Hastelloy B, Inconel, Stellite 21, and types 302, 310, and 446 stainless steels was investigated for utilizing the high strength of Mo at 1800 to 2000°F. under oxidizing conditions. Ni gave best results; Inconel was superior to Ni for resistance to oxidation but inferior for bonding. Satisfactory joining and edge production of the clad products was secured by using a suitable Ni-base filler metal and A-arc or oxyacetylene braze-welding techniques. W. A. M.

Strength of pure molybdenum at 1800 to 2400°F. Roger A. Long, K. C. Dike, and H. R. Bear (Lewis Flight Propulsion Lab., Cleveland, O.). *Metal Progress* 60, No. 3, 81-8(1951); cf. *C.A.* 45, 5589*f*.—Pure Mo, as-swaged or recrystd., has tensile properties at 1800 to 2400°F. equiv. to or higher than Ti carbide, with or without a Co binder, or ceramic bodies; at lower temps., up to 1500°F., Mo is weaker than com. alloys like Inconel "X" and 422-19. W. A. Mudge

Malleable cast irons. L. Sanderson. *Eng. and Boiler House Rev.* 66, 238-40, 244(1951).—A review, relating phys. and chem. compn. to uses. R. W. Ryan

Rhenium and its present technical uses. Walter Noddack and Ida Noddack (Geochem. Inst., Bamberg, Ger.). *Werkstoffe u. Korrosion* 2, 296-8(1951).—The phys. and chem. properties are reviewed. Methods of prepn. are outlined. More recent uses are in thermoelements with Pt metals and in catalysts. M. F. Quaely

Tin and tungsten—their past, present, and future. Charles A. Scarlott (Westinghouse Elec. Corp., Pittsburgh, Pa.). *Materials and Methods* 34, No. 3, 69-73(1951).—A summary is given of resources and principal uses. W. A. Mudge

Titanium in aircraft. J. B. Johnson and E. J. Hassell (Wright-Patterson Air Base, Dayton, O.). *Metal Progress* 60, No. 3, 51-5(1951).—Strength-to-wt. ratios, in tension, are given of 304 and 347 stainless steels, 2 Al alloys, one Mg alloy, and Ti and one exptl. Ti alloy at 70, 300, and 700°F. Ti and some of its alloys are inherently stable, have good mech. and corrosion-resisting properties, and are useful up to 800°F. W. A. Mudge

Inspection of drop forgings from a metallurgical standpoint. R. J. Brown (Coventry, Engl.). *Metal Treatment* 18, 312-15(1951).—A review is given of the various inspection operations required for quality control in drop forging. These include superficial examn., chem. compn., and mech. properties. L. H. Seabright

Investigation of the quenching characteristics of a salt bath. M. J. Sinnott and J. C. Shyne (Univ. of Michigan, Ann Arbor). *Trans. Am. Soc. Metals* Preprint No. 29, 12 pp.(1951).—Type 430 stainless steel was quenched from a 1550°F. neutral chloride salt bath into unagitated nitrate-nitrite salt baths at 385 to 725°F. Values for severity of quench and H were comparable to those reported for oil-quenching with good to violent agitation. W. A. M.

Electrolytic etching—the sigma-phase steels. John J. Gilman (Crucible Steel Co., Harrison, N.J.). *Trans. Am. Soc. Metals* Preprint No. 12, 31 pp.(1951).—KOH (10 *N*) colors the sigma phase and concd. NH_4OH colors the carbide. Dil. solns. are not satisfactory. Cd and Pb acetate solns. color carbides more rapidly than sigma. The "characteristic cracks" in sigma of stainless steels are assocd. with the etch film and not with cracks in the underlying sigma phase. Photomicrographs are included. W. A. Mudge

The formation of sigma phase in 13 to 16% chromium steels. H. S. Link and P. W. Marshall (U.S. Steel Co., Pittsburgh, Pa.). *Trans. Am. Soc. Metals* Preprint No. 11, 12 pp.(1951).—Exptl. melts of simulated com. purity steels, cold-worked 95%, and heated for 5000 and 10,000 hrs. at 900 to 1200°F. were used. Hardness, metallographic, and x-ray studies showed sigma was formed at 1050 and 900°F. in 16, 15, and 14% steels after severe cold reduction, and at 1050°F. in 16 and 15% steels after annealing at 1550°F. The increase in hardness of each of the prior annealed steels during heating at 900°F. is related to the amt. of sigma formed and confirms the "885°F. embrittlement" caused by incipient sigma-phase pptn. The rate of formation of sigma is very low. A third series of steels is being heated for 100,000 hrs. W. A. M.

The determination of flow stress from a tensile specimen. E. R. Marshall and M. C. Shaw (Massachusetts Inst. of Technol., Cambridge). *Trans. Am. Soc. Metals* Preprint No. 24, 16 pp.(1951).—The Bridgman expression for the flow stress in the neck of a tensile specimen holds quantitatively for 4140 steel and for annealed Cu. The fracture condition of both materials is best expressed by the max. shear theory. W. A. Mudge

Stress-induced transformation of retained austenite in hardened steel. B. L. Averbach, S. G. Lorris, and Morris Cohen (Massachusetts Inst. of Technol., Cambridge). *Trans. Am. Soc. Metals* Preprint No. 28, 11 pp.(1951).—Tapered tensile bars of hardened and tempered 2340 steel contg. originally 6% retained austenite were used. After testing, complete transformation of retained austenite was found at the fracture and some transformation was detected in all sections where plastic strain had occurred. Retained austenite was converted completely before necking. The strain-induced transformation proceeded more rapidly in untempered steels owing to the relaxation of strain embryos in austenite during tempering. Similar effects were observed in V-notch slow-bend and Charpy impact bars. W. A. Mudge

Anisothermal diffusion of carbon in austenite. Joseph E. Black and Gilbert E. Doan (Lehigh Univ., Bethlehem, Pa.). *Trans. Am. Soc. Metals* Preprint No. 9, 9 pp.(1951).—Expts. at an interface temp. of 1800°F. and math. analysis (it is assumed that diffusivity is not a varying function of concn.), give an integrated verification of the isothermally detd. temp. effect; evaluate the magnitude of distortion of diffusion data introduced by temp. variations; and indicate there are small departures only between the anisothermal and the classical isothermal C diffusion penetrations for moderate temp. gradients in austenite. W. A. Mudge

Interstitial diffusion. I. Analysis of experimental data. A. G. Guy (North Carolina State Coll., Raleigh). *Trans. Am. Soc. Metals* Preprint No. 6, 22 pp.(1951).—Data from *C.A.* 44, 3421*h*, on the interstitial diffusion of C in austenite, are used to obtain empirical evidence for the hypothesis that an activity diffusion coeff., independent of solute concn., describes diffusion phenomena adequately. Tentative exptl. results suggest that a corresponding constancy of the diffusion coeffs. exists in substitutional diffusion when activities are used instead of concns. **II. Theoretical considerations.** Equations are derived for 3 possible diffusion consts. The usual concn. diffusion const. has little fundamental significance. The activity diffusion const. suggests a useful relation between an activity coeff. and the free energy of activation. W. A. Mudge

Experimental studies of the diffusion phenomena. A. Guinier. *Métaux & corrosion* 25, 227-36(1950).—A crit. review of published theories. 14 references. G. T. M.

The carbonitriding of plain carbon steel. H. C. Fiedler, M. B. Bever, and C. F. Floe (Massachusetts Inst. of Technol., Cambridge). *Trans. Am. Soc. Metals* Preprint No. 7, 9 pp.(1951).—Carbonitriding of 1020 steel at 1625°F. with an inlet gas contg. NH_3 10, CH_4 10, and carrier gas 80% produces a satisfactory case. For equal case depths, carbonitriding causes considerably more growth than carburizing, owing to the formation of a compound layer; however, in com. operations distortion is the crit. factor affecting final dimensions. **The carbonitriding of alloy steels.** *Ibid.* 14 pp.—Specimens of 5120, 4620, and C1117 steels were oil-quenched after carbonitriding 4 hrs. at 1300, 1400, 1500, and 1625°F. with an inlet gas contg. 10% CH_4 and NH_3 40% at lower temps. and 10% at higher temps. Microhardness and depth hardness measurements, metallographic examn. of case structures, and detn. of retained austenite showed (1) the case structure of 5120 contains a ppt. of Cr nitride and the compound layer is $^1/_3$ as thick as on 1020; (2) except for larger amts. of retained austenite, the cases on 4620 and C1117 are similar to those on 1020; (3) case hardness is less in the alloy steels than in 1020; (4) carbonitride low-C, Ti-bearing steel has a low case hardness, and a shallow case depth; and (5) although the hardness of carbonitrided cases on alloy steels as quenched is lower than for plain C steels, case properties are superior, resistance to tempering is greater, and wear service may be superior in some cases even though the case is softer. W. A. M.

Ferrite formation associated with carbide precipitation in 18 Cr-8 Ni austenitic stainless steel. E. J. Dulis and G. V. Smith (U.S. Steel Co., Kearny, N.J.). *Trans. Am. Soc. Metals* Preprint No. 14, 12 pp.(1951).—Com. steels were studied at room temp. by microscopic examn. and at room and elevated temps. by x-ray diffraction and magnetic permeability methods. Ferrite forms as a result of heating in the sensitizing range (1000°-1300°F.). W. A. M.