METALLURGICAL ABSTRACTS

(GENERAL AND NON-FERROUS)

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I.—PROPERTIES OF METALS

Beryllium. Maurice Déribéré (*Mécanique*, 1936, 20, (269), 259–264, 270).—This account of the sources, production, properties, and applications of beryllium amplifies an earlier description (*Met. Abs.*, 1934, 1, 399). The beryllium–copper constitutional diagram according to Masing and Dahl is reproduced, and the mechanical properties and thermal and electrical conductivities of a number of beryllium alloys are tabulated. A *bibliography* is appended. —P. M. C. R.

Damage to Lead-Sheathed Cables by Caterpillars. C. E. Richards and F. C. Bond (*Post Office Elect. Eng. J.*, 1936, 29, (3), 239–240).—A short, illustrated account of damage to cable-sheaths by caterpillars; both cases described occurred in Great Britain.—P. M. C. R.

***A Study of the Phenomena Associated with a Vertical Jet of Mercury [Surface Tension of Mercury].** John Satterly and J. R. Levitt (*Trans. Roy. Soc. Canada*, 1936, [iii], 30, (III), 129–135).—To obtain consistent results for the surface tension of mercury by the method of a vertical jet directed into a mercury reservoir, small jets and small rates of flow should be used. A value of 510 ± 10 dynes/cm. was obtained. With small flows, an interesting example of a *vena contracta* is obtained just above the level of the mercury in the reservoir.—S. G.

***Investigation of the Heat Effect in the Magnetic Transformation of Nickel.** Hellmuth von Steinwehr and Alfred Schulze (*Z. Metallkunde*, 1936, 28, (11), 347–349).—The heat of transformation of magnetic into non-magnetic nickel at 333°–362° C. is 0·65 grm.-cal./grm. The determination was made on a 26·7 kg. cylinder of metal of 99·1% purity. A further small heat evolution occurred at 100° C. above the Curie point with this material, but its cause could not be ascertained.—A. R. P.

***Soft X-Rays and Photoelectrons from Nickel at Different Temperatures.** S. Ramachandra Rao (*Current Sci.*, 1936, 5, 73–74; *C. Abs.*, 1936, 30, 8015).—The photoelectric efficiencies of copper and nickel when exposed to soft X-rays with applied potentials of 100 and 150 v. were independent of temperature in the range 30°–500° C. These results agree with observations made in the optical region. The soft X-ray intensity from nickel increased with temperature. No abrupt change was observed at the Curie point.—S. G.

***Influence of Recrystallization on the Emission of Platinum.** Fritz Schubert (*Physikal. Z.*, 1936, 37, (16), 595–598).—Paper read before the Deutsche Physikalische Gesellschaft. Experiments on the polarization of the light emitted by heated platinum show that the light emitted from the grain boundaries is unpolarized, and therefore the polarization ratio of the light emitted depends on the amount of grain boundary present, and is thus influenced by recrystallization.—B. C.

***Deformation in D.C. Heavily Loaded Silver Contacts of Telephone Apparatus.** W. Krüger (*Z. Fernmeldetechnik*, 1936, 17, (1), 1–13; (2), 24–28; (3), 41–43; (4), 56–60; *Sci. Abs.*, 1936, [B], 39, 400).—Describes a series of experiments to determine the causes of alteration of shape of silver contacts and to fix electrical conditions which will prevent this. Four types of circuit were provided: (1) non-inductive resistance; (2) capacitative and

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

resistance; (3) non-inductive circuit with spark-quenching circuit; and (4) inductive circuits with spark-quenching arrangements. The relays were regularly pulsed by means of a uniselector switch. Sketches are given of various types of contact, illustrating the deformation they undergo with various electrical conditions. Some oscillograms are given showing the current flow in an electromagnet fitted with spark-quenching arrangements and with non-bouncing and bouncing contacts. The deformations of the contacts under these conditions are shown by a series of diagrams. K. establishes that there are 3 types of contact deformation and that to prevent arcing at the opening of the contacts quenching resistances of a value depending on the contact metal and the strength of the current being broken are necessary. To prevent damaging effects of condenser discharge when a contact is bouncing, the value of the capacity must be so high that the voltage at the condenser terminals must not increase to a high value. The time-constant of the spark-quenching circuit must remain small enough so that with contact bounce the condenser discharges do not result in arcing.—S. G.

***The Electrical Anisotropy of Tungsten Single Crystals at Low Temperatures in Strong Transverse Magnetic Fields.** E. Justi and H. Scheffers (*Physikal. Z.*, 1936, 37, (20), 700–708).—Describes measurements of the electrical resistance of very pure tungsten at temperatures down to 4° A. in transverse magnetic fields up to 20,000 gauss. The results show that the resistance depends on the angle between the magnetic field and the crystallographic axes, and that the ratio of maximum to minimum is independent of the field. The results are considered in terms of the theory of conduction.—B. C.

***Remarks on Scratch Hardness.** Gustav Tammann and Richard Tampke (*Z. Metallkunde*, 1936, 28, (11), 336–337).—The scratch hardness of pure aluminium, copper, nickel, and iron is unaffected by cold-working and remains unchanged on heating to any temperature below the recovery temperature; at higher temperatures it decreases rapidly. No change occurs in the scratch hardness of Duralumin on ageing.—A. R. P.

***On the Internal Friction of Solid Bodies; Absorption Frequencies of Metals in the Acoustic Region.** K. Bennewitz and H. Rötger (*Physikal. Z.*, 1936, 37, (16), 578–588).—A theory of internal friction is proposed, in which the time of relaxation and the existence of faults are used to deduce the absorption frequencies. Experimental evidence of the absorption effects in various metals is shown to agree with the theoretical deductions. The method of experiment is described, and the elimination of external disturbances is discussed.—B. C.

***Calorimetric Studies of Solids at Low Temperatures [Silver, Zinc, Tin, Bismuth, Lead, Thallium, Indium].** W. H. Keesom and J. A. Kok (*7e. Congr. internat. Froid, 1er. Comm. internat., Rapports et Communic.*, 1936, 156–168; *C. Abs.*, 1936, 30, 7991).—Debye's "characteristic temperatures" are plotted up to 20° K. for silver, zinc, tin, bismuth, lead, and KCl, and up to 4° K. for non-superconducting thallium. The atomic heats of nickel (1°–4·5° K.) and tin (3·5°–3·9° K.) are plotted. Tin exhibits a transition at 3·71° K. The effects of an external magnetic field, a persistent (internal) current, and of adiabatic magnetization on the atomic heat of thallium are shown. The superconductivities of tin, thallium, and indium agree well with those derived from the thermodynamic definition. 17 references are given.—S. G.

***Thermal Conductivity at Low Temperatures.** W. J. de Haas and Th. Biermasz (*7e. Congr. internat. Froid, 1er. Comm. internat., Rapports et Communic.*, 1936, 204–216; *C. Abs.*, 1936, 30, 7944).—The thermal conductivities of metals and of single crystals were studied at temperatures as low as that of liquid helium. Mercury becomes a superconductor at 4·8° K.; the specific resistance *W* is 1·06–1·50/w. at 2·51°–4·07° K. A few values of *W* are: 56 : 44 lead–tin, 2·07–4·01/w. at 70°–14·7° K.; 50 : 25 : 25 bismuth–lead–tin, 11·8–

211/w. at 82°–2·60° K.; 91·4 : 8·6 indium–lead, 2·58–75·9/w. at 174°–2·60° K.; 50 : 50 indium–lead, 10·2–130/w. at 83°–2·51° K.; 1 : 99 indium–lead, 3·8–6·73/w. at 81°–14·8° K.; copper, 0·0182–0·0168/w. at 20·1°–14·5° K.; tungsten, 0·055–0·042/w. at 21·8°–15·5° K.; bismuth (3 crystal forms) P, S_1, S_2, 0·0397–0·151, 0·0621–0·184, 0·0492–0·236 cal./cm./sec./degree, 81·5°–16·5° K. The effects of magnetic fields up to 721 gauss on the thermal conductivities of alloys were determined.—S. G.

The Electrical Conductivity of Pure Metals. W. J. de Haas and G. J. van den Berg (*7e. Congr. internat. Froid, 1er. Comm. internat., Rapports et Communic.*, **1936**, 194–203; *C. Abs.*, 1936, **30**, 7944).—Cf. *Met. Abs.*, 1934, **1**, 550; 1935, **2**, 200, 550. The "ideal" electrical resistances of pure platinum, gold, lead, cadmium, thallium, tin, and silver are shown graphically from 1° to 20° K.; that of copper is tabulated from 3·70° to 6·95° K. 14 references are given.—S. G.

***The Increase of Electrical Resistance in a Magnetic Field; Diamagnetism.** W. J. de Haas and J. W. Blom (*7e. Congr. internat. Froid, 1er. Comm. internat., Rapports et Communic.*, **1936**, 217–235; *C. Abs.*, 1936, **30**, 7933).—Determinations of the effect of a magnetic field on electrical resistance have been continued at liquid helium temperatures. Graphs are given showing the effect of fields up to 22,000 gauss, at various orientations of the crystal axis, at 4°–77° K., on the electrical resistance of single crystals of bismuth and gallium; with fields of 0–33,000 gauss, at 14·2° K., on the electrical resistance of silver, aluminium, indium, thallium, tin, and platinum. Data are given for 23,500 gauss, at 14·2° K. for all, at 77° K. and 0° for most of the elements: copper, silver, gold, zinc, cadmium, mercury, aluminium, indium, thallium, zirconium, tin, lead, germanium, tellurium, platinum, titanium, bismuth, antimony, and gallium, and also graphite. 22 references are given.—S. G.

Superconductivity. W. H. Keesom and J. A. Kok (*7e. Cong. internat. Froid, 1er. Comm. internat., Rapports et Communic.*, **1936**, 178–182).—Cf. *Met. Abs.*, 1934, **1**, 287, 545; 1935, **2**, 219, 413; 1936, **3**, 270.—S. G.

Superconductivity. W. J. de Haas, O. A. Guineau, and J. M. Casimir-Jonker (*7e. Congr. internat. Froid, 1er. Comm. internat., Rapports et Communic.*, **1936**, 236–254).—Cf. *Met. Abs.*, 1935, **2**, 585; 1936, **3**, 240.—S. G.

***The Dependence of the Emission of Electrons in an Electric Field on the Work of Emission.** Erwin W. Müller (*Z. Physik*, 1936, **102**, (11/12), 734–761).—Describes an investigation of the emission of electrons both under high fields and at elevated temperatures from tungsten coated with barium, magnesium, and cæsium. The results are discussed in terms of wave-mechanics.—B. C.

II.—PROPERTIES OF ALLOYS

†Progress in the Development and Application of Aluminium and Its Alloys. G. A. Anderson (*Metallurgia*, 1936, **15**, (86), 33–36; and *Light Metals Rev.*, 1936, **3**, (9), 187–193).—The production and properties of super-purity aluminium of 99·99% purity is first discussed, then consideration is given to alloy improvements with particular reference to heat-treated wrought alloys and to alloys of the aluminium–magnesium series with and without small additions of other metals; to recent developments in the production of free-cutting aluminium alloys by additions of lead, tin, antimony, or bismuth; to the production of better casting alloys having tensile strengths up to 22 tons/in.^{2}; and to the improvements which have been made in the production of aluminium alloy forgings. The production of aluminium alloy reflectors by a two-stage electrolytic treatment and the value of aluminium as an alloying element in steel and in non-ferrous alloys are also discussed.—J. W. D.

***The Mechanical Properties of Sand-Castings of Some Aluminium Alloys with Additions of $MgZn_2$.** P. Bergmann (*Metallwirtschaft*, 1936, 15, (49), 1146–1148).—Sand-castings of an alloy of aluminium with 7·6% $MgZn_2$ had a tensile strength of 14–15 kg./mm.² with a Brinell hardness of 80–88. After appropriate ageing treatment these values were improved by 15% and after addition of 1% manganese by a further 20–30%. Addition of up to 0·2% of cerium or thorium had no effect.—v. G.

***Modulus of Elasticity, Elastic Limit, and Limit of Shear Resistance of Various Alloys of the Duralumin Type.** M. Prever (*Industria meccanica*, 1936, **18**, 485–489; *C. Abs.*, 1936, **30**, 8127).—Four different aluminium alloys were examined: (1) silicon 0·7, magnesium 0·6, chromium 0·15; (2) copper 2·4, silicon 0·7, magnesium 1·6, nickel 1·2, titanium 0·06; (3) copper 4·25, silicon 0·75, magnesium 0·75, manganese 0·75; (4) copper 0·9, silicon 12·5, magnesium 1·2, nickel 0·9%. The elastic limit was greatest for alloy (1) with 25 kg./mm.², as also was the shear strength (29 kg./mm.²) and tensile strength; only (3) had a higher value for the latter, 40 kg./mm.². Except for the last, the values did not differ very greatly. The Brinell hardness was best for (3) with 120, while (1) has 105. Complete test curves are given.—S. G.

Lead–Aluminium Alloys. Willi Claus (*Aluminium*, 1936, **18**, (11), 544–545).—From a review of our knowledge of the system lead–aluminium it is concluded that many of the claims made for such alloys in German patents are of no technical importance.—A. R. P.

Nickel-Cadmium Alloy Bearings [Asarcoloy]. —— (*Nickel Bull.*, 1936, **9**, (11), 233–236).—The structure and mechanical properties of Asarcoloy, an alloy of cadmium containing 1·3% nickel, are described. The microstructure consists of angular crystallites of a hard intermetallic compound approximating to the formula $NiCd_7$, uniformly dispersed in a matrix of the eutectic of this compound and cadmium. Owing to the almost identical densities of the two constituents, there is no tendency for these to segregate during casting. The metalling procedure is described in detail, the pouring temperature of the alloy being 380°–400° C.—J. H. W.

On Hardenable Bronzes with a Copper–Nickel–Tin Basis. VII.—Temperature Stability of the Hardening Effect. Erich Fetz (*Z. Metallkunde*, 1936, **28**, (11), 350–353).—Precipitation-hardened nickel–tin–copper alloys are the more resistant to increase in temperature the more complete is the precipitation of the nickel–tin phase from solid solution, hence for use at elevated temperatures under alternating stresses the alloys should be slightly over-aged, *i.e.* heated for some time after the maximum hardness is attained; this treatment has no deleterious effect on the mechanical properties since the rate of coagulation of the precipitated phase is very small. Even very prolonged heating of over-aged alloys at temperatures just below the α-phase boundary does not reduce the hardness to that of the quenched homogeneous alloy. Stability to high temperatures increases with increase in the nickel content with a constant degree of supersaturation. At temperatures between 250° and 450° C. a state of equilibrium is reached on prolonged heating of either the soft-annealed or the hardened alloys.—A. R. P.

***A Study of the Molecular Phases of Variable Composition in the Gold–Copper System.** N. W. Ageew and D. N. Shoyket (*Izvestia Sektora Fiziko-Khimicheskogo Analiza* (*Ann. Sect. Anal. Phys.-Chim.*), 1936, **9**, 129–146).—[In Russian.] See *Met. Abs.*, 1935, **2**, 467, 575.—N. A.

***Investigation of the System Iron–Carbon–Molybdenum.** V. N. Svechnikov and N. S. Alferova (*Teoriya i Praktika Metallurgii*, **1936**, (4), 72–84; *C. Abs.*, 1936, **30**, 8128).—[In Russian.] Samples containing Armco iron (carbon 0·02, manganese 0·09, silicon 0·02, phosphorus 0·004, sulphur 0·0024%), molybdenum wire (99·98% molybdenum), and ferro–molybdenum (carbon 1·01, molybdenum 73·26, manganese 0·15, silicon 0·05, phosphorus 0·05%) were prepared in carborundum crucibles in a Tammann furnace. The percentages of carbon and molybdenum in the samples were up to 2·2 and 10%, respectively.—S. G.

***Observations of Stresses in Nickel–Iron Sheet by Means of X-Rays.** W. G. Burgers and F. M. Jacobs (*Metallwirtschaft*, 1936, **15**, (46), 1063–1066).—Cobalt $K\alpha$ radiation is particularly suitable for determining the lattice constants of and internal stresses in 50 : 50 nickel–iron alloys. The recrystallization texture of drawn wire of these alloys is such that a [100] axis is parallel to the axis of the wire.—v. G.

***The Equilibrium Diagram of the System Nickel–Silicon.** Masazô Okamoto (*Tetsu to Hagane* (*J. Iron Steel Inst. Japan*), 1936, **22**, (11), 869–875).—[In Japanese.] The equilibrium diagram of the system nickel–silicon was carefully investigated by thermal, microscopic, X-ray, and magnetic methods, and a new diagram is proposed. In this system there are six compounds: Ni_5Si_2, Ni_2Si, $NiSi$, Ni_3Si, $NiSi_2$, and Ni_3Si_2. The first three primarily crystallize from liquid, the melting points being 1255°, 1285°, and 992° C., respectively; the next three are formed by peritectic or peritectoid reactions, as follows: melt + $Ni_5Si_2 \rightleftarrows Ni_3Si$, 1163° C.; melt + $Si \rightleftarrows NiSi_2$, 993° C.; θ + $NiSi \rightleftarrows Ni_3Si_2$. 845° C. θ is a solid solution of the crystal type of Ni_2Si containing 23·5% silicon, and the compound $NiSi_2$ undergoes an allotropic change at 981° C.—S. G.

A New Method for Determining the Curie Points of Ferromagnetic Materials. Ludwig Bergmann (*Physikal. Z.*, 1936, **37**, (15), 547–548).—P. W. R.

Selection and Application of Cast Metals to Machine Construction. Garnet P. Phillips (*J. Western Soc. Eng.*, 1936, **41**, 187–201; *C. Abs.*, 1936, **30**, 8113).—A brief discussion of the properties and some of the present applications of the cast metals now obtainable. The classes of cast metals discussed are: cast steels, malleable irons, grey irons, special alloy irons, and non-ferrous cast metals. Tables give compositions and property ranges for (1) cast carbon steel, (2) alloy cast steels, (3) malleable cast irons, (4) cast irons, and (5) cast non-ferrous alloys.—S. G.

III.—STRUCTURE

(Metallography; Macrography; Crystal Structure.)

Recommended Practice for Metallographic Testing of Ferrous and Non-Ferrous Metals (E 3–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 773–805).—The aim of metallographic testing is to reveal the constitution and structure of metals and alloys by means of the microscope, at relatively high magnification (microscopic examination) or at low magnification (macroscopic examination). As the preparation, etching, and examination of the different metals vary to some extent, the metallographic examination of each metal and its alloys is discussed separately. The metals and alloys covered are: iron and steel, aluminium and its alloys, copper and its alloys, lead and its alloys, magnesium and its alloys, nickel and its alloys, precious metals, tin and its alloys, zinc and its alloys. Tables of etching reagents are given. A *bibliography* of 96 references is appended.—S. G.

Standard Rules Governing the Preparation of Micrographs of Metals and Alloys, Including Recommended Practice for Photography as Applied to Metallography (E 2–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 763–772).—These methods establish a practical routine to follow in the examination and photography of ferrous and non-ferrous metals and alloys. They include standard methods of procedure for securing standard magnifications, means for expressing and measuring grain-size, and rules to be followed in making photomicrographs of metallurgical specimens. An appendix sets forth the recommended practice for the care of the eyes when using a metallographic microscope.—S. G.

Micrographic Etching Methods for Nickel Rolled on Steel. —— (*Nickel Bull.*, 1936, 9, (12), 256–257).—The final polish of nickel-clad steel is effected on billiards cloth impregnated with (*a*) a suspension of chromium oxide polishing powder in water, (*b*) levigated alumina in water. The specimen is then dipped in a 50 : 50 mixture of 10% ammonium persulphate and 10% potassium cyanide (the mixture does not keep) for about 20 seconds, and washed in water and alcohol. The mixture attacks the nickel, but not the steel. The latter is then etched in the usual picric acid or 2–4% nitric acid in alcohol. For Monel metal welded to steel, the former is first etched in cold concentrated nitric acid, agitation being avoided, and then, after washing, the steel is etched with 2% nitric acid in alcohol.—J. H. W.

Grinding and Polishing for Micrography.—I–II. W. H. Dearden (*Metallurgist* (Suppt. to *Engineer*), 1936, **10**, 157–159, 162–164).—A survey of recent published information on the preparation of specimens for microscopic examination, preparation of abrasives, and developments in the use of mounting media.—R. G.

Mounting and Polishing Small Wire Specimens for Microscopic Examination. A. M. Cameron Murphy (*Wire Industry*, 1936, **3**, (34), 411, 413).—Discusses difficulties encountered in the preparation by the usual methods of sections of wires of from 0·125 to 0·003 in. diam. for microscopic examination; they are overcome by mounting the wires in beads of borax glass, round which Wood's metal is then cast. The mounting of a specimen can be completed in 5 minutes. Polishing is effected in the ordinary way, the use of chromic oxide for the final stages being recommended (presumably for ferrous wires).—W. E. A.

Metallography in the Service of Technology. Hugo Becker (*Emailwaren-Ind.*, 1936, **13**, 291–293; *C. Abs.*, 1936, **30**, 8113).—The use of metallography for the study of the inner structure of materials is discussed in detail.—S. G.

Veining and the Mosaic Structure in Metals. I.—Veining and Sub-Boundary Structures. L. Northcott (*Metallurgist* (Suppt. to *Engineer*), 1936, **10**, 165–167).—The term "veining" is restricted to a network of precipitated oxide, as distinct from "sub-boundary structures" due to a precipitate of a constituent of the alloy. Of the hypotheses concerning imperfect or "mosaic" crystal lattices, that of Darwin is considered to be the only one based on adequate evidence. The hypotheses of Zwicky, of Smekal, and of Buerger are briefly discussed. It is considered that in the general case there are likely to be small intermittent dislocations of the lattice, and a continuous series of crystal types, the mosaic passing gradually into the perfect crystal by the increase in size of perfect regions.—R. G.

***On the Structure of Thin Metal Films.** R. Riedmüller (*Z. Physik*, 1936, **102**, (5/6), 408–416).—An investigation of the lattice constants and crystal structure of films of nickel, gold, and silver from 100 to 1000 A. is described. The electron diffraction method was employed and the films prepared by evaporation. The results indicate that all three metals have their usual lattice (face-centred cube) when prepared in this way, but that the lattice constant is larger by about 1%. The effect of air and hydrogen is further to increase the lattice constants.—B. C.

Statistical Investigation of Structure [of a Metal]. II.—Measurement of the Volume of the Crystals. Erich Scheil and Hermann Wurst (*Z. Metallkunde*, 1936, **28**, (11), 340–343).—The specimen is polished and the sizes of the individual grains in a marked area are measured; this procedure is repeated three times on the same area after polishing away a thickness of 0·008 mm., and from these results frequency curves of grain-size are constructed, from which the average volume grain-size can be deduced.—A. R. P.

Contribution to the Recognition of Crystal Symmetry [of Metals] by Observations of the Polarization Colours Between Crossed Nicols. Maximilian (Frhr.) von Schwarz and Hans Daschner (*Z. Metallkunde*, 1936, **28**, (11), 343–346).—The orientation of the crystallites in various silicon–copper and copper–aluminium alloys can be ascertained by observations of the polarization colours made in reflected light. This is possible only if there is no sudden change in the colours on rotating the stage through $\frac{1}{16}$ of a circle. Methods of calculating the symmetry are given.—A. R. P.

***X-Ray Investigation of the Recrystallization of Copper and α-Brass.** V. I. Iveronova and H. S. Shdanow (*Metallwirtschaft*, 1936, **15**, (47), 1086–1088).—The temperature at which recrystallization commences rises with the zinc content from 240° C. with 0% to 290° C. with 5%, and then decreases slowly to 250° C. with 40% zinc. The number of nuclei and their rate of growth can be determined by counting the crystallites on the röntgenograph; for all the alloys tested there were about 100 times more nuclei at 425° than at 325° C. At any given temperature there was little difference in the number of nuclei in the various alloys.—v. G.

†Principles of Crystal Chemistry and Physico-Chemical Analysis. A. F. Kapustinskiy (*Izvestia Sektora Fiziko-Khimicheskogo Analiza* (*Ann. Sect. Anal. Phys.-Chim.*), 1936, **8**, 103–114).—[In Russian.] A review.—N. A.

IV.—CORROSION

***Corrosion and Protection of Light Alloys.** E. E. Halls (*Metal Treatment*, 1936, **2**, (7), 110–118).—The results of salt-spray tests extending from 1 to 14 days and of humidity tests for 16 weeks on aluminium and a number of representative alloys are summarized and discussed. Aluminium of high purity is most resistant to corrosion, alloying elements increasing the susceptibility to corrosion in the order manganese, magnesium, silicon, and copper, the copper alloys suffering most intense attack. The principal chemical and electrolytic processes for anodizing aluminium and its alloys are described, attention being directed to a number of operating details. Brief reference is made to the use of electroplated and organic protective finishes on aluminium and to methods of protecting magnesium alloys.—J. C. C.

The Corrosion-Resistance of Aluminium and Aldrey. G. Dassetto (*Energia élect.*, 1936, **13**, (8), 478; *Light Metals Rev.*, 1936, **3**, (7), 154).—A review is given of the experiences with aluminium, aluminium–steel, and Aldrey overhead lines in severe atmospheric conditions, *e.g.* near the coast. Results obtained with experimental and working lines have been entirely satisfactory. Data on older lines, particularly in tropical countries, are collected in a table. —L. A. O.

***Effect of Sulphur Sprays on Corrosion of Prune Cans.** E. H. Wiegand (*Canning Age*, 1936, **17**, (2), 72–74, 89–90; *C. Abs.*, 1936, **30**, 8420).—Actual spraying tests on prunes showed that prunes after canning retained less than 1 p.p.m. of reducible sulphur. In all types of cans no swelling or corrosion occurred for 502 days, and in the plain cans (no enamel) swells did not appear until after 600 days. Various sulphur sprays were used in the experiments. Can failures were obtained after a year or more in storage when 10 p.p.m. of various sulphur sprays were introduced directly into the cans of Royal Anne cherries. Some sulphur dusts and sprays had no effect on the keeping quality of canned gooseberries, while others were detrimental. With elemental sulphur no swelling occurred in plain tin cans. Enamelled cans concentrated the spoilage action to a few spots on the tinplate and did not keep so long as non-enamelled cans.—S. G.

Corrosion of Metal Surfaces by [Rayon] Spinning Mill Gases. R. Monterray (*Rusta-Rayonne*, 1936, **11**, 327–335; *C. Abs.*, 1936, **30**, 8606).—A discussion of the qualitative and quantitative composition of rayon spinning-mill gases, of the mechanism of corrosion and of methods for preventing it in these mills. —S. G.

Preparation of Surfaces for Corrosion-Resistance. Harry Shaw (*Machinery* (*Lond.*), 1936, **48**, (1248), 713–715).—The effect of surface roughness in accelerating corrosion is discussed. Corrosion is reduced by a protective "graphoid" coating, as formed on a journal bearing which has been run in a graphited lubricant. This coating may also be formed by lapping the surface with a chilled-iron plate, using a lubricant of paraffin and colloidal graphite.—J. C. C.

Fourth General Meeting of the (Mixed) International Research Committee on the Protection of Telegraphic Conductors and of Underground Lines. —— (*Ann. Postes Télég. Téléph.*, 1936, **25**, (10), 957–969).—Section II (Corrosion) of the Report includes the reports of the 8 sub-committees on bibliography and statistics, typical cases of electrolysis, apparatus for the detection and measurement of corrosive attack, the origin and course of stray currents, the mechanism of corrosion, drainage and joint construction, protection of underground lines and pipes, and miscellaneous types of damage.—P. M. C. R.

V.—PROTECTION

On the Action of Amines as Protective Agents in the Dissolution of Pure Aluminium in Acids. Werner Geller (*Z. Metallkunde*, 1936, **28**, (11), 354–356).—Addition of methyl-, ethyl-, butyl-, or amyl-amines to 10% sulphuric acid has no inhibiting effect on the rate of dissolution of 99·5% aluminium therein, but such additions to 5% hydrochloric acid have an inhibiting effect which increases with the proportion of amine present, but is actually only a transitory effect since it disappears within a few hrs., *i.e.* the action of the additions is really only to prolong the period of induction.—A. R. P.

Aluminium–Plus, With a Word for Brew Masters. J. W. Hishon (*Metallizer*, 1936, **5**, (3), 2, 3, 13).—A description of the M.B.V. process for the protection of aluminium, with particular reference to sprayed aluminium coatings. The coating is treated with a paste consisting of sodium chromate 10, sodium carbonate 4, caustic soda 4, water 10–15 parts. The paste is applied with a brush and afterwards a warm solution of 3–5% sodium silicate is applied with a brush. It is suggested that afterwards the coating is to be treated with a blow-pipe. Suggestions are given with regard to the use of the M.B.V. process, and H. concludes with a description of the methods used in removing beer stone from aluminium tanks.—W. E. B.

Tin as an Anti-Corrosion Coating. Bruce W. Gonser (*Metallizer*, 1936, **5**, (3), 5).—A description is given of the use of tin coatings in industry. —W. E. B.

***Protection of Under-Water [Iron] Surfaces from Rust by Zinc.** E. Cantignon (*Z.V.d.I.*, 1936, **80**, (40), 1210).—Soldering of 4 zinc plates 2 mm. thick and 0·1–0·2 m.^{2} cross-section to the bottom of Berlin canal boats 20 m. long has afforded efficient protection of the steel bottoms during the past 12 years. Ordinary commercial zinc is sufficiently pure for the purpose.—v. G.

Problems in Electrogalvanizing Round Wire. (Lyons.) See p. 10.

The "Blue Tarnish" of Hot Galvanized Sheet on Storage. Heinz Bablik (*Illust. Zeit. Blechindustrie*, 1936, **65**, (40), 1184–1187).—An analysis of the conditions under which "blue tarnish" occurs shows that the phenomenon is due to corrosion in a humid atmosphere where air exchange is difficult. Improved methods of storage and of air-conditioning are suggested.—P. R.

Standard Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses (A 120–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 295–300).—Cover black and hot-dipped galvanized " standard weight," " extra strong," and " double extra strong " welded and seamless steel pipe. Pipes covered by these specifications are intended for ordinary uses such as low-pressure service in steam, water, and gas lines, and are not intended for close bending or coiling, or high-temperature service. The weight of zinc coating is to be not less than 2·0 oz. per ft.^{2} of total coated service.—S. G.

Standard Specifications for Zinc-Coated (Galvanized) Wrought-Iron Sheets (A 163–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 448–452).—Cover wrought-iron sheets for use in culverts, roofing, siding, for corrugating and moderate forming, with 4 classes of zinc coatings applied by the hot-dip process: Classes A and B—Extra heavy and heavy coated sheets that are not intended to be formed other than by corrugating and curving to large radii; Class C—Moderately heavily coated sheets for moderate bending; Class D—Ordinary sheets for general utility. A table gives the requirements for weight of coating for the various gauges in Classes A–C. For Class D no definite weight of coating is guaranteed, and these sheets are not subject to coating tests.—S. G.

Zin-o-Lyte. —— (*Amer. Metal Market*, 1936, **43**, (233), 5, 7).—A brief note of a process for the production of bright zinc coatings. These are deposited from the bath without bright dipping. The process operates with equal success in still plating or in barrel plating and is applicable to almost all types of iron and steel products except some types of castings. The coatings are ductile and firmly adherent.—L. A. O.

Processes That Protect from Rust. Burnham Finney (*Machinist* (*Eur. Edn.*), 1936, **80**, (42), 869–870).—Describes rust-proofing processes for protecting steel, zinc- and cadmium-surfaced articles, and zinc alloys from rust.—J. H. W.

†**Metal Spraying. Comparison with Other Methods of Protecting the Surface of Metals.** G. Schenk (*Z.V.d.I.*, 1936, **80**, (39), 1189–1192).—The mechanism of the spraying process is discussed, and some of its applications are described, especially the application of a 0·2 mm. thick layer of zinc on steel and the production of conducting surfaces on non-metallic articles.—v. G.

Metallizing in the Canning Industry. William Hishon (*Metallizer*, 1936, **5**, (3), 7, 12).—Discusses the applications of metal-sprayed coatings in the canning industry. Zinc, tin, and nickel coatings are recommended for various vessels used in connection with peas, and Monel metal coatings and aluminium coatings are recommended for the protection of metal against tomato juices. Lists are given of the right metals to use in various parts of the plant,
—W. E. B.

Mogul—High-Production Metallizing Unit. —— (*Metallizer*, 1936, **5**, (3), 8, 9).—A description of the new Mogul piston.—W. E. B.

Follsain Treatments [Protection Against High-Temperature Oxidation]. Mark Barr (*Metal Treatment*, 1936, **2**, (7), 144–147).—The Follsain H.T. Penetral treatment produces an aluminium-rich layer on iron and steel articles and affords protection against oxidation at high temperatures. The articles are heated above 1000° C. for 1–6 hrs. in a mixture of aluminium, chromium, and other chlorides with carborundum. Reference is made to two alloys " EVHI " and " CY " (compositions not stated) for which considerable strength at high temperatures and unusual abrasion-resistance are claimed, respectively.—J. C. C.

Revised Method for Carrying Out Pinhole Tests on Enamelled Wire. —— (*Brit. Elect. Res. Assoc. Rep.*, **A/544**, 1936, 3 pp.; *Sci. Abs.*, 1936, [B], **39**, 624).—Wire travelling at 12 in./second is immersed to a length of 2·4 in.

in a mercury bath, giving an immersion time of 0·2 second. Using a 1-in. amalgamated copper guide pulley, there is no advantage in exceeding a testing voltage of 50 v. A suitable relay to indicate fault currents operates with certainty when 50 v. is maintained for 0·2 second across a fault resistance of 10,000 Ω, but is unaffected if the fault resistance is 15,000 Ω. A convenient method for adjusting the sensitivity, using a 2-part commutator driven at an appropriate speed by, for instance, a gramophone motor is described. The wire must not be stretched during the pinhole test to such an extent that the resistance per yard is increased by more than 5%.—S. G.

Acid-Resistant Varnishes for Tinplate Food Containers. Arthur Jones (*Paint Tech.*, 1936, **1**, 330, 337; *C. Abs.*, 1936, **30**, 8659).—The phenol-formaldehyde type of finishes are among the most waterproof and germicidal of all coatings and may be diluted with 5–10 times their own weight of other varnishes. Admixture with cumarone or copal varnish improves the working properties with tung oil without weakening the waterproofness. Several acid-resisting formulæ are given.—S. G.

Progress in Rust Proofing. Herbert R. Simonds (*Iron Age*, 1936, **138**, (17), 32–35).—Discusses the use of paint for rust-proofing and compares the costs encountered in installing various rust-proofing equipment. The Granode (zinc phosphate), Cromodizing (iron chromate), and zinc–mercury plating processes are briefly described.—J. H. W.

Recent Developments in Aluminium Pigments. Robert I. Wray (*Official Digest Fed. Paint Varnish Production Clubs*, 1936, (**158**), 250–254).—S. G.

VI.—ELECTRODEPOSITION

What the Operator Should Know About Nickel Plating. Eugen Werner (*Werkstatt u. Betrieb*, 1936, **69**, (23/24), 321–325).—The various stages in the process are described and explained, and common defects are discussed, with methods of prevention.—P. M. C. R.

Problems in Electro-Galvanizing Round Wire. Ernest H. Lyons, Jr. (*Iron Age*, 1936, **138**, (19), 47–49).—The problems of removing drawing compounds embedded in the surface of round wire and of obtaining good dense castings at high current densities are discussed. The properties of electro-galvanized wire, and the operation and maintenance of an electro-galvanizing plant are described (see Arnold Weisselberg, *Met. Abs.*, 1936, **3**, 260). —J. H. W.

IX.—ANALYSIS

Polarization Effect in the Spectrum Analysis of Zinc and Tin. R. Breckpot (*Natuurw. Tijdschr.*, 1936, **18**, 173–180; *C. Abs.*, 1936, **30**, 8018).—The polarity of electrodes plays an important rôle in the quantitative spectrum analysis, especially in that of Zn and Sn. The spectral lines of the common impurities of Zn are enhanced relative to the Zn lines when the spectra of these elements are photographed with the oxides on the positive electrode. The lines of the impurities of Sn, on the other hand, are enhanced with respect to the Sn lines with the oxide on the negative electrode. Therefore ZnO analysis is better carried out on the anode and that of SnO better on the cathode.—S. G.

Quantitative Spectral Analysis of Aluminium and Its Alloys. A. R. Striganov (*Legkie Metalli* (*Light Metals*), **1936**, (7), 20–27).—[In Russian.] A detailed review.—D. N. S.

Volumetric Analysis of Military Brass. Antonio Blanco García (*IX Congr. internat. quim. pura applicada* (*Madrid*), 1934, **6**, 310–320 (published in 1936); *C. Abs.*, 1936, **30**, 8070).—[In Spanish.] A review of various methods for the analysis of brass, with particular reference to the precipitation of Cu as acetylide and ferrocyanide. A method proposed for volumetric analysis consists in the solution of brass in HNO_3 and addition of excess NH_3 to precipitate hydroxides of Pb and Fe, which are filtered off. By addition of a small excess of $NH_2OH{\cdot}HCl$ the Cu^{++} is reduced to Cu^{+}, which is precipitated by C_2H_2. The Cu precipitate is dissolved in *aqua regia* and a portion titrated with $0{\cdot}1N$ $K_4Fe(CN)_6$. The Zn in the filtrate can be titrated in a similar way with $FeCl_3$ as indicator.—S. G.

***Comparative Study of Various Methods for the Determination of Tantalum and Niobium.** L. Bleyenheuft (*Ing. chimiste*, 1936, **20**, (119), 165–185).—A thesis dealing with the examination of published methods on chemical analytical methods for Ta and Nb. The principal quantitative reactions of Ta and Nb and the known methods of separation are discussed. A third section deals with the separation of the elements which are usually found with Ta and Nb in minerals. The details of the method found most suitable by the author are given. It is confirmed that the tannin separation of Schoeller is very accurate and that the double fluoride method of Marignac is not reliable. —R. G.

X.—LABORATORY APPARATUS, INSTRUMENTS, &c.

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

***On an Apparatus for the Production of Metal Powders under Nitrogen or Other Gases.** F. Durau (*Physikal. Z.*, 1936, **37**, (19), 684–688).—Describes an apparatus for making powders of nickel, silver, copper, &c., by filing in an atmosphere of nitrogen or other gas as required. The purpose of the method is to produce powders suitable for adsorption measurements.—B. C.

Details of X-Ray Apparatus. Robert C. Woods (*Iron Age*, 1936, **138**, (17), 36–41).—The basic operations of the various parts of X-ray equipment are explained in simple language.—J. H. W.

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

Standard Definition of Terms Relating to Methods of Testing (E 6–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 861–867; and (II), 1429–1435).—The terms defined are: stress, strain, stress–strain diagram, elastic limit, yield-strength, tensile strength, compressive strength, and modulus of elasticity.—S. G.

Naval Welding Process Approval Tests. William C. Stewart (*J. Amer. Soc. Naval Eng.*, 1936, **48**, (4), 553–574).—A discussion of welding process approval tests for Naval and marine machinery includes details of the tests, tensile, visual, macro-, and microscopic, required for nickel–copper alloys containing a minimum of 60% nickel, and for an alloy containing 25% chromium and 20% nickel. The preparation of test-specimens and of electrodes used are also considered.—J. W. D.

The Fatigue Testing of Wire. E. V. Walker (*Post Office Elect. Eng. J.*, 1936, **29**, (3), 237–239).—The general principles of fatigue testing are summarized, and an illustrated description is given of the Haigh–Robertson fatigue testing machine, which is designed to prevent the fracture of the wire within the grips and to permit representative results to be obtained from samples of hard-drawn material.—P. M. C. R.

Standard Methods of Tension Testing of Metallic Materials (E 8–36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 833–848).—Deals with the apparatus and speed of testing; test-specimens for various materials; determination of proportional limit, elastic limit, yield-strength, yield-point, and tensile strength (with definitions of the terms); plotting stress–strain diagrams; and the measurement, after fracture, of the elongation and the reduction of cross-section of tension test-specimens.—S. G.

Standard Methods of Rockwell Hardness Testing of Metallic Materials (E 18–36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 824–832).—S. G.

Direct-Reading Conveyor Brinell Machine. —— (*Instruments*, 1936, 9, (10), 274).—A brief description of a direct-reading Brinell machine designed primarily for the routine testing of cylinder blocks and heads. These are brought under the machine on a conveyor.—J. C. C.

Standard Accelerated Life Test for Metallic Materials for Electrical Heating (B 76–36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 734–744).—Covers the determination of the resistance to oxidation at high temperatures under intermittent heating. The method is applicable to two general classes of metallic materials for electrical heating: Class A—alloys suitable for commercial service up to 1100° C.; Class B—alloys suitable for commercial service up to 900° C.—S. G.

A Simple Arrangement for the Measurement of Thermal and Electrical Conductivity [of Metals]. Fritz Förster (*Z. Metallkunde*, 1936, 28, (11), 337–340).—A description, with detailed diagrams, is given of an apparatus for measuring the thermal conductivity of a metal by comparison with a specimen of known conductivity. Only small specimens are required for the test and the temperature differences between the ends does not exceed 6° C. The apparatus can be set up and a result accurate to ± 1% obtained in 15 minutes. With a slightly modified apparatus the electrical conductivity can be measured simultaneously and measurements of both conductivities can also be made at elevated temperatures.—A. R. P.

Standard Method of Test for Resistivity of Metallic Materials (B 63–36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 749–751).—This method is intended to cover the determination, to an acuracy of 1%, of the electrical resistivity of rolled and drawn metallic materials.—S. G.

Standard Method of Test for Temperature-Resistance Constants of Alloy Wires for Precision Resistors (B 84-36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 752–757).—This method provides for determining the change of resistance of alloy wires used for resistance standards and for precision resistors in electrical apparatus. It is applicable in the temperature range 0–80° C.—S. G.

Standard Definitions of Terms, with Units and Symbols, Relating to Magnetic Testing (A 127–36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 518–523).—Definitions are given of the units: gauss, gilbert, maxwell, and oersted. The following terms are listed followed by any optional alternative terms; the symbol for the quantity is then given, followed by the definition of the standard term: ageing of magnetic materials; coercive force, coercivity, core loss ageing coeff.; core loss; standard core loss; cyclicly magnetized condition; diamagnetic material; differential permeability; eddy current loss; ferric induction; ferromagnetic material; hysteresis loss; incremental permeability; initial permeability; intrinsic induction curve; intrinsic induction in a magnetic material; intrinsic permeability; linkage; magnetic circuit; magnetic field; magnetic flux; magnetic hysteresis; magnetic induction; magnetic potential difference; magnetician; magnetizing force; magnetomotive force; normal induction curve; normal induction in a ferromagnetic material; normal permeability; permeability; permanence;

reluctance; reluctivity; remanence; residual induction; retentivity; reversible permeability; saturation induction; space permeability.—S. G.

†**Metal Research with Supersonic Waves.** H. J. Seemann (*Metallwirtschaft*, 1936, **15**, (46), 1067–1069).—A review of the literature on the production and use of sonic and supersonic vibrations in metal research.—v. G.

Standard Methods of Verification of Testing Machines (E 4–36). —— (*Book of A.S.T.M. Standards*, 1936, (I), 849–860; and (II), 1417–1428).—S. G.

XII.—TEMPERATURE MEASUREMENT AND CONTROL

Temperature Control. —— (*Electrician*, 1936, **118**, 540–541).—Radiation from a heated body, such as a bar heated by an electric current, is directed on a light-sensitive cell. When a predetermined temperature is reached, relays are operated by the cell and cut off the heating current.—J. C. C.

The Use of Thermoelectric Couples. L. Scheepers (*Rev. Univ. Mines*, 1936, [viii], **12**, (9), 369–375).—A review.—S. G.

***A Standard Cell for Small Voltages.** W. Gremmer (*Physikal. Z.*, 1936, **37**, (20), 697–699).—Describes a standard cell depending on the cadmium-mercury system that gives a voltage of about 0·04 v., a suitable value for use with thermocouples.—B. C.

***The Relation Between the Platinum Resistance Thermometer and the Helium Gas Thermometer in the Range 14°–90° K.** F. Henning and J. Otto (*Physikal. Z.*, 1936, **37**, (17), 601–609).—An expression containing five constants is derived for relating the resistance of platinum with the temperature between 14° and 90° K.—B. C.

***The Platinum Resistance Thermometer as Secondary Standard of Temperature Between 14° and 90° K.** F. Henning and J. Otto (*Physikal. Z.*, 1936, **37**, (18), 639–641).—The standardization of platinum resistance thermometers for temperatures of 14°–90° K. is discussed.—B. C.

XIII.—FOUNDRY PRACTICE AND APPLIANCES

†**Casting Non-Ferrous Billets.** Gilbert Evans (*Metallurgia*, 1936, **15**, (85), 7–10).—A description of methods adopted by various British and Continental founders to produce billets with a perfect surface and free from porosity. E. deals with the temperature and treatment of the poured metal, teeming, the control of volume of water in water-cooled moulds, the care of moulds, and the real value of dressing for moulds. A comparison is also made of cannon-type cast-iron moulds and water-cooled moulds as regards length of life and replacement, casting time from pan to extraction, number of moulds and space required, casting speed for continuous work, number of operators for a 300 kg. unit, and quality of the slabs cast. As regards the latter, it is stated that with iron moulds the structure of the metal is unequal and quite beyond control, while water-cooled moulds provide a uniform structure that can be regulated as desired.—J. W. D.

Permanent-Mould Castings in Aluminium. R. J. Roshirt (*Iron Age*, 1936, **138**, (19), 50–52, 134; and (summary) *Found. Trade J.*, 1936, **55**, (1061), 270).—Permanent-mould aluminium castings, the moulds being made of semi-steel or high-test cast iron, are said to be about 20% stronger than the corresponding aluminium die-castings, since gas pockets and voids in the metal are sometimes trapped under the surface of the casting in the latter. For the same reason, the die-castings cannot be heat-treated, while the permanent-mould castings can be partly improved by proper heat-treatment.—J. H. W.

The Technique of Casting Light Metal Pistons Consisting of Two Alloys. G. Gressenich (*Automobiltech. Z.*, 1936, **39**, (19), 482).—The method of casting, which involves the manipulation of a movable insert when the first-poured alloy is semi-solid, is described, with 4 diagrams.—P. M. C. R.

New [Process] for Silumin (Alpax). —— (*Giesserei-Praxis*, 1936, **57**, (41/42), 464).—Describes the modification of aluminium alloys by the provision of a salt cover to the molten metal. The salt cover can be a neutral, acid, or basic compound of light or heavy metals. Commonly used are the chlorides and fluorides of the light metals, and carbonates and oxides of the alkalis or alkali earths. The salt cover is melted and stirred into the melt and the alkali metal, preferably sodium, introduced. The metal is allowed to stand for a few minutes and then poured. By this means, sound, blister-free castings are obtained with very small amounts of salt or sodium.—J. H. W.

Bronze Foundry Practice (Brass). —— (*Machines*, **1936**, (Oct.), 7–13).—The development of bronze foundry practice in Belgium is outlined and the conditions necessary for the successful operation of crucible furnaces are examined. The limitations of pyrometric and visual temperature control are considered, and the influence of casting temperature on homogeneity is illustrated by an account of a series of tests on cast bars of bronzes and brasses of stated composition.—P. M. C. R.

Die-Casting Elektron Metal. —— (*Machinery* (*Lond.*), 1936, **48**, (1245), 623–624).—Brief details are given of the operation of making die-castings from Elektron. A totally-enclosed melting pot, charged from an enclosed bin, is situated directly below the die-actuating mechanism, and a small quantity of sulphur is added to the charge to produce a neutral atmosphere of sulphur dioxide. As the alloy does not attack iron, wear and erosion of the dies is negligible. The design and dimensioning of parts to be die-cast in Elektron are discussed.—J. C. C.

The Manufacture of White Metal Lined Bearings. —— (*Machinery* (*Lond.*), 1936, **49**, (1254), 93–97).—A brief description is given of the operation of lining mild steel shells with white metal by pressure die-casting machines at the works of the Glacier Metal Co., Ltd. Subsequent machining operations are described in detail.—J. C. C.

Die-Casting Machines in the U.S.A. Herbert Chase (*Machinery* (*Lond.*), 1936, **48**, (1241), 503–506).—For die-casting zinc alloys, plunger-type machines which inject the metal rapidly and under high pressure are coming into general use. Some typical modern American machines are illustrated and briefly described.—J. C. C.

Applications of Zinc Die-Castings in the U.S.A. Herbert Chase (*Machinery* (*Lond.*), 1936, **48**, (1247), 683–685; (1250), 781–783).—Some typical zinc alloy die-castings are illustrated and described.—J. C. C.

Hardness Tester for Baked Cores and Sand Moulds. —— (*Instruments*, 1936, **9**, (10), 269).—This instrument measures the normal pressure exerted on a diamond cone which is forced to a fixed depth and drawn along the surface.—J. C. C.

Modern Non-Ferrous Foundry Equipment. J. Laing (*Met. Ind.* (*Lond.*), 1936, **49**, (21), 505–509; (22), 531–534).—A review of recent developments in sand-mixing machines, moulding machines, core-making machines, and core ovens.—J. E. N.

XV.—FURNACES AND FUELS

Furnaces for Melting Light Metals and Alloys. R. Barbanel (*Legkie Metalli* (*Light Metals*), **1936**, (7), 38–46).—[In Russian.] A detailed report read at the All-Union Conference on Light Metals.—D. N. S.

Meaning of the Input in Electric Resistance Furnaces. Victor Paschkis (*Cong. internat. applications électrocalorif. électrochim.*, *Scheveningen*, **1936**, 15 pp.; *C. Abs.*, 1936, **30**, 8032).—The input value is discussed from electrical, thermal, and economic points of view.—S. G.

Resistance Materials for Electric Furnaces. Research and Testing. C. J. Smithells and P. R. Bardell (*Cong. internat. applications électrocalorif. électrochim., Scheveningen*, 1936, 13 pp.; and *Met. Ind.* (*Lond.*), 1936, **49**, (6), 134–138).—A review.—S. G.

Heat Losses in Periodically Operated Electric Furnaces. New Method for Predetermining Non-Stationary Heat-Flows. C. L. Beuken (*Congr. internat. applications électrocalorif. électrochim., Scheveningen*, 1936, 10 pp.; *C. Abs.*, 1936, **30**, 8031).—An analogy is found between heat and electrical conduction; a method based on model measurements is given which permits the predetermination of any possible non-stationary heat-flows. Several examples are given of such computations for industrial electric furnaces.—S. G.

***Radiation of the Bare Heat Conductor in the Electric Furnace.** Wilhelm Fischer (*Congr. internat. applications électrocalorif. électrochim., Scheveningen*, **1936**, 18 pp.; *C. Abs.*, 1936, **30**, 8031).—By determining individual radiation components, the total radiation emitted from the furnace wall with different arrangements of the heating units was computed. At a given temperature, maximum radiation occurs if the walls are completely covered by the heating units. In practice this cannot be accomplished, but compensation can be obtained by increasing the depth dimensions of the heating units. The thermal characteristics of the " felly " type of heating unit are discussed and compared with those of the ribbon and rectangular types.—S. G.

Annealing Copper Alloy Components in Controlled Atmosphere Furnaces. E. E. Halls (*Machinery* (*Lond.*), 1936, **48**, (1247), 690–692).—The construction and operation of conveyor-type controlled-atmosphere annealing furnaces is briefly described.—J. C. C.

Development and Progress of Heat-Treatments Due to the Electric Furnace. A. Sourdillon (*Congr. internat. applications électrocalorif. électrochim., Scheveningen*, **1936**, 27 pp.; *C. Abs.*, 1936, **30**, 8118).—The theoretical foundations of the heat-treatment of various ferrous and non-ferrous alloys are reviewed, and the rôle of electric furnaces in the close control of the processes is discussed. —S. G.

Developments in Electric Heat-Treatment Furnaces. A. G. Robiette (*Metallurgia*, 1936, **15**, (86), 57–60).—A brief survey of the trend of development in electric heat-treatment furnaces. R. deals with some outstanding examples of the progress achieved in batch-type furnaces for the solution treatment of aluminium alloy tubes, sections, and sheets; in salt-baths for low-temperature heat-treatment; and in continuous furnaces for reheating brass, copper, and aluminium alloy billets for rolling or extrusion, and for the normalizing of hot-rolled strip and the annealing and normalizing of cold-rolled products. Consideration is also given to furnaces with protective atmospheres for special heat-treatments and for bright-annealing.—J. W. D.

†**Electric Hardening and Heat-Treatment Furnaces.** Fr. Knoops (*Z.V.d.I.*, 1936, **80**, (40), 1225–1227).—A review.—v. G.

XVII.—HEAT-TREATMENT

Copper That Can Be Hardened. John Haydock (*Machinist* (*Eur. Edn.*), 1936, **80**, (41), 841–844).—An alloy having the strength and hardness of alloy steel and the conductivity and corrosion-resistance of copper is obtained by adding 2–2·25% beryllium to copper. A commonly used alloy contains 0·25–0·50% nickel and a trace of iron. The improvement in the physical properties (up to 200,000 lb./in.^{2} and 360 Brinell) by heat-treatment is caused by " precipitation " of the γ-phase from the supersaturated solid solution. Any severe cold-working must be done while the alloy is in the soft state, *i.e.* in the supersaturated solid solution. The heat-treatment consists in heating to 500°–575° F. (260°–300° C.) and cooling in air. The time of heating, which controls the quantity, particle size, and distribution of the precipitate, must be predetermined and accurately regulated. In a series of forming operations, intermediate anneals at 1450°–1500° F. (790°–815° C.) for 15–30 minutes and quenching in water is required to remove the effect of cold-working. Hot-working may be carried out from 1075° to 1400° F. (580°–760° C.). The working and applications of beryllium–copper containing 0·25–0·50% nickel are described.—J. H. W.

Low-Temperature Annealing of Phosphor–Bronze. H. H. Parrett (*Met. Ind.* (*Lond.*), 1936, **49**, (20), 479–481).—Phosphor–bronze wires of composition copper 92·82, tin 6·90, phosphorus 0·23, iron 0·03% were cold-drawn by amounts varying from 8·1 to 93·8%. Low-temperature annealing at various temperatures below the softening point was carried out for varying periods of time. When the cold-work was between 15 and 30% reduction of area, annealing at temperatures of 170°–250° C. for periods up to 2 hrs. produced considerable increase in elongation with no decrease in tensile strength. The increase amounted to 8–10 times the elongation before treatment. An explanation is offered, but it is suggested that X-ray analysis may reveal interesting phenomena.—J. E. N.

XVIII.—WORKING

Aluminium and Aluminium Alloy Sheet. William Ashcroft (*Metallurgia*, 1936, **15**, (85), 11–12).—A brief description of the grades of aluminium and its alloys in the form of sheet, plate, coiled sheet, circles, and composite sheet and of the various tempers and heat-treatments required in their production is given to assist in the selection of such materials for drawing, spinning, stamping, and other forming operations.—J. W. D.

Hot-Rolling. Leonhard Weiss (*Z. Metallkunde*, 1936, **28**, (11), 331–335).—Mathematical. The mechanism of the hot-rolling process is expressed in equations and graphs. Temperature–flow pressure curves are given for aluminium and various brasses.—A. R. P.

Individual Drive of Live Rolls. L. O. Whittaker (*Metropolitan-Vickers Gazz.*, 1936, **16**, (280), 186–188).—S. G.

Progress in Seamless Tube Manufacture. Gilbert Evans (*Metallurgia*, 1936, **15**, (86), 45–47).—Progress in the manufacture of seamless tubes is briefly reviewed, and non-ferrous tube manufacture is considered with reference to the extrusion of Monel metal, Duralumin, cupro–nickel, pure nickel, &c. Attention is directed to the factors, which have contributed to this progress, in the development of the endless-chain draw-bench, the rotary piercing of solid billets into hollow blooms, the use of special dies and plugs, and improvements in annealing and heat-treatment furnaces.—J. W. D.

Straightening Tubes and Round Bars. —— (*Metallurgia*, 1936, **15**, (85), 25–26).—A description of machines used in straightening tubes 3¼–6⅝ in. diameter, and bars 2¼–4 in. diameter for modern high-speed production methods.—J. W. D.

***The Hot-Drawing of Copper Wire.** Edgar L. Francis (*Wire Industry*, 1936, **3**, (30), 243, 245, 246).—F. describes experiments undertaken to investigate the possibility of drawing copper wire at temperatures above that of recrystallization of the cold-worked material, *i.e.* without any work-hardening. Fully annealed H.-C. copper, 0·048 in. diam., was drawn at 20 ft./minute at varying temperatures through tungsten carbide dies of 5¾° semi-angle. Lubrication presented the greatest difficulty, special oils for high temperature operation failing above 350° C. Molten lead functioned up to 485° C., but produced marked embrittlement of the wire above about 350° C. The lubricant finally used was "Oildag," a concentrated mixture of colloidal graphite with oil; the operative lubricant at higher temperatures was a thin film of graphite. With lead as lubricant and a uniform reduction of area of 17·5% drawing was too erratic to yield any useful data for the tractive effort required; the elongation of the drawn wire decreased rapidly above 350° C., and this is ascribed to embrittlement as the result of intercrystalline penetration of the stressed copper by the molten lead. With "Oildag" and 19·7% reduction, the elongation of the drawn wire increased smoothly with temperature until at 485° C. it was equal to that of fully-annealed wire of the same diameter. The pull required for drawing at first diminished rapidly, but increased slightly at about 400° C. to a value which underwent little further change; it is suggested that at lower temperatures oil and at higher temperatures graphite is the principal lubricant. In both cases the tensile strength of the drawn wire diminished rapidly above 350° C.; at 480° C. approximately it was equal to that of the fully-annealed undrawn wire. With ("Oildag" and) 12·3% reduction, the results were generally similar, but the temperatures of incipient and full softening were appreciably higher. With this light draft it was possible to draw up to 575° C., but not beyond. Above about 550° C. the elongation decreased rapidly; there was no corresponding change in tensile strength, and no simple explanation of the sudden loss of ductility is apparent. "Sucking" was much less serious with 12·3% reduction than with the more severe drafts; it was inappreciable below 500° C. at 12·3% reduction, but increased rapidly with temperature above 500° C. The tungsten carbide dies showed no wear below 500° C., but did show signs of wear after the highest temperature experiments.—W. E. A.

The Production of Bronze Wires. A. Walker Fielding (*Wire Industry*, 1936, **3**, (32), 339, 341, 343).—A review of drawing practice for phosphor-bronzes and other "bronzes," with and without tin, *e.g.* aluminium bronze. Phosphor-bronzes are very important. Wire is drawn from α alloys with up to 9% tin and 0·40% phosphorus; alloys with higher tin and phosphorus content are much used in cast form, but cannot be drawn into wire. Phosphor-bronzes are divided into the softer, with up to 2% tin, and the harder. The former draw well and can be drawn on modern high-speed machines at about half the speeds used for copper. The latter harden much more rapidly, and need correspondingly more frequent annealing. Surface oxidation leads to formation of stannic oxide, which rapidly cuts drawing dies, and hence intermediate annealing without oxidation is essential. For high-tin and complex bronzes, moderate drawing speeds are recommended, with straight-sided dies of 8° total angle; synthetic dies are usual down to 25 I.S.W.G. and diamonds below. Annealing at 650° C., or at 700° C. if iron is present, in a gas-seal annealing pail, and continuous flash annealing in the hardening section of a card wire hardening and tempering machine, are described. Regular metallographic control of all processes is strongly advocated.

—W. E. A.

The Drop-Forging of Automobile and Aeroplane Parts from Light Metals or Stainless Steel, and the Cost of the Process. —— (*Aviation*, **1935**, (July); and *Werkstatt u. Betrieb*, 1936, **69**, (23/24), 316–318).—A full description is given of the necessary plant and of the preparation of the lead-alloy and zinc dies employed. An estimate of the cost of various parts is appended.

—P. M. C. R.

XIX.—CLEANING AND FINISHING

When Metals Must Be Cleaned. —— (*Machinist* (*Eur. Edn.*), 1936, **80**, (42), 871–872).—Describes various machines and reagents for cleaning metals and preparing them for painting.—J. H. W.

Durability of Lapped Surfaces. Francis W. Shaw (*Machinery* (*Lond.*), 1936, 48, (1240), 480–482).—Surfaces of cast iron, mild steel, phosphor-bronze, and hardened lead were hand-lapped with carborundum, wiped clean with cotton wool, and then rubbed together for 15 minutes with mineral oil as a lubricant. Examination of the surfaces with a Contograph showed no furrows which could be attributed to the action of abrasive grains left after lapping. The prejudice against lapping, on the grounds that some abrasive powder inevitably remains on the surface and leads to a reduction in working life, thus appears unjustified.—J. C. C.

XX.—JOINING

The Use of Silver in Modern Brazing. Herbert E. Bennett (*Metal Treatment*, 1936, 2, (7), 130–131).—Silver in brazing alloys lowers the melting point and produces free-flowing alloys of high strength and ductility. "Sil-Fos," containing silver 15% and a small amount of phosphorus, is exceptionally free-flowing and requires a minimum amount of flux. It is not suitable for jointing steels. For these, including stainless steels, a silver solder containing manganese may be used.—J. C. C.

Practical Pointers on Plant Mechanics. Ray Monahan (*Proc. 9th Ann. State Coll. Wash. Inst. Dairying*, 1936, 57–59; *C. Abs.*, 1936, 30, 8134).—A solder for aluminium, stainless steel, and other metals is described. It is applied in powder form to the hot metal which is to be soldered. The solder mixture consists of 4 parts $ZnCl_2$, 4 parts NH_4Cl, and 1 part powdered solder. The solder recommended is lead 70, tin 30%.—S. G.

Observations on the Welding of Light Metal Profiles. M. Maier (*Aluminium*, 1936, 18, (11), 537–541).—For welding certain sections of aluminium alloys, such as those specified in paragraph 4 of DIN 1713, it has been recommended to use welding rods of aluminium containing 4–5% silicon to prevent cracking around the weld. Experiments have shown that it is possible by proper manipulation to use rods of the same alloy as that being welded, but, since this requires much care and practice, it is safer to use the silicon-alloy rods. —A. R. P.

The Study of Welds and Weld Metal. —— (*Murex Welding Processes, Ltd.*, *Booklet* No. M3, 1936, 30 pp.).—An elementary description of the methods, used to prepare and examine metallographic specimens, is followed by a discussion of the structures of welds, illustrated by excellent photomicrographs, which are well reproduced. Not a single picture of a non-ferrous weld is included. The authors mention nickel and Monel metal, but are apparently unaware that aluminium, copper, and many alloys can be welded by the metallic arc.—H. W. G. H.

Fusion Welding. Bela Ronay (*J. Amer. Soc. Naval Eng.*, 1936, 48, (4), 532–552).—The fusion welding of ferrous and non-ferrous metals is discussed with regard to electrodes and their selection, power sources, position welding, position welding with non-ferrous electrodes, and preparation of base metal in metallic arc welding. Consideration is also given to oxy-acetylene welding and to the metallurgy of fusion welding.—J. W. D.

Naval Welding Process Approval Tests. (Stewart.) See p. 11.

Ten Years of Welding Development. Norman L. Mochel (*J. Amer. Soc. Naval Eng.*, 1936, 48, (4), 455–475).—In a retrospect of the last 10 years of welding development, consideration is given to welding electrodes, materials for welding, matters of technique or practice, equipment, inspection methods, general design consideration, and to the many applications of welding. In marine applications special reference is made to the fabrication of copper-nickel or other copper alloy water boxes for marine condensers, to its applications in the construction of electrical apparatus, and to the local applications of copper–nickel alloys to various parts.—J. W. D.

XXI.—INDUSTRIAL USES AND APPLICATIONS

Aluminium Now an Important Part of Modern Engineering. Theodore Varney (*Canad. Mach.*, 1936, **47**, (11), 26–28).—From a paper read before the Toronto Section, American Institute of Electrical Engineers. A review of modern applications of aluminium in electrical equipment, electric traction, radio work, machine construction, and hydraulic engineering—P. M. C. R.

Reconstruction and Increased Efficiency on the Beckenried–Klewenalp Aerial Railway. Carl Haefner (*Allégement dans les Transports*, 1936, **5**, (11/12), 148–152).—The reconstruction included the introduction of the following light alloy parts: suspension gear (Anticorodal), cabin framework (Anticorodal), roof and outer panelling (Aluman). A lightening of about 660 lb. has been effected (20%).—P. M. C. R.

Trolley Wire System with Copper Contact and Aluminium–Steel Support Wires. M. Süberkrüb (*Elekt. im Bergbau*, 1936, **11**, (March), 21–25; *Sci. Abs.*, 1936, [B], **39**, 318).—The Bergwitz–Zschornewitz mine provides the Zschornewitz generating station with part of its brown coal supply over a 16 km. railway, electrified at 1200 v., d.c. A 100 mm.^{2} copper contact wire is used, the supporting catenary being of aluminium or aluminium–steel of 120 mm.^{2} nominal section.—S. G.

Aluminium. A Decorative Medium. —— (*Metallurgia*, 1936, **15**, (85), 4).—The advantages of aluminium for architectural purposes are considered as regards finish, working, and jointing, and examples are given of decorative forms of aluminium in gates and brackets.—J. W. D.

***Stainless Steel [Compared with Aluminium] from the Hygienic Point of View.** Charles Sunder (*Bull. Soc. indust. Mulhouse*, 1936, **102**, 15–16; *C. Abs.*, 1936, **30**, 2895).—S. states that more metal is dissolved by boiling water from a vessel of aluminium than from one of stainless steel. This is shown by tests in which samples of Indian cotton were dyed with alizarin after exposure to Doller water which had been boiled in vessels of the two metals. The water boiled in an aluminium vessel contained sufficient colloidal aluminium hydrate to mordant the dye, but no such effect occurred with the water boiled in a stainless steel vessel. After boiling, the stainless steel vessel retained its metallic lustre while the aluminium vessel had a black coating, apparently due to impurities in the metal.—S. G.

Standard Specifications for Bare, Stranded Copper Cable: Hard, Medium-Hard, or Soft (B 8–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 638–641).—Cover bare stranded cables made from round copper wires, for general use as electrical conductors.—S. G.

Standard Specifications for Copper Trolley Wire (B 47–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 644–648).—Cover round and grooved hard-drawn copper trolley wire.—S. G.

Recent Trends in the Development and Use of Copper Alloys. —— (*Metallurgia*, 1936, **15**, (86), 42–44).—Recent developments in connection with applications of copper and copper alloys in the electrical, railway, automobile, and marine industries, and for plant construction are reviewed. Reference is also made to copper–beryllium alloys, copper–chromium and other chromium alloys, and to alloys of copper with selenium.—J. W. D.

Standard Specifications for Copper-Base Alloys in Ingot Form for Sand-Castings (B 30–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 538–542).—Cover copper-base alloys in ingot form for sand-castings in 20 different compositions regularly sold by the trade. As an appendix (not part of the specifications) tables are given setting forth the approximate physical properties that may be expected of carefully manufactured alloys (bronzes, red brasses, semi-red brasses, yellow brasses, and high-lead alloys) of the formulæ indicated. —S. G.

Standard Specifications for Aluminium Bronze Castings (B 59–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 543–546).—Covers two grades: *A*—not responding to heat-treatment and *B*—capable of heat-treatment. The requirements as to chemical composition are: Grade *A*—copper 87–89, aluminium 7–9, iron 2·5–4, tin (max.) 0·5, other impurities (max.) 1·0; Grade *B*—copper 89·5–90·5, aluminium 9·5–10·5, iron (max.) 1·25, tin (max.) 0·2, other impurities (max.) 0·5. Requirements as to physical properties are Grade *A* (as cast)—tensile strength 65,000 lb./in.^{2}, yield-point 25,000 lb./in.^{2}, elongation 20% on 2 in.; Grade *B*—tensile strength: as cast 65,000, heat-treated, quenched, and drawn, 80,000 lb./in.^{2}; yield-point: as cast 25,000, heat-treated 50,000 lb./in.^{2}; elongation, as cast 15, heat-treated 4% on 2 in. —S. G.

Standard Specifications for Bronze Trolley Wire (B 9–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 649–654).—Cover round and grooved bronze trolley wire. Three classes are specified.—S. G.

Standard Specifications for Castings of the Alloy: Copper 88 Per Cent.; Tin 8 Per Cent.; Zinc 4 Per Cent. (B 60–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 547–550).—The castings are intended for use where an excellent steam metal, withstanding in the cast state hydrostatic pressures satisfactorily, is required, such as in expansion joints, pipe fittings, valves, pumps, pump pistons, and in general where good strength and resistance to salt-water are required. It is recommended that this alloy shall not be used where castings are subjected to a temperature exceeding 260° C. The requirements, as to physical properties are: tensile strength 38,000 lb./in.^{2}, yield-point 16,000 lb./in.^{2}, elongation 22% on 2 in.—S. G.

Standard Specifications for Steam or Valve Bronze Castings (B 61–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 551–554).—Cover alloy castings commonly used as high-grade steam metal or valve bronze suitable for applications involving temperatures of 260° C. The requirements as to chemical composition are: copper (min.) 86·5, tin 5·5–6·5, lead 1·5–2·0, zinc 2–5, iron (max.) 0·25, nickel (max.) 1·00, phosphorus (max.) 0·05%. The minimum requirements for physical properties are: tensile strength 34,000 lb./in.^{2}, yield-point 16,000 lb./in.^{2}, elongation 22% on 2 in.—S. G.

Standard Specifications for Composition Brass or Ounce Metal Castings (B 62–36). —— (*Book of A.S.T.M. Standards*, **1936**, (I), 555–558).—Cover copper–tin–lead–zinc alloys known commercially as composition metal, 85 : 5 : 5 : 5, or ounce metal. Castings of this alloy are commonly used in hydrostatic pressures up to 350 lb./in.^{2}. Requirements as to physical properties are: tensile strength 30,000 lb./in.^{2}, yield-point 14,000 lb./in.^{2}, elongation 20% on 2 in.—S. G.

Seamless, Elastic, Corrugated Tubes. —— (*Machinery* (*Lond.*), 1936, **48**, (1239), 447–449).—Metallic bellows are constructed from (unspecified) copper alloys for use below 200° C. or nickel–brass, Monel metal, or ferrous alloys for use above 200° C. Tubes are first deep drawn to close dimensional tolerances and the corrugations then formed by rolling. The design of these bellows, permissible pressures and movements, and methods of forming and connecting their ends are briefly discussed.—J. C. C.

***An Effective Method for Using Lead or Other Low Melting Metals for X-Ray Targets.** T. R. Folsom (*Rev. Sci. Instruments*, 1936, [N.S.], **7**, (11), 406–408). —Experiments were conducted to develop a more economical and satisfactory target for a 650,000 v. X-ray machine. It was found that lead, electroplated on to a thin stretched disc of copper cooled with water would withstand up to

2 ma./cm.^{2} electron bombardment continuously at 650 kv. This technique seems applicable to experimental tubes where lead or other low melting point metal is desired as a target material.—S. G.

Developments in the Tin Industry. —— (*Metallurgia*, 1936, **15**, (86), 61–62).—Recent progress in the tin-consuming industries is reviewed, with special reference to improving the quality of tinplate, and researches on tin-rich alloys.—J. W. D.

†**New Bearing Metals, Their Working and Use.** E. Meier (*Maschinenbau*, 1936, **15**, (19/20), 543–545).—A pressure-casting machine for making shells of lead-base bearing metals is described, and examples of turning up the bearings are given.—v. G.

Zinc[-Base] Die-Castings. Herbert Chase (*Automobile Eng.*, 1936, **26**, (353), 496–500).—A review of the latest developments in the application of zinc-base die-cast alloys ("Zamak" and "Mazak" types) to the U.S. automobile industry. The chemical and physical properties of these alloys, and their many applications for such parts as carburettors, window frames and regulators, radiator grilles, decorative parts, horns, and wireless fittings for cars are dealt with. The advantages of using die-castings for these parts are discussed as regards appearance, design, plating, and length of service.—J. W. D.

Zinc Alloy Die-Castings Prominent in 1937 Cars. Herbert Chase (*Iron Age*, 1936, **138**, (20), 34–37, 114).—Describes the increased use of zinc alloy die-castings in modern motor-cars.—J. H. W.

The Spraying of Molten Metal. L. E. Kunkler (*Metallizer*, 1936, **5**, (4), 2, 3).—A general description of the metallizing process, with particular reference to the building up of worn parts with steel.—W. E. B.

XXII.—MISCELLANEOUS

Henry Louis Le Chatelier. G. Tammann (*Naturwiss.*, 1936, **24**, (49), 49–50).—Obituary.—B. Bl.

Some Recent Metallurgical Advances. L. Sanderson (*Machinist* (*Eur. Edn.*), 1936, **80**, (43), 634E).—A short article outlining the properties and applications of non-ferrous boron alloys.—J. H. W.

Manganese Poisoning. W. H. Diffenbach (*J. Amer. Inst. Homeopathy*, 1936, **29**, 642).—The symptoms of industrial manganese poisoning are summarized.—S. G.

Tantalum, Niobium, Uranium, and Radium Deposits in Brazil. O. Henry Leonardos (*Ministry Agr.* (*Rio de Janeiro*), *Servico fomento produccao mineral.*, *Bull.* **11**, 1936, 56 pp.).—Includes descriptions of the properties and applications of these metals, a list of companies handling the ores, and a list of the world's uranium and radium deposits. A *bibliography* is included.
—S. G.

Report of the Activities of the "Physikalisch-Technische Reichsanstalt," 1935. —— (*Physikal. Z.*, 1936, **37**, 277–314).—Contains brief accounts of numerous investigations in progress, including researches on temperature dependence of the principal elastic constants of silver, palladium, and iron single crystals from − 253° to + 50° C. (Goens); improvements in testing standards (Werner, Boehmann, Lehmann, and Bürger); testing of toothed wheels; investigations on the electrochemical properties of iron–cobalt alloys (Scharnow); lubricating oils (Vieweg, Kluge, Maske, Tiedemann); transformations of nickel alloys (Schulze); magnetic materials; resistances of very pure metals: silver, molybdenum, palladium, and platinum (Steiner and Fünfer); measurement of compressibilities of iron, aluminium, gold, lead, silver, and magnesium (Ebert).—B. C.

New Discoveries on Injury to Health by Chemical Substances. F. Koelsch (*Chem. Fabrik*, **1936**, 421–429).—An address. Among other matters, discusses the diagnosis and proper sanitary precautions to be taken with regard to lead, mercury, zinc, copper, nickel, aluminium, selenium, and tellurium and their compounds and alloys.—S. G.

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