.

*On the Problem of Replacement of Scarce Non-Ferrous Metals in High-Strength [Copper] Alloys. I. P. Velichko and L. A. Shipkina (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (9), 546-550).—[In Russian]. Equilibrium isotherms were determined for the beryllium-silicon-copper system at 400° and 800° C. and the beryllium-manganese-copper system at 800° C. Beneficial effects of adding silicon and manganese to the copper alloy containing 1% beryllium are indicated. The effect of a simultaneous addition of silicon and beryllium to copper containing 0.5% beryllium was investigated.—N. A.

*The Electrical Conductivity of the Alloy AuCu₃ in a Transverse Magnetic Field and [Its Relation to] the Ordered Distribution of the Atoms. A. Komar (*Zhur. Eksper. Teoret. Fiziki*, 1941, 11, (6), 717-722).—[In Russian]. K. investigated the electrical conductivity of the alloy AuCu₃ in a transverse magnetic field in relation to the degree of ordering in the alloy and the strength of the field at room temp. and at the temp. of boiling nitrogen.—D. A.

*Diffusion Measurements in Gold and Platinum Alloys. Oswald Kubaschewski and Hans Ebert (Z. Elektrochem., 1944, 50, (6/7), 138-144).—The rates of solid diffusion in alloys of gold and platinum were studied. A series of binary alloys of gold containing 5% by wt. of iron and nickel, and of platinum containing 5% by wt. of copper and nickel were prepared. Small buttons of these alloys were welded to similar buttons of gold and platinum and heated for known times between 750° and 1000° C. for gold and its alloys and 1040° and 1400° C. for platinum and its alloys, during which periods diffusion occurred. The depth-concentration limits in the diffusion zone were then determined by X-ray measurements of the alteration of lattice constants. The diffusion coeff. (D) at the different temperatures (T° abs.) were calculated from the slope of the lines obtained by plotting log D against 1/T and from the Arrhenius formula : $D = A \cdot e^{-Q|RT}$. The diffusion values were found to be : (i) for gold + 5% iron, $D = 10 \cdot e^{-24400/RT}$; (ii) for gold + 5% nickel, $D = 150 \cdot e^{-31200/RT}$; (iii) for platinum + 5% copper, $D = 4.2 \times 10^3 \cdot e^{-55700/RT}$; (iv) for platinum + 5% nickel, $D = 68 \cdot e^{-43100/RT}$. Further experiments are necessary to form a clear relationship between the diffusion rate and other properties such as m.p., atomic radius, electrovalent factor, &c.—E. N.

*On the Effect of Cerium on the Properties of Magnesium-Aluminium Alloys. V. I. Mikheeva (*Izvest. Akad. Nauk S.S.S.R.*, **1941**, [Khim.], (6), 661-667).— [In Russian]. An experimental study was made of the effect of small additions of cerium (0·2, 1·5%), manganese (0·2%), and titanium (0·2%) on the microstructure of magnesium-aluminium alloys. The effect of small quantities of cerium in refining the structure of these alloys during heat-treatment is explained by reference to the equilibrium diagram.—N. A.

*On the Solubility of Iron and Manganese in Magnesium and Magnesium-Aluminium Alloys. A. Beerwald (Metallwirtschaft, 1944, 23, (44/47), 404-407).—A new determination is reported of the constitution of the magnesiumrich alloys of magnesium and manganese and a partial diagram is given. The four methods used in the preparation of the various alloys are described. The liquidus is slightly to the left of that of Grogan and Haughton (J. Inst. Metals, 1943, 69, 241), the eutectic is at 2.1% manganese, the eutectic line is at 652° C., and at this temp. the solid solubility of the manganese is 3.5%. The solubility of iron in pure magnesium is 0.015% at 660° C. and 0.07% at 800° C., the solubility decreasing sharply as the manganese content increases, becoming 0.002% in magnesium saturated with manganese. Additions of aluminium decrease the solubility of manganese and iron in magnesium. Reactivity between the iron pot and the melt at their surface of contact is discussed.-E. N.

*Some Properties of Sand-Cast Alloys in the Magnesium-Rich Corner of the Magnesium-Aluminium-Zinc System. R. S. Busk and R. F. Marande (Metals Technol., 1946, 13, (4); A.I.M.M.E. Tech. Publ. No. 2009, 19 pp.).—Sand castings of numerous magnesium-aluminium-zinc alloys containing from $0^{-6}\%$ zinc and $0^{-10}\%$ aluminium were prepared and were examined in the as-cast, heat-treated, and heat-treated and aged conditions. Comprehensive tests were carried out and diagrams are given showing the effect of composition on liquidus temp., solidus temp., solvus temp., freezing range under equilibrium conditions, non-equilibrium solidus temp. (*i.e.* m.p. of alloys in the as-cast state), non-equilibrium freezing range, porosity, shrinkage, fluidity, maximum practical heat-treating temp., elongation in tensile test, yield strength, tensile strength, and Brinell hardness number. These diagrams enable the correct composition to be chosen for a particular combination of properties. Eight typical commercial alloys of this type are discussed and, in general, their compositions are among the more suitable possibilities.

-W. H.-R.

*Rates of High-Temperature Oxidation of Magnesium and Magnesium Alloys. T. E. Leontis and F. N. Rhines (Metals Technol., 1946, 13, (4); A.I.M.M.E. Tech. Publ. No. 2003, 28 pp.).-The high-temperature oxidation of magnesium and various magnesium-rich alloys was studied in the range 412°-575° C., using atmospheres of oxygen and air. Magnesium forms a protective oxide coating at low temp., but at higher temp. a non-protective, loose scale is formed, while at the highest temp. combustion may occur. Under conditions where the rate of oxidation is const. (linear oxidation), the logarithm of the rate is directly proportional to the reciprocal of the abs. temp. The energy of activation E in this range is 50,500 cal., and the action const. A is 6.2×10^{12} mg./sq. cm. per hr. In general, alloving increases the rate of oxidation if the alloying element depresses the m.p. appreciably. A theory is proposed according to which the early stages of oxidation result in the formation of a protective film. On reaching a critical thickness, the film splits and a linear zero-order action begins at the surface of the metal. At the highest temp.,

vaporization of magnesium and oxidation in the vapour state probably occur.-W. H.-R.

Grain-Boundary Penetrations by Liquid Metals. I.—Some Service Failures. W. R. Smith and P. E. J. Forsyth (*Metallurgia*, 1946, 34, (202), 186–188.— Grain-boundary penetration by a molten metal is discussed with reference to copper, aluminium, and ferrous alloys, special consideration being given to the nature of the alloy and of the liquid metal in contact with it, and to the presence of tensile stresses either applied externally or present as internal stresses across the grain boundary. Intercrystalline failure of copper alloys caused by season-cracking or penetration by molten metals in soldering is dealt with, reference being made to the susceptibility to penetration of alloys with a completely β -structure. The intercrystalline penetration of steels by solders and brazing alloys, and of aluminium-copper-magnesium-zinc alloys by Wood's metal is also considered.—J. W. D.

Theory of the Shrinkage Phenomena in Alloys. A. A. Bochvar and O. S. Zhadaeva (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (9), 534–545).—[In Russian]. An attempt is made to develop a theory of the relationship between linear shrinkage and the alloy composition for various types of binary systems.—N. A.

[†]Some Metallurgical Investigations on Non-Ferrous Alloys Carried Out in England During the War. John L. Haughton (*Mém. Soc. Ing. Civils France*, 1945, 98, (6/8), 323-328).—A brief review of some of the theoretical and practical metallurgical research work carried out in England during the war includes investigations on atomic structure of metals, the allotropic modification of cobalt, the effect of cold work on orientation and crystal structure, age-hardening, the effect of small quantities of silicon, tellurium, bismuth, and other metals on copper, the metallographic examination of aluminium alloys, and the study of the oxidation of aluminium and magnesium by the electrondiffraction method. A list of the equilibrium diagrams or modifications thereof published during this period is given.—J. H. W.

The Chemistry of Metallic Alloys. N. V. Agecv (*Izvest. Akad. Nauk* S.S.S.R., 1941, [Khim.], (6), 653-659).—[In Russian]. The reaction of metals to form solid solutions and intermetallic phases is determined by the electron configuration and atomic vol. of the components.—N. A.

On the Calculation of the Simplest Binary Equilibrium Diagrams. B. Ya. Pines (*Zhur. Eksper. Teoret. Fiziki*, 1943, 13, (11/12), 411–417).—[In Russian]. P. gives approx. equations for the decomposition curves representing phase changes, and explains the relations between the const. from which the simplest types of equilibrium diagram are obtained.—N. A.

On the Question of the Ferromagnetism of Alloys. V. Rudnitsky (Zhur. Eksper. Teoret. Fiziki, 1940, 10, (1), 63-66).—[In Russian]. A discussion of a number of theoretical questions connected with the ferromagnetism of alloys, in particular the dependence of the Curie point and the magnitude of the magnetic saturation on the degree of order.—D. A.

*On Solid Solutions. I.—A Model of Elastic Spheres Applied to Solid Solutions, and the Deviation from Vegard's Law. B. Ya. Pines (*Zhur. Eksper. Teoret. Fiziki*, 1941, 11, (1), 147–158).—[In Russian]. Lattice distortion in a solid solution has been calculated with the aid of a model made up of elastic spheres. The change in lattice dimensions of a disordered solid solution has been evaluated for a series of binary systems. Comparison of the quantities calculated with experimental data has shown that the proposed method of computation enables the sign and order of magnitude of the departure from Vegard's law to be determined for many binary metallic systems. The method is not applicable, however, to alloys of the transition metals, or to gold-silver alloys.—D. A.

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The Change in Resistance of Ordered and Disordered Solid Solutions in a Magnetic Field. V. Rudnitsky (*Zhur. Eksper. Teoret. Fiziki*, 1940, 10, (7), 783-785).—[In Russian]. A theoretical survey is made of the question of the change of the additional resistance of an alloy in a magnetic field at the transition from the disordered to the ordered state. At this transition the degree of anisotropy of the properties of the electrons may change considerably as a result of the increase of the additional Brillouin zones ("superzones") caused by the appearance of the greater degree of order in the crystal lattice. —D. A.

On the Theory of Second-Order Transformations. I.—The Change in the Elementary Crystal Cell with a Second-Order Transformation. II.—Second-Order Transformations in Alloys. E. M. Lifshits (Zhur. Eksper. Teoret. Fiziki, 1941, 11, (2/3), 255-268, 269-281) .- [In Russian]. [I.-] A theoretical consideration of phase changes which are not accompanied by evolution or absorption of heat and which are characterized by a sudden change in heat capacity, i.e. the so-called second-order transformations or Curie points. It is shown that such changes can occur only between phases having different degrees of symmetry, the symmetry of one phase being always lower than that of the other. All possible changes in the Bravais lattice that can take place at the Curie point have been investigated. In the majority of cases the transformation results in the duplication of one or other of the lattice units. [II.--] An investigation was made of the possibility of second-order transformations occurring in order-disorder transformations in alloys of the substitution type. Possible superstructures were considered for face-centred cubic, body-centred cubic, and hexagonal close-packed lattices in which second-order transformations may take place. Such transformations are possible in the ordering of CuPt, β-brass, Cu, AlMn, and Fe, Al. On the other hand, Curie points appear to be impossible in ordered alloys of the CuAu and Cu₃Au type .- D. A.

On the Energy of Mixing and the Energy of Ordering of Solid Solutions. B. Ya. Pines (*Zhur. Eksper. Teoret. Fiziki*, 1941, 11, (6), 725-727).—[In Russian]. A calculation of the potential energy of a solid solution.—D. A.

III.--STRUCTURE

(Metallography; Macrography; Crystal Structure.)

[For all abstracts on the constitution of alloy systems, including X-ray studies, see Section II.—Properties of Alloys.]

*New Method for Preparing Micro-Specimens so that the Edges are Preserved. P. M. Trismakov, F. A. Mikul'chik, and Sh. L. Lobrushkin (Zavod. Lab., 1941, 10, (3), 323-324).—[In Russian]. It is recommended that coarse polishing be carried out by means of tin-lead alloys covered with emery, and fine polishing by means of 40% wax and 60% resin, or 40% paraffin and 60% resin, or alumina.—N. A.

[†]The Physico-Chemical Problem of the State of Metallic Surfaces. Paul Bastien (Mém. Soc. Ing. Civils France, 1945, 98, (6/8), 344–356).—The problem of the state of the true surface of a metal, i.e., the metal/air discontinuity and immediately subjacent metal, has two essential aspects : the geometric and the physico-chemical. The latter is considered from three points of view : (i) the theoretical physico-chemical state, (ii) the real state, very different from (i), and (iii) the principles of the methods of study of the constitution and structural state of the metallic surface. The first concerns crystal structure and growth and the intentional alteration of the surface by cementation, heattreatment, electrolytic deposition, and chemical deposition. The second concerns the alteration in the form of the metal by solidification in a mould, by plastic deformation, and by machining, and its effect on the crystal surface. The methods of studying the state of the surface considered involve the use of the metallographic microscope, the electron microscope, X-ray diffraction, and electronic diffraction. 19 references are given.—J. H. W.

The Determination of Optimum Heating and Cooling Rates in Differential Thermal Analysis. M. V. Zakharov (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (8), 78-95).—[In Russian]. Z. discusses factors affecting the character of the curves obtained in thermal analysis by using the Le Chatelier-Saladin pyrometer.—N. A.

Universal Apparatus for Rapid X-Ray Structure Analysis. L. V. Al'tshuller (Zavod. Lab., 1940, 9, (8), 872-876).—[In Russian]. Descriptive.

—N. A. Apparatus for Rapid X-Ray Structure Investigations at High Temperatures. V. A. Tsukerman (Zavod. Lab., 1940, 9, (10), 1115-1119).—[In Russian]. Descriptive.—N. A.

Rapid Methods of Exposure in X-Ray Structure Analysis. M. M. Umansky (Zavod. Lab., 1940, 9, (8), 869-871).—[In Russian]. Focusing methods are described.—N. A.

The Theory of the Focusing of Axial Pencils of Rays and Methods for High-Speed X-Ray Structure Analysis. L. V. Al'tshuller (*Zhur. Eksper. Teoret. Fiziki*, 1943, 13, (11/12), 888–898).—[In Russian]. Principles and methods are dealt with.—N. A.

The Theory of the Fine Structure of the Absorption Bands of the X-Ray Spectra of Solids. A. I. Kostarev (*Zhur. Eksper. Teoret. Fiziki*, 1941, 11, (1), 60-73).—[In Russian]. A new theory is developed according to which the fine X-ray absorption spectra of solids, and also of polyatomic gases, are caused by the scattering of the waves of X-ray electrons by the atoms in the immediate neighbourhood. The fine structure of the X-ray absorption spectrum of polycrystalline copper has been calculated, and the results are in good agreement with experimental data.—D. A.

Calculation of the Effect of the Thermal Oscillation of the Atoms on the Scattering of X-Rays by Polycrystals. L. M. Brekhovskikh (Zhur. Eksper. Teoret. Fiziki, 1942, 12, (7/8), 287-310).—[In Russian]. An attempt is made to arrive at a theory of the scattering of X-rays in a polycrystalline specimen on the basis of the thermal oscillation of the atoms. The conditions are considered under which the thermal oscillations can be neglected.—D. A.

V.-POWDER METALLURGY

*On the Pressing of Platinum [Powders] and Similar Metals. O. E. Zvyagintsev (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (9), 426-430).—[In Russian]. Experiments were carried out on the pressing of platinum powders and subsequent annealing at 1000° C. for $1\frac{1}{2}$ hr. The results show that platinum obtained in this way has a structure, density, and toughness superior to that of platinum obtained from molten metal.—N. A.

Recent Developments in Powder Metallurgy. R. Kieffer and W. Hotop (*Metallwirtschaft*, 1944, 23, (40/43), 361-366; also (translation) *Metal Ind.*, 1945, 66, (22), 342-344; (23), 354-356; (24), 378-380).—A review of recent literature. Fundamental conceptions, the manufacture of metal powders, and the production of sintered metals and alloys, together with their technical applications, are briefly surveyed.—E. N.

*The Production of Sintered Components by the Die-Pressing Process. K. Marquardt (*Metallwirtschaft*, 1944, 23, (40/43), 377-379).—Mixtures of copperzine and copper-aluminium powders were prepared by cold pressing and sintering and by hot pressing, and the resulting products were compared. It is shown that the compacts made by hot pressing had better mechanical properties, especially density and hardness. Furthermore, the dimensions could be controlled within closer tolerances.—E. N.

*Extrusion in Powder Metallurgy. R. Kieffer and W. Hotop (*Metallwirtschaft*, 1944, 23, (40/43), 379-386).—Compacts were prepared of iron, nickel, copper, silver, tungsten-copper, and tungsten-silver by cold pressing, sintering at a high temperature, and then extruding into wires, tubes, and sections. The microstructure, density, hardness, and mechanical and electrical properties of the resulting products were studied and shown to be almost identical with those of similar cast or wrought materials.—E. N.

Porous Metals in the Chemical Industry. J. W. Lennox (*Indust. Chemist*, 1944, 20, (238), 600-604, 615).—Filters and diffusion diaphragms are available in the form of sheet, discs, and conical capsules; the present account refers mainly to a 90:10 bronze, but copper-nickel alloys are likely to be used for the purpose later. The porous material should preferably be moulded to the exact size and shape required, as its cutting and machining properties are poor. Soldering is practicable if the flow of solder and flux is restricted; spot and seam welding can be carried out easily. The relationship between porosity, pore size, pressure, and rate of flow of petrol, oil, and Cl_4 is shown in tabular form; graphs correlate porosity, thickness, and rate of flow, and diagrams show the design of apparatus for flow tests and for demonstrating the use of porous metal for the separation of liquids of different surface tension.

-P. R.

VI.---CORROSION AND RELATED PHENOMENA

The Corrosion of Metals.—I-IV. —— (Sheet Metal Ind., 1946, 23, (236), 309-320, 334; (227), 527-532; (228), 731-736; (229), 933-940, 954; (230), 1145-1146, 1159; (231), 1333-1342, 1350).—[I.—] The nature and mechanism of corrosion is considered, each contributing factor being discussed separately in some detail. [II.—] The various types of corrosion are considered, including direct oxidation at low and high temp., dezincification, electrolytic corrosion, intercrystalline attack, impingement attack, and corrosion fatigue. [III.—] The factors which influence corrosion testing are discussed and the tests used are described; these include atmospheric, spray, total-immersion, alternateimmersion, and partial-immersion tests in liquids in movement, soil corrosion tests, and tests with simultaneous application of stress and corrosion. The need for standardization of tests is explained. [IV.—] The corrosion of iron and steel is discussed.—R. GR.

Electrolysis and Corrosion of Underground Power-System Cables. L. J. Gorman (*Elect. Eng.*, 1945, 64, (6), 329-336).—A comprehensive review of the subject in which are discussed (i) electrolytic corrosion, (ii) stray-current electrolysis, (iii) electrolysis surveys and tests, (iv) classification of cablesheath corrosion, and (v) mitigation of cable-sheath corrosion.—E. V. W.

Nitric and Sulphuric Acids: [Use of Non-Ferrous Metals in] Transport and Handling. — (Indust. Chemist, 1944, 20, (234), 345-352; (235), 416-422; (236), 475-480; (237), 537-543).—Memorandum No. 13 of the Directorate of Ordnance Factories and the Ministry of Supply. The transport and handling of nitric and sulphuric acids are reviewed. Non-ferrous metals and alloys used for pump or tank linings, valves, and other purposes include aluminium, lead, tellurium-lead, regulus metal (lead containing 12-15% antimony), R. 55 alloy, and Everdur; the special applications of these are indicated.

-P. R.

XI.—Analysis

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VII.—PROTECTION

(Other than by Electrodeposition.)

*The Mutual Displacement of Metals from Vapours of Their Salts and the Application of These Processes to the Protection of Metals. N. A. Izgaryshev (*Izvest. Akad. Nauk S.S.S.R.*, 1941, [Khim.], (6), 673-681).—[In Russian]. The process of the displacement of chromium and aluminium from vapours of their chlorides has been studied, and also the diffusion layers formed by these metals in iron and steel. The corrosion- and heat-resistance of parts protected by aluminium and chromium is demonstrated.—N. A.

VIII.—ELECTRODEPOSITION

*The Production of Nickel Hydroxide by the Electrolysis of the Sulphate. Albert Nicol (Compt. rend., 1946, 222, (18), 1034-1035) .- The formation of nickel hydroxide during the electrodeposition of nickel has been described by various investigators. In the present research, the electrodeposition of nickel hydroxide from solutions of the sulphate running from N/1000 to N was studied, using the method previously described (Compt. rend., 1945, 222, 491; 1946, 222, 382; Met. Abs., 1946, 13, 126). The current was kept const. at about 10 m.amp., and the dissolved hydroxide was estimated by conductivity for solutions of N/1000, N/500, and N/200, and by variation of pH for N/10 and N. The results are tabulated. For normalities of 1/1000 and 1/500 the deposit is green, granular, and non-adherent. For N/200 it is similar, with some greyish spots, apparently due to the basic sulphate, since at N/10 the deposit is still non-adherent and consists of a yellowish film containing a large amount of sulphate. At N, the deposit begins to adhere to the cathode as a greyish mass consisting of nickel with green spots of hydroxide. This precipitate dissolves rapidly in cold, conc. hydrochloric acid. The deposits were analysed by Guichard's method, which showed that the hydroxide was Ni(OH)₂. The transformation to the anhydrous oxide begins at 225° C., or, if the basic sulphate is present, at 700° C. It was also found that during electrolysis the pH becomes approx. neutral. The conclusions reached are similar to those in the case of dilute solutions of silver and copper.—J. H. W.

XI.—ANALYSIS

*A Selective Spot-Test for Copper. Philip W. West (Indust. and Eng. Chem. (Analyt. Edn.), 1945, 17, (11), 740–741).—On a filter paper are placed in succession 1 drop of 20% malonic acid solution, 1 drop of the solution to be tested, 1 drop of 10% ethylenediamine solution, and 1 drop of alcoholic 1% dithiooxamide solution; a green colour develops if Cu is present to the extent of 0.3 microgram at a conc. of 1 in 10⁵. Only excessive amounts of Pd and Pt interfere by giving brown stains.—A. R. P.

*Detection of Ytterbium in Mixtures of Rare Earths. G. Beck (*Helv. Chim.* Acta, 1946, 29, (3), 506-507).—[In German]. A characteristic reaction for Yb, especially valuable since this element shows no absorption bands in the visible spectrum, consists in reducing a (sulphate) solution with Na amalgam in the cold, addition of (a) conc. oxalic acid solution, (b) a small amount of solid naphtho-resorcin, and (c) a vol. of fuming HCl equal to the total vol. of the solution, boiling, cooling, and extracting with ether. The extract is coloured pink if Yb is present.—P. R.

*Quantitative Fluorescent Method for the Determination of Aluminium. A. L. Davydov and V. S. Devekki (Zavod. Lab., 1941, 10, (2), 134-138).--[In Russian]. It is proposed to make use of the reaction of Al with quercetin $(C_{15}H_{10}O_7)$, and the optimum conditions have been determined. The max. intensity of fluorescence is attained immediately after addition of the quercetin and remains const. for several hr.—N. A.

*The Determination and Separation of Bismuth and Magnesium Using 8-Hydroxyquinoline. H. G. Haynes (Analyst, 1945, 70, (829), 129–131).—The Bi is precipitated from a neutral tartrate solution buffered with acetic acid and Na acetate to a pH of 5.2–5.8, and the Mg precipitated from the filtrate by adjusting the pH to >7.5 with NH₄OH. Re-precipitation of the Mg oxine is advisable.—A. R. P.

*New Method of Fractionating the Rare Earths with Nitrilo-Triacetate : Separation of Lanthanum and Cerium. G. Beck (*Helv. Chim. Acta*, 1946, 29, (2), 357-360).—[In German]. The nitrilo-triacetate complex of La, formed by dissolving the oxalate in nitrilo-triacetate, is decomposed by acidifying the solution to pH 6, the La being precipitated as oxalate. Ce^{TV}, Ti, Zr, Th, and Mn^{IV} are precipitated from oxalate-nitrilo-triacetate solutions by rendering these feebly alkaline and oxidizing with H_2O_2 , the Ce separating as the orangecoloured perhydroxide provided that the pH is kept const. by additions of ammonia. A detailed account is given of the precipitation of La as oxalate by acidifying with acetic acid; the purity of the product depends on close control of pH. The method is also applicable to Sa-Gd mixtures.—P. R.

*The Determination of Mercury as Mercuric Iodate. C. H. R. Gentry and L. G. Sherrington (Analyst, 1945, 70, (836), 419–421).—The solution containing 0·1–0·3 g. of Hg is treated with 1 c.c. of HNO₃, diluted to 100 c.c., and treated while boiling with 2 g. of HIO₃ in warm, saturated solution. After 5 min., the solution is cooled rapidly and filtered through a grade-4 sintered-glass crucible, the precipitate being washed with cold 1% HNO₃ containing 2% of HIO₃ and finally thrice with cold water. After drying at 140° C. for 1 hr. the precipitate is weighed; it contains 36·44% Hg. Alternatively the washed precipitate, collected on filter paper, may be rinsed back into the beaker and treated with 3 g. of KI and 5 c.c. of HCl; the liberated I is then titrated with 0·1N·Na₂S₂O₃, 1 c.c. of which = 1·672 mg. of Hg. Ag, Pb, Bi, Ti, Zr, and Fe⁻⁻⁻ interfere.

-A. R. P.

*Micro-Volumetric Method for the Determination of Potassium, Rubidium, and Cæsium. O. G. Sheintsis (Zavod. Lab., 1941, 10, (2), 151-153).—[In Russian]. K, Rb, and Cs are precipitated as hexanitrodiphenylamines, the precipitate washed with dry ether and then dissolved in acetone, and the hexanitrodiphenylamines reduced by excess of V⁺⁺.—N. A.

*The Precipitation of Tin by Tannin. H. Holness and W. R. Schoeller (Analyst, 1946, 71, (839), 70-74).—Sn can be separated from Fe, V, Al, Be, Cu, and Pb but not from Sb, Zr, or Ti, by precipitation with tannin from a hot chloride solution containing NH_4Cl and HCl to 0.05N; the white, flocculent precipitate settles rapidly and, after washing with 2% NH_4NO_3 solution to remove all Cl', can be ignited directly to SnO_2 . In oxalate solutions Sn is somewhat more readily precipitated by tannin than is Ta and hence can be separated from Zr in this solution.—A. R. P.

*The Gravimetric Determination of Tin in Alloys by the Tannin Method. W. R. Schoeller and H. Holness (*Analyst*, 1946, 71, (842), 217-220).—Leadbase white metal is dissolved in Br-HCl, the excess of Br is boiled out, and the solution diluted to 150 c.c. with hot water and boiled for $\frac{1}{2}$ hr. with 1 g. of Ni powder to remove the Sb. The filtered solution is oxidized with Br and the Sn precipitated by the basic-acetate method; the washed precipitate is dissolved in 3-5 g. of $(NH_4)_2C_2O_4$ dissolved in 50 c.c. of N-HCl, and the filtered solution is adjusted to nearly neutral with NH₄OH boiled with NH₄Cl and precipitated with tannin, the precipitate being washed with 2% NH₄NO₃ solution and ignited to SnO_2 . Tin-brasses are dissolved in *aqua regia* with 0.05 g. of Fe wire, the Sn and Fe are precipitated with NH_4OH and washed free from Cu, the precipitate is dissolved in acid oxalate as above and the analysis completed in the same way. Bronzes are analysed in a similar way to brasses, Ni reduction being used in addition if Sb is present. To determine Sn in zinc-base die-casting alloys 100 g. are dissolved in 700 c.c. of 1:1 HCl, a little bromine water is added (or HNO₃ to dissolve Cu), the solution is diluted to 1000 c.c., treated with 1 g. of taunin and ammonia until the Al begins to precipitate, the precipitate is collected, washed, and dissolved in $(\text{NH}_4)_2\text{C}_2\text{O}_4$ and HCl, and the Sn re-precipitated with tannin after adding a little Fe⁻⁻⁻ to act as indicator in adjusting the acidity.—A. R. P.

*Polarographic Determination of Titanium. A. M. Zan'ko, B. A. Geller, and A. D. Nikitin (*Zavod. Lab.*, 1940, 9, (9), 976–979).—[In Russian]. The possibility of determining small quantities of Ti in the presence of large quantities of Al and Fe has been investigated.—N. A.

*The Precipitation of Titanium by Tannin from Chloride Solutions. W. R. Schoeller and H. Holness (*Analyst*, 1945, 70, (834), 317–323).—Ti is precipitated quantitatively from chloride solutions by tannin when the acidity does not exceed 0.02N; in this feebly acid solution it can be separated from V, Al, and Fe^{...}, but not from Zr or Th which are also quantitatively precipitated. The greater part of the Ti is best precipitated in 0.1N-acid containing NH₄Cl and the remainder by neutralizing the filtrate to 0.005-0.01N with dilute NH₄OH. —A. R. P.

*Studies in the Analytical Chemistry of Tungsten. III.—The Precipitation of Tungsten with Tannin. D. A. Lambie (Analyst, 1945, 70, (829), 124-128).— Phenazone (antipyrine) is a suitable substitute for cinchonine in Schoeller and Jahn's tannin method for determining W (Analyst, 1927, 52, 504-514; 1934, 59, 466; J. Inst. Metals, 1927, 38, 500). The alkaline tungstate solution is treated with 10 g. of NH₄Cl, 1 g. of tannin for every 0.1 g. of W present, HCl until neutral and 5 c.c. of 1:1 acid in excess, and then at 60-70° C. with 20 c.c. of 10% phenazone for every 1 g. of tannin. After cooling overnight the precipitate is collected, washed with acidulated NH₄Cl, solution and ignited to WO₃. Organic acids and MOO₄" interfere; the Mo can be separated as sulphide in the usual way.—A. R. P.

*On the Determination of Zinc with Dithizone—a Photometric Mixed Colour Method. G. Kortüm and B. Finchh (*Chemie*, 1944, 57, (9/12), 73–74).—[In German]. In the colorimetric estimation of Zn by dithizone according to the method of H. Fischer and G. Leopoldi (*Aluminium*, 1943, 25, 356–357; *Met. Abs.*, 1945, 12, 334) the errors amount to 1-5% of the Zn content. An investigation was made of the sources of error and the following results were obtained: (i) the extinction factor varies by 0.5% for every 1° C. difference in temp.; a convenient working temp. is 25° C.; (ii) the optimum acidity is at *p*H 6; (iii) the presence of NH₃ in the solution used for decolorizing interfering elements does not affect the Zn determination; (iv) SiO₂ should be filtered off in the initial stages; (v) removal of excess dithizone with dil. Na₂S solution causes a slight loss of Zn as ZnS and the quantity of dithizone should, therefore, be kept as small as possible. It is concluded that when these conditions are taken into account and the method modified accordingly, the determination is accurate to +1.5% of the Zn content.—E. N.

*Determination of Zirconium by the Iodate Method. Yu. A. Chernikhov and T. A. Uspenskaya (Zavod. Lab., 1941, 10, (3), 243-251).—[In Russian]. The conditions for the formation of the iodate $2Zr(IO_3)_3$, KIO_3 , $8H_2O$ have been determined. The proposed volumetric method is based on the relation of Zr^{IV} to IO_3 in this compound and leads to the reductometric determination of IO_3 in the precipitate obtained.—N. A.

*Polarographic Analysis of Aluminium Alloys. I. M. Kolthoff and George Matsuyama (Indust. and Eng. Chem. (Analyt. Edn.), 1945, 17, (10), 615-620).—Detailed procedures are given for determining Fe, Cu, Pb, Ni, and Zn in Al alloys by the polarograph. The alloy is dissolved in 15% NaOH solution and the mixture is boiled with excess of HNO_3 to dissolve all the alloying constituents. After diluting to a standard vol., aliquot portions are taken for the various determinations. Fe and Cu are determined together unless the Fe : Cu ratio is large; in this case the Fe^{...} is reduced with NH₂OH before obtaining the Cu wave. Pb is determined after reducing the Fe^{...}, removing the Cu as CuCNS and adjusting the PH, and the Ni and Zn are determined in a similar solution after addition of Na citrate and pyridine. Various modified procedures are given for special cases where the metals occur in unusual ratios. An analysis for the five metals takes only 45 min.—A. R. P.

*Determination of Copper in Aluminium and Magnesium Alloys by Internal Electrolysis. I. I. Blok, N. A. Shumilova, and N. F. Gorskaya (Zavod. Lab., 1941, 10, (1), 28-31).—[In Russian]. A method has been worked out for the determination of Cu (up to 4.5%) in Al alloys by internal electrolysis without the use of diaphragms.—N. A.

Photometric Determination of Silicon in Aluminium and Its Alloys. W. H. Hadley (*Analyst*, 1945, 70, (827), 43-45).—Criticisms of H.'s method are discussed and filter combinations are given for use with the Spekker absorptiometer.—A. R. P.

*Quantitative Spectrochemical Analysis of Aluminium by the Electric Arc. Ir. J. Eeckhout (Verhandl. K. Vlaam. Acad. Wetensch., Lett. Schoone Kunst. Belg., 1941, [W.], 111, (1), 1-148) .-- [In Flemish]. This paper, which has almost the scope of a text-book, is remarkable in that it deals with the analysis of Al and its alloys by arc spectra instead of with the usual spark. Blocks of metal of 10×20 mm. cross-section are used as the electrodes and an arc 1.2 mm. long is maintained by a current of from 1 to 1.5 amp. Other methods are discussed, including the use of one graphite and one metal electrode, which is said to be second-best. A precision given by a standard deviation of about 4% of the conc. of minor elements present is claimed over most of the range. Calibration lines are given for Fe from 0.0002-4, Si 0.001-10, Cu 0.0003-10, Mg 0.0001-12, Mn 0.07-1.6, and Zn 0.7-20%. Ternary alloys are briefly dealt with, and tables of correction factors are given with the aid of which the data already given can be corrected to allow for the effect of one element on the relative line intensity of another element. Some examples of chemical and spectrographic analysis of Duralumin are quoted to illustrate this method. E. also deals with the principles of spectrum evaluation by means of stepped spectra, taken through a rotating sector and with the necessary corrections for reciprocity-law failure of the photographic plate and for spectrum backgrounds. A chapter is devoted to a statistical analysis of the sources of error in the results, which are predominantly due to the source, plus possibly heterogeneity of the samples. Various makes of photographic-plate emulsion are compared in detail, mostly British, and there is an adequate bibliography.--E. VAN S.

Semi-Quantitative Spectrographic Analysis of Aluminium Alloys. A. A. Yavnel (Zavod. Lab., 1940, 9, (9), 999-1001).—[In Russian]. A method has been worked out for distinguishing between 15 different kinds of Al alloys by means of the steeloscope.—N. A.

Spectrographic Analysis of Aluminium Alloys for Silicon, Iron, and Magnesium. N. A. Sokolov (Zavod. Lab., 1940, 9, (11/12), 1276-1278).-[In Russian].-N. A.

spectra of Al and Mg alloys obtained in a spark of the ordinary type, using Wolbank's method, and in the interrupted arc.—N. A.

The Use of Spectrographic Analysis in the Production of Aluminium. M. S. Beletsky (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 627-628).—[In Russian]. Working conditions are given for the analysis of Al and Silumin. —N. A.

*Spectrum Analysis of Certain [Aluminium and Bearing] Alloys. N. A. Zheleztsov (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 623-626).—[In Russian]. Describes certain improvements in technique for the analysis of Al alloys containing Si, Cu, Mg, Mn, and Cu in the rapid control of production. The use of clips to hold the electrodes and employment of an automatic timer speed up the exposures; also the reduction of self-inductance in the spark circuit reduces the pre-exposure sparking time. Microphotometric methods are used in which the contrast factor of the plates is controlled by measuring two lines. The method is also applied to the estimation of Sb, Pb, Fe, and Cu in bearing metal, average errors of the order of 2-3% being obtained. By rapid processing and a radiant-heat drier the time needed for duplicate analyses is shortened to about 15 min.—E. VAN S.

*A Contribution to the [Spectrographic] Analysis of Iron-Nickel-Aluminium Alloys. I. M. Minz (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 669– 670).—[In Russian]. Arc spectra and a visual steeloscope have been used for checking the composition of Fe-Ni-Al alloys and it was observed that the length of the arc gap had a strong influence on the relative intensity of the spectrum lines. Co lines in these alloys are fainter than in steel of the same Co content, and the annealed alloys show weaker lines of the other elements relative to Fe, especially if the Al content is high.—E. VAN S.

Spectrum Analysis of Silumins by the Method of Photographic Interpolation at the Ural Machinery Works (Uralmashzavod.). A. D. Glukhov (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 619–622).—[In Russian]. Spark spectra of Al alloys are used with a method of photographic interpolation in which standard alloys are not repeated on each plate. By selecting the exposures so that the blackenings lie in the linear portion of the curve, the same calibration graphs can be used for various plates. A table of the lines used for the estimation of Si, Mg, Fe, Mn, and Cu in Al alloys is given and the sources of spectrographic instead of chemical methods in foundry control is estimated.

-E. VAN S.

Experience of Spectrographic Work in the Works' Laboratory. V. A. Kuznetsov (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 643-644).—[In Russian]. Deals with Al alloys.—N. A.

*Spectrum Analysis of Metallic Antimony by Means of Compressed Electrodes. S. M. Solodovnik and A. K. Rysanov (*Izvest. Akad. Nauk-S.S.S.R.*, 1945, [Fiz.], 9, (6), 635–638).—[In Russian]. Spark spectra of tablets made from powdered Sb were used for the analysis of Sb alloys containing Pb, Bi, Cu, Sn, Ag, Cd, As, Au, Co, Ni, Mn, and Fe and tables of the lines used are given. Synthetic standards were made from Sb alloys, powdered and diluted with pure Sb. The richer alloys were also diluted for analysis so that comparisons were only made with <0.3–0.5% of the element present in the tablet. The method results in a probable error of 3–5% of the conc. of the element estimated.—E. VAN S.

*The Cobalticyanide Ion as a Precipitant for Metal Ions. Determination of Cadmium in Pb-Sb-Cd and Pb-Sn-Cd Alloys, Silver in Lead, and Manganese in Citrate Solutions. B. S. Evans and D. G. Higgs (Analyst, 1945, 70, (830), 158-165).---Cd is completely precipitated with $K_3Co(CN)_6$ in 15-20% HNO₃ or H_2SO_4 solutions but not from chloride solutions. To determine Cd in cable alloys containing 0.15-0.25% Cd, 5 g. of alloy is dissolved in 1:1 HNO₃ and

-N. A.

the solution evaporated with KNO₃ to remove Sn. The filtrate is adjusted to 15% HNO₃ and treated with 20 c.c. of 10% K₃Co(CN)₆ solution. The precipitate is collected, washed with 5% HNO₃ containing 1% of the precipitant, and decomposed with NaOH; the resulting Cd(OH₂ is washed free from Co, dissolved in H₂SO₄, purified by precipitation with H₂S, and converted into CdSO₄ for weighing. A similar method can be used for determining Zn in Pb, or Ag in Pb, the Ag being finally weighed as AgCl. Mn is completely precipitate being converted to MnO₂ with NaOH and H₂O₂ and determined by the bismuthate process. Quadrivalent V is precipitated completely from sulphate solutions by K₃Co(CN)₆ and can subsequently be determined volumetrically after freeing it from Co by precipitation as vanadyl hydroxide with Na₂S₂O₄ and NaOH.—A. R. P.

*Polarographic Determination of Bismuth, Nickel, Lead, and Zinc in Copper. S. A. Pletenev, E. I. Dubovitskaya, and T. V. Aref'eva (Zavod. Lab., 1940, 9, (8), 824–827).—[In Russian]. Pb and Bi are separated from Cu by precipitation with hydroxide of iron and polarographed in 6N-HCl. To determine Ni and Zn, Cu is removed by electrolysis and the polarographic analysis is then carried out in 0.1N-CH₃COONH₄ and 0.025N-KCNS.—N. A.

*Electrogravimetric Determination of Copper in Copper-Base and Tin-Base Alloys by Controlled-Potential Electrolysis. James J. Lingane (Indust. and Eng. Chem. (Analyt. Edn.), 1945, 17, (10), 640-642).—The alloy (0.5-2 g.) is dissolved in 8 c.c. of HCl and 2 c.c. of HNO₃, the solution boiled to expel NO₂ and free Cl₂, treated with 100 c.c. of 23% Na tartrate solution, I g. of urea, 10 c.c. of 20% NaOH solution and 1-2 g. of NH₂OH,HCl, diluted to 200 c.c., and electrolysed at -0.36 V. versus a saturated calomel electrode using platinum-gauze cylindrical electrodes, the anode being half the dia. of and inside the cathode. The Cu is completely precipitated in 60 min. if the solution is stirred with a motor-driven glass paddle, the shaft of which passes through the anode cylinder. Relatively large amounts of Sn, Pb, Sb, In, and many other metals do not interfere if the potential is controlled to ± 0.02 V. of -0.36 V.—A. R. P.

*The Photometric Analysis of Copper-Base Alloys. II.—The Determination of Manganese by Oxidation at Room Temperature. John H. High (Analyst, 1945, 70, (826), 18-19).—An aliquot of the solution containing 0.25 g. of Cu is treated with 10 c.c. of 15% (NH₄)₂S₂O₈ solution, 1 c.c. of 7.5% AgNO₃ solution, and 1 c.c. of 10% urea solution. After 15 min. the solution is diluted to 100 c.c. and the absorption measured in the Spekker apparatus.—A. R. P.

An Analytical Method for the Determination of Gold, Platinum, and Palladium in Copper-Nickel Slimes. N. K. Pshenitsyn and P. V. Simanosvky (*Izvest. Sekt. Platiny*, 1940, (17), 135-138).—[In Russian]. Conc. HCl is recommended for dissolving Cu and Ni. Pd and Pt dissolved at the same time are subsequently separated by HCOOH.—N. A.

Analysis of Copper Slimes Containing Metals of the Platinum Group. N. K. Pshenitsyn and P. V. Simanovsky (*Izvest. Sekt. Platiny*, 1940, (17), 129–133).— [In Russian]. P. and S. give a scheme for the analysis of slime and describe a method for the determination of moisture and platinum-group metals.

*The Analysis of Chromium-Zinc Bronzes. Z. S. Mukhina and M. L. Mironenko (Zavod. Lab., 1941, 10, (2), 145-147).—[In Russian]. A mixture of acids is used to dissolve the bronze; a method has been evolved for determining Zn with ortho-oxyquinoline.—N. A.

*The Determination of Iron, Manganese, and Aluminium in Bronzes After Separation of Copper as Oxalate. F. H. Edwards and J. W. Gailer (*Analyst*, 1945, 70, (835), 365-368).—The drillings (2 g.) are dissolved in 20 c.c. of $1:1 H_2SO_4$ and 20 c.c. of 100 vol. H_2O_2 keeping the temp. below 40° C. After boiling to remove the excess of H_2O_2 , 10 c.c. of 1:1 HCl is added to dissolve any precipitate followed by 150 c.c. of 10% $H_2C_2O_4$ solution. The mixture is boiled for 10 min., cooled, diluted to 250 c.c., and decanted through a dry double Whatman 40 paper. An aliquot 50 c.c. is taken for Fe and Mn, evaporated with 10 c.c. of H_2SO_4 and 5 c.c. of HNO₃ to fumes, diluted to 100 c.c., boiled, and cooled; 10 c.c. is used for Fe by the thiocyanate method and 20 c.c. for Mn by the periodate method, both metals being estimated by means of the Spekker absorptiometer. An alternative procedure is given for low Fe contents in Cu alloys. Al is determined by treating a 100 c.c. aliquot of the oxalate filtrate exactly as in the Mn and Fe method to destroy oxalic acid, then removing Cu, &c., with H_2S , separating Fe and Al from Mn, &c., by the basic-acetate method, determining the Fe iodometrically and the Al by precipitating with thiosulphate followed by ignition to Al_2O_3 .—A. R. P.

*The Volumetric Determination of Tin and Antimony in Brasses and Bronzes After Their Separation by Distillation. H. L. Lehmann (Analyst, 1945, 70, (836), 428-430).-The sample (2.5 g.) is dissolved in 20-30 c.c. of HCl and 10-15 c.c. of 100 vol. H, O, added in 2-3 portions and the solution is transferred to a distillation flask with the aid of 20 c.c. of $1:1 H_2SO_4$. The flask is heated by means of a cyclohexanol bath and the distillate passes through a condenser to a receiving flask, distillation being accelerated by bubbling a slow stream of air through the solution. When the cyclohexanol boils, 25 c.c. of a 1:3 mixture of conc. HCl and HBr is slowly run into the distillation flask; when this acid has distilled off, a further 15 c.c. of the same acid mixture diluted with 30 c.c. of water is run in in a slow stream and this is distilled off; finally, the first distillation with conc. acid mixture is repeated. The distillate is reduced with a nickel spiral and the Sn" determined by titration with KI-KIO3 mixture. If Sb is also present the distillate is boiled with 5 g. of KClO3 to expel Br, then with 2 g. of Na2SO3 to reduce the Sb, and titrated with 0.1N-KBrO, for Sb. The titrated solution is reduced with Ni for the titration of the Sn.-A. R. P.

Spectrum Analysis of Non-Ferrous Alloys [Brasses and Bronzes]. V. K. Prokofiev (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (9), 607-618).—[In Russian]. Arc and spark spectra of brasses and bronzes have been used for analysis (a) by means of a steeloscope in the visual region, (b) by a spectrograph, and (c) by a direct photocell and filter instrument used as a spectrophotometer. The influence of the upper electrode of the arc on the spectra is noted. Cu, Ni, Al, and graphite were each tried and gave different relative intensities for the Pb, Sn, and Zn lines in the spectra of brasses; in general, Cu is better.—E. VAN S.

Some Results of the Use of Spectrographic Analysis [for Brass]. A. R. Striganov (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 641-642).—[In Russian]. Description of a method used for determining Pb (0.01-0.20%) in brass (62 and 70% Cu).—N. A.

Quantitative Spectrum Determination of Aluminium in Tin Bronzes. N. F. Zakhariya (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 629-632).—[In Russian]. Arc spectra of bronzes were used to estimate Al in the range of 0.01-0.05% in tin bronzes with a great saving of time. Al lines are compared with Ni lines from the nickel rod used as the second electrode. A comparison of chemical and spectrographic results is given in detail and the results are in fair agreement.—E. vAN S.

Spectrographic Analysis of Bronzes. Simplification of the Three-Standard Method. M. S. Ashkinadzi and R. S. Tripol'skaya (*Zavod. Lab.*, 1941, **10**, (6), 624–626).—[In Russian]. A method is proposed for constructing analytical curves from a single standard. The analysis of bronze for Zn (0.8–3.3%), Sn (5.7–10.2%), and Mn (0.7–1.8%) gives satisfactory results by this method.

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Cf. Izvest. Akad. Nauk S.S.S.R., 1941, [Fiz.], 5, (2/3), 289-292; Met. Abs., 1944, 11, 299.—N. A.

Method for the Spectrographic Analysis of Tin Bronzes in the Ultra-Violet Region of the Spectrum. L. E. Vvcdensky and A. K. Andon'eva (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 633-634).—[In Russian]. Describes the determination of six constituents in the following ranges of composition : Sn 6-11, P 0.01-1.35, Zn 0.05-3, Al 0.01-0.20, and Pb 0.05-0.40%.—N. A.

The Determination of Nickel in Magnesium Alloys. J. T. Minster (Analyst, 1946, 71, (839), 74–77).—An apparatus for separating Ni from Mg by electrodeposition into a Hg cathode is described with reference to drawings and a wiring diagram. The Mg in the spent electrolyte is then determined with 8-hydroxyquinoline.—A. R. P.

*Spectrochemical Analysis of Palladium in Platinum. P. Van der Voort (Bull. Soc. Chim. Belg., 1945, 54, 57-72).—Various types of arc- and spark sources are compared for the estimation of Pd in Pt. For sensitivity, a D.-C. arc between a Pt globule and a graphite cathode is recommended; with this as little as 0.001% of Pd can be detected. Spark spectra are much less sensitive. An arc with mechanical interruptions was tried, but not an A.-C. arc. A glow discharge can be obtained in air at ordinary pressures between a Pt globule and an Ag wire within narrow limits of current: 0.25 amp. at 370 V. is recommended across a 1.5-mm, gap. Pd can be detected in this source down to 0.01% and the reproducibility of spectra is quite good. Chemical methods of purifying Pt are also discussed.—E. VAN S.

*Determination of Thickness and Composition of Tin-Lead Alloy Coatings on Terne Plate. J. W. Price (Analyst, 1946, 70, (826), 10-14).—A sample of known area to give ≥ 0.8 g. of coating is degreased cathodically in 1% Na₂CO₃ solution, and then immersed in 100 c.c. of a solution of 20 g. of Sb₂O₃ in 800 c.c. of HCl and 200 c.c. of water until the coating is dissolved; the Fe base is then cleaned from metallic sponge by means of a rubber-tipped rod, removed from the solution, washed, dried, and weighed. The solution is boiled for 10 min. in an atmosphere of CO₂, cooled, diluted with an equal volume of water, treated with 1 g. of KI and starch, and titrated for Sn with KIO₃. The difference between loss in wt. of the plate and the Sn content is Pb.—A. R. P.

*The Determination of Small Quantities of Silica, Alumina, and Lime in Tungsten Carbide Powder. C. E. A. Shanahan (Analyst, 1945, 70, (836), 421-423).—The carbide (2.5 g.) is heated in a silica boat in a slow stream of HCl (gas)-air at 650° -800° C. or CHCl₃-air at 600° -650° C. until all the W is volatilized as chloride and oxychloride, leaving a white residue which is analysed by any convenient method for SiO₂, Al₂O₃, and CaO. During volatilization of the W the temp. must not exceed the above-mentioned limits otherwise SiCl₄ and AlCl₃ are volatilized.—A. R. P.

*Quantitative Analysis by Internal Electrolysis. A. Schleicher and T. Todoroff (Z. Elektrochem., 1944, 50, (1), 2–7).—S. and T. review the technique of quantitative analysis by galvanic or internal electrolysis. The theoretical basis, types of apparatus, electrolytes, and the influence of agitation and temp. of the solution are discussed. A method for the estimation of Cu in the presence of various conc. of Pb and Fe is described in detail, together with its application to the analysis of Cu alloys and copper pyrites.—E. N.

Internal Electrolysis [for Quantitative Analysis]. W. Cule Davies and C. Key (Indust. Chemist, 1944, 20, (237), 544).—Internal electrolysis, *i.e.* the deposition of a metal from a dissolved salt by means of an electric current generated in the cell itself, permits certain easy separations to be made, which if carried out by "external" electrolysis would need close control. In order to ensure quantitative separation, the metallic deposit must be neither spongy nor too hard and adherent. An illustrated account is given of an assembly carrying thermometer, two anodes enclosed in permeable cells, a platinumgauze electrode, and stirring gear. The estimation of Cu in pyrites by means of this apparatus is reported in detail, and the results compared with those obtained by other methods. The accuracy of the method is illustrated by a tabulated comparison of the "known" and "found" percentages of Cu in five common alloys in the presence of several interfering elements. A further tabulated summary indicates conditions for a number of separations, *e.g.*, of Cd and of Ni in the presence of large amounts of Zn, Cu (in steel), Ag (in Pb), and Hg (in brass).—P. R.

Qualitative Analysis of Non-Ferrous [Scrap] Metals. A. D. Mayants (Zavod. Lab., 1941, 10, (3), 362-372).—[In Russian]. A review of drop methods for the analysis of non-ferrous scrap.—N. A.

Qualitative Analysis Without Sulphuretted Hydrogen. —— (Indust. Chemist, 1944, 20, (239), 672).—A short account is given of a scheme of qualitative analysis suggested by L. Rosenthaler (Helv. Pharm. Acta, 1944, 19, 95), consisting in the precipitation of metals from appropriate solutions by means of Mg metal, after the elimination of Pb, Ag, and Hg'. The metals are precipitated in 3 groups, each of which is then examined by means of special reagents. —P. R.

[†]Spectrochemical Analysis of Metals and Alloys. P. Van Pee (*Techn.*-Wetensch. Tijdschr., 1944, (3), pp. 8).—[In Flemish]. A competent review, with bibliography, of continental publications, mostly of the period 1933-1942. —E. VAN S.

Experimental Work in the Spectrographic Laboratory. V. N. Nikitin (*Izvest. Akad. Nauk S.S.S.R.*, 1945,*[Fiz.], 9, (6), 645-646).—[In Russian]. Describes the determination of Mg, Fe, Mn, Si, Zn, Cu, Ni, P, Sn, Pb, and Al in Cu and Al alloys.—N. A.

On the Spectrographic Analysis of Powdered Specimens. N.S. Vasileyskaya (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 639-640).---[In Russian]. A method is described for determining 0.03-0.2% Ag.---N. A.

The Present Position of Spectrographic Analysis in the U.S.S.R. and Proposals for Its Development. G. S. Landberg (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 585-591).—[In Russian].—N. A.

Methods of Calibration in Spectrographic Analysis. C. Weyn (Techn.-Wetensch. Tijdschr., 1944, (3), pp. 14).—[In Flemish]. A detailed survey of methods of calibration used in spectrographic analysis by microphotometric methods. After a discussion of photographic theory as applied to microphotometry, various methods of determining the relative intensities of spectrum lines from the microphotometer measurements are described and compared. The method in which a rotating sector is used so that part or the whole of the calibration curve can be established for each line measured is selected as best, and the simplification of this method by graphical calculating devices is described in detail. Special attention is paid to Belgian and American work. The methods of making background correction, and the determination of relative intensities from measurements of line widths are also described.

-E. VAN S.

Instruments for Spectrum Analytical Investigations and Their Production in the U.S.S.R. S. A. Khrashanovsky (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 721-732).—[In Russian]. K. reviews the production of optical instruments for spectrochemical analysis in the U.S.S.R., and describes the design of some of the instruments, including a new type of steeloscope. Standard electrical equipment for light sources will also be made.—E. VAN S.

Some New Types of Apparatus for Spectrographic Analysis. L. M. Ivantsov (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 733-738).—In Russian]. A review.—N. A.

XII.—LABORATORY APPARATUS, INSTRUMENTS, &c.

(See also "Testing" and "Temperature Measurement and Control.")

An Apparatus for the More Accurate Determination of Hydrogen Liberated from Acids by Metals. B. S. Evans and D. G. Higgs (Analyst, 1945, 70, (835), 356-362).—An apparatus and technique is described for evaluating the metal content of magnesium, aluminium, zinc, and other metals by measuring the hydrogen evolved when the metal is dissolved in acid. The apparatus used consists of a measuring vessel with a single graduation on a constriction in the neck, with a water jacket with efficient water circulation. The amount of metal taken is such that the vol. of hydrogen evolved will approximately fill the flask, and the final adjustment of the gas vol. is made by means of a water manometer and adjustment of the temp.—A. R. P.

[Apparatus for] the Determination of Nickel in Magnesium Alloys. (Minster). See p. 362.

New Developments in the Study of Surface Chemistry. Earl A. Gulbransen (Metal Progress, 1946, 49, (3), 553-559).—Fundamental factors in the study of a given surface are its physical form, the chemical nature of the surface layer, and the speed at which chemical and physical changes occur on and through the surface. These may be studied by the electron microscope (opaque materials being investigated by means of surface replicas), the electron-diffraction camera, and the vacuum micro-balance. The design and operating principles of these types of apparatus are described, the working system being illustrated by diagrams.—P. R. The Electron Microscope and Its Application to the Study of Metals.

The Electron Microscope and Its Application to the Study of Metals. Robert G. Picard (*Metallurgia*, 1946, 34, (202), 181–185).—The principle of the electron microscope is briefly discussed, special reference being made to the optical analogy between light and electron microscopes and to the special technique required for specimen preparation. The application of the electron microscope to the study of metals is dealt with, consideration being given to the study of the structure of metallic surfaces, where accurate replicas of the surfaces have to be made for examination, and to the various methods used for the preparation of such replicas. P. also describes the technique used in the application of the electron microscope to the study of the atomic structure of metals and alloys.—J. W. D.

A New Model of Reflecting Spectrograph. L. E. Vvedensky (*Izvest. Akad. Nauk S.S.S.R.*, 1945, [Fiz.], 9, (6), 750-752).—[In Russian]. A new autocollimating-mirror type of spectrograph with Cornu prism has a mirror with a focal length of 820 mm. and a flat field from 2200-3500 Å. The resolving power is 17,120 and a similar model of longer focal length is being designed. —E. VAN S.

*A Simple X-Ray Spectrometer. R. S. Rivlin and H. P. Rooksby (J. Sci. Instruments, 1946, 23, (7), 148-150).—Describes a simple X-ray spectrometer which is suitable for determining the orientation, relative to the crystal axes, of a surface cut on a single crystal, when the orientation is already approx. known. The apparatus is made almost entirely from standard Meccano parts.—W. H.-R.

*A Simple Method of Shielding for Use on an X-Ray Spectrometer. F. Happey and A. W. Porter (J. Sci. Instruments, 1946, 23, (7), 160).—Describes the construction of an X-ray trap for use where long exposures are necessary. —W. H.-R.

*A Simple Measurer for X-Ray-Powder-Diffraction Photographs. J. Gibson (J. Sci. Instruments, 1946, 23, (7), 159).—Description of a simple sliding vernier instrument which is easy to construct, and gives readings to 0.05 mm. —W. H.-R.

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*A Machine for the Summation of Fourier Series. G. Hāgg and T. Laurent (J. Sci. Instruments, 1946, 23, (7), 155–158).—A machine is described which will perform a purely electric summation of Fourier series.—W. H.-R.

XIII.—PHYSICAL AND MECHANICAL TESTING, INSPECTION, AND RADIOLOGY

Rationalization of Aluminium Alloy Specifications. A. E. Russel (J. Roy. Aeronaut. Soc., 1945, 49, (409), 14-20).—R. pleads for extension of the scope of the routine testing of materials, to permit a balanced assessment of specification strength values. This valuation should take into account the gain in the operational efficiency of aircraft resulting from increasing the minimum acceptable stresses at the cost of increased scrap. The behaviour of materials in compression is best represented by a curve of the ratio of the stress to the tangent modulus plotted against stress. As a spot check, the 0.1% proof stress is a better indication than the 0.2% proof stress. A complete revision of the max. acceptable tolerances of sheet material is necessary, in R.'s opinion. Until improved rolling-mill equipment is available, the limits should be narrowed, with a strong bias towards nominal average thickness, *i.e.*, with unequal bilateral tolerances. This procedure would be quite safe owing to the very local nature of the low spots which could be catered for in design. R. suggests that the increased cost of materials consequent on the changes would be economically sound from the operations point of view.—H. S.

Apparatus for the Creep Testing of Non-Ferrous Metals. K. I. Portnoy. (Zavod. Lab., 1940, 9, (9), 1020-1024).-[In Russian]. Descriptive.-N. A.

The Sorting of Sheets of AMTS [Aluminium-Magnesium-Zinc] Alloy from Duralumin Sheets by a Thermoelectric Method. V. L. Blinov and D. I. Il'in (Zavod. Lab., 1945, 11, (2/3), 222-223).—[In Russian]. The equipment is described.—N. A.

Sorting Bronzes and Brasses with the Steeloscope. V. E. Bel'masov (Zavod. Lab., 1940, 9, (11/12), 1272–1276).—[In Russian].—N. A.

Quality Control and Research on [Wimet] Cemented Carbides. — (Machinery (Lond.), 1946, 68, (1759), 809-816).—The manufacture of Wimet sintered carbide is described, with particular reference to the inspection methods employed for production control. The equipment of the metallurgical, spectrographic, and X-ray crystallographic sections of the Wimet

research laboratories is described.—J. C. C. Non-Destructive Inspection of Castings. Clyde L. Frear and Robert E. Lyons (*Amer. Foundryman*, 1946, 9, (4), 120–133).—A general, illustrated review in which are discussed a number of non-destructive methods of inspection. These include visual inspection, sound or percussion tests, impact tests, pressure tests, radiographic examination, magnetic inspection, electrical-conductivity tests, and tests with fluorescent materials and supersonics.—J. E. G.

RADIOLOGY

30 Years of X-Ray Research at the G.E.C. Research Laboratory. A. W. Hull (Amer. J. Physics, 1946, 14, (2), 71-79).—A reminiscent historical review describing H.'s crystallographic work and the development of the X-ray tube from the 1913 Coolidge tube to the modern one- and two-million-volt tubes and the betatron. Metallic barium serves as a lubricant in the rotating-anode tube. Beryllium windows are used in X-ray tubes intended for generating the characteristic rays from targets of low atomic number. The radiation from the latter type of X-ray tube may be used for measuring the thickness or density of materials by its absorption.—L. M.

†Radon. Its Properties and Proparation for Industrial Radiography. J. A. T. Dawson (J. Sci. Instruments, 1946, 23, (7), 138-144).—A lecture given before the Industrial Radiology Group of the Institute of Physics. The use of radon instead of radium for γ -radiography enables higher γ -ray intensities to be obtained from bulks of smaller dimensions, and so improves the quality of the photographs. The principles governing the growth and decay of radon are described, and also methods for its extraction and purification. Radiographs of a 2-in. steel plate with penetrameters lying on top are reproduced in order to compare radon and X-ray radiographs.—W. H.-R.

Development of Stereoscopic Photography and Radiography. Leslie P. Dudley (Light Metals, 1945, 8, (89), 259-270; also (abridged) Indust. Radiography Non-Destructive Test., 1946, 5, (1), 23-25, 39).—Lecture to the British Institute of Radiology.—L. M.

Institute of Radiology.—L. M. Apparatus for the X-Ray Determination of Principal Stresses. M. P. Zheldak (Zavod. Lab., 1940, 9, (7), 755–757).—[In Russian]. Descriptive. —N. A.

On the Determination of the Sensitivity of the Visual Method of Control by X-Rays. A. K. Trapeznikov (Zavod. Lab., 1940, 9, (8), 876-878).—[In Russian]. Screens at the Semashko works reveal defects of 6-8% thickness; Patterson screens 5-6% for magnesium alloys and 4-5% for aluminium.

-N. A.

New X-Ray Tubes for Radiology. V. I. Rakov (Zavod. Lab., 1941, 10, (1), 73-76).—[In Russian]. A review.—N. A. New [X-Ray] Ion Tube (T4). G. I. Aksenov and A. I. Gaiko (Zavod.

New [X-Ray] Ion Tube (T4). G. I. Aksenov and A. I. Gaiko (Zavod. Lab., 1941, 10, (3), 324-326).—[In Russian]. An X-ray tube designed by A. and G. for structure analysis is described.—N. A.

A Test for Lead-Screen Contact. H. E. Seemann and L. L. Macgillivray (*Indust. Radiography Non-Destructive Test.*, 1946, 5, (1), 17–19).—A test object for investigating the contact between lead screens and the film is made by supporting lead shot one layer deep in the meshes of wire gauze, the shot being held in position by shellac. Lead shot of 0-14 in. dia. and gauze with six square openings per inch and a wire dia. of 0.035 in. are recommended.

-L. M.

XIV.—TEMPERATURE MEASUREMENT AND CONTROL

A "Cold-Junction" Box for Thermocouples. L. Bastings (J. Sci. Instruments, 1946, 23, (6), 132).—A device is described for keeping the cold junction of a thermocouple at 25° C. instead of using an ice box. The apparatus is essentially a toluene thermostat-regulator incorporating a bath of transformer oil within the regulating bulb; the cold junction is placed in this bath. The whole is placed in a cork-lined cabinet which the regulator keeps at 25° \pm 0.05° C.—W. H.-R.

XV.—FOUNDRY PRACTICE AND APPLIANCES

*Segregation of Iron, Manganese, and Titanium in Aluminium Piston Alloys, (Meyer-Rässler and Laurs). See p. 348.

*Blister Formation in Semi-Fabricated Parts of Aluminium or Aluminium Alloys. (Domony). See p. 345.

*On the Question of Modification of Silumin. A. G. Spassky and V. V. Rogozhin (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (9), 566-569).—[In Russian]. Aluminium-silicon alloys appear to have an inherent modified structure. Sodium eliminates the segregates of silicon in the liquid alloy and thus brings about solidification in the near-equilibrium state. Modified structure can be obtained by heating the alloy to temp.

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above $900^{\circ}-1000^{\circ}$ C., followed by rapid cooling. The temp. of superheating has a decisive influence.—N. A.

*Microporosity in Magnesium Alloy Castings. L. W. Eastwood and J. A. Davis (Amer. Foundryman, 1946, 9, (4), 148-155).—It is submitted that the principal factors determining the occurrence of microporosity in magnesium alloy castings are : (i) the alloy composition, (ii) the gas content of the melt, and (iii) the degree of feeding provided. In this investigation four alloys were studied : (1) A8—aluminium 8, zinc 0.4, and manganese 0.2%; (2) AZ 91—aluminium 9.4, zinc 0.4, and manganese 0.2%; (3) A.S.T.M.-AZ 63—aluminium 6, zinc 3, and manganese 0.2%; and (4) A.S.T.M.-AZ 92—aluminium 9, zinc 2, and manganese 0.2%; magnesium providing the balance in all cases. A.S.T.M.-AZ 63 is markedly inferior to the other three alloys in respect of its tendency to microporosity. Variation in pouring temp. had little effect upon the amount of microporosity produced. The amount of microporosity produced.—J. E. G.

Centrifugal Casting of a Magnesium Part. F. P. Strieter and R. J. Maenner (*Amer. Foundryman*, 1946, 9, (5), 43-47).—An illustrated account of the commercial production of a magnesium alloy ring, 12 in. in dia. and weighing 2.8 lb., by the centrifugal-casting process. The composition of the alloy used was : aluminium 9, zinc 2, manganese 0.2%, magnesium remainder.

-J. E. G.

Aluminium Alloy Die-Casting. — (Amer. Foundryman, 1946, 9, (4), 103-111).—Report of the A.F.A. Committee on die-castings. A detailed and illustrated account is given in which are surveyed the various types of die-casting machines and their detailed mechanisms. Metal characteristics with respect to the die-casting process, fettling, and inspection are also reviewed.—J. E. G.

Use of Insulating Pads and Riser Sleeves for Producing Sound Bronze Castings. H. F. Taylor and W. C. Wick (Amer. Foundryman, 1946, 9, (3), 48-68).—See Met. Abs., this vol., p. 231.—J. E. G.

*The Effect of Phosphorus on the Properties of Gun-Metal. (Colton and Loring). See p. 348.

*On the Mechanism of Increasing the Density of Castings by Crystallization Under Pressure. A. A. Bochvar (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (8), 5-14).—[In Russian]. Solidification under pressure results in the shrinkage porosity being reduced and concentrated in the regions of the last crystallization. A pressure of 2-3 atm. is sufficient to reduce the vol. of gas porosity to a value comparable with the vol. of shrinkage porosity. The vol. of the porosity is determined, not by the gas vol. at a given pressure, but by the vol. of shrinkage porosity in which gas pressure does not reach the value of atmospheric pressure. A considerable portion of the gas is retained in solution after solidification under pressure.—N. A.

On the Efficiency of the Method of the Crystallization Under Pressure for Various Alloys. A. A. Bochvar (Sbornik Nauch. Trudov Moskov. Inst. Tevet. Metallov Zolota, 1940, (8), 14-21).—[In Russian]. Shrinkage porosity in alloys having a narrow solidification range (up to 10° C.), *i.e.*, eutectic Silumin, 10% "aluminium bronze," and pure metals, is usually of a conc. type. Alloys having a wide solidification interval (up to 70° -140° C.), *i.e.*, aluminium-4% copper, aluminium-1-2% silicon, and copper-5-8% tin, give a dispersed type of shrinkage porosity. Intermediate cases are possible.

--- N. A.

Principles of the Delayed-Crystallization Method of Obtaining Castings Free from Shrinkage Porosity. A. G. Spassky (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (9), 551-555).—[In Russian]. S. discusses the possibility of eliminating shrinkage porosity by feeding with liquid metal or by the construction of feeding heads and so delaying crystallization. Shrinkage porosity cannot be eliminated by the maintenance of a uniform temp. distribution in the cooling of the casting.—N. A.

*Shrinkage Phenomena in Alloys as a Function of the Composition. K. I. Akimova (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (8), 22-39).—[In Russian]. Experiments carried out with aluminiumsilicon, aluminium-copper, lead-antimony, lead-cadmium, zinc-tin, and bismuth-cadmium alloys showed that the distribution of shrinkage porosity in alloys forming a eutectic depends on the crystallization interval and the amount of the eutectic. The amount of shrinkage porosity also depends on the crystallization interval.—N. A.

*Effect of Casting Conditions on the Malleability of Alloys. Paul Bastien (Fonderie, 1946, 1, (3), 99–109).—Read before the Association Technique de Fonderie. The factors affecting the malleability of metals and alloys are considered under the following headings: (a) Those depending on the metals or alloys, such as the capacity for crystal slip and its variation with temp., the capacity for forming twins and its variation with temp., the capacity for forging temp.; (b) those depending on the piece itself, such as the shape, weight, and crystal structure; (c) those depending on the deformation, such as type of plastic deformation and rate and extent of deformation; (d) those depending on the contact between the part to be formed and the die, such as rate of cooling and the value of the coeff. of friction. The methods of carrying out tests of these properties and the apparatus required are described.—J. H. W.

Eliminating Castings Defects. Pierce Boutin (Amer. Foundryman, 1946, 9, (3), 42-44).—A summary of the procedures to be followed in tracing castings defects.—J. E. G.

*The Technical Preparation of Work in the Casting of Varied [Bronze] Parts. Charles Dennery (*Fonderie*, 1946, 1, (6), 207-218).—Read before the Association Technique de Fonderie. Experiments were carried out on the design of feeding heads for casting bronze made up from secondary material containing tin, zinc, and lead of the order of 5, 7, and 2% respectively. D. compares the mechanics of self-feeding with those of special feeding heads, and describes the effect of the susceptibility of the alloy to piping and contraction.—J. H. W.

Elimination of the Falling Metal Stream [in Casting]. A. A. Bochvar and A. G. Spassky (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (8), 45-51).—[In Russian]. A mould is filled by creating in it a partial vacuum and drawing in liquid metal, or by forcing the liquid metal with compressed air through a tube into the mould, followed by solidification under pressure. B. and S. suggest an apparatus for this purpose and discuss the advantages of the method.—N. A.

Standard Test Bars for the Non-Ferrous Foundry. Frank Hudson (Found. Trade J., 1946, 79, (1557), 185-191).—Read before the Birmingham Conference of the Institute of British Foundrymen. It is submitted that the keel bar should be tentatively adopted as a standard for copper-base alloy castings.—J. E. G.

Metallurgical Advantages of Centrifugal Casting. —— (J. Commerce, Ship. Eng. Edn., 1946, July 25, p. 1).—Three types of centrifugal casting : true centrifugal, semi-centrifugal, and centrifuge centrifugal, are discussed with special reference to the type of casting produced by each method, and to the speeds used. Special reference is made to the production of coppertin-lead bearing bushes and of gun-metal bushes for marine steel propeller shafts by centrifugal casting.—J. W. D.

Non-Destructive Inspection of Castings. (Frear and Lyons). See p. 365.

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Pattern Analysis for Buyers of Patterns and Castings. Vincent J. Sedlon (*Amer. Foundryman*, 1946, 9, (3), 24–26).—A pattern-classification chart with accompanying description. Suggested materials and methods of construction are given for all sizes of patterns intended to be used for small or large casting production (10–500 or more castings).—J. E. G.

[†]The Use of Ethyl Silicate in the Foundry—Precision Moulding by the *Cire Perdue* Method. Pierre Nicolas (*Fonderie*, 1946, 1, (7), 260–265; also (abridged translation) *Found. Trade J.*, 1946, 79, (1565), 401–402).—Where higher temp. are required, siliceous sand and plaster is not sufficiently refractory. For these, sodium silicate can be used up to a point as a binder for the siliceous sand, but beyond this point pure colloidal silica hydrate is used. This hydrate is formed by the hydrolysis of ethyl tetrasilicate: $Si(OC_2H_5)_4 + 4H_2O = Si(OH)_4 + 4C_2H_5OH$. The development of the process for the manufacture of alloys of cobalt, tungsten, and chromium for aeroplane motors is outlined, and the technique of the process, preparation of the moulds, and the melting, casting, and finishing of the alloys are described.—J. H. W.

*The Control of Moulding and Coring Sands. Raymond Guerin (Fouderie, 1946, 1, (2), 43-52).—Read before the Association Technique de Fonderic. The limitations of testing moulding sands by hand are pointed out and methods are described for the mechanical testing of sands for : (i) humidity and temp., (ii) cohesion, (iii) grain-size, permeability, and fineness. Although the tests described are primarily for natural sands, they apply also, for the most part, to synthetic sands. The properties of coring sands are much more complex than those of moulding sands; the criterion in this case is the dry strength or cohesion, which depends on the facing given to the core and the actual strength of the burnt sand. G. discusses the effect of grain-size, the addition of clay, dust content, and conditions of drying (e.g., 240° C. for max. strength).—J. H. W.

[†]Introduction to the Study of Moulding Sands. Eddie Cambier (*Ing. Chim.*, 1945, 27, (162), 25–43).—C. discusses the principal properties, and the effects of the various constituents, of foundry sands in general and describes a number of tests for these sands.—J. H. W.

Sand Control in a Bronze Foundry. Clinton J. Converse (Amer. Foundryman, 1946, 9, (4), 164-165).—A general account.—J. E. G.

*Bentonites and Clays from the Foundryman's Point of View. Methods for Determining Their Values for Securing Cohesion in the Green State. P. Dauxois (Bull. Assoc. Tech. Fonderie, 1944, 18, (4/12), 44-55; discussion, 55-56).—In the regeneration of used moulding, the ordinary clay that these contain is progressively replaced by bentonites and selected clays. The undoubted advantages of these is somewhat offset by their high price, but this in turn is offset by economy in transport. The usual data of their physical properties are insufficient as a criterion of their use in the foundry, and a study has been carried out to determine by direct trial a series of curves of const. cohesion as a function of the water content and the composition of the sand, thus indicating the characteristics of the mixture.—J. H. W.

[†]Cement Applied to Foundry Moulds. [Randupson Process.] Louis Maillard (Fonderie, 1946, 1, (1), 5-11).—Read before the Association Technique de Fonderie. In the Randupson process, siliceous sand is mixed with about 10% cement and slightly moistened. The moulds and cores are made and, after stripping, left in the air for 48 hr. The sand must be 95-97% pure and contain no alkali fusible at low temp. and little or no clay. The grainsize is 0.25-1 mm.; dust must be avoided as it reduces the permeability. The cement, such as is used in reinforced concrete, is slow-setting and quick-hardening. The permeability, cohesion, facing, manufacture, and behaviour of the moulds are described, and their advantages, disadvantages, and applications discussed. Of the disadvantages, the chief are the long period of drying and the necessity of using the moulds within 3 hr. of their being dry; on the other hand, they have all the advantages of a green sand with high permeability and cohesion, and are suitable for the casting of pieces of all dimensions and weights.—J. H. W.

Core Ovens [for Magnesium Alloy Casting Cores]. H. E. Linsley (Amer. Foundryman, 1946, 9, (3), 27-31).—A general illustrated account of equipment and processing methods for cylinder-head moulds and cores and for magnesium alloy casting cores. Core-sand mixtures for use in connection with magnesium alloys are identified by a dyestuff which is added in liquid form during the first mulling; while the dyestuff does not retain its full colour after baking, it is still readily identifiable.—J. E. G.

The American Foundry. René Kenner, (Jean Montupet, and Robert Ronceray) (Fonderie, 1946, 1, (7), 247-259).—Read before the Comité Technique du Centre Technique des Industries de la Fonderie. As a result of a tour in the U.S.A. it is considered that the development of the foundry industry there is shown by the increase in the capacity for production and by the increase in the quality of the castings. This is due not to sensational inventions but to the application, on a large scale, of the principle of mechanization, of the technique of melting and moulding, and of rigorous control.

J. H. W.

XVII.-FURNACES, FUELS, AND REFRACTORY MATERIALS

Melting Light Alloys in the Electric Furnace. —— (Fonderie, 1946, 1, (5), 189-191).—Practical hints in the use of electric-melting and soaking furnaces for light alloys, principally "Alpax," are given.—J. H. W. An Introduction to the High-Frequency Induction Furnace. J. H. H.

An Introduction to the High-Frequency Induction Furnace. J. H. H. Tcece (J. Inst. Elect. Eng., 1946, 93, [I], (61), 50-51).—Contains a brief description of the homo-polar inductor-type alternator as a source of power for large, high-frequency induction furnaces.—E. V. W.

[†]High-Frequency Electronic-Valve Furnaces. André de Saint-Andrieu (*Fonderie*, 1946, 1, (4), 143-155).—Read before the Association Technique de Fonderie. There are three types of electric furnace: (i) resistance, (ii) arc, and (iii) induction furnaces. The electronic furnace is a type of induction furnace, and the theory, installation, advantages, and uses of a 250-kW. furnace are described. The description also applies to 20-100 kW. furnaces.

-J. H. W.

Induction and Dielectric Heating. — (Metallurgia, 1946, 34, (202), 210-212).—The use of electronic heat, which may be applied in two forms as induction heating and dielectric heating—is discussed with reference to the improvement it has brought about in production and quality in industry. Brief reference is made to each form of heating and to such applications of induction heating as tempering and tipping tool steels, brazing, heating billets for forging, fluxing plated coatings to remove porosity, sintering metallic powders, &c. The use of dielectric heating for drying cores and moulds and for producing physical changes, as in the polymerization of thermosetting plastics, is considered.—J. W. D.

High-Frequency Heating. —— (Automobile Eng., 1946, 36, (471), 13–19). —Some recent developments in the design of high-frequency inductionheating equipment are discussed. The basic principles of the process are considered, and fields of application including brazing, soldering, and sintering outlined. Three types of equipment are discussed, including motor generator, spark-gap converter, and thermionic oscillator. Consideration is also given to the technical advantages of induction heating, the quality of the product, the speed of production, and the economics effected.—J. W. D. On the Resistance to Wear of Rotary Melting-Furnace Linings. E. J. Kohlmeyer (*Metall u. Erz*, 1944, 41, (9/10), 99-101).—K. discusses the factors influencing the rate of wear of rotary melting-furnace linings: flame temp., temp. of melt, structure and m.p. of the lining, viscosity of the slag, reactions between the slag and the lining, &c. It is recommended that above 1300° C., and when working with alkaline fluxes, the lining should be a well burnt magnesite with a backing brick of grog mixed with 45% of alumina. By the choice of suitable materials the lining life should be, on the average, 2-3 years.—E. N.

XIX.-WORKING

Possible Means of Speeding Up the Rolling of Magnesium Alloys. S. I. Gubkin and E. M. Savitsky (*Izvest. Akad. Nauk S.S.S.R.*, 1941, [Khim.], (6), 669-672).—[In Russian]. The possibility of rolling the alloys MA-1 and MA-3 under selected conditions of temp. and speed, is pointed out.—N. A.

*A Method of Calculation of the Number of Passes in the Cold Rolling of Sheet and Strip. S. I. Gubkin and K. D. Kurakin (Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov Zolota, 1940, (9), 570-579).—[In Russian]. For cases where const. pressure is applied for all passes, a method of calculation of the number of passes required is suggested, and formulæ are given. Check tests have been carried out on the method.—N. A.

*Some Observations on Cut Necks in Rolling-Mill Practice [Bronze Bearings]. G. P. Contractor and S. Viswanathan (*Sheet Metal Ind.*, 1946, 23, (230), 1037-1096).—Observations are made on the effect of the structure and composition of the bronze bearing material on the cutting or scouring of roll necks. The effect of inverse segregation on the problem is discussed and the results of experiments described.—R. GR.

*Investigations Into the Rapid Deformation of Aluminium. (Kistler). See p. 345.

XXI.—JOINING

On the Spot Welding of Aluminium. W. Heiz (Schweiz. Arch. angew. Wiss. Techn., 1946, 12, (7), 227).—[In German]. Spot welding is compared with riveting, to the advantage of the former.—N. B. V.

The Relation Between Welding Conditions and Mechanical Properties in , the Spot Welding of Aluminium. R. Irmann (Schweiz. Arch. angew. Wiss. Techn., 1946, 12, (6), 194–195).—[In German]. A brief note, summarizing the effects of welding conditions, in particular electrode pressure, on the quality of spot welds, and indicating the considerable variation in strength of spot welds in different aluminium alloys under identical conditions of welding.—N. B. V.

Determinative Factors in the Spot Welding of Light Metals. H. A. Schlatter (Schweiz. Arch. angew. Wiss. Techn., 1946, 12, (7), 222-226).—[In German]. A review. After briefly indicating the requirements of a good weld, S. discusses the effects of the physical and chemical properties of the aluminium alloys, the shape of the piece being welded, the shape and composition of the electrode, and the current, time, and electrode pressure.—N. B. V.

Electric Spot Welding in Light-Metal Railway-Carriage Construction. Choice of Type of Welding Machine and Description of the Construction. H. A. Schlatter (Schweiz, Arch. angew. Wiss. Techn., 1946, 12, (6), 195-198).--[In German]. A description of the characteristics and operation of a machine specially designed for spot welding light-alloy railway carriages.--N. B. V.

The Use of Spot Welding in the Construction of Light-Metal Railway Carriages. R. Bornand (Schweiz. Arch. angew. Wiss. Techn., 1946, 12, (7), 228-230).--[In German]. A very brief note, with 10 illustrations showing

-P. R.

various aspects of the construction. The machine used is that described by Schlatter (see abstract above).—N. B. V.

The Welded Joint in Non-Ferrous Chemical Plant. W. K. B. Marshall (Indust. Chemist, 1944, 20, (231), 171-181).—See Met. Abs., 1944, 11, 350.

*Welding Flames. T. Courard (Rev. Soudure Autogène, 1945, 1, (1), 22-33). -A comparative thermodynamic study was made of the intrinsic properties of the flames used in welding and of the action of these flames on different industrial metals. The investigation was essentially theoretical, but serves to indicate the general trend in practice. The flames considered were due to the combustion by oxygen of acetylene, hydrogen, town gas, and butane. There are, in general, two periods of combustion : (1) that of primary combustion resulting from the reaction of the gas with the oxygen provided by the torch and taking place in the point of the flame, and (ii) that of a secondary combustion resulting from the reaction of the products of the primary combustion with atmospheric oxygen and taking place in the body of the flame. In autogeneous welding only the primary combustion is used. The results of the investigation indicated that acctylene has considerable advantages over the other three gases studied, owing to its composition and its strongly endothermic nature, as manifested by the conc. of heat, available heat for melting the metals, and the reducing nature of its products of combustion. The use of the other three gases would seem to be confined to the welding of low-m.p.- and not readily oxidizable metals, although even here the oxy-acetylene flame would appear to be preferable.-J. H. W.

XXII.-INDUSTRIAL USES AND APPLICATIONS

Lithium: Extraction, Recovery, and Industrial Uses. (Arend). See p. 345. Magnesium in German Aircraft. H. W. Schmidt (Aeronaut. Eng. Rev., 1943, 2, 7-21, 145).

Industrial Significance of the Basic Characteristics of Magnesium. J. D. Hanawalt (Metal Progress, 1946, 49, (3), 548-552; (4), 739-743).—Important factors in the future economic applications of magnesium include (a) wide distribution and universal availability, (b) the need for adequate protection from oxidation in alloying and casting, (c) low freezing point, (d) inertness towards iron, (e) limited workability in the cold and (frequently overlooked) excellent workability at higher temp., (f) ease of fabrication, and (g) high machinability. The development and scope of the German magnesium industry is described. Attention is directed to the simplification in design. and the consequent economy, in taking advantage of the lightness of magnesium by providing thicker sections and thus eliminating ribs and stiffeners. The proportionate increase in bending strength and rigidity is shown to be considerable. Reference is made to the high resilience of magnesium, which is much used, e.g., in rollers for conveyors and wheels for automobiles. Although readily attacked by salt water, magnesium is only slightly affected by ordinary atmospheric conditions .--- P. R.

Magnesium Alloys. Jerome Baird (*Wisconsin Eng.*, 1943, 47, (3), 10–17).— A review of the properties, manufacture, and uses.

Application of Magnesium Alloys. D. A. Tooley (Machinery (Lond.), 1946, 68, (1750), 527-530).—J. C. C.

World Production and Consumption of the Platinum Metals. B. V. Nevsky (Izvest. Sekt. Platiny, 1943, 19, 5-20).—[In Russian].—N. A.

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The Uses of Platinum and Palladium in the Laboratory. A. M. Rubinshtein (Izvest. Sekt. Platiny, 1943, 19, 45-59).—[In Russian]. A review.—N. A.

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Precious Metals in the Chemical Industry. M. Blot (*Chim. et Ind.*, 1945, 54, (4), 227-234).—A general account is given of the properties and uses of gold, silver, the platinum metals, and their derivatives.—J. C. C.

Rare Metals in War-Time—Vanadium. Hermann Baum (*Metall u. Erz*, 1944, 41, (9/10), 108-109).—A review of the occurrence, manufacture, use, market conditions, world production, and price of vanadium from 1935 to 1941. While Peru is the chief source of supply, the ore deposits in South-West Africa, the Transvaal, Rhodesia, Australia, and the United States are briefly described. The recovery of vanadium in Germany, from vanadium-bearing slags obtained in iron smelting, is mentioned.—E. N.

Uses of High-Grade Zinc Alloys. E. Bjerre (Ingenioren, 1942, 51, (25), M33-44; Chem. Zentr., 1942, 113, (II), 1396; C. Abs., 1943, 37, 5357).— A comprehensive summary, in which B. discusses methods of production, properties, machinability, sand- and permanent-mould die-castings, extruded alloys, bearings, alloys for electrical purposes, armatures, rolling of sheet, and surface treatments.

Substitute Alloys for Brass and Bronze. J. Schoofs (*Rev. Univ. Mines*, 1941, 17, 318-327; *Chem. Zentr.*, 1942, 113, (II), 1396; *C. Abs.*, 1943, 37, 5687).—The zinc-aluminium, zinc-copper, and zinc-aluminium-copper alloys are suitable to replace brasses and bronzes. S. discusses their mechanical properties, behaviour at high and low temp., corrosion-resistance, effect of additions of other metals and of impurities, casting and forgeable alloys, bearing alloys, melting and working practice, surface treatment, and the plating of zinc alloys with nickel, chromium, copper, and brass.

Bearing Parts from Very Pure Zinc Alloys. W. F. Beunderman (*Polytechn. Weekbl.*, 1941, 35, 4-5; *Chem. Zentr.*, 1941, 112, (I), 1728; *C. Abs.*, 1943, 37, 2325).—An alloy consisting of zine 95 (99.99% purity), aluminium 4, copper 1%, and a small amount of magnesium, is described, and suggested as a substitute for the copper-containing alloys GBz 14 and SRg 5. Its tensile strength, yield point, and hardness correspond to, but its extension coeff. is not so great as, those for the copper alloys mentioned. The resistance to wear, which is especially important for bearing metal, was found to be as good for the zine alloy as for the bronzes. The zine alloy machines well; its tendency to splinter off is about the same as that of brasses. Although the coeff. of bronze, the difference is scarcely of practical importance.

Centrifugal Castings in the Shipbuilding Industry. N. N. Sokolov (Sudostroenie, 1945, (3/4), 25-31).--[In Russian]. Metallurgical and engineering aspects of centrifugal castings are discussed. Centrifugal-casting machines and the technique of casting pipes and screws in ferrous and non-ferrous alloys in Russia at the present time are described.--V. K.

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