BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

SEPTEMBER, 1937

I.—GENERAL; PLANT; MACHINERY.

Rôle of moisture in a boiler furnace. F. J. Matthews (Steam Eng., 1935, **5**, 25—26).—A discussion. Ch. Abs. (*e*)

Temperature measurements in rotary kilns. Trott (Feuerungstech., 1937, **25**, 160—161).—The position of the temp.-measuring points and methods of mounting thermocouples and leads are discussed. R. B. C.

Drying granular solids. N. H. Ceaglske and O. A. Hougen (Ind. Eng. Chem., 1937, **29**, 805—813).—The concept of diffusion, which has been useful in evaluating the progress of the drying of a porous solid, presumes the flow of liquid within the pores from regions of high concn. to regions of lower concn. With granular solids (*i.e.*, where the pores are relatively large) this no longer holds good, since the capillary forces may well draw the liquid away from the region of low concn. Layers of sand have been examined as to their capillary suction, moisture distribution, and drying rates. The drying rates were then interpreted in terms of the capillary theories and experimental determinations. The mathematical analysis so obtained is shown to be in better agreement with the experimental results than that arrived at on the basis of the diffusion concept, and to be applicable over a wider range. It is also shown by experimental figures that where a layer of finer sand is on top of a layer of slightly coarser sand the mass dries out more rapidly, and *vice versa*, which leads to important technical applications. F. J. B.

Integration of the drying equation at constant temperature. A. E. Markham (Ind. Eng. Chem., 1937, **29**, 641—642).—Theoretical. An easily integrated form of the left-hand side of the drying equation, $\int_{W_1}^{W_0}[dW/W(H_s - H)] = bf(v)\theta/L$ (where W is the free [H_2O] in the charge, H_s is the wet-bulb humidity, and H the humidity of the air) is developed, based on an empirical relation between H and $H_s - H$. R. C. M.

Centrifuge method of investigating variation of hydrostatic pressure with water content in porous materials. R. J. Schaffer, J. Wallace, and F. Garwood (Trans. Faraday Soc., 1937, **33**, 723—734).—The radial distribution of H_2O along specimens of Portland stone initially saturated has been determined after centrifuging until equilibrium is attained. The results are in accordance with the general formula $h = \omega^2(a^2 - r^2)/2g$, where h is the height of a H_2O column equiv. to the difference between atm. pressure and the hydrostatic pressure at the position indicated, ω = angular velocity, and a and r are the respective distances of the outermost points of the centrifuged specimen and of the position in question from the axis of rotation. The hydrostatic and centrifuge methods are compared. F. L. U.

Theory of the single-pass cross-flow heat interchanger. A. M. Binnie and E. G. C. Poole (Proc. Camb. Phil. Soc., 1937, **33**, 403—411). F. J. L.

Application of spun glass and similar materials to heat insulation in railway vehicles. Nordmann (Chem. Fabr., 1937, **10**, 299—300).—Spun glass is one of the best insulating materials for boilers and steam pipes. It is used in the form of mats or strips. Pipes are covered with strips 50 or 100 mm. wide, 20 mm. thick, which are wound so tightly that they are compressed to 15 mm., and gauze, plaster, gauze, and finally paint are applied. Where appearance requires it they are finally covered with sheet Fe. For fire-box and high- and low-pressure cylinders mat thicknesses of 25, 50, and 40 mm., respectively, are used. Glass wadding, a more expensive but more easily handled form, is now being tested on the German railways. I. C. R.

Comparison of economy of different heat-insulating materials. F. Vogeler (Gummi-Ztg., 1937, **51**, 608).—It is shown how the relative effective cost can be calc. from knowledge of the heat-conductivity, vol.-wt., and price per unit wt. D. F. T.

Thermal conductivity of porous and powdered materials. Ribaud (Chaleur et Ind., 1937, **18**, 36—43).—Theoretical formulæ are derived. R. B. C.

Heat-transfer coefficient from a tube wall to carbon dioxide in its critical range. K. Schmidt (Z. ges. Kälte-Ind., 1937, **44**, 21—24, 43—49, 65—70).—Heat transference to a vertical tube, through which CO_2 is passed under pressure (60—95 atm.) from a surrounding tube containing cold H_2O in counterflow was investigated. Experimental data are discussed. Below the crit. pressure of CO_2 the heat-transfer coeff. depended on the temp. difference between the condensation and wall temp. R. B. C.

Thermal-conductivity coefficients of heat-insulating and refractory materials. A. Aubert (Chaleur et Ind., 1937, **18**, 87—90).—Published data are summarised. R. B. C.

Turbulence and the equations of thermal diffusion. J. K. de Fériet (Ann. Soc. Sci. Bruxelles, 1937, **57**, **B**, 67—72).—Mathematical. On the basis of Reynolds' hypotheses, the equation of thermal diffusion in a fluid in turbulent motion can be deduced from the Fourier–Kirchhoff formula of heat diffusion in a fluid. N. M. B.

Operational determination of Green's functions in the theory of heat conduction. A. N. Lowan (Phil. Mag., 1937, [vii], 24, 62—70).—Mathematical. A. J. E. W.

Heat radiation from water vapour mixed with non-radiating gases. E. Schmidt and E. Eckert (Forsch. Geb. Ing.-Wes., 1937, 8, 87—90).—Measurements of the radiation (R) from H_2O vapour–N_2 mixtures show that Beer's law [R is dependent on the product of the partial pressure (P) and the layer thickness (T)] is invalid. R is shown to depend on P and T individually. The results calc. for large T from those obtained experimentally for small T may be inaccurate to the extent of 100%. R. B. C.

Construction of riveted jacketed pans. J. N. Bewsher (Ind. Chem., 1937, **13**, 277—280).—Types of construction are illustrated and necessary thickness of plates and pitch of rivets for given sizes are calc. In most cases an all-welded inner pan is preferable and stays between the inner and outer pans should be excluded. C. I.

Factors in high-pressure design. C. W. Siebel (Ind. Eng. Chem., 1937, **29**, 414—420).—Practical factors such as properties of available materials, methods of fabrication, temp. of operation, and danger from leakages are discussed in relation to size and type of compressor, piping, autoclaves, heat exchangers, etc. The advantages of rupture discs over safety valves, especially at very low temp., are mentioned, and it is suggested that the former can be designed to rupture at within 2% of the calc. pressure. A short list of safety precautions to be observed in connexion with high-pressure work is given. F. J. B.

Resistance of seamless drill pipe against collapsing pressure. Anon. (Oel u. Kohle, 1937, **13**, 531—538).—If P_k = crit. external pressure (metric atm.), E = modulus of elasticity, s = wall thickness (cm.), D = outside diameter of tube (cm.), σ_s = yield point (kg./sq. cm.), then for the elastic range $P_k = 2E(s/D)^3$ and for the yielding range $P_k = \sigma_s[(2{\cdot}63s/D) - 0{\cdot}043]$. Nomograms are given, based on these formulæ, enabling P_k to be read off for different vals. of s and D. The formulæ have been proved by testing to destruction A.P.I. casing made from various materials. H. C. R.

Fundamental laws of crushing and grinding. F. Hönig (Forschungsheft 378, Suppl. to Forsch. Gebiete Ingenieurw., Ed. *B*, 1936, 7, 21 pp.; Road Abs., 1937, 4, No. 18).—The theory of grinding is discussed, and it is shown that the Kick and Rittinger laws are limiting cases. The importance of mol. structure in fine grinding, and the influence of roughness on surface area, are indicated. The following law is advanced: the greater are the stressed vol. and the stress intensity in comparison with the new surface produced the less efficient is the process of comminution. The reasons for the favourable effect of impact as compared with static stressing, and methods of increasing crushing efficiency, are discussed. The results of experiments to substantiate the theory are given. D. K. M.

Comparison of low *versus* high discharge for ball mills. E. L. Longmore, and the Hollinger Mill Staff (Bull. Inst. Min. Met., 1937, No. 392, 23—24). A. King and A. Clewes (*Ibid.*, 24—27). L. E. Djingheuzian (*Ibid.*, 27—30).—Reduction of the size of the ball feed from 3 to 2·5 in. increased the daily throughput from 1430 to 1507 tons in mills of the low-discharge and from 1117 to 1277 tons in the high-discharge type. Rand practice seems to confirm the conclusion that a medium to low discharge is preferable to a high discharge and that, when an all-slime product for cyaniding is required, an increase in length to > the diameter is advantageous. Some details are given of the operation of Marcy mills at the Siscoe mine. (Cf. B., 1937, 508.) A. R. P.

Law of size distribution and statistical description of particulate materials. P. S. Roller (J. Franklin Inst., 1937, **223**, 609—633).—Data obtained with the air separator previously described (B., 1937, 781) are analysed. The wt.-% (y) is related to the particle size (x) by $y = ax^{\frac{1}{2}}e^{-b/x}$, where a and b are characteristic consts. This law holds good for materials reduced by chemical or physical means or by grinding. From the vals. of a and b the surface area per g., the no. of particles per g., and the coeff. of uniformity may be calc. J. A. S.

Determination of particle size of powdered materials. E. Szinger and L. Weil (Tonind.-Ztg., 1937, **61**, 565—568, 579—581).—The construction and operation of a sedimentation apparatus are described. A special form of "push–pull" tap is used to take the sample at the various heights in the settling column. Tables are given for use with Portland cement (d 3·1) and EtOH. J. A. S.

Characteristic properties of certain industrial dusts. H. V. A. Briscoe, (Miss) J. W. Matthews, P. F. Holt, and (Miss) P. M. Sanderson (Bull. Inst. Min. Met., 1937, No. 391, 11 pp.; cf. B., 1937, 2).—Dusts collected in $C_{10}H_8$ or salicylic acid filters from certain Cornish mines and from industrial operations involving silicate minerals have a high content of H_2O of hydration and are distinctly alkaline, due to hydrolysis of alkali silicates in the dust minerals. Asbestos dust is markedly alkaline and H_2O-extraction yields also sol. SiO_2, facts which may account for its highly damaging effect on lung tissue when inhaled. Dust freshly formed by breaking of rock matter is much more dangerous to health than "dead" dust such as is stirred up by wind after being long exposed to the weather. Addition of dusts of absorptive substances, such as sugar, charcoal, coal, or CaO, to quartz or asbestos dust reduces considerably the sol. SiO_2 and, therefore, the toxicity of the dust. A. R. P.

Characteristic properties of certain industrial dusts. H. V. A. Briscoe, (Miss) J. W. Matthews, P. F. Holt, and (Miss) P. M. Sanderson (Bull. Inst. Min. Met., 1937, No. 393, 12 pp.).—The dissolution of powdered cryst. quartz in H_2O requires long periods to attain equilibrium. The solvent action in 5 hr. at 80° is as great as that after a month at 20°. Particle size and the SiO_2 : solvent ratio both have marked effects on the solubility. Asbestos or raw flint dust yields more sol. SiO_2 than does quartz and also generally yields alkali $\propto$ the amount of SiO_2 extracted. The amount of alkali extracted from calcined flint dust, however, is almost independent of particle size, whereas the amount of SiO_2 dissolved increases rapidly with decreasing particle size. The SiO_2 is less easily extracted from calcined flint, cement, sillimanite, felspar, sericite, or kaolin than from raw flint and asbestos. CaO and MgO depress the solubility of SiO_2 from asbestos and quartz very considerably, and $CaCO_3$, $Ca_3(BO_3)_2$, and Ca lactate depress it slightly. Addition of charcoal also reduces the solubility. Na_3AlF_6 and NaF reduce the yield of sol. SiO_2 from flint and asbestos, but increase that from kaolin, felspar, cement, or quartz. J. W. S.

Sampling of industrial dusts by means of the "labyrinth." H. V. A. Briscoe, (Miss) J. W. Matthews, P. F. Holt, and (Miss) P. M. Sanderson (Bull. Inst. Min. Met., 1937, No. 393, 21 pp.).—Passage through labyrinths (cf. preceding abstract) gives representative samples of dust solids, but the salicylic acid and acenaphthene filters are at present the only trustworthy means of determining mass concns. J. W. S.

Behaviour of certain dusts under mechanical impingement. J. B. Ficklen and L. L. Goolden (Science, 1937, **85**, 587—588).—Experiments with finely-ground felspar (I), quartz (II), and the dried spores of *Penicillium oxalicum* impinging on dry surfaces of gelatin and glycerin, and on dry and wet glass plates, indicate that the composition of the dust, the velocity of impact, and the nature of the surface affect the amount of crushing. On a dry surface the fineness to which a particle will shatter appears to be limited to approx. 1 μ; on a wetted surface this limit is lowered to approx. 0·5 μ. With (I) and (II) any estimation of particle-size distribution in the air from the resultant particles is erroneous, and with each of the three dusts an estimation under the above conditions of the no. of particles in the air sampled is untrustworthy. L. S. T.

Dust measurement. H. W. Gonell (Arch. tech. Mess., 1937, No. 68, 23—24T).—German technical terms used in connexion with the above, *e.g.*, heaped wt., bulk *d*, compacted wt., etc., are defined. The % of void space in loosely heaped pulverised material is given by $(1 - g/d)100$, where g is the wt. per unit vol. of the loosely heaped powder and d is the density of the material. R. B. C.

Crystal and the engineer. (Sir) W. H. Bragg (J. Inst. Civil Eng., 1936—7, No. 7, 181—201).—A lecture on the relation between crystal structure as revealed by *X*-rays and electron diffraction and engineering. D. K. M.

Fluid-flow design methods. R. P. Genereaux (Ind. Eng. Chem., 1937, **29**, 385—388).—Alinement charts are given for the resistance to fluid flow in clean steel pipes and for the economic pipe diameter in the case of turbulent flow. The assumptions and calculations on which the charts are based are given and examples worked out to show the method of use. F. J. B.

Fluid friction in conduits. R. P. Genereaux (Chem. Met. Eng., 1937, **44**, 241—248).—A practical account of the selection of economical pipe lines on the basis of accepted theoretical considerations of pipe resistances combined with suitable cost data. F. J. B.

Pipe and fittings. Anon. (Chem. Met. Eng., 1937, **44**, 265—271).—The utilisation of all types of materials of construction in the manufacture of pipes is reviewed, together with the methods of producing fixed, flexible, rotating, and expansion joints. Simple standard fittings and the methods of suspension are also illustrated. F. J. B.

Pumps and pumping. F. A. Kristal (Chem. Met. Eng., 1937, **44**, 250—257).—A general survey, illustrated by diagrams, of all types of pumps, and the principles involved in their design. Sufficient information is given to narrow down the selection in a given case to one or two types. F. J. B.

Pump maintenance. F. H. McBerty (Chem. Met. Eng., 1937, **44**, 257—258).—The advantages of working to a predetermined maintenance schedule are stressed. Flexible connexions to the piping system are advocated, since mechanical strains give rise to gland troubles etc. F. J. B.

Chemical plant valves. P. D. V. Manning (Chem. Met. Eng., 1937, **44**, 272—276).—Modern developments in all types of valves with a view of overcoming corrosion and mechanical troubles are described and illustrated. Consideration is given to the inherent high resistance to flow of some types. F. J. B.

Remote valve operation. Anon. (Chem. Met. Eng., 1937, **44**, 277).—Some electrical, hydraulic, and compressed-air systems for remote control of valves are discussed. F. J. B.

Co-ordinated valve operation. L. B. Lumpkin (Chem. Met. Eng., 1937, **44**, 283).—A simple means of operating a plant automatically to a predetermined time schedule by means of compressed air at 15 lb./sq. in. is indicated. Small pilot valves are actuated in sequence by cams driven from a synchronous motor. F. J. B.

Fractionating columns of high efficiency. D. F. Stedman (Canad. Chem. Met., 1937, **21**, 214—216).—A new type of gauze packing for fractionation columns is described and the results of experiments show its effectiveness. D. K. M.

Recent advances in water softening and boiler feed-water conditioning. P. Hamer (J. Soc. Dyers and Col., 1937, **53**, 265—268).—A lecture.

Determination of free ammonia in boiler feed-waters etc., using the Hellige comparator. Anon. (Int. Sugar J., 1937, **39**, 231).—Nessler reagent and Winkler's seignette salt solution are added to the H_2O, and the colour developed is read in the comparator, using colour disc 3060/58. Very hard waters are pretreated with aq. Na_2CO_2, and the ppt. is allowed to settle out. In presence of protein-N, the H_2O is distilled after adding buffer solution, and the distillate used for the determination of free NH_3. J. P. O.

Calculation of conduits for fluids taking account of heat exchange. Gas under pressure, steam, hot gases, chimneys, and thermosiphon. A. Mondiez (Chaleur et Ind., 1936, **17**, 339—348, 397—404, 441—448, 489—497; 1937, **18**, 122—128).—The thermo- and hydro-dynamic and mechanical aspects of fluid flow are treated mathematically. R. B. C.

Heating of fluids in the chemical industry by means of electrical [induced] currents. P. Wiessner (Chem.-Ztg., 1937, **52**, 535—536).—A method is described whereby a suitably insulated Cu-plated vessel is heated by induced currents from a transformer. R. S. B.

Bubble-cap column as a liquid–liquid contact apparatus. M. C. Rogers and E. W. Thiele (Ind. Eng. Chem., 1937, **29**, 529—530).—A model bubble column in the form of a wooden rectangular half-column with a glass front was provided with three plates each carrying a half-bubble cap. This was used to examine the possibilities of liquid–liquid extraction in bubble-cap columns suggested by the analogy between continuous extraction and distillation operations. By comparison with batch extraction it is shown that plate efficiencies are distinctly $<$ 33·3%, and it is suggested that owing to the liquid η this type of plant provides insufficient agitation and that a packed column is preferable. F. J. B.

Diacolation. C. Masino (Boll. Chim. farm., 1937, **76**, 333—334, 337—338, 341—344).—Diacolation is a method of percolation under pressure so that min. amounts of solvent are necessary. The construction of a diacolator and its application to the prep. of fluid extracts are described (cf. Breddin, B., 1935, 782). F. O. H.

Flow of heterogeneous fluids through porous media. M. Muskat and M. W. Meres (Physics, 1936, **7**, 346—363).—Theoretical. H. J. E.

Flow of gas–liquid mixtures through unconsolidated sands. R. D. Wyckoff and H. G. Botset (Physics, 1936, **7**, 325—345).—Experiments on the flow of CO_2–H_2O mixtures through four sands of different permeabilities are described. Under steady flow conditions the liquid saturation of the sand is determined by the gas/liquid ratio, and for a given ratio does not vary greatly with the sand permeability. H. J. E.

Filtering action of porous media. W. N. Arnquist (J. Appl. Physics, 1937, **8**, 363—367).—Data are recorded for the permeability (P) of samples of Berea sandstone of moderate P before and after treatment at 80 lb./sq. in. with a water-mud (d 1·5), made with commercial Baroid containing 5% of bentonite. P was reduced to 50—60% of the original val. by a single mudding. H. J. E.

Fluid measurement and control. E. S. Smith, jun. (Chem. Met. Eng., 1937, **44**, 278—282).—The principles underlying the metering of fluids and some of the apparatus in which they are applied are discussed at length. Graphs are given of discharge coeffs., velocity of approach factors, and nett-expansion factors for orifices, nozzles, and Venturi tubes. The application of pressure and flow indicators to automatic control is considered and the problems involved in "hunting" of such apparatus are pointed out. Means for minimising the oscillations are briefly pointed out. F. J. B.

Charts for gas-flow measurement. M. C. Molobad and F. B. Varga (Chem. Met. Eng., 1937, **44**, 143).—A nomographic chart for the solution of $w = 0{\cdot}525C_m d^2\sqrt{(\Delta\rho_m)}/\sqrt{(1-\beta^4)}$ for the flow of air under large pressure drops is given, where w is the gas flow in lb./sec.; C_m is the discharge coeff. of the orifice, based on the mean pressure of the gas (taken as 0·601); d is the orifice diameter in in.; Δ is the pressure drop through the orifice (lb./sq. in.); β is the ratio of orifice diameter to pipe diameter; $\rho_m = M(p_1 + p_2)/2R(460 + t)$, where M is the mol. wt. of the gas, p_1 and p_2 are gas pressures above and below the orifice, respectively, R is the gas const., and t° F. the gas temp. D. K. M.

Construction of containers for compressed gases. I. I. Gelperin and S. M. Rips (J. Chem. Ind. Russ., 1937, **14**, 257—266, 409—420).—Directions for construction of containers for liquefied gases are given. R. T.

Medium-pressure compressors. G. L. Montgomery (Chem. Met. Eng., 1937, **44**, 259—262).—A brief survey is given, illustrated by diagrams, of fans, rotary blowers, and reciprocating compressors suitable for delivering gases at pressures up to 125 lb./sq. in. F. J. B.

High-pressure compressors. C. H. Vivian (Chem. Met. Eng., 1937, **44**, 263—264).—Multistage reciprocating compressors for delivery pressures ranging from 125 to 15,000 lb./sq. in. are described. It is pointed out that compression ratios of 3 or 4 to 1 are normal, though in small machines this may exceed 5 : 1. Diagrams illustrating arrangement of stages to balance end-thrusts are given. F. J. B.

Adaptable arrangement of vacuum pumps. K. Peters (Chem. Fabr., 1937, **10**, 292—295).—An apparatus for high-vac. technique is described. It consists essentially of a Hg-vapour diffusion pump and a Hg-lift pump in series. A manifold allows water-jet or oil pumps, charcoal absorption tubes, etc. to be connected, and an attachment has a series of containers in parallel. Gases may be collected, measured, separated, stored, circulated, etc. The Hg vapour has no action on org. gases, *e.g.*, C_2H_2, CO, nor is the grease of the stop-cocks affected by vapours, although contact with liquids such as C_6H_6 should be avoided. I. C. R.

Vacuum producers. Anon. (Chem. Met. Eng., 1937, **44**, 262).—It is pointed out that all compressing plant is suitable for the production of low vac. and that for high-vac. work only little modification is required, whilst for handling large capacities steam-jet ejectors are preferable, although somewhat less economical than other types. F. J. B.

Sorptive activity of U.S.S.R. clays with respect to vapours. I. Determination of optimum conditions of thermal treatment of clays. E. V. Alexeevski and V. K. Serebrenni (J. Appl. Chem. Russ., 1937, **10**, 787—796).—The greatest adsorptive capacity for Cl_2 or org. vapours is achieved by heating various clays at 120°. R. T.

Technology of the dispersion of gases [in liquids]. R. Auerbach (Chem. Fabr., 1937, **10**, 271—273).—Three types of commercial apparatus are described. In the injector type (*a*) the liquid (containing a stabiliser) is circulated through a jet pump or a Venturi tube (with an adjustable slit) and the gas is drawn in through a throttled valve. In the cylinder type (*b*) the liquid is stirred by a perforated cylinder which is rotating between baffles to give a Venturi effect, the gas being introduced through the hollow shaft. In the multi-stirrer type (*c*) the stirrer consists of several discs which may be perforated, and the gas is introduced below the bottom disc. Applications suggested are: (*a*) (low gas concn.), froth formation, (*b*) (high gas concn.), hydrogenations, oxidations, (*c*) gas washing, hydrogenations. I. C. R.

Design of gas-cleaning installations. C. W. Hedberg (Ind. Eng. Chem., 1937, **29**, 406—413).—A non-mathematical discussion of the commercial methods available for gas cleaning. Suggestions are made for choice of process on technical grounds only, depending on the temp. of the gas, permissible moisture content, size of impurity, and whether the effluent should be clean or look clean. F. J. B.

Development of flue gas dedusting plant. O. Knabner (Feuerungstech., 1937, **25**, 127—130).—An illustrated review of the patent literature is given. R. B. C.

Ash and dust elimination [from boiler flue gases]. V. Walker (Elect. Times, 1937, **91**, 383—384).—A review. R. B. C.

Chemical policemen. R. S. Shane (J. Chem. Educ., 1937, **14**, 207—209).—Substances that control chemical reactions in many commercial processes and materials, such as gasoline, rust removal and prevention, lubricants, paint driers, and food preservation, are discussed. L. S. T.

Measurement of gas pressures. F. Kretzchmer (Arch. Wärmewirts., 1937, **18**, 141—144).—Illustrated descriptions are given of various types of laboratory apparatus suitable for measuring small pressure differences in gases and liquids. R. B. C.

Manometer for very small pressure differences. E. Robbelen (Z. tech. Physik, 1937, **18**, 11—14).—A single-arm manometer is described in which the usual capillary tube is replaced by a grooved, flat capillary. In the horizontal position the true liquid column is magnified 2500 times, which ensures high accuracy over a small pressure range without the use of special auxiliary appliances. R. B. C.

Reliability of common types of thermocouples. D. Quiggle, C. O. Tongberg, and M. R. Fenske (Ind. Eng. Chem., 1937, **29**, 827—830).—Cu–copel, Cu–constantan, and chromel–alumel thermocouples were tested at fixed points or in a large, electrically heated Cu block against calibrated standard thermocouples which were frequently checked. In all cases couples made from wires taken from the same spools are shown to give closely reproducible results, whereas although the Cu is reproducible from spool to spool, the other wires vary, and considerable deviations occur with the chromel–alumel couples. Heat-treatment of the couples was shown to affect the results given by them, but the deviations are small, showing the high degree of reliability of Cu–copel and Cu–constantan couples up to 200°. F. J. B.

Measurement of low temperatures. O. A. Slizkovskaja (J. Chem. Ind. Russ., 1937, **14**, 576—580).—The construction and calibration of low-temp. thermocouples are described. R. T.

Separation etc. of cinders etc. Bar mill. Mineral oils. Viscosimeters.—See II. **Countercurrent extraction.**—See III. **Agglomeration of salts. SO_2 for refrigerators. CO_2 from flue gas.**—See VII. **Glass- and ceramic-lined equipment.**—See VIII. **Efficiency of pulverisers.**—See IX. **Equipment. Boiler plates and steels. Acid-resisting steels. Steels for autoclaves. Refrigerating plant and corrosion. Corrosion and chemical plant protection. Influence of service conditions on metals. Classification. Hydrolysis of minerals.**—See X. **Centrifugal concn. of latex. Rubber-lined equipment.**—See XIV.

Patents.

Furnace construction. M. H. Detrick Co. (B.P. 467,300, 15.6.36. U.S., 15.6.35).—A furnace wall is composed of a metallic framework and intermeshing tiles, all joints being tortuous and provision being made for removal of intermediate courses without dismantling the whole wall. B. M. V.

Furnaces. A. Vandervelde (B.P. 466,641, 6.8.36. Belg., 17.1.36).—A forced-draught furnace for heating H_2O, using small solid fuel, is described. B. M. V.

Heating [cooling] plant, and the use of heavy hydrocarbon vapours such as butane. P. Zehnlé and A. Koechlin (B.P. 465,802, 12.11.35. Ger., 4.7.35).—A heat-transmitting medium having an overhanging temp.–entropy curve and an atm. b.p. $<$ room temp. (a mixture of C_4H_{10} and C_4H_8 is especially suitable) is passed through a closed circuit embodying: (1) an evaporator at near atm. pressure and temp. in which heat is withdrawn from the surroundings, producing useful cold, (2) a pump or compressor to raise the temp., (3) a condenser to deliver heat to waste, (4) an expander in which the pressure is lowered to slightly above atm. B. M. V.

Rotary apparatus for heating or cooling liquids or semi-liquids. R. L. Munday (B.P. 465,833, 17.12.35).—Two rotors are run together similarly to a gear-wheel pump but the teeth are helical and almost perpendicular to ordinary spur teeth. Heating/cooling medium is caused to flow around the casing and inside the rotors. B. M. V.

Plate heat exchangers for fluids. C. Rosenblad (B.P. 466,685, 12.5.36. Swed., 13.5.35).—

A single elongated plate is wound in S form over a pair of tubes at the centre and then in parallel convolutions forming two passages for the fluids. Alternatively two plates may be joined to a thicker one at the centre. In either case a no. of specially shaped spacers are secured to the centre plate or tubes to determine the contour of the spiral plates. B. M. V.

Surface apparatus for exchange of heat between fluids. G. N. Preston, and G. W. B. Electric Furnaces, Ltd. (B.P. 466,801, 5.12.35).—The apparatus is composed of alternate frame-like distance pieces having inlet and outlet apertures in the corners arranged to produce fan-shaped flow and plates having pressed-up ridges to produce sinuous flow of at least one fluid. B. M. V.

(A) Continuous production of warm air and gases. (B) Apparatus for the production of warm air and gases for drying wood and other structural materials. Eisenwerke Weserhütte A.-G., and H. Lösche (B.P. 465,516 and 465,585, 6.8.35. Ger., [A] 29.1.35).—(A) Portable apparatus is described. (B) In a system comprising a furnace, an intermediate chamber, and a fan, the construction of the intermediate chamber is described. B. M. V.

Drying plants. H. Possekel (B.P. 465,942, 12.9.35).—The material is preheated by direct heat, passed on an endless band through hot gases, then if necessary broken up, and passed in suspension through a pneumatic finish dryer; it is then screened, the dusty hot waste gases being passed to the endless-band stage, and the material is finally compressed in a worm press. B. M. V.

Drying machines. Manlove, Alliott, & Co., Ltd., E. A. Alliott, and F. Read (B.P. 466,120, 21.11.35).—A wedge and differential screw device for adjusting the gap between twin drying rollers is described. B. M. V.

Combined drying and grinding of materials. M. Vogel-Jørgensen (B.P. 466,035, 20.11.35).—A tube mill or the like is provided with a preliminary section, preferably comprising a no. of drums arranged around the periphery, in which drying alone is effected and a large proportion of the air which has entered with the material is withdrawn through an axial conduit before the material enters the grinding zone. B. M. V.

Insulation of surfaces against heat and cold. H. Musker (B.P. 467,553, 30.12.36).—Cores for magnesia or like insulation are made of sheet metal having high insulation properties formed as a templet to the object to be covered but having raised portions to produce air spaces between the metal sheet and the object. B. M. V.

Insulator [against light and thermal radiation]. P. A. Wickmann, Assr. to Sylvania Industrial Corp. (U.S.P. 2,039,372, 5.5.36. Appl., 19.1.35).—Fine particles of metal (Ag, Au, Pt, Cr, Sn) in the form of an adherent, continuous coating ≯0·0002 in. thick are deposited (by cathode sputtering, deposition from solution, electrodeposition) on one or both sides of a sheet of material of low thermal conductivity, *e.g.*, H_2O-swelling colloids (regenerated cellulose, gelatin, alkali-sol. cellulose ethers) or porous fibrous material treated with a suitable base coat to render it non-porous and receptive to the subsequent metal coating. One or more of such sheets constitute(s) an insulator against visible and infra-red radiation, suitable for use as wrapping material, food containers, linings, etc. S. S. W.

Heat-insulating covering for pipes. F. W. Krausse Ges.m.b.H. (B.P. 465,690, 21.5.36. Ger., 21.5.35).—Mats of rectangular form are provided with metallic reinforcement (helical coils or bent wire) in the long edges and ends so that they may be removed and replaced many times without losing their shape. B. M. V.

Controlling the temperature of exothermic reaction chambers. Robinson Bindley Processes, Ltd., and A. A. Aicher (B.P. 467,564, 18.11.35 and 27.2.36).—Vigorously boiling liquid is maintained in close contact with the wall of the reaction chamber and the temp. is adjusted by adjusting the pressure. B. M. V.

Roller mills for grinding paint and other substances. C. Carruthers, and Torrance & Sons, Ltd. (B.P. 467,349, 13.1.36. Addn. to B.P. 441,382; B., 1936, 256).—A doctor for removing ground material from the middle part of a roll separately from that from the ends is described. B. M. V.

Disintegrators for fluid-borne solids. Hathorn, Davey, & Co., Ltd., and H. R. Lupton (B.P. 466,109, 18.11.35).—The disintegrating element is a rotating plate through which the stream of material and air passes; the plate is formed with holes as closely spaced as possible and inclined to the axis to present sharp edges. B. M. V.

Sifters. L. E. Simpson (B.P. 467,453, 24.1.36).—A flat screen is oscillated in a path (described) which is inclined to both lengthways and crossways wires of the screen. B. M. V.

Kneading and mixing machines. Artofex Eng. Works, Ltd. (B.P. 467,474, 21.12.36. Switz., 23.12.35).—The apparatus comprises a rotating bowl and two mixers on inclined axes, all three axes being in the same vertical plane. The blades intermesh and substantially generate part of the contour of the bowl. The stopping and lifting devices are interlocked. B. M. V.

Mercury-vapour vacuum pumps. Brit. Thomson-Houston Co., Ltd., and J. C. Read (B.P. 465,831, 21.11.35).—A Hg boiler-type pump which is situated independently of the rectifier or other vessel to be kept exhausted and provided with a gauge-glass and means by which the Hg can be replenished is described. B. M. V.

Water softeners. C. P. Eisenhauer (B.P. 466,634, 22.6.36).—An automatic valve system for operating a base-exchange H_2O softener is described. The amounts of H_2O softened each period and used for washing after regeneration are both controlled by a meter. B. M. V.

Sedimentation or other apparatus having rotary rakes or like members. Dorr Co., Inc.

(B.P. 466,862, 4.12.35. U.S., 22.12.34).—A driving gear and weight-supporting bearing for an apparatus having a central suspended shaft is described; means to prevent tilting are embodied. B. M. V.

Filters. J. Zwicky (B.P. 466,603, 23.11.35).—A cylindrical strainer or filter is provided with a rotary cock which, when operated by hand or electrically due to increased pressure drop in the filter, momentarily shuts off or by-passes the prefilt and simultaneously opens the prefilt side of the filter to free discharge so that a back-wash is effected by the residual pressure in the filtrate. B. M. V.

Separation of liquid mixtures by distillation. J. Rennotte (B.P. 465,757, 6.2.36. Fr., 8.2.35).—A ternary azeotropic mixture, *e.g.*, EtOH, H_2O, and an "entrainer" (C_6H_6), is diluted with H_2O so that the C_6H_6 may be decanted off, and this is boiled and introduced as vapour into the final dehydrating column at a point below the EtOH–H_2O feed and flows countercurrent to the other products, especially to the reflux. Abs. EtOH is collected at the bottom. B. M. V.

Extraction of a liquid mixture with the aid of a selective solvent. N. V. de Bataafsche Petroleum Maats. (B.P. 466,730, 19.2.36. U.S. 14.5.35).—In the separation of three components, $A + B + C$, having ascending solubilities in a solvent S, the first extract $S + B + C$ is treated with another solvent L which is immiscible with S to form an extract $B + L$ containing some C and a trace of S, and a residue high in C and S containing some B. Previously $S + B + C$ may be scrubbed with B to effect a partial separation. *E.g.*, an original mixture comprising a Venezuelan lubricating oil distillate containing (A) paraffins, (B) *sec.*-olefines, and (C) *tert.*-olefines may be treated with (S) SO_2, furfuraldehyde, $PhNO_2$, "Chlorex," *iso*quinoline, and (L) a saturated aliphatic hydrocarbon. B. M. V.

Apparatus for extracting soluble principles from, or washing or dyeing, stuff. Aktieb. Lavator, and C. G. T. Salenius (B.P. 467,635, 16.12.35).—Liquid is forced from a lower-pressure chamber (P) to an upper treatment chamber (T) by means of a heating medium (steam) introduced under pressure and allowed to run back from T to P by equalisation of pressure. The claims relate to means for guiding the liquid in P to effect even distribution in T and to a device for pressing down the material in T. B. M. V.

Effecting transfer of volatile material from a region of low pressure to a region of higher pressure. Linde Air Products Co., Assees. of J. J. Murphy (B.P. 465,043, 25.10.35. U.S., 14.11.34).—A liquid at atm. pressure and low temp. is transferred to other vessels at a higher pressure and temp. in partly gaseous form by means of intermediate transfer vessels (which may be used as meters) and in a substantially adiabatic manner, only a small quantity of heat or pumping power being necessary to start the flow. Some of the high-pressure vapour is condensed in the low-pressure liquid to effect the rise in pressure of the latter and is itself condensed to form liquid for future use. B. M. V.

Acid composition for treatment of deep wells. S. M. Stoesser and W. Fry, Assrs. to Dow Chem. Co. (U.S.P. 2,048,362, 21.7.36. Appl., 4.5.34).—An aq. oxidising solution (1—10% of HNO_3, 5—20% of HCl, 1—10% of HF) suitable for treating wells in which the producing stratum is silicate rock is rendered inactive towards metal parts of the well at 37° by adding 0·1—1·0% (or by previously treating with a solution) of a $(NH_2)_2$-derivative of $COPh_2$ or Ph_2O. A. H. C.

Absorption refrigeration. G. F. Zellhoefer (U.S.P. 2,040,894—912, 19.5.36. Appl., [A]—[F] 11.12.34, [G]—[K] 18.4.35, [L] 20.4.34, [M]—[R] 3.5.35, [S] 29.7.35).—Refrigerant mixtures for the absorption type of apparatus, whether of the two- or three-fluid type, are claimed as follows. (A) $(CH_2{\cdot}OAc)_2$ as solvent with a halogen derivative of an alkyl monofluoride, *e.g.*, $CHCl_2F$, as refrigerant. In other cases the refrigerant is a volatile, chemically stable halogenated hydrocarbon sol. in the solvent, *e.g.*, $CHCl_2F$, and the solvent is: (B) diethylene glycol Et_1 ether acetate, (C) diethylene glycol Et_2 ether, (D) trimethylene glycol diacetate, (E) tetrahydrofurfuryl acetate, (F) triethylene glycol Me_2 ether, (G) tetraethylene glycol Me_2 ether, (H) diethylene glycol Me_1 ether methoxyacetate, (I) a derivative of tetrahydrofurfuryl alcohol in which the H of the OH has been replaced by a short-chain acyl, alkyl, or alkoxyacyl, *e.g.*, tetrahydrofurfuryl methoxyacetate, (J) Et lævulate, (K) triethylene glycol Me_1 ether acetate, (M) diethylene glycol Me_1 ether acetate, (N) diethylene glycol Me_1 ether methoxyacetate, (O) $OEt{\cdot}[CH_2]_2{\cdot}OAc$, (P) ethylene glycol acetate tetrahydrofurfuryl ether, (Q) hexaethylene glycol Me_2 ether, (R) diethylene glycol ditetrahydrofurfuryl ether, (S) tetraethylene glycol Et_2 ether. (L) MeCl is the refrigerant and an ethylene glycol alkyl ether, *e.g.*, $OH{\cdot}[CH_2]_2{\cdot}OBu$, the solvent. D. M. M.

Removal of gaseous weak acids from gases. I. G. Farbenind. A.-G. (B.P. 450,519 and Addn. B.P. 467,579, [A] 24.1.35, [B] 17.12.35. Ger., [A] 1.2.34).—(A) Scrubbing liquid regeneratable by heat comprises or contains basic compounds $NAA'{\cdot}R{\cdot}NA''A'''$, where R is an aliphatic residue which may contain NH_2 and at least one A is alkyl or aryl which may contain OH or NH_2, or two A attached to different N may form an alkylene while the remaining A are alkyl or aryl. In (B) R is an aliphatic residue containing one free or substituted OH, and A are alkyl, *cyclo*alkyl, aryl, or aralkyl. B. M. V.

Cyclone separators. E. King A.-G. (B.P. 465,897, 23.4.35. Ger., 13.3.35).—The separator is jacketed for a heating medium. B. M. V.

Manufacture of self-lubricating mechanical bodies. F. Sattler (B.P. 465,936, 13.8.35).—Graphite of colloidal size, without oil or fluid medium, is evenly distributed among powdery metal or alloy and the whole is compressed. B. M. V.

Analysis of gases by differential thermal conductivity measurements. W. J. Willenborg, Assr. to U.S. Fire Protection Corp. (U.S.P. 2,042,646, 2.6.36. Appl., 20.11.30).—Samples of gas from a common source are passed continuously through two thermal conductivity cells, one of which receives the gas after it has been submitted to chemical treatment to remove one constituent only; the pressure is equalised before the samples pass the cells. D. M. M.

Pyrometers. R. C. K. Young (B.P. 465,614, 9.11.35. Austral., 9.11.34).—A tube having high expansion is filled with C resistance blocks, an insulating sleeve being interposed. Shrinkage of the tube causes decreased resistance of the C; the device may therefore be used as a regulating rheostat for a resistance heater, and if a voltmeter and ammeter are connected the actual temp. may be calc. B. M. V.

Apparatus for measuring hardness or [compressive] strength of materials. J. F. Williams (B.P. 465,804, 13.11.35).—The apparatus comprises a ball-headed impacting element and a microscope for measuring the dent. B. M. V.

Furnaces [for burning slack]. Streichenberger Soc. Anon. (B.P. 465,854, 6.7.36. Switz., 6.7.35).

Heat-insulating elements. Aktieb. Termisk Isolation, Assees. of C. G. Munters (B.P. 465,602 and 465,654, 8.11.35. Swed., 10.11.34).

Heat insulation. [Refrigerating cabinet.] Aktieb. Termisk Isolation, Assees. of C. G. Munters (B.P. 465,980, 10.3.36. Swed., 13.3.35).

Crushing and dispensing device [for tablets]. L. W. Meyer. From Miles Labs., Inc. (B.P. 467,537, 28.8.36).

[Transportable] mixing machines, primarily intended for concrete. T. Howell (B.P. 466,121, 21.11.35).

Liquid heating apparatus [geyser]. H. G. Redrup (B.P. 466,845, 29.11.35).

[Underground] storage tanks for liquids. Soc. d'Études & de Travaux d'Imperméabilisation Proc. d'Étanchéité S.E.T.I. (B.P. 465,856, 7.8.36. Fr., 11.5.36).

Storage reservoir for gas, steam, or volatile liquids and method of frabricating the same. Stacey Bros. Gas Construction Co. (B.P. 466,622, 28.2.36. U.S., 4.3. and 14.12.35).

[Apparatus for] prevention and extinction of fire. Graviner Manufg. Co., Ltd., and H. M. Salmond (B.P. 466,599, 19.10.36).

Froth-producing apparatus [for fire-extinguishing]. C. O. Thernell (B.P. 465,771, 11.11.36).

Production of liquid [gas or foam] baths. Allgem. Electricitäts-Ges. (B.P. 467,359, 25.3.36. Ger., 30.3.35).

Apparatus for gravity determinations [for locating ores etc.]. W. W. Triggs. From Bolidens Gruvaktieb. (B.P. 466,080, 4.8.36).

Flaking of amorphous solids.—See VII. **Welding.**—See X. **Drying etc. plant.**—See XIX.

II.—FUEL; GAS; TAR; MINERAL OILS.

Fuel supplies of Great Britain. A. W. Nash (J. Soc. Arts, 1937, **85**, 787—806).—A lecture.

Illinois coals—classification and analyses. P. B. Place (Combustion, 1935, **7**, No. 3, 29—32). Ch. Abs. (*e*)

Fuel and metallurgical industries of Soviet Russia. E. Prost (Rev. Univ. Min., 1936, **12**, 460—474).—A review. R. B. C.

Coal seams of North Staffordshire. Anon. (Dept. Sci. Ind. Res., Fuel Res. Survey Paper 39, 1937, 49 pp.).—Proximate and ultimate analyses, calorific vals., caking properties, and ash fusion points and analyses are tabulated for representative samples from the following seams: Eight-Foot Banbury or Cockshead, Seven-Foot Banbury, Hard Mine, Holly Lane or Bottom Two Row, Bowling Alley or Top Two Row, Ten-Foot, Moss or Four-Foot, and Great Row. The seams yield coking, gas, house, manufacturing, and steam coals. A. B. M.

Yorkshire, Nottinghamshire, and Derbyshire coalfield. West Yorkshire Area. Wheatley Lime Seam. Anon. (Dept. Sci. Ind. Res., Fuel Res. Survey Paper 38, 1937, 47 pp.; cf. B., 1937, 403).—Results of a detailed examination, from floor to roof, of nine complete samples are given. The proximate and ultimate analyses, % of org., pyritic, and sulphate-S, % Cl, caking index, *d*, results of the Gray–King assay, and ash fusion point are tabulated for each sample. Proximate and ultimate analyses of the banded constituents and the characteristics of the cokes obtainable therefrom are discussed. In addition, an ash analysis of a typical section and the results of coal-washing tests on a sample from one of the collieries are recorded. The H_2O and ash contents of the seam average 1·5% and 4—6%, respectively. The general character of the coal as shown by the C and H figures is very const. The calorific val. of the seam is satisfactory over the greater part of the area, but falls in the north. The coal has strong coking properties. Its use for gas-making could be developed if the S content (in general, $>5\%$, dry ash-free basis) were reduced by suitable treatment. The lower part of the seam is rather poorer in quality than the upper, and thin bands of inferior coal occur near the roof and floor. R. B. C.

Occurrence of gas in bituminous coal mines. L. J. Rüland (Braunkohlenarch., 1937, No. 47, 1—42).—The geological causes of accumulations of gas (chiefly CH_4 and CO_2) in Dutch coal mines are discussed. The gas is stored mainly in the rock overlying the coal and not to any great extent in the coal itself from which it originated. R. B. C.

Friability of South African coals. I. J. C. Vogel and F. W. Quass (J. Chem. Met. Soc. S. Africa, 1937, **37**, 469—478).—The impact-resistance of 25 typical S. African coals has been studied, using a modified A.S.T.M. shatter-test apparatus, and their "% friabilities" determined. The screening analyses were in accord with Rosin's exponential law of size distribution (cf. B., 1936, 1136), and the Rosin consts. have been used for evaluating the resistance to breakage and the tendency to dustiness of the coals. The greater advantages attending the use of the Rosin consts. in place of the "% friability" for the assessment of degradation test results are discussed. In the round coals examined, the mineral matter was conc. in the smaller sizes, but when the larger sizes were shattered by impact there was no appreciable concn. of the mineral matter in either the large or the small sizes produced. The high-volatile coals were, in general, harder than those which had been partly burned by igneous intrusions, whilst such intrusions which had reduced the volatile content of Natal coals had also increased their tendency to dustiness. H. C. M.

Drying of fine coal by means of centrifuges. P. Rzezacz (Glückauf, 1937, **73**, 496—507).—Diagrammatic descriptions, including performance data, are given of various types of horizontal and vertical centrifuges, *e.g.*, Reineveld and Wedag–Gröppel. Sludge utilisation and the economics of dewatering coal fines are discussed. R. B. C.

Control of a colliery spoil-heap fire. H. Price (Trans. Inst. Min. Eng., 1937, **93**, 261—271).—Limestone dust–H_2O treatment has proved highly effective in extinguishing fires in conditions favourable to the propagation of combustion. The treatment is easily applied into the heart of a fire, and the mixture flows readily into all the cavities and settles rapidly when the flow is retarded or stopped. H. C. M.

Weathering of coal. II. N. M. Karavaev, I. B. Rapoport, and V. A. Choller (Chim. Tverd. Topl., 1934, **5**, 510—525).—The properties of weathered and brown coals are compared. Weathering increases the C : H ratio, the O content, hygroscopicity, acidity, content of CO groups, gas yield, and CO_2 and CO in the primary gas, and decreases the C, H, and OMe contents, the yield of primary tar, and the I val. of the bitumen. Ch. Abs. (*e*)

Inflammability of dusts from Lancashire coals. N. Simpkin and G. Wrapson (Trans. Inst. Min. Eng., 1937, **93**, 229—251).—The inflammability of several Lancashire coals has been studied using the Safety in Mines Research Board's laboratory test. Although the various sub-sections of a seam may differ considerably from one another in inflammability, that of the whole seam is the average of the sub-sections when due allowance is made for their respective thicknesses. In all coals examined, dull coal is less inflammable than bright coal from the same seam. The formula, $S = 100—1250/V$, connecting the inflammability of a coal and its volatile matter content (V), is not considered sufficiently reliable to be applied to all Lancashire coals. H. C. M.

Relations between the spontaneous combustion in coal seams and their petrographic composition. H. Pohl (Kohle u. Erz, 1936, **33**, 421—424; Chim. et Ind., 1937, **37**, 668).—Spontaneous combustion never occurs in fusain unless it is in juxtaposition with vitrain, which plays an active part in, and may be considered the principal cause of, outbreaks of fire in coal seams. Fusain, however, may act catalytically because of the fineness of its particles and consequently its high power of absorbing O_2. Durain plays a secondary part, its high volatile content merely facilitating the development of a fire. Pyrites has less effect than might be expected from the ease with which it oxidises, because the heat developed is too small to start a fire. R. B. C.

Fuel and heat requirements in drying crude brown coal with furnace gases [from a steam boiler]. F. Gropp (Braunkohle, 1937, **36**, 129—137).—The costs of brown-coal briquette works using steam and furnace gases, respectively, for drying brown coal are compared. Provided use can be made of all steam generated, the employment of a furnace gas dryer is justified. Steam-drying, however, appears to be the more economical method. The combination of both systems may be advisable when intensive drying is required. R. B. C.

Factors recommended for consideration in the selection of coal. Anon (Nat. Assoc. Purchasing Agents, New York, 1936, 21 pp.).—A series of charts prepared by the Amer. Soc. Test. Mat. in conjunction with American industrial concerns indicating in order of importance the properties, *e.g.*, % of H_2O, volatiles, and ash, ash fusion point, etc., desirable in coals used for the production of steam, coke, cement, ceramics, etc. is given. R. B. C.

Use of oil immersion in coal microscopy. E. Stach (Glückauf, 1937, **73**, 330—333).—The technique of examining polished sections of coal by the oil-immersion method is described. The petrographic constituents of the coal are more clearly differentiated than when employing the dry-objective method of examination. Photomicrographs are given. R. B. C.

Average error in coal sampling. F. J. Tromp and J. P. Duminy (J. Chem. Met. Soc. S. Africa, 1937, **37**, 495—499).—Bushell's results (B., 1937, 513) are shown to be not only qualitatively but also quantitatively in excellent accord with the theory of errors. H. C. M.

Apparatus for precise plasticity measurements at high temperatures. Data on coal plasticity. H. K. Griffin and H. H. Storch (Ind. Eng. Chem. [Anal.], 1937, **9**, 280—286).—Apparatus and procedure are described. The plastic properties of Pittsburgh and Alma seam coals are transient, having a life period of about 1 min. at 460°. At 410° the deformation is elastic. The solid plus oily bitumen obtained by C_6H_6 extraction of Pittsburgh seam coal at 120° is truly plastic. E. S. H.

Recent developments in the preparation of coal. R. A. Mott (Gas World, 1937, **107**, Coking Sect., 80—84).—Present-day practice in dedusting, H_2O clarification, and slurry treatment, in the use of jig and trough washers and of washers employing dense media (*e.g.*, the Barvoys washer), in dry-cleaning, etc. is critically reviewed. A. B. M.

Action of aqueous alkali on a bituminous coal. L. Kasehagen (Ind. Eng. Chem., 1937, **29**, 600—604).—The action of aq. alkali on Edenborn (Pittsburgh seam) coal has been investigated at 250—400° and at [NaOH] from N to 100%. The principal product of the reaction was a coke-like residue having lower O and

H contents than the original coal. Neutral, viscous liquids, solid phenolic substances of high mol. wt., CO_2, free H_2, and gaseous hydrocarbons were also obtained as by-products, the O_2 in the CO_2 and the free H_2 being derived partly from the coal and partly from the decomp. of the H_2O. By the proper choice of conditions, residues having H contents as high as, but O contents $\leqslant$, those of the coal were formed. Hydrogenation of these residues formed products more hydrocarbon-like in character than did a similar hydrogenation of the coal itself. The results are held to confirm the view that O in coal is present in ether or heterocyclic linkings. The residues produced by the alkali treatment of both the whole coal and the light petroleum-insol. fraction of the pressure–C_6H_6 extract were closely similar as regards yields and composition.
H. C. M.

Briquetting coal with sodium silicate. F. D. Snell and C. S. Kimball (Ind. Eng. Chem., 1937, **29**, 724—726).—Briquettes made with a solution of silicic acid in Na silicate (I) as binder are considerably more resistant to erosion by H_2O than are those made with the corresponding (I) ($Na_2O : 3{\cdot}57SiO_2$) containing the same $Na_2O : SiO_2$ ratio. Additional resistance to H_2O can be obtained by pretreatment of the coal with a dispersion of 3% of Al palmitate and 2·5% of glue in H_2O or, to a smaller degree, by surface treatment of the briquettes with the diluted dispersion.
H. C. M.

Separation and emission of cinders and fly ash. A. C. Stern (Trans. Amer. Soc. Mech. Eng., 1937, **59**, 289—296).—The size–frequency analysis of cinders and fly ash and the variation of the efficiency of dust separation with changing particle size are discussed. It is shown how these two factors may be combined to determine the overall efficiency of separation. A method is described for calculating dust separation and emission in complex coal-burning units in which dust originating in the furnace passes, prior to its emission into the atm., through heat-absorbing units in some of which dust removal occurs. The experimental data necessary for predetermining the operating characteristics of equipment with respect to fly-ash emission are indicated and a theoretical analysis is made of the efficiency of dust separation in settling chambers, centrifugal concentrators, and cyclone separators.
R. B. C.

Influence of oxidation on the coking property of bituminous coals. N. A. Kutscherenko (Koks i Chim., 1933, No. 12, 63—65).—Data are recorded.
Ch. Abs. (e)

Carbonising coal by electricity. Anon. (Elektrotech. Z., 1937, **58**, 154; Feuerungstech., 1937, **25**, 134).—A vertical retort, 1·83 m. diameter and 12·2 m. high, containing 30 tons of coal has electric leads at top and bottom. When single-phase a.c. is passed through a central core of coke the adjacent coal is carbonised. The conducting core becomes progressively larger until all coal is carbonised. Gas (283 cu.m. per ton of coal) is withdrawn from the sides of the retort without coming in contact with the glowing coke. The coke resembles high-temp. coke, but the tar is similar to low-temp. tar. 350 kw.-hr. are consumed per ton of coal.
R. B. C.

Production of artificial graphite by graphitisation of coal. V. S. Veselovski and V. N. Pertzov (J. Phys. Chem. U.S.S.R., 1934, **5**, 557—573).—Data are given for various coals. The temp. required for 3% combustion in 10 min. decreases with the addition of mineral matter (CaO, B_2O_3, Fe_2O_3, Al_2O_3, and SiO_2) up to a limit for each substance and is then const. Only anthracites can give " oily " graphites.
Ch. Abs. (e)

Analysis of used graphite crucible. M. Straschill (Chem.-Ztg., 1937, **61**, 328).—Graphite C is determined by heating with $CrO_3 + H_2SO_4$ and absorbing the CO_2 (after passing over heated CuO) in KOH, and total C by fusing with PbO in a Ni or Pt crucible in a stream of O_2 and absorbing the CO_2. The resulting $PbSiO_3$ melt is dissolved in HNO_3, from which the total Si is weighed as SiO_2 and the alkalis are determined in the filtrate. The total SiO_2 is determined by fusion with NaOH (or KOH) + Na_2O_2, followed by the usual pptn. method. Fe_2O_3 and Al_2O_3 are pptd. from the filtrate. Elementary Si is determined by measuring the vol. of H_2 evolved on boiling with aq. 50% NaOH. SiC may be calc. from the above C or Si data or by heating with HF + HNO_3 until no more SiF_4 is evolved, fusing the residue (SiC) with alkali, and pptg. the SiO_2. Fe_2O_3 and Al_2O_3 may also be determined in the usual way after $Na_2S_2O_7$ fusion.
J. A. S.

Time required for the combustion of coal dust. W. Gumz (Feuerungstech., 1937, **25**, 74—77).—Discrepancies in the calc. and observed combustion times of coal dust in coal-dust furnaces are discussed. By taking into account the changes in excess air during combustion and the effect of the ash content of the coal it is shown that practical results can be brought into line with Nusselt's theoretical combustion formulæ. Differences in the ignitabilities of coal and coke can be partly attributed to their different thermal conductivities.
R. B. C.

Chemical changes in the semi-acid masonry of coke ovens. R. N. Golovatnui (Ogneuporui, 1935, **3**, 277—280).—Changes in composition are chiefly due to absorption of Fe oxides by the surface layer and the formation of low-melting silicates. The slag layer protects the brick against corrosion. Deposition of C in the mass of the brick aids the adherence of the slag layer by loosening the structure. Alkali oxides do not cause any disturbance as the coke ash is acid.
Ch. Abs. (e)

Coke from Illinois coal. Temperature conditions in sole-flue ovens. G. Thiessen (Ind. Eng. Chem., 1937, **29**, 506—513).—Comprehensive tests have been made to determine the temp. conditions inside a charge of Illinois fine coal being coked in a Knowles sole-flue regenerative oven (B., 1935, 534), in which the coal lies in a wide, shallow layer and is heated from the bottom. Data are given showing the rate of travel of the plastic zone, the temp. gradient, and the final temp. attained in the charge at selected points. Of the coke produced, the lower two thirds had the properties of a high-temp., low-volatile coke; the remainder had more of the characteristics of low-temp. coke. The gas produced had lower H_2 and CH_4 contents than normal coke-oven gas. Analysis of coals coked, of coke and gas produced, and of horizontal sections of coke at various intervals from the oven floor are tabulated. H. C. M.

Heat of coking of coal containing various percentages of water and of mixed coals. F. Johswich (Thesis, Berlin Tech. Inst., 1936, 59 pp.).—The Terres–Voituret method (cf. B., 1931, 427) for determining the heat of coking (*H*) of coal was found to be inaccurate. Experiments on coals containing known % of H_2O and on coal blends, using an improved form of the same apparatus, showed that *H* is additive, *i.e.*, the *H* of a given coal is not influenced by addition of H_2O or of another coal. R. B. C.

Reactivity of brown-coal cokes. R. Heinze and H. Farnow (Braunkohle, 1937, **36**, 277—283, 300—302).—An apparatus for determining the ignition point, *I*, of coke is described. Dry air is passed, at the rate of 20 litres per hr., through a layer, 1 cm. thick, of coke (2 mm. size) resting on a perforated plate half way up a vertical quartz tube inside an electric furnace. The temp. is raised at the rate of 6—8° per min. The point of intersection of the temp.–time curves before and after ignition = *I*. Data obtained for a no. of high- and low-temp. cokes from brown coal are discussed. The temp. and rate and method of carbonisation have a marked influence on *I*. Impregnation of the cokes with 5—10% aq. K_2CO_3, KCN, or Na_2CO_3 lowered the *I*. Cokes with the highest initial *I* were most affected, K salts giving the best results. Storing the cokes for various times had little effect on *I*. Brown coal low-temp. coke had a lower *I* than anthracite, coke from bituminous coal or peat, or wood charcoal. R. B. C.

Foundry and laboratory characteristics of cupola cokes. H. O'Neill and J. G. Pearce (Inst. Brit. Foundrymen, Preprint 609, 1937, 13 pp.).—Cupola results of the behaviour of 14 different foundry cokes are given, coke merit being assessed on the basis of metal temp. Since a max. variation of 5% was found between the best and worst cokes, the correlation of cupola and laboratory tests is limited. No test can yet predict definitely the practical cupola properties of a coke, although cokes giving low metal temp. are low in shatter index, rate of wet oxidation, RI—RIII reactivity val., and resistance to abrasion, and high in *d* of cell structure and resistance to static compression. R. B. C.

Bar mill for pulverising wet coke. E. C. Blanc and H. Fleming (Génie Civil, 1937, **110**, 420—422).—A mill for grinding coke containing 10—15% of H_2O is described. Power requirements and costs for producing a product 80—90% of which is <0·8 mm. size are discussed. Carbonising tests showed that coking coal blended with 10—12% of the pulverised coke yields a coke superior to that from the coal alone. R. B. C.

Coke strength as affected by coke breeze admixture to coal. F. J. Pfluke, A. C. Sedlachek, and A. B. Huyck (Proc. Amer. Gas Assoc., 1936, 771—792).—Coal mixed with 1—5% of five sizes ($\frac{1}{32}$, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, and $\frac{1}{4}$ in.) of coke breeze was carbonised in Becker coke ovens in various localities. In general, the size of coke obtained increased with the % of added breeze, whilst coke strength decreased with increasing size of breeze. R. B. C.

Dustproofing coke with cold oil spray. I. J. True (Amer. Gas J., 1937, **146**, No. 6, 33—34).—The technique employed by the Providence Gas Co., U.S.A., is described. 0·2 gal. of oil per ton of coke is required. R. B. C.

Use of oil for dustproofing coke at Springfield [U.S.A.]. C. H. Thorington (Amer. Gas J., 1937, **146**, No. 6, 35).—Experience has shown that refined petroleum oil (*d* 0·905) is preferable to aq. $CaCl_2$ for dustproofing coke. Costs are compared. R. B. C.

Dustless coke. R. C. Downing (Amer. Gas J., 1937, **146**, No. 6, 35—36).—The costs per ton of dustproofing coke with "Coalkote B" emulsion are tabulated. R. B. C.

Coke–carbon dioxide relations. K. G. Skinner (Ind. Eng. Chem., 1937, **29**, 696—697).—By means of the quadrant chart given, the wt. of coke (ash content *A*%) required to deliver, and the wt. of CO_2 contained in, *V* cu. ft. of gas at *t*° and *p* lb./sq. in., using *x*% excess of air, can be read off directly. H. C. M.

Sources of error in determination of calorific values of fuels. H. H. Müller-Neuglück (Glückauf, 1937, **73**, 345—355).—Results of determining the calorific val. of the same fuel (coal, coke, or oil) by the standard German method (DIN, DVM 3716) have shown considerable variation. Sources of error, *e.g.*, incorrect choice of formulæ used for calculation, are discussed. Recommendations, based on experimental work, are given for the procedure which should be adopted, *e.g.*, in the case of coke containing a high % of ash, to ensure accurate results. R. B. C.

Methods of testing solid fuels. H. Richter (Feuerungstech., 1937, **25**, 72—74).—German standard methods for determining, *e.g.*, the calorific val. of coal, coke reactivity, ash fusion point, etc., are summarised. R. B. C.

Determination of sulphur in coal and coke. A. Z. Jurovski (Koks i Chim., 1933, No. 12, 75—76).—The pptd. $BaSO_4$ is centrifuged in a standard tube and its amount deduced from the depth of the deposit. Ch. Abs. (*e*)

Evaluation of activated carbons. I. P. Tolotschko (Nauch. Zap. Sach. Prom., 1934, **11**, No. 5, Book 43, 43—63).—A method of determining the colour adsorption based on adsorption isotherms is described. Ch. Abs. (*e*)

Utilisation of lignite and peat in view of the production of motor fuels. F. Michot-Dupont (Bull. Soc. d'Encour., 1937, **136**, 227—246).—By carbonising at low temp., *e.g.*, 500°, lignites to which 1·5—2% of $Ca(OAc)_2$, 2—4% of Na_2CO_3, and 0·1% of Fe have been added the phenols otherwise present in the tar are converted almost completely into aromatic hydrocarbons. There results a marked increase in the proportion of the fraction of b.p. <180° (from 2—7% to 13—40%), the aromatic content of which is 70—90%, and the production of a heavy oil which is more amenable to cracking or hydrogenation. The carbonisations have been carried out principally in an externally-heated, continuously operated, horizontal tube retort (U-shaped in plan) through which the material is passed by means of an endless scraper–conveyor. The retort has a capacity of 120 kg./hr. and is operated at a max. temp. of 600°. The coke may be briquetted and used as a domestic or industrial fuel. The process may be applied successfully to lignite, to peat dried to 30% H_2O, or to cannel coal; it fails with bituminous coal. The mechanism of the process is briefly discussed. A. B. M.

Changes in chemical composition of peat during storage in stacks. P. N. Gerasimov (J. Appl. Chem. Russ., 1937, **10**, 873—876).—The bitumen, hemicellulose, N, and ash contents of peat vary irregularly during storage, at different depths from the surface of the stack. R. T.

Utilisation of bagasse. VIII. Calculation of the heat lost in the flue gases from burning bagasse. IX. Products from the combustion of bagasse. H. Kato (J. Cellulose Inst. Tokyo, 1937, **13**, 197—199, 199—204).—VIII. A method is described for calculating the vol. of gas produced by the combustion of bagasse, and the loss of heat up the stack.

IX. The H_2O content and vol. of gas resulting from the combustion of bagasse containing various % of H_2O with various vols. of excess air are calc. A. G.

Low-temperature carbonisation of bituminous coal. D. Brownlie (Ind. Eng. Chem., 1937, **29**, 734—741).—See B., 1937, 637. Other plants and processes are also described.

Low-temperature distillation tests of sub-bituminous coal from the Denver Region coal field, Colorado. W. H. Ode and W. A. Selvig (U.S. Bur. Mines, 1937, Rept. Invest. 3342, 7 pp.).—Low-temp. assays were made at 200°, 350°, and 500° on two highly oxygenated sub-bituminous coals. No tar or oil was detected at 200°. Small amounts of tar, oil, and gas were evolved at 350°; these yields increased considerably at 500°. The gas produced at 200° consisted principally of CO_2. The petrographic characteristics of one of the coals are also described. H. C. M.

Blending properties of certain high-volatile coals as brought out by high-temperature carbonisation. J. D. Davis (Proc. Amer. Gas Assoc., 1936, 808—814).—The yields obtained on carbonising high-volatile coal blended with 20—30% of low-volatile coal in the Bureau of Mines–Amer. Gas Assoc. experimental retort at 900° are tabulated. In general, the coke strength was improved. R. B. C.

Low-temperature carbonisation of bituminous coal. A. Jenkner, F. L. Kühlwein, and E. Hoffman (Glückauf, 1937, **73**, 213—219, 240—247).—Various English and German processes for the production of lump low-temp. coke from fine coal are described. Details are given of laboratory and small-scale experiments to determine the connexion between the products of low-temp. carbonisation and the age and petrographic composition of coal. The effects of oxidation and coal size on the strength and structure of the coke are discussed in relation to photomicrographs. R. B. C.

Smokeless fuel and by-products from a 20-ton [Coalene low-temperature carbonisation] plant at Tacoma, Washington. J. E. Louttit (Coal Age, 1937, **42**, 155—157).—The Coalene (Record–Louttit) process for the low-temp. carbonisation of coal is described. Carbonisation of the coal is effected by passage therethrough of steam at 650°. 0·7—1 lb. of steam is required per lb. of coal. The yields per ton obtained from a 40/60 blend of coking and non-coking coals are: 1456 lb. of coke, 35·64 gals. of tar oil, 3·36 gals. of gas oil, and 5600 cu. ft. of gas having a calorific val. of 600 B.Th.U. per cu. ft. R. B. C.

Catalysts and constructional materials for [pressure] hydrogenation [of coal etc.]. H. Winter (Glückauf, 1937, **73**, 420—424).—The types of catalyst employed, methods for obtaining max. catalytic activity and preventing poisoning, and the effect of varying the operating conditions, *e.g.*, temp., pressure, and throughput, are discussed. In general, C steels are unsuitable for high-pressure hydrogenation plant. Low-C Fe–Ni–Cr or Fe–W steel is usually employed for exposed parts. R. B. C.

Thermal decomposition of wood with superheated steam. P. A. Bobrov (Lesochim. Prom., 1935, **4**, No. 3, 9—15; cf. B., 1935, 659).—In distilling sawdust and wood chips up to 2 × 2 × 4 cm. with superheated steam the yield of acids is raised by 100%; gases and tar are not produced. The yield is less with wood in larger pieces, and decomp. products, tar, and gases are formed. Ch. Abs. (*e*)

Consolidation of [town] gas. C. F. Broadhead (Inst. Gas Eng., 1937, Comm. 153, 61 pp.).—At Melbourne the demand for gas is increasing whereas that for residuals is uncertain. Brown-coal briquettes, coal, and oil compete with coke, the domestic market for which is no longer worth cultivating. Tar is being replaced by bitumen on roads and is largely used as fuel, whilst its disposal for carburetting water-gas and possibly by hydrogenation is contemplated. In view of the situation, horizontal, inclined, and intermittent vertical retorts have been replaced by continuous verticals, chamber ovens, and carburetted water-gas plant, and an experimental plant for complete gasification has been constructed which is largely automatically controlled, is flexible in operation, and can deal with coal, coke, or brown coal with or without carburetting with tar or residual oil. The gas produced is low in O_2, inerts, and gum-formers and the tar is highly aromatic. Intense cooling (cf. B., 1937, 201) is regarded as a promising means of removing NH_3 and gum-formers and dehydrating the gas. For S purification the oxide method is considered preferable to the liquid processes examined and its improvement by admixture of specially prepared $Fe(OH)_3$ and use of tower purifiers is being investigated. Three new gasholders have been built of mild steel, wrought Fe, and Armco ingot Fe to test the relative merits of these materials. Holder-H_2O is deodorised by means of activated C. A. R. Pe.

Changing influences in [town] gas manufacture. E. G. Stewart (Inst. Gas Eng., 1937, Comm. 155, 33 pp.).—Progress in manufacture and purification since 1920 is reviewed. More general removal of $C_{10}H_8$, H_2O vapour, and S compounds and recovery of benzol is advocated. The first two processes may allow, respectively, formation of H_2S in the holder-H_2O and deposition of gum, but these difficulties can be overcome. To meet variations of load reserve water-gas plant is favoured and relief at peak loads through connexions to adjacent undertakings is suggested. For variable market conditions debenzolisation and dilution with gases made from coke are applicable. The coal and oil used, coke and benzol recovered, and the *d* of the gas of a given calorific val. are connected by formulæ and graphs (cf. B., 1935, 389). Complete gasification is not yet commercially feasible. Standards or limits of variation of *d* may be required in future. Suggestions for standard calorific vals. are made. A. R. Pe.

Gas generators for motor vehicles. H. Brückner (Gas- u. Wasserfach, 1937, **80**, 446—451, 463—466).—Generators suitable for different fuels (wood, charcoal, brown coal products, coke, semi-coke, and anthracite) and devices for de-dusting the gas are described. The chief bar to commercial development is the loss of power when an engine is switched over from a rich fuel such as petrol to a poor gas, but this can be diminished by raising the compression ratio. Capital and running costs for a goods vehicle using benzol mixture, Diesel oil, or producer gas and for a tug using steam, Diesel oil, and producer gas are tabulated. A. R. Pe.

Gas producers for motor vehicles. C. Berthelot (Génie Civil, 1937, **110**, 376—378).—Gas producers of French design, *e.g.*, Gohin–Poulenc type, using wood, charcoal, anthracite, and low-temp. coke as fuel, are diagrammatically described. Performance data for vehicles equipped with producers are given and costs in comparison with petrol discussed. R. B. C.

Compressing town's gas at Vienna for use in motor vehicles. W. Horak (Z. öst. Ver. Gas- u. Wasserfachmänn., 1937, 77, 63—74).—A plant with a capacity of 225 cu.m. per hr. delivering gas at 400 atm. pressure is described. Gas flasks of 100 litres capacity are filled at a pressure of 220 atm. R. B. C.

Bottling of town's gas for use as motor fuel. H. Wanser (Z. kompr. flüss. Gase, 1936, **32**, 61—63).—The compressibility coeff. (*C*) of Berlin town's gas has been calc. at 20° over the range 50—350 atm. from compressibility data available for the gas constituents. *C* decreases with the pressure up to 85 atm. but steadily increases thereafter. Up to 206 atm. C is <1; at 350 atm. $C = 1{\cdot}119$. Since a gas flask of 1 cu.m. capacity contains 89·5, 206, and 313·5 cu.m. of gas (referred to 1 atm.; 20°) at 85, 206, and 350 atm., respectively, no advantage is gained by compressing above 350 atm. R. B. C.

Gas flasks of light metals. N. Christmann (Wärme, 1937, **60**, 236—237; cf. B., 1937, 247, 577).—Experience has shown that the internal and external varnish coatings for flasks made of lautal, bondur, and duralumin should be applied after the official hydraulic pressure tests. The neck of the flask where the pressure-reducing valve is screwed in should be reinforced by shrinking-on a steel collar. R. B. C.

Industrial system for fuel gas handling. R. S. McBride (Chem. Met. Eng., 1937, **44**, 234—240).—A full account, with diagrams and flow sheets, of the scheme adopted at the Ford Motor Co.'s Works at Dearborn, Mich., for distributing blast-furnace gas, coke-oven gas, and gasified C_4H_{10} to all the consuming departments to the best advantage. It is pointed out that, owing to the low capital cost, the C_4H_{10} plant is a more economical way of providing for an emergency supply than would be the installation of large waterless gasholders. F. J. B.

Handling heavy tar emulsion. T. Loftus (Gas Age-Rec., 1937, **79**, No. 8, 41—42).—When using heavy oil instead of gas oil in the production of carburetted water-gas difficulties arise from the presence of tar in the gas and the formation of stable tar emulsions containing up to 60% of H_2O. By lowering the temp. of the gas at the condensers and tar extractors and installing a Cottrell precipitator, tar in the gas is considerably reduced. Emulsions are dehydrated by treatment with steam. R. B. C.

Iron–aluminium mixed oxide catalysts for water-gas synthesis. G. Panning (Thesis, Berlin Tech. Inst., 1936, 22 pp.).—The catalyst employed at Hameln gas works for converting CO in town's gas into CO_2 and H_2 by means of steam consists of Luxmasse and $CaCO_3$ bound with Portland cement. An attempt was made to determine the contribution of each constituent in the catalyst to its activity. Synthetic, mixed catalysts comprising two or more of the following substances, viz., Fe_2O_3, Al_2O_3, K_2O, Na_2O, and Portland cement, were prepared and their efficiencies in promoting the above reaction were compared. Data are tabulated and discussed. The most efficient mixture contained $Fe(OH)_3$ 40, $Al(OH)_3$ 30, K_2CO_3 10, and Portland cement 20%. R. B. C.

Recovery of hydrogen from coke-oven gas. V. Fischer (Z. Ver. deut. Ing., Beih. Verfahrenstech., 1937, No. 1, 14—20).—A plan is given of a coke-oven gas fractionation plant in which precooled, compressed gas, from which CO_2 and C_6H_6 have been removed, is successively freed from C_2H_4, CH_4, and N_2. Material and heat balances are calc. for each stage. Equations are given for calculating the efficiency of a NH_3 vaporiser or expansion machine used for precooling operations. The power requirements of a plant operating under various conditions of temp. and pressure and producing 1000 cu.m. of H_2 per hr. are tabulated. R. B. C.

Production of ethylene in the fractionation of coke-oven gas by intense refrigeration. N. S. Torotscheschnikov (J. Chem. Ind. Russ., 1937, **14**, 510—512).—A fraction containing $\nless 70\%$ of C_2H_4 is obtained by appropriate distillation of liquefied coke-oven gas. R. T.

Preheating in dry purification [of coal gas]. J. Castle (Gas J., 1937, **218**, 636—637).—The reaction between H_2S and $Fe(OH)_3$ proceeds best when the particles of the latter are just covered by a thin layer of H_2O. The H_2O content should therefore be controlled to this condition by preheating and saturating the gas at the inlet to each oxide box, making allowance for the H_2O formed in the reaction. In revivification H_2O recombines as $Fe(OH)_3$ and saturation must be adjusted to allow for the quantity so fixed. Plant for the saturation control is briefly described. A. R. PE.

Removal of naphthalene from coal gas. P. MICHAELIS (Glückauf, 1936, **72**, 1102—1107).—Various methods for removing $C_{10}H_8$ are summarised. A method is described for determining, by means of the picric acid (I) method (cf. B., 1934, 530), $C_{10}H_8$ remaining in the gas after scrubbing with tetralin (II). Precautions are necessary for ensuring that (II) carried over from the scrubber does not interfere with the reaction between (I) and $C_{10}H_8$, thereby vitiating the results. A table shows the % of $C_{10}H_8$ in gas before and behind the S purifiers, after compression to 4 atm., and after leaving the $C_{10}H_8$ scrubber. R. B. C.

Effect of hydrogen cyanide on [iron] oxide and hydrogen sulphide efficiency [in gas purification]. R. C. DOWNING (Proc. Amer. Gas Assoc., 1936, 699—702).—Corrosion troubles in a town's gas supply main were traced to the presence of HCN in the gas. By allowing a sufficient amount of NH_3 to remain in the gas entering the Fe_2O_3 purification boxes, HCN was efficiently removed as $(NH_4)_4Fe(CN)_6$. Costs of the process are discussed. R. B. C.

Blast-furnace slag for dry-box purification [of town's gas]. R. L. PRESBREY (Proc. Amer. Gas Assoc., 1936, 698; cf. B., 1934, 818).—A 1 : 1 Lux–slag mixture has proved satisfactory for purifying town's gas and its use is being extended in place of the usual wood shavings–Fe oxide mixture by the Boston Consolidated Gas Co. Costs when employing the two materials are compared. R. B. C.

Blast-furnace slag for dry-box purification [of town's gas]. E. L. SWEENEY (Proc. Amer. Gas Assoc., 1936, 696—698; cf. B., 1934, 818).—The experiences of two gas companies using a 1 : 1 Lux–slag mixture for gas purification are recorded. The material appears to be as efficient as the standard wood shavings–Fe ore mixture. R. B. C.

Purification of [town's] gas. M. THOMA (Monats.-Bull. Schweiz. Ver. Gas- u. Wasserfachmänn., 1936, **16**, 257—268).—Results obtained at Basle when employing the Benzorbon activated-charcoal process are discussed. 95—100% of C_6H_6 is removed from the gas. Costs are given. R. B. C.

Extraction of sulphur from coke-oven gas and obtaining it in elementary form by a method similar to the "Thylox" method. K. N. SCHEBALIN and E. M. MICHELSON (Trans. VI Mendeleev Congr., 1935, 1932, 2, No. 1, 353—354).—As_2O_3 and As_2O_5 were used as catalysts in the oxidation of gas-purification liquor. 0·8—2·0 kg. of As per ton of S was needed. CH. ABS. (*e*)

Abolute efficiency tester, a new apparatus for supervising and controlling [the combustible properties of town's] gas. G. ALLIATA (Monats.-Bull. Schweiz. Ver. Gas- u. Wasserfachmänn., 1937, **17**, 9—14).—The calorific val. of town's gas in conjunction with its burning properties determine burner performance. Of various methods proposed for assessing the properties of gas by a comprehensive formula, the Wobbe no. $H/\sqrt{d}$, where H is the nett calorific val. and d the density, is considered the most useful. A Sarco calorimeter has been adapted for recording the heat output of the Ott burner. The instrument is calibrated so that the results are recorded as a % of the heat output of the burner when using H_2. Data obtained for town's gas, producer gas, water-gas, and mixed gases are discussed. R. B. C.

Detection of gum in gas. G. BODMER (Monats.-Bull. Schweiz. Ver. Gas- u. Wasserfachmänn., 1936, **16**, 300).—10—100 c.c. of the gas are forced through a fine jet on to a glass surface whereon gum condenses. An apparatus suitable for such determinations is described. R. B. C.

Gas analysis. W. SCHULTES (Z. Ver. deut. Ing., 1937, **81**, 373—379).—The methods and apparatus available for analysing gases are comprehensively summarised. R. B. C.

Modern technique of benzol recovery. A. THAU (Oel u. Kohle, 1937, **13**, 568—583).—Processes for the continuous regeneration of wash oil, the direct manufacture of a rich crude benzol, the regeneration of acid residues, the continuous manufacture of motor benzol in column stills, combined benzol and gas-oil recovery, the elimination of CS_2 from crude benzol, the purification of benzol by means of a heated contact material, the recovery of benzol without the use of direct steam and by using activated charcoal in the Benzorbon process are described and illustrated with diagrams and photographs. H. C. R.

Testing and assessing benzol wash oils. E. KÖNIG (Glückauf, 1937, **73**, 325—330).—The present specifications for the oil are considered to be unsatisfactory. The absorptive capacity of an oil may be determined by measuring the partial pressure of C_6H_6 in a C_6H_6–wash oil mixture; this is the chief factor determining scrubbing efficiency. A method is described in which the partial pressure of small concns. of C_6H_6 in wash oil can be measured accurately and rapidly by means of a gas interferometer. The efficiencies of various wash oils are compared. Cresols and phenols in wash oil have a deleterious effect on benzol scrubbing. R. B. C.

Preparation of lubricants from coal and lignites. C. BERTHELOT (Chim. et Ind., 1936, **36**, 270—280).—The Fischer and Bergius processes are described. The former embodies non-catalytic polymerisation of hydrocarbons, catalytic polymerisation of olefines, dechlorination of chlorinated hydrocarbons and condensation of these with olefines, and condensation of chlorinated products with aromatic hydrocarbons. W. P. R.

Oil from coal process by Messrs. Catalysts, Ltd. ANON. (Coal Carbonisation, 1937, **3**, 86—

94).—An experimental plant at Dartford for the distillation of coal–oil mixtures according to the Gifford process (cf. B., 1936, 678) is described. A flow sheet of the process and yields of various products are given. The coke obtained is suitable for domestic purposes. R. B. C.

Preparation of non-toxic tar. Chem. Dept. South Metropolitan Gas Co. (J.S.C.I., 1937, **56**, 184—190T).—All ingredients of tar with the possible exception of pitch are to some extent sol. in H_2O and physiological tests show that, undiluted, these solutions are all toxic to fish. In the case of the tar acids and tar bases the toxicity increases with increase in b.p. The toxicity of the neutral substances is independent of the b.p. The variations in solubility are $\gg$ the variations in toxicity, and therefore the solubility of a tar ingredient is the main factor determining its harmfulness to fish. The tar acids are the most sol. constituents, followed by the tar bases. The neutral substances, including $C_{10}H_8$, are so slightly sol. as to be practically harmless. It is concluded that in the prep. of non-toxic tar it is necessary to eliminate as far as possible H_2O-sol. ingredients. It is suggested that in the case of horizontal-retort tar the best method is by the addition of oils of suitable boiling range, washed to remove tar acids and bases, to briquetting pitch. No one chemical test has been found that will enable the toxicity of a tar extract to be estimated, and the toxicity is best determined by a direct test on fish. Since the neutral substances make a small and substantially const. contribution to the toxicity of an extract, an indication of the toxicity can be obtained from the determination of the concn. of tar acids and bases.

Continuous distilling and fractionating plant for tars and oils. E. G. Gnignard (Oel u. Kohle, 1937, **13**, 584—590).—The author's plant, which has been erected in Brussels and for which high efficiency and low maintenance and labour costs are claimed, is described and illustrated. H. C. R.

Yields of oil and pitch from treatment of tar. E. Moehrle (Glückauf, 1937, **73**, 302—306).—On distilling coke-oven tar the yield of pitch increased and of oil decreased as the distillation pressure was raised (30—760 mm. Hg). Autoclaving the tar for 3—6 hr. at 120°, followed by distillation, had little effect on pitch yield. The yield increased only slightly when the tar was heated for the same time at 120—325°, but rapidly at $>325°$. Variation of the distillation time from 7 min. up to 6 hr. had no effect on the yield of pitch if the final temp. was $<280°$. Various solvent-extraction processes proposed for obtaining fuel and Diesel oils from the tar are summarised. R. B. C.

High-pressure hydrogenation of various tars. I. Comparison of low-temperature tar oil, phenolic oil, and creosote oil. S. Andô (J. Soc. Chem. Ind. Japan, 1937, **40**, 12—14B).—Low-temp. tar oil, b.p. 200° (free from pitch and paraffin wax), phenolic oil, and creosote oil, b.p. 200°, are hydrogenated at 440—500°/200—250 atm. for 1 or 2 hr. in presence of MoO_3. The tar oil is the most easily hydrogenated to form a gasoline fraction, the proportion of low-boiling hydrocarbons increasing with rise of reaction temp. Phenolic and creosote oils yield gasolines of almost identical composition, the proportion of aromatic hydrocarbons being $>$, and of paraffins $<$, in the case of the low-temp. tar oil products. With all three oils the proportion of aromatic hydrocarbons in the gasoline fraction increases with rise of reaction temp. J. D. R.

Determination of phenol in tars. E. Feil (Chem.-Ztg., 1937, **61**, 549—550).—An empirical method for the comparison of the phenol contents of tars is described, based on the colour given with Millon's reagent. E. A. H. R.

Production of gasoline and lubricating oils from wood tar and shale oil by hydrogenation. H. Bergström, K. N. Cederquist, and K. G. Trobeck (Iva, 1937, **1**, 15—29; J. Inst. Petrol. Tech., 1937, **23**, 159—160A).—Hydrogenation of wood tar in an autoclave [350°; about 200 atm.; $(NH_4)_2MoS_4$ (I)] yielded gasoline 12·3, lubricating oil 57·1, and heavy oil 10·6%. Pressure-hydrogenation of the tar in stages [350°, 375°, 425°, and 450°; catalyst (I); cooling, and removal of low-boiling fractions at each stage] yielded gasoline 54·4 and light oil (b.p. $>220°$) 25·5%. Pressure-hydrogenation of shale oil in presence of (I) yielded gasoline 24·6, and oils (b.p. $>220°$) 70%. When shale oil and H_2 were added continuously to the autoclave 83·6% of oil was obtained, 48% of which was gasoline and 49·6% oil (b.p. $>210°$). Hydrogenation at 350° of Rosin Beck yielded an oil only a small % of which was suitable as a lubricant. Hydrogenation in stages, as in the case of wood tar (above), of liquid rosin (fatty acids 53, resinous acids 40%) yielded 63% of oil (b.p. $<220°$). R. B. C.

Vapour-phase cracking of paraffin fraction of peat tar. K. K. Dubrovai (Sotz. Rekonstr., 1935, No. 2, 168).—The paraffin fraction of the peat tar is more easily cracked than are petroleum products. A single cracking yielded 30—33% of motor fuel (C_8H_{18} no. 87). Ch. Abs. (*e*)

Importance of the refraction for determination and characterisation of the constituents of natural and synthetic fuels. H. Winter and G. Free (Oel u. Kohle, 1937, **13**, 670—677).—The light oil fraction of a hydrogenated low-temp. tar was fractionally distilled and the 33 fractions so obtained were refractionated. The composition of the fractions was deduced from their *n* and *d*. It was concluded that the lower-boiling fractions consisted principally of open-chain saturated and unsaturated hydrocarbons; with rising b.p. the proportion of hydroaromatic and naphthenic compounds became appreciable, whilst the higher-boiling fractions approached the pure aromatic hydrocarbons in composition. A. B. M.

Hydrogenation of crude anthracene by the Bergius method. I. Production of concentrated carbazole. V. N. Chadshinov and V. Moiseenko (Koks i Chim., 1933, No. 12, 66—74).—A product containing anthracene (I) 43·0, carbazole (II) 40·7, H_2O 1·0, ash 2·0, phenanthrene and other substances 13·1% gave on hydrogenation 42·0% of solids and 54·0% of liquids (based on the original charge). Of the solids 83·0% was (II). The pressure

was 100—88 atm. No catalyst was used. Alschevski crude (I) when hydrogenated at 400—410° with 5% of a MoS_3 catalyst gave 94·6% of liquid products.
Ch. Abs. (*e*)

Indene-coumarone solvent oils. W. E. Sheehan, H. E. Kelly, and W. H. Carmody (Ind. Eng. Chem., 1937, **29**, 576—579).—The commercial production of indene-coumarone solvent oils from crude solvent naphtha by polymerisation with conc. H_2SO_4 is described. The mechanism of the polymerising reaction is discussed, and evidence given of the persistence of the *cyclo*pentadiene structure in indene polymerides. The physical properties (*d*, temp.–η characteristics, and temp.-v.p. curves) and chemical reactions of di-indene and dicoumarone are described. Suggested uses for the new solvents are outlined.
H. C. M.

Humic acids. G. Stadnikov (Kolloid-Z., 1937, **80**, 60—80).—The no. of CO_2H groups in humic acids and derivatives can be determined from the amount of Ca taken up on treatment with $Ca(OAc)_2$ and AcOH. The sum of CO_2H and OH is determined by reaction with $Ba(OH)_2$; OH is determined by difference.
E. S. H.

Separation of wood creosote into its constituents. V. P. Sumarokov and V. D. Ugriumov (Lesochim. Prom., 1935, **4**, No. 1, 5—8; No. 2, 3—6).—The wood creosote is dissolved in Et_2O and treated first with *N*-$NaHCO_3$ to remove acids and then with 10 portions of NaOH. The Et_2O retains phenols and neutral oils which do not react with NaOH.
Ch. Abs. (*e*)

Separation of furfuraldehyde from pyroligneous acid. K. Nogin (Maslob. Shir. Delo, 1934, No. 2, 41).—The acid fraction from the destructive distillation of hulls was neutralised with CaO and distilled. 0·78—0·90% (on the acid) of crude furfuraldehyde was obtained. Ch. Abs. (*e*)

Converting liquid distillates obtained in the dry distillation of wood by the Bruester–Badger method in the Asha wood-chemistry plant. I. V. P. Sumarokov (Lesochim. Prom., 1935, **4**, No. 6, 21—29; No. 7, 13—17).—The Bruester–Badger wood-alcohol rectifying apparatus is described.
Ch. Abs. (*e*)

Economics of the preparation of pyrocatechol and pyrogallol from wood tars and aromatic substances derived from lignin. D. I. Elkin and S. J. Valikov (Lesochim. Prom., 1935, **4**, No. 7, 9—12).—A discussion. Ch. Abs. (*e*)

Oxidation of the oil in two air- and air–gas-repressuring projects. T. W. Johnson and S. S. Taylor (U.S. Bur. Mines, 1937, Rept. Invest. 3325, 24 pp.).—The principal effect of the oxidising action of the air in air-repressuring on the crude oil was to reduce its interfacial tension at the oil–H_2O interface and so slightly to reduce its demulsibility. The reduction was from 35·5 to 27·5 dynes/cm.
H. C. R.

Physics of surface phenomena in petroleum technology. M. M. Kusakov, V. S. Kuznetzova, and N. A. Semenenko (J. Tech. Phys. U.S.S.R., 1934, **4**, 1877—1894).—Data are given for the adsorption of *iso*-C_5H_{11}·OH, and stearic and oleic acids at H_2O–oil interfaces. Surface-tension date are given for various crude and refined products. Their use in judging the nature and extent of refining is discussed. Ch. Abs. (*e*)

Growth of mineral oil science. L. Ubbelohde (Oel u. Kohle, 1937, **13**, 521—530).—A survey of the accelerated development of petroleum technology during the last few decades under the influence of co-operation between chemists, physicists, geologists, geophysicists, and engineers, aided by the national petroleum institutes and international conferences.
H. C. R.

Application of sand filters to oilfield brine-disposal systems. S. S. Taylor and I. F. Christianson (U.S. Bur. Mines, 1937, Rept. Invest. 3334, 28 pp.).—The best particle size for the sand and dimensions for the filter were carefully determined. Effluent regulation is necessary to maintain a const. rate and efficient filtration. Oil must be effectively prevented from reaching the filter. The best rate of filtration was 2·5 (U.S.) gals./min./sq. ft. of filter area, which removes an average of 95% of the insol. Fe from the brine. A backwash rate of 15 gals./min./sq. ft. continued for 10 min. was adequate for cleaning the sand. Filters can be used until a pressure of 10-ft. head of brine is built up across the filter. H_2S content and $[H^{\cdot}]$ of the brine are unaltered by filtration, but the chemical balance of the carbonates is affected. The proposed method of brine-conditioning involves adequate separation of the oil, settling some of the suspended matter, pressure-filtering and keeping the brine under pressure, and using corrosion-resisting pipe to carry the brine from the filter to the disposal stratum in order to prevent further formation of FeS.
H. C. R.

Analyses of crude oils from some fields of Michigan. E. L. Garton (U.S. Bur. Mines, 1937, Rept. Invest. 3346, 28 pp.).—Details are given of the analyses of 15 samples of crude oil drawn from 13 fields. The oils are predominantly paraffin intermediate-base, wax-bearing crudes. In general, they yield 25—35% of highly paraffinic gasoline, 25—35% of kerosene + gas oil, 12—15% of lubricating oil stock, and 20% of residuum with a C residue of 6—7%. Some correlation is found between certain properties of the oils and both the geographical location and geological structure of the oil-producing areas.
H. C. M.

Mol. wts. of viscous petroleum fractions. J. R. Keith and L. C. Roess (Ind. Eng. Chem., 1937, **29**, 460—464).—Mol. wts. of distillate fractions from two crude oils with relatively large differences between their η–temp. relations were determined by a cryoscopic method and related directly to the η of the fractions at 38°, a separate curve being obtained for each crude oil. The differences shown by these two curves was used as the basis for establishing the effect of the slope of the η–temp. curve on mol. wt. and subsequently for formulating a general correlation of mol. wt. with η at 38° and 99°, whereby mol. wt. can be predicted for η with a probable error of $\pm3\%$.
C. C.

Lubricating hydrocarbons in petroleum. III. Conversion of chlorinated hydrocarbons obtained

from vaseline oil into acetylated hydrocarbons. IV. Selective extraction of the acetates in acetylated vaseline. E. André and A. Maurel (Bull. Soc. chim., 1937, [v], 4, 1024—1033, 1033—1036).—III. An account of work already noted (B., 1937, 324).

IV. The acetylated oil is separated by extraction with different EtOH–EtOAc mixtures into three fractions with different Ac vals. J. L. D.

Trends in organic chemicals from petroleum and natural gas. B. T. Brooks (Chem. Met. Eng., 1937, 44, 18—21).—A review. H. C. R.

Use of anhydrous ammonia to inhibit gas hydrate formation [in natural gas]. J. T. Russell (Amer. Gas J., 1937, 146, No. 6, 22—26, 32).—The min. [NH_3] effective for inhibiting hydrate formation is 42 p.p.m. of gas (0·0042% by vol.). Brass and bronze fittings were not corroded. The costs of the process and its limitations are discussed. R. B. C.

Sodium phenolate used in the removal of hydrogen sulphide from refinery gas. Anon. (Chem. Met. Eng., 1937, 44, 33).—The second plant erected for this purpose in the United States is described. 95—99·8% of the H_2S is removed. It is recovered by steaming the spent liquor and converted into H_2SO_4, and the liquor is recycled. H. C. R.

Compression of methane by the cascade process. M. Rueman (J. Chem. Ind. Russ., 1937, 14, 420—423).—A cascade process, whereby C_2H_4 is liquefied by cooling with liquid NH_3, and CH_4 is liquefied by cooling with liquid C_2H_4, is described. R. T.

Thermal polymerisation of gaseous hydrocarbons. W. W. Gary (World Petroleum, 1935, 6, 622).—A discussion. Ch. Abs. (e)

Recovery of bitumen. L. J. Chalk (J.S.C.I., 1937, 56, 156—160T).—A method for the rapid and accurate recovery of bitumen is described. The results are satisfactory with the exception that the ductility of the recovered bitumen is usually high. This discrepancy appears to be due to the presence of a trace of solvent in the recovered bitumen. The tabulated characteristics of the bitumens extracted from a no. of rock asphalts indicate that wide variations in consistency may be expected even in samples derived from the same locality. Attention is drawn to the similarity in properties of the bitumens associated with Trinidad Lake and Boeton asphalts. Asphaltene colour val. determinations are recommended as an aid in the identification of rock asphalts, the estimation of Epuré in admixture with asphaltic bitumens, and in the examination of natural rock mastics.

Machine for testing ductility of bituminous substances. R. R. Thurston and C. E. Cummings (Ind. Eng. Chem. [Anal.], 1937, 9, 286).—Modified apparatus is described. (Cf. Amer. Soc. Test. Mat., Method D-113—35.) E. S. H.

Naphthenic acids from redistillation asphalt. W. Schaefer (Fette u. Seifen, 1937, 44, 146—147).—A modified Spitz–Hönig method for the determination of naphthenic acids in the asphalt, together with a rapid titrimetric method suitable for routine factory control, and laboratory methods for the recovery of the acids from redistillation asphalt (by leaching with hot H_2O) and their purification (by distillation and fractionation with solvents), are described. E. L.

[Petroleum] wax precipitation from propane solution. A. P. Anderson and S. K. Talley (Ind. Eng. Chem., 1937, 29, 432—439).—The conditions which affect the wax structures produced in C_3H_8-dewaxing of Mid-Continent residuum have been studied by means of the polarising microscope. Mixing is best carried out at a temp. above that of complete dissolution. The rate of chilling is unimportant but chilling by spontaneous evaporation of C_3H_8 produces a more filterable wax than does indirect refrigeration. A certain amount of agitation is helpful in circulating the nuclei and building up clusters. Violent churning is undesirable but the ratio of C_3H_8 to stock is not important provided it is not too low. The most easily filtered wax is made up of clusters which consist of small wax grains cemented together by naturally-occurring aromatic resins. C. C.

Solubility of refined paraffin waxes in petroleum fractions. A. Berne-Allen (Thesis, Columbia Univ., New York City, 1936, 83 pp.).—In order to obtain data of use in the refining of paraffin wax by recrystallisation a study was made of the solubility relations of the commercially refined wax in petroleum derivatives. The average b.p. of petroleum fractions and the m.p. of the wax were directly related to the mol. wt. of the solvents and solutes, respectively. The quant. relations between wax solubilities in the above fractions and the following variables, viz., wax m.p., average b.p. of solvent, and dissolution equilibrium temp., were investigated and an empirical equation was established to express the solubility of the wax in the fractions in terms of them. When compared with Schröder's theoretical solubility equation this equation was found acceptable within all practical limits. R. B. C.

Advantages and disadvantages of ethyl alcohol–petrol mixtures for motor engines. J. P. Pfeiffer (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 614—631).—Addition of 15% of EtOH causes 5% greater fuel consumption with no increase in power. The higher octane no. is of no practical advantage. Risks of engine stoppage through gas locks in summer and poor starting properties in winter are increased with EtOH addition. EtOH must be of high degree of purity. Engine lubrication is hampered and glands and gaskets are attacked by EtOH, and engine corrosion is greater. W. L. D.

Experiences [in Sweden] with petrol–alcohol mixtures as motor fuel. E. Hubendick (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 640—670).—A 3 : 1 mixture of petrol and 99% EtOH, denatured with crotonaldehyde, has given satisfaction during the last 10 years. Analyses of commercial samples (Lättbentyl) show 25±3% of EtOH. EtOH is manufactured from the waste

H_2O of wood pulp factories. Homogeneity of mixtures depends on the H_2O content being low, but petrols containing aromatic hydrocarbons, especially C_6H_6, can contain more H_2O than paraffin or naphthenic petrol. The effect of constitution of petrol, temp., and EtOH content on turbidity and separation into two layers is described. The mixture carburates satisfactorily and the effect of [EtOH] on power is discussed. The octane no. $\propto$ [EtOH] from 68 to 82 with 0 to 30% of EtOH; $>25\%$ of EtOH is not recommended. Deposited resins during storage in tanks can be cleaned out by rinsing with EtOH. W. L. D.

Theoretical aspects of the use of [sewage] sludge gas as a fuel for internal-combustion engines. S. L. Neppe (J. South African Inst. Eng., 1937, **35**, 160—172).—The theoretical factors involved in employing sludge gas (CH_4 70%, CO_2 30%, with traces of NH_3, H_2S, and N_2) obtained from the alkaline anaërobic fermentation of sewage are analysed and discussed in relation to trial runs of a commercial vehicle using the gas. The removal of CO_2 from the gas is conditioned by the extent to which the treatment costs are repaid by improved engine performance. R. B. C.

Flame travel in internal-combustion engines. S. S. Watts and B. J. Lloyd-Evans (Engineering, 1937, **143**, 713—714).—Although the flame temp. is too low for appreciable dissociation of combustion products (B., 1934, 564) there is evidence that the energy conversion is not completed in the flame front (B., 1931, 618, 829; A., 1934, 368, 1288). Flame speeds in a gas-engine cylinder under various working conditions, measured by a method depending on the conductivity of the burning gases, are greatest when the mixture is about 18% rich. A. R. Pe.

Carbon monoxide in engine exhaust, using alcohol blends. L. C. Lichty and C. W. Phelps (Ind. Eng. Chem., 1937, **29**, 495—502).—Engine tests with gasoline and 10 and 20% EtOH–gasoline blends show that the % CO in the exhaust gases depends on the air–fuel ratio and is practically the same for all three fuels at comparable air–fuel ratios. No appreciable differences are observed in the mixture-distribution characteristics of all three fuels, distribution being apparently more dependent on other factors such as speed, load, and method of introducing both the air and fuel for a given engine design. The reduction or elimination of CO from the exhaust can be effected by the use of leaner mixtures, but this condition results in a lowered performance that is not considered desirable.

H. C. M.

Control of combustion in the internal-combustion engine. W. Ostwald (Petroleum, 1937, **33**, No. 23, 1—13).—The thermodynamics of the engine and the manner in which combustion is influenced by (*a*) the method of introducing the charge, (*b*) the control of the chemical reaction, (*c*) vol. and surface factors in the combustion space, and (*d*) time–vol. relationships in the early part of the stroke are studied. Some unusual types of engine in which the movement of the piston is not controlled by attachment to a flywheel have been examined and indicator diagrams for them are given. H. C. R.

Combustion as a flow process. Marcard (Wärme, 1937, **60**, 257—266).—Combustion in a boiler furnace is treated as a flow process. The practical difficulties involved are overcome by using models and applying Reynolds' laws of similarity. Owing to lamination of the gas streams and their relatively slow mixing rate combustion in the furnace chamber may take as long as 1 sec. Furnace design is discussed in relation to the distribution of the combustion air and the subsequent mixing of the combustion gases. R. B. C.

Hydrocarbon reactions and knock in the internal-combustion engine. G. von Elbe and B. Lewis (Ind. Eng. Chem., 1937, **29**, 551—554).—A brief summary is given of the chain mechanism of the oxidation of hydrocarbons as applied to combustion in the internal-combustion engine. It is suggested that knock in the Otto-cycle engine is due to the spontaneous ignition of the unburnt charge ahead of the flame front. The tendency to knock can be reduced by any change in conditions that decreases the normal burning time of the charge or increases the ignition lag, and the various factors that determine the rate of flame travel and ignition lag are discussed. An early proposal that antiknock agents destroy peroxidic substances is considered plausible. C. C.

Vaporisation and knock. O. Herstad (Oel u. Kohle, 1937, **13**, 208—212).—Vaporisation (transformation) curves are given for low-boiling fuel oils up to 700°, and their characteristics are discussed. A simple linear relationship exists between the max. vaporisation time (τ) and the mol. parachor of fuels. There also appears to be a relationship between the C_8H_{18} no. and τ for mixtures of *C*-8 reference fuel and C_6H_6. H. C. R.

Motor fuel from oil cracking. Production by the catalytic water-gas reaction. G. Egloff, E. F. Nelson, and J. C. Morrell (Ind. Eng. Chem., 1937, **29**, 555—559).—Water-gas is converted into hydrocarbon oil (Kogasin) by treatment with catalyst (Fischer–Tropsch process). The product is topped and the naphtha reformed while the still bottoms are cracked. The olefinic gases obtained during cracking are catalytically polymerised, giving high-antiknock gasoline which is blended with the low-boiling products of the topping, reforming, and cracking operations. A good yield (84%) of gasoline of high antiknock val. is obtained. Details of yields and properties of the products at various stages are tabulated. Aviation gasoline may be obtained by blending low-boiling, straight-run gasoline with "polymer" gasoline.

C. C.

Fuel oils for small compression–ignition engines. A. T. Wilford (Auto. Eng., 1937, **27**, 241—242).—Recent developments relating to the formulation of specifications are summarised.

R. B. C.

Refining and recovery of light motor fuels by a low-temperature process. H. Naphtali (Refiner, 1937, **16**, 224—226).—The crystals obtained by freezing crude benzol are separated from the mother-liquor by centrifuging. The liquid resulting from the dissolution of the crystals in dil. aq. EtOH is passed countercurrent to incoming crude benzol, the temp. of which is thereby lowered to 7°, and further to −10° by means of heat interchange with mother-liquor. The C_6H_6 separated from the C_6H_6–EtOH mixture is purified by distillation. A process is described for recovering light spirit from natural gas or cracking gases which consists in condensing easily liquefiable hydrocarbons by progressive cooling. The condensate is stabilised by evaporating off the more volatile hydrocarbons (C_3H_8 and C_4H_{10}). R. B. C.

Petrol substitutes. C. GIORDANI (J. Usines Gaz, 1937, **61**, 170—175, 196—202, 229—233).—The present state of development of the coal hydrogenation and Fischer–Tropsch processes is comprehensively summarised. R. B. C.

Gum inhibitors [for motor fuel]. J. H. BYERS (Nat. Petrol. News, 1937, **29**, No. 11, 157—160; No. 15, 58—61).—American patents are summarised. R. B. C.

Motor oils. B. J. ROBERTSON (Univ. Minn. Eng. Exp. Sta., 1935, Bull. 10, 46 pp.).—A review of the properties of samples retailed in the St. Paul region. CH. ABS. (*e*)

High-grade fuels and lubricants for internal-combustion engines. C. BERTHELOT (Chim. et Ind., 1937, **37**, 1043—1055).—Specifications for various grades of petrol are discussed. Aviation spirit for use at high altitudes should have high octane no. and relatively close distillation range. Gum formation is also a greater hazard than in automobile use and this constitutes a difficulty for petrols prepared by the Fischer process or from shale oil. Lubrication requires an oil stable at 150°. Specifications for lubricants are discussed and the advantages of refining with solvents are pointed out. Satisfactory synthetic lubricants can be produced by hydrogenation or by $AlCl_3$ treatment of oils produced by the Fischer synthesis; chlorination of this material and condensation with an aromatic hydrocarbon gives "Paraflow," which depresses the setting point of paraffin lubricants. C. I.

Production of premier Diesel fuels. G. M. WOODS (Petrol. Eng., 1936, **8**, No. 2, 90—92; No. 3, 58—64).—The characteristics of petroleum high-speed Diesel fuels at present in use are discussed. Various possible methods of producing fuels of high Diesel index (I) and low pour point (P) are considered. Hydrogenation produces a high-grade fuel of low P from either straight-run or cracked oils. Cracking tests carried out with the paraffinic Diesel fuels showed that I and P were lowered simultaneously. The effects on P of adding 0·1—3% of Paraflow or wool fat to various Diesel fuels are tabulated; these substances were most effective on stocks of low initial P. The I of dewaxed oil was $<$ that of the stock; process losses were high, but dewaxed oil of a given I had a lower P than that of straight-run fuel of the same I. Extraction of cracked Diesel fuels with liquid SO_2 yielded oils of high I and low P. Straight-run fuels of low I did not respond as readily to solvent treatment as did cracked fuels. The costs of improving Diesel fuels by acid treatment were too high for commercial application of the process. Attempts to control the P by blending high- and low-grade, straight-run and cracked fuels were unsuccessful. R. B. C.

Stratford plant in the Rumanian petroleum industry. S. SAVENCU (Petroleum, 1937, **33**, No. 16, 1—5).—The Stratford continuous plant for the fractionation of crude oil, and the continuous countercurrent plant for treating kerosene or white spirit with H_2SO_4, are fully described, with diagrams. The mixing and separation of the liquids in the latter plant are effected by means of electrically driven centrifuges. These plants have recently been installed at the Dacio-Romano refinery at Ploesti. H. C. R.

Experimental cracking plant for mineral oils. L. UBBELOHDE [with F. SCHLOSSER] (Oel u. Kohle, 1937, **13**, 553—562).—A small-scale plant constructed for studying cracking reactions is described. There are three tubular heaters the temp. of which can be accurately and independently controlled as they are heated by a 3-phase current controlled by a regulating transformer enabling the current feed to be regulated independently to the three pipe sections although they are not electrically insulated from one another. Diagrams, illustrations, and a full description of the plant are given. H. C. R.

Fractional distillation of cracked and "polymer" gasolines. C. O. TONGBERG, J. E. NICKELS, S. LAWROSKI, and M. R. FENSKE (Ind. Eng. Chem., 1937, **29**, 571—574).—A cracked and a "polymer" gasoline were fractionated in a 39-ft., 100-plate column. The cracked gasoline gave fractions similar to those from a Bradford straight-run gasoline as regards the shape of the *n* curve, indicating that under the cracking conditions used the charging stock is broken down to hydrocarbons the division of which into mol. size approximates that in the straight-run gasoline. The "polymer" gasoline differs considerably, having no sharp breaks in the *n* curve, so that the same type of structure predominates and the aromatic, cyclic olefine, and diolefine contents are low. The C_8H_{18} no. of fractions of the "polymer" gasoline varied from 72 to 82 and of the cracked gasoline from 41 to 75. C. C.

"Stratcold" treating process [for refining gasoline]. J. A. ALTSHULER, F. G. GRAVES, and E. S. BROWN (Nat. Petrol. News, 1937, **29**, No. 12, 71—76; Refiner, 1937, **16**, 181—187).—A commercial unit employing the H_2SO_4 contacting process at low temp. for refining cracked gasoline is described. The distillate makes contact thrice, at the same or different temp., twice with used, and finally with fresh, 98% H_2SO_4 in cooled, high-dispersion, centrifugal contactors. The acid sludge formed is removed by centrifuging. As the treating temp. rises the losses increase due to refining and polymerisation and the C_8H_{18} rating of the refined spirit obtained decreases. R. B. C.

Fractionation of Michigan straight-run naphthas. S. LAWROSKI, C. O. TONGBERG, A. H. MAZZAROLA, and M. R. FENSKE (Ind. Eng. Chem., 1937, **29**, 674—676).—Two naphthas, boiling range 44—134° and 157—206°, respectively, were fractionated (reflux ratio 40) in a column having the equiv. of 70—75 theoretical plates. The lower-boiling naphtha gave two large fractions consisting mainly of n-C_6H_{14} (I) and n-C_7H_{16} (II), respectively. The (I) fraction comprised 12% of the charge, and had a mol. purity of 90—93%; the corresponding figures for the (II) fraction were 12·4% and 85%. The higher-boiling naphtha contained 12·4% of n-C_9H_{20} (III), mol. purity 83—87%, and 15% of n-$C_{10}H_{22}$ (IV) (80%). By refractionation in a 100-theoretical plate column, (II), (III), and (IV) of greatly increased mol. purity were obtained. H. C. M.

Selective refining of light distillate and recovery of by-products. S. E. Campbell (Refiner, 1935, **14**, 381—383).—The continuous refining of light California straight-run distillates is described. Towers 1 and 2 contain 15% Na_2CO_3 to remove acidic compounds (*e.g.*, naphthenic acids). In towers 2 and 3 phenols are removed by 10—20% NaOH, in 4 and 5 50% H_2SO_4 removes bases, and in 7 and 8 fuller's earth removes coloured compounds. Ch. Abs. (*e*)

Solvent extraction of lubricating oils from crude oils. H. Steinbrecher and H. Kuehne (Oel u. Kohle, 1937, **13**, 563—568).—In the solvent refining of crude oils by the authors' method (cf. B., 1937, 407) they must be pretreated in order to get a sharper separation of the various hydrocarbon groups without changing their original nature. After removing the fractions to 300°, the topped residue is further distilled, using superheated steam having a temp. corresponding with that of the distilling vapours. H. C. R.

Granular active earths [in petroleum refining]. A. Berczeller (Petroleum, 1937, **33**, No. 25, 1—3).—The use of such earths in the refining of vapour-phase cracked petroleum and such properties as their polymerising activity, the amount of petrol which can be refined per ton of earth, grain size, and ease of regeneration are discussed. A simple method of determining their polymerising activity by measuring the rise of temp. on mixing the earth with turpentine oil is described. Adsorbed H_2O slows down the reaction at 20—80°, but it is unaffected at 150—230°, to which the earth is exposed in the process. H. C. R.

Rapid volumetric determination of lead in [oil-refinery] doctor solution. R. M. Lilly (Refiner, 1935, **14**, 473—474).—Pb is pptd. with 2% aq. Na_2S, dissolved in HNO_3, and the solution made alkaline with aq. NH_3 and then acid with AcOH. The Pb is pptd. with 5% aq. $K_2Cr_2O_7$, filtered off, and the ppt. dissolved in dil. HCl. Excess of 0·1N-$FeSO_4,(NH_4)_2SO_4$ is added and the excess determined with 0·1N-$K_2Cr_2O_7$. Ch. Abs. (*e*)

Practical experience with mineral oils and their changes with use. H. Stäger (Petroleum, 1937, **33**, No. 7, 1—16).—If transformer oils are too highly refined, peroxides and volatile acids destructive to textiles, Pb, and Cd are formed during their oxidation, especially with paraffinic oils. Cu is better than Ag for oil switch contacts. Switch oils after prolonged test under conditions of use gave no products which damaged textiles, their breakdown being quite different from that of transformer oils. The separation of wax from oils used in high-tension cables and the damage caused to the impregnated paper windings are described and various theories as to its cause are discussed. Loss of dielectric strength of oils in service depends on the frequency of potential change, but oils which have not been over-refined give the longest life. The breakdown of oils under boundary lubrication conditions was studied with a loaded thrust bearing with a glass surface. Photographs are given of the oil film at various stages of breakdown. The importance of a good adsorptive surface for polar mols. in bearing metals is stressed and the texture of various metals is discussed and illustrated. The corrosion of bearing metals through oil films is connected with O_2 absorption by the spongy metal surface and has no relation to the acidity or sap. val. of the oil. Pure mineral oils give only a limited protection against rust, depending on the humidity of the atm. Troublesome deposits were formed on the heating surface of a boiler by the use of an oil otherwise up to specification, the ash of which contained small amounts of Na_2CrO_4 and $Fe_2(SO_4)_3$. H. C. R.

Oxidation in insulating oil. J. B. Whitehead and F. E. Mauritz (Elect. Eng., 1937, **56**, 465—473).—Changes in the chemical and electrical properties of an insulating oil during oxidation were investigated. The power factor of the oil was related to oil acidity and O_2 absorption. R. B. C.

Fundamentals of extreme-pressure lubricants. W. F. Pauk (Petroleum, 1937, **33**, No. 23; Motorenbetr., **10**, 2—5).—True extreme-pressure lubricants are distinct from mere compounded oils and their action rests on the formation of a film of a sulphide or Cl–S compound of the metal over its surface. Once this is formed no further corrosion of the metal surface should take place. The three types of extreme-pressure lubricant are: (1) compounded oils with a Cl–S compound in solution, (2) compounded oils with S in solution, and (3) mixtures of mineral oil and Pb soaps. Type (1) withstand the highest pressures, but may become corrosive in presence of H_2O, a danger that is absent with (2). (3) will withstand up to 15 times more pressure than ordinary lubricants, but there is danger of separation of PbS. Possible uses for such lubricants in industry are indicated. H. C. R.

Effects of pressure and temperature on the viscosity of lubricating oils. R. B. Dow (J. Appl. Physics, 1937, **8**, 367—372).—The η of samples of Pennsylvania, Oklahoma, and California lubricating oils were measured at 38—100°/1—4000 atm. The initial η were matched at 0·4 poise at 43° but at 43°/1825 atm. the increases in η for the three oils were 25-, 35-, and 100-fold, respectively. H. J. E.

Changes in lubricating oil with use. H. Suida (Oel u. Kohle, 1937, **13**, 201—206, 225—232).—In lubricating oils the *tert.* C are the most subject to oxidation while the oil is in use. Cu and Ag are stronger catalysts for oil oxidation than the white metals. The various ways in which oils can break down under oxidation are described. In absence of O_2 and metals condensation occurred below 120°. Breakdown of Pennsylvanian oil with formation of volatile unsaturated products took place below 120° in the presence of Cu or Ag, but not with Fe. The process of ageing of an oil is described with reference to the usual physical consts. The primary oxidation product (petroleum resins) was present (1—5%) in all market oils examined; solvent-refined oils showed the lowest content (1·4—1·9%). Analyses of samples of resins separated from typical oils and asphalt show considerable differences in properties; d is >1 and all oily properties have been lost. The action of metallic soaps formed from oxidation products of the oil on the separation of sludge is described. Graphs show changes in resin content, sap., ester, acid, and tar vals., benzine-insol., and hard asphalt in presence and absence of air. Increase of petroleum resins and sap. val. is the most marked in presence of air. The early separation of sludge caused by metallic soaps can be utilised, when oil filters are in use, for the automatic self-cleansing of the oil in circulation and for retention of high lubricating power (due to the presence of polar mols.). The ageing tendency of different oils can be followed only by determining all the decomp. products; a method by which this was effected for oils for use in a high-pressure blower (using an autoclave) is described. Oils of poor stability have a detrimental effect on the stability of stable oils with which they are mixed. The compounding of mineral oils with small amounts of fatty oils also very much decreases their stability to oxidation, and the incorporation of Pb soaps is preferred for heavy-duty lubricants. Highly refined oils of high H content are the most stable. Distillates are superior to residuals of the same η. H. C. R.

Resistance to flow of lubricating oils at low temperatures. S. Erk (Physikal. Z., 1937, **38**, 449—453).—Microscopical observations of the solidifying of lubricating oils at low temp. have been made. The pour point coincides with the beginning of crystallisation of paraffin. Mechanical liquefaction is due to distortion of the cryst. skeleton. In one oil examined two kinds of paraffin with different m.p. and crystal size were observed, which determined the resistance of the oil to flow. A. J. M.

Improvement of mineral lubricating oils. Roegiers (Petrol. Times, 1937, **37**, 814—815).—Addition of Elecktrion R, obtained by the action of silent electric discharge (voltolisation) on petroleum or vegetable oils, to lubricants improves the η index and lowers sludge formation and pour point. The beneficial effects of its addition to various oils are shown by means of curves. R. B. C.

Cutting lubricants. H. N. Bassett (Auto. Eng., 1937, **27**, 154).—The types employed in the machining of various metals are reviewed. R. B. C.

Railway lubricants. B. F. Hunter (Mech. Eng., 1937, **59**, 235—238).—The types of lubricants used on United States railways are described and various lubricating problems discussed. R. B. C.

Use of olive oil as motor lubricant. Péru (Ann. Off. nat. Comb. liq., 1936, **11**, 1071—1083).—A report is given of trials carried out in Tunis with a Peugeot vehicle to test the effect of mixing 20% of olive oil with petroleum lubricating oil. After a run of 6000 km. gum and signs of corrosion were found in the engine; the oil consumption was $\gg$ when using mineral oil alone and an objectionable odour was noticeable. In a trial with a Citroen vehicle using a 4 : 1 Mobiloil–olive oil mixture containing $<1\%$ of free fatty acids, considerable corrosion of the piston heads occurred after 2700 km. R. B. C.

Lubricating properties of lime-base greases. F. H. Rhodes and T. E. Wannamaker (Ind. Eng. Chem., 1937, **29**, 702—704).—The effect of the concn. of soap, H_2O, and free oleic acid (I) on the static coeff. of friction (μ) of greases prepared from a rather viscous paraffin-base oil and Ca oleate has been investigated. At relatively low temp. the lubricating power increased with increase in the H_2O content and, at some definite and high temp., there was an abrupt decrease in μ, this crit. temp. falling as the H_2O content in the soap increased. Addition of (I) improved the lubricating properties at low temp. but decreased them at high temp.; there was, however, no sharply pronounced decrease in μ as the temp. was raised. Addition of glycerol increased the lubricating power at all temp. $<90°$, but there was no marked decrease in μ between 30° and 60° such as was shown by the corresponding glycerol-free grease containing a high H_2O : soap ratio. H. C. M.

Determination of adulteration of lubricating oils by means of identifiers. S. Fischer (Petrol. Eng., 1937, **8**, No. 4, 128—130; No. 5, 70—76; No. 6, 101—106).—The procedure adopted by a firm manufacturing Pennsylvania-base lubricants to detect adulteration of their oils before the introduction of sealed cans is described. Phenolphthalein (I) dissolved in *cyclo*hexanol and mixed with the oil was found to be a satisfactory indicator. (I) was separated from equal vols. of a pure and a suspected oil and the colour intensities produced on addition of aq. Na_2CO_3 were compared. Finely-ground Oil Brown M was also successfully tried. A combination of both identifiers was almost undetectable. Ni oleate was the best indicator for detecting adulteration of used oils. R. B. C.

Analysis of lubricating oils by Waterman's method. E. N. Pilat (Petroleum, 1937, **33**, No. 7; Motorenbetr., No. 2, 2—4).—This method (cf. B., 1932, 536; 1935, 836, 934) was applied to several oils of various origins with satisfactory results. Assuming an accuracy of ±2·5% in the mol. wt. and 0·5° in the NH_2Ph point determination, any constituent can be determined to within 2%. H. C. R.

Four-ball top for testing boundary lubricating properties of oils under high mean pressures. G. D. Boerlage and H. Blok (Engineering, 1937, **144**, 1—2).—Three ½-in. steel balls in an oil-bath having an electric heater are in point contact with an upper ball fixed in a weighted arm which can be rotated. Friction is determined by the time required to stop the arm after it has been set in motion. C. I.

New system of Ostwald viscosimeters speeds laboratory routine. E. H. Zeitfuchs (Nat. Petrol. News, 1937, **29**, No. 7, 68—71).—The Ostwald viscosimeter has been redesigned with the aid of Poiseuille's equation, corr. for loss of head due to velocity in the capillary and capillary end effects, to cover the range of η 30—5000 sec. Saybolt Universal. The accuracy of the instrument described is claimed to be $\pm$0·2%. For rapid control work eight viscosimeters are assembled in a thermostat. R. B. C.

Calibrating Saybolt Universal viscosimeters. C. F. Bonilla (Nat. Petrol. News, 1937, 29, No. 14, 79—80).—By applying Poiseuille's law to the Saybolt instrument and ignoring kinetic corrections, a table is derived which gives the approx. % error in η produced by an increase of 1% in each significant dimension, *e.g.*, internal diameter of the efflux tube, total initial oil head, vol. of the receiving flask, etc. R. B. C.

Resistance of seamless drill pipe. Chemical policeman.—See I. **Hydrogenation of xylene and solvent naphtha. System benzine–EtOH. Separation of CH_4–C_2H_6–C_3H_8 mixtures. CS_2 synthesis. Refining naphthenic acids. Alkylbenzenes. Aminocymene as antiknock.**—See III. **Needles of coniferous trees.**—See V. **$Ca(OAc)_2$. CaC_2. By-products from making Al_2O_3. H_2. CO conversion.**—See VII. **Road composition. Paving composition. Preservatives.**—See IX. **Die-castings. Soldering pipe threads. Corrosion of Mg alloys by petrol. Oil-cracking chambers etc. Flotation.**—See X. **Conductivity of graphite.**—See XI. **Al stearate grease.**—See XII. **Bitumen plastics.**—See XIII. **Quality of chars. Collactivit.**—See XVII. **Germicidal properties of bases from transformer oil.**—See XXIII.

Patents.

Production of activated carbon. W. Fuchs (U.S.P. 2,040,931, 19.5.36. Appl., 27.11.33. Ger., 26.1.33).—Finely powdered raw brown coal, lignite, peat, wood, etc. is washed with half its wt. of conc. HCl and filtered by suction after dilution with H_2O if required. After washing to remove HCl it is dried and carbonised in thin layers, $\not>$20 mm., or in a revolving furnace at 800° in presence of superheated steam. Small quantities of P_2O_5 may be added to the coal just before carbonising if desired. The product is highly reactive. D. M. M.

Carbonisation of coal. Gas Light & Coke Co., and N. E. Siderfin (B.P. 467,909, 24.12.35).—In a low-temp. carbonising retort of the Salermo type, the retort is maintained for the whole or the greater part of its length at the max. coking temp. and the coal is fed into the travelling charge at intervals along its path at a rate which enables the temp. to be kept sufficiently high to avoid the formation of large plastic masses. Tar may be fed into the retort either alone or with the coal. D. M. M.

Hydrogenation of carbonaceous materials. T. W. Pfirrmann (U.S.P. 2,041,858, 26.5.36. Appl., 31.8.32. Ger., 8.9.31).—Carbonaceous materials are hydrogenated in an autoclave at 400—500°/100 atm., the H_2 required in the reaction being generated *in situ* by interaction of spongy Fe and H_2O in presence of chlorides of Mg, NH_4, Ni, etc. or such liquor as the residual liquor, containing $MgCl_2$, from the treatment of K minerals. D. M. M.

Destructive hydrogenation of carbonaceous materials. H. E. Potts. From Internat. Hydrogenation Patents Co., Ltd. (B.P. 467,853, 24.1.36. Cf. B.P. 443,937; B., 1936, 533).—The regulation of the temp. in the different parts of the reaction space where disturbances are likely is carried out by the introduction of cooling or heating fluids at the parts in question by means of insulated pipes. D. M. M.

Purification of gas obtained by distillation of coal and other carbonaceous material. Ingham's Thornhill Collieries, Ltd., and T. Taylor (B.P. 467,927, 1.2.36).—Gum etc. is deposited from purified gas by forcing the gas to flow through a no. of small-bore ($\frac{1}{8}$-in.) tubes or nozzles and then immediately to impinge on a solid plate having gas ways merely at top and bottom and placed close to the outlets of the tubes etc., the no. of such tubes or nozzles in use being adjusted by a movable solid diaphragm which can be automatically adjustible according to the pressure difference at opposite sides of the perforated plate. D. M. M.

Inhibition of crystallisation in coal-tar distillates. Armour & Co. (B.P. 467,757, 20.4.36. U.S., 21.8.35. Cf. B.P. 463,014; B., 1937, 413).—Crystallisation of $C_{10}H_8$ etc. in coal-tar distillate is inhibited by addition of 0·1—5·0% (0·5%) of a Friedel–Crafts reaction product from a coal-tar fraction of b.p. $>$200° and a fatty acid chloride of $\nless C_6$, *e.g.*, stearyl chloride. D. M. M.

Coking of pitch. D. T. Smith, Assr. to Barrett Co. (U.S.P. 2,042,639, 2.6.36. Appl., 28.2.33).—Successive charges of pitch are coked in a beehive oven, the temp. of the floor just prior to the introduction of the pitch charge being 316—427°; the coke is quenched when the temp. of the floor reaches 816—1093°, with just sufficient H_2O to reduce the floor temp. to 316—427°. D. M. M.

Manufacture of highly unsaturated or aromatic distillates from heavier oils. R. T. Haslam, Assr. to Standard–I.G. Co. (U.S.P. 2,042,306, 26.5.36. Appl., 31.5.30).—Heavier refractory distillates are mixed with H_2, heated to $>$500°/$>$50 atm. (150—300 atm.), and passed over a compound of a negative element with a heavy metal, both from group VI. The partial pressure of the H_2 is 3—5 times that of the oil and the oil passes through the reaction zone at a rate $>$1 vol. of oil per vol. of reaction space per hr. D. M. M.

Solvent fractionation of motor fuel stock. O. F. Simons, Assr. to Standard Oil Co. (U.S.P. 2,043,288, 9.6.36. Appl., 5.6.33).—The stock is solvent-fractionated by means of an alcohol, *e.g.*, MeOH, and liquid SO_2, with or without addition of an aromatic compound, *e.g.*, C_6H_6. D. M. M.

Treatment of hydrocarbon oil. W. W. Gary (U.S.P. 2,041,754, 26.5.36. Appl., 8.1.34).—Sludge oil separating on diluting with H_2O the acid sludge from treatment of hydrocarbon oil with H_2SO_4 is dried, after neutralisation if desired, by keeping in storage and the required quantity is then added to the H_2SO_4 prior to another acid wash. Lower losses and

superior gum removal are claimed. A small "clean-up" wash of H_2SO_4 only may be used subsequently.
D. M. M.

Conversion of acid sludge into sulphur dioxide, hydrocarbons, and coke. W. H. Bahlke, Assr. to Standard Oil Co. (U.S.P. 2,043,646, 9.6.36. Appl., 30.6.32).—The sludge is heated to 205—275° (232°) with flue gases from a pipe still, thereby driving off most of the S as SO_2; the semi-coke is passed by a worm conveyor to a coking apparatus, where it is coked at 425—540° by direct contact with the oil vapours from the pipe still, the hydrocarbons driven off being recovered separately. D. M. M.

Treatment of (A) hydrocarbon oils, (B) hydrocarbons. V. Ipatieff, Assr. to Universal Oil Products Co. (U.S.P. 2,039,798—9, 5.5.36. Appl., [A] 11.2.33, [B] 4.12.33).—(A) Hydrocarbon oils (motor fuels) in which alkylation of aromatic constituents by olefinic gases has been induced by H_2SO_4 are freed from S by treating with 1 vol.-% of H_3PO_4 or graded H_2SO_4-H_3PO_4 mixtures at 50°. (B) Oils obtained by polymerising olefines with H_2SO_4 are freed from S, as in (A), H_3PO_4 being regenerated from the acid sludge by hydrolysis.
A. H. C.

Treatment of hydrocarbon oil. W. M. Malisoff, Assr. to Atlantic Refining Co. (U.S.P. 2,043,254, 9.6.36. Appl., 7.4.32).—Hydrocarbon oil is treated with an alkali dissolved in an alcohol or ketone, *e.g.*, NaOH in MeOH, containing $<15\%$ of H_2O, separated therefrom, and then treated with a sludge-forming agent, *e.g.*, H_2SO_4. D. M. M.

(A, B) Purifying, (B) treating, (C) refining, and (D—F) sweetening, hydrocarbon oils. C. O. Hoover, Assr. to Bennett-Clark Co., Inc. (U.S.P. 2,042,050—055, 26.5.36. Appl., [A] 10.8.35, [B] 9.9.32, [C] 25.5.31, [D] 26.3.32, [E] 11.11.30, [F] 24.2.32. Renewed [B] 10.2.36, [C] 4.6.35. Can., [A] 4.5.35).—(A, B) S compounds, especially mercaptans, are removed from the oil by bringing it in contact with a finely-divided adsorbent, *e.g.*, clay, a metal salt, *e.g.*, a chloride of Cu, and an oxidising agent, *e.g.*, $KMnO_4$, O_2 or a gas containing O_2. (C) Hg^I, Co^{II}, and Cd chlorides are added to the reagents as in (A) and (B). (D) The oil, either as liquid or vapour, is treated first with the metal compound as in (A) and (B) and then with an adsorbent material and the adsorbent material treated with O_2 or other oxidising agent. (E) The oil is filtered through a cake of adsorbent material, *e.g.*, clay, a metallic compound ($CuCl_2$), and a strongly oxidising Mn compound ($KMnO_4$). (F) Mercaptans are removed from oil by treating it with "doctor" solution (Na_2PbO_2), decanting, and treating it with an adsorbent material, *e.g.*, fuller's earth, in presence of added O_2. D. M. M.

Purification and desulphurisation of low-boiling distillates. G. H. B. Davis, Assr. to Standard-I.G. Co. (U.S.P. 2,042,298, 26.5.36. Appl., 31.8.29).—Oil fractions of boiling range below that of kerosene are purified by passing rapidly through a reaction zone in contact with a gas rich in H_2 at 420—465°/$>$20 atm. (preferably $>$100 atm.) in presence of an oxide or sulphide of group VI, with or without an alkali or alkaline-earth oxide.
D. M. M.

Sweetening of sour petroleum oil and revivification of the sweetening agent. O. Codier, Assr. to Bennett-Clark Co., Inc. (U.S.P. 2,042,056, 26.5.36. Appl., 27.2.32).—Oil is treated with "doctor" solution, decanted off, and treated with finely-divided adsorbent material (clays, active C), which is removed by settling or filtering and treated with NaOH solution in presence of O_2, air, or an oxidising agent; the solution, after removing adsorbent, is used as fresh "doctor" solution.
D. M. M.

Treatment of hydrocarbon oils. W. M. Stratford, Assr. to Texas Co. (U.S.P. 2,043,016, 2.6.36. Appl., 23.10.25).—Cracked hydrocarbon vapours are passed over a polymerising catalyst which is maintained in a state of activity by continuous washing, countercurrent to the vapours, with a solvent for the polymerides produced. The catalyst chamber may be placed between the rectifying column and the reflux condenser of a fractionating still and the reflux used as the washing medium on its way back to the column. D. M. M.

Treatment of petroleum oils. E. B. Hjerpe and W. A. Gruse, Assrs. to Gulf Research & Development Corp. (U.S.P. 2,042,995, 2.6.36. Appl., 2.11.34).—The use as solvent, at −18° to 0°, of 60—80% of $(CH_2Cl)_2$ mixed with 40—20% of MeOH is claimed. D. M. M.

Dewaxing of oils. (A) B. G. Aldridge and B. Hopper, (B) H. F. Fisher and B. G. Aldridge, Assrs. to Union Oil Co. of California (U.S.P. 2,042,758 and 2,042,887, 2.6.36. Appl., [A] 18.9.33, [B] 9.10.33).—(A) Chilled oil is passed continuously through an electric field wherein wax is continuously deposited on one electrode or set of electrodes, while the oil is continuously removed through the other. The wax is continuously scraped off the wax-bearing electrodes. (B) The wax is deposited on one electrode terminating in an edge or point, and is continuously removed from this electrode by the electric windage established between the electrodes; oil is continuously withdrawn countercurrent to the electric windage, wax accumulating in the bottom of the apparatus and being withdrawn periodically. D. M. M.

Mineral oil composition. R. C. Moran, Assr. to Socony-Vacuum Oil Co., Inc. (U.S.P. 2,043,836, 9.6.36. Appl., 29.11.33).—Pour points of oils containing waxy materials are depressed by adding 0·5 wt.-% of the oily material which is the principal product of the interaction of oleic acid, an alkyl dichloride $[(CH_2Cl)_2]$, and an unsubstituted aromatic hydrocarbon ($C_{10}H_8$) in presence of $AlCl_3$.
D. M. M.

Refining of mineral oil. M. H. Tuttle, Assr. to M. B. Miller & Co., Inc. (U.S.P. 2,041,308, 19.5.36. Appl., 31.1.34. Cf. B.P. 445,942; B., 1936, 730).—The residual oil from the distillation of mineral oil is extracted with paraffinic and naphthenic solvents which are miscible only to a limited extent, preferably by introducing the residual oil into the middle of the apparatus while the two solvents flow countercurrent to each other. Part or all of the naphthenic layer is added to the distillate, which is separated into paraffinic and naphthenic fractions by means of a paraffinic solvent, and sometimes additional naphthenic solvent. D. M. M.

Refining of hydrocarbon oils. Le R. G. Story, Assr. to Texas Co. (U.S.P. 2,043,936, 9.6.36. Appl., 15.10.32).—Oil is refined with H_2SO_4 at $\not>$93°/20—200 atm.; the treatment may be carried out in countercurrent continuous flow with a temp. gradient. D. M. M.

Refining of hydrocarbon oils. A. Lachman, Assr. to Vapor Treating Processes, Inc. (U.S.P. 2,042,718, 2.6.36. Appl., 27.6.30. Renewed 6.2.36).—Vapours of cracked petroleum spirit are mixed with 0·5—1·5 vol.-% of air and scrubbed with an aq. solution of, *e.g.*, a Zn salt (other than ZnI_2), preferably in a packed tower at 150—368°. D. M. M.

Refining of hydrocarbons. W. J. Sparks, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,042,557, 2.6.36. Appl., 26.5.33).—Oils are treated simultaneously, at 100—250°, with an alkali metal (Na) and O_2 or gas containing O_2, the flow of gas being regulated so that 1·0—5·0 wt.-% of O_2 on the oil is absorbed. The unchanged Na is removed by filtration. D. M. M.

Refining of hydrocarbons. N. D. Scott, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,169, 21.7.36. Appl., 19.5.34).—Liquid hydrocarbons are treated (2—60 hr.) with an additive compound of an alkali metal and a polycyclic aromatic hydrocarbon in an ether. Conjugated unsaturated compounds are removed at 20—30° and S compounds at 100—200°. The use of the additive compounds of Na (1 lb. per 10—50 gals. of hydrocarbon to be refined) with $C_{10}H_8$, anthracene, or Ph_2, in Me_2O, MeOEt, polyethers, and cyclic ethers, is claimed. The process is described in its application to gasoline. A. H. C.

Removal of corrosive substances from hydrocarbons. W. Miller, Assr. to Continental Oil Co. (U.S.P. 2,041,364, 19.5.36. Appl., 7.5.34).—Corrosive substances, particularly corrosive mercaptans, are removed from cracked hydrocarbons by countercurrent washing with a lean absorbing oil. The oil is then distilled to free it from absorbed materials and re-cycled, and the materials driven off are fractionated, H_2S and lighter hydrocarbons passing off in the gaseous state; the liquid heavier S compounds and heavy hydrocarbons are caustic-washed to remove the S compounds. A rich hydrocarbon gas and a light hydrocarbon liquid result. D. M. M.

Manufacture of motor fuel. E. W. Isom, Assr. to Sinclair Refining Co. (U.S.P. 2,046,749, 7.7.36. Appl., 1.5.30).—Hot oil products, from a severe vapour-phase cracking operation, together with an additional gas mixture containing $\not<$ 20% (>30%) of free H_2 and preheated to 650°, are passed upwards through an accumulating body of coke into an overlying body of oil and pitch undergoing conversion into coke at >650°. 9 examples are cited, and apparatus is described. H. C. M.

Oil gasification process. A. Johnson, Assr. to Combustion Utilities Corp. (U.S.P. 2,042,997—9, 2.6.36. Appl., [A] 5.9.31, [B] 16.1.32, [C] 24.8.32. Can., [C] 16.8.32).—(A) Hydrocarbons are cracked by passing through a deep bed of refractory material where the C set free is filtered out; by successively blasting air vertically in both directions through the bed between make periods, the C is burned and heats the bed again to gas-making temp. (B) The air blast is preheated by the combustion of the blast gases in the carburetter. (C) Additional heat is produced in the top of the carburetter by burning a small quantity of liquid hydrocarbon (0·1—0·8 gal. per 1000 cu. ft. of combustible gas) during the blast cycle. D. M. M.

Emulsion oil composition. A. W. Burwell and A. Kempe, Assrs. to Alox Corp. (U.S.P. 2,043,922, 9.6.36. Appl., 14.5.31).—Petroleum hydrocarbon mixtures are subjected to controlled oxidation in the liquid phase with O_2 or O_2-enriched air in presence of a catalyst at 100°/$\not>$320 lb. per sq. in.; the product is treated with aq. NaOH and the resulting soap solution extracted with EtOH. The residue after distilling off the EtOH is the emulsifying agent. D. M. M.

Manufacture of asphaltic or bituminous emulsions. O. Ovregard (B.P. 467,719, 16.10.36. Nor., 29.10.35).—Emulsions of this type with a slight acid reaction are prepared by first producing a basic emulsion by means of NaOH or Na_3PO_4 and then adding enough citric acid (I) or extracts of woods to bring the p_H to 6, the (I) being added in two stages, of which the first is pretreated with NaOH. Small quantities of high-mol. products, *e.g.*, algin and/or casein, may be added to the basic emulsion before acidifying, if required. D. M. M.

Recovery and purification of lubricating oils from mineral oils. F. X. Govers, Assr. to Indian Refining Co. (U.S.P. 2,041,677, 19.5.36. Appl., 28.2.34. Cf. U.S.P. 1,920,125; B., 1934, 392).—Lubricating oils are distilled off from crude oils under diminished pressure, *e.g.*, 5 mm., by indirect heating at 105—327° with cut at 205°. The 205—327° fraction is extracted with a mixture of an aliphatic ketone, *e.g.*, $COMe_2$, and an aromatic solvent, *e.g.*, benzol, the wax is separated out at –18°, and the dewaxed oil extracted with a new portion of solvent in which the ketone predominates, to produce a low pour-test oil of high η index. D. M. M.

Lubricants. G. Kaufman, Assr. to Texas Co. (U.S.P. 2,043,961—2, 9.6.36. Appl., [A] 11.3.33, [B] 21.3.34).—(A) Improved cutting oil and pressure lubricants may be obtained by mixing with the mineral oil a S base prepared by heating pine oil, a terpene, terpineol, etc. with 5—25% of S at 149—260°/50—500 lb. per sq. in. (B) The above S base is distilled under reduced pressure until 20—25% of the charge remains, and this residue is mixed with the mineral oil. D. M. M.

Lubricant composition. A. W. Burwell, Assr. to Alox Corp. (U.S.P. 2,043,923, 9.6.36. Appl., 15.1.34).—The lubricating qualities of the oil are improved by the addition of, *e.g.*, 0·3% of a mixture of oxidation products derived from at least two different hydrocarbon materials of the type of scale wax, amorphous wax, and normally liquid petroleum hydrocarbons. D. M. M.

(A) Production of lubricating oil. (B) Solvent extraction of oil. D. R. Merrill, Assr. to Union Oil Co. of California (U.S.P. 2,043,388—9, 9.6.36. Appl., [A] 6.11.33, [B] 26.8.33).—(A) Paraffinic and non-paraffinic hydrocarbons are separated by solvent extraction in several stages preferably set vertically above each other. The extractions are arranged so as to mingle the extract phases with raffinate phases of low paraffin content, thereby increasing the yield of paraffinic constituents. (B) Hydrocarbon oil is solvent-extracted with SO_2, furfuraldehyde, $(CH_2Cl \cdot CH_2)_2O$, $PhNO_2$, or NH_2Ph in a series of stages at progressively higher temp., the temp. at each stage being approx. 11° < miscibility temp. D. M. M.

Penetrating oil. B. H. Lincoln and A. Henriksen, Assrs. to Continental Oil Co. (U.S.P. 2,041,076, 19.5.36. Appl., 25.7.32).—An oil of high penetration is prepared by mixing a low-boiling petroleum oil, *e.g.*, kerosene, a small amount of fatty acid, preferably halogenated, and a solvent, with or without a proportion of low-η lubricating oil. An example is kerosene 60—75, lubricating oil 22—37, chlorinated Et oleate 0·5—3·0, and amyl acetate 0·1—2·0%. D. M. M.

Testing lubricants. L. Cammen (U.S.P. 2,041,525, 19.5.36. Appl., 20.4.32).—The lubricant is applied to the periphery of a member rotating rapidly at controllable speed, which is increased until either the lubricant is entirely thrown off or the layer of lubricant reaches a desired thickness; the speed at which this occurs is a measure of the adhesive quality of the lubricant. D. M. M.

Treatment of hydrocarbon oil. P. C. Keith, Assr. to Gasoline Products Co. (U.S.P. 2,046,385, 7.7.36. Appl., 10.2.34).

Extraction of liquid mixtures. Analysing gases.—See I. ***tert.*-Alcohols. Antioxidants.**—See III. **Bitumenised felts.**—See VI. **H_2SO_4. Regenerating alkaline wash-liquors. ZnS. CO_2.**—See VII. **Gases for bright annealing.**—See X. **Prepared resin.**—See XIII.

III.—ORGANIC INTERMEDIATES.

Separation of methane–ethane–propane mixture. V. Fischer (Z. Ges. Kälte-Ind., 1936, 43, 146—152).—Separation of a CH_4–C_2H_6–C_3H_8 mixture obtained from natural gas by repeated fractionation was carried out in a special rectifying column. The effects of different conditions, *e.g.*, temp. and pressure in the cooler, on the operation of the plant were investigated. R. B. C.

Reactivity of carbonaceous materials in the synthesis of carbon disulphide. L. J. Markovski (J. Appl. Chem. Russ., 1937, **10**, 624—629).—The yields of CS_2 obtained by passing S vapour over different types of C at 900° vary in the order fir < pine < beech < oak < birch < peat C; graphite < pitch- < electrode- < metallurgical coke < anthracite < peat coke. No connexion between flash point and reactivity was established. R. T.

Application of calcium chloride solutions in the rectification of methyl alcohol. P. V. Izmestiev (Lesochim. Prom., 1935, 4, No. 5, 16).—An improved separation of $COMe_2$ from MeOH was obtained by flushing the rectification tower with aq. $CaCl_2$. Ch. Abs. (*e*)

Composition of mixtures containing ethyl alcohol. R. Fritzweiler (Z. Ver. deut. Ing., 1937, **81**, 407—408).—Physical and chemical methods employed for determining the composition of EtOH–H_2O and EtOH–MeOH–Et_2O mixtures etc. are reviewed. R. B. C.

System benzine–ethyl alcohol. E. Keller (Farben-Chem., 1937, 8, 225—228).—Mutual solubilities of 96% EtOH and petroleum distillate (benzine) of varying b.p. range and aromatic contents were determined. The EtOH was coloured with Victoria-blue, which is insol. in the benzine. Results are much modified by aromatic content. Tests with benzine containing coumarone resin and asphalt in solution showed that these could be pptd. by dissolution of the benzine in the EtOH layer. C. I.

Hydration of propylene by means of aqueous sulphuric acid. V. S. Gutiria and V. L. Bujnitzkaja (J. Appl. Chem. Russ., 1937, **10**, 882—887).—62·6% conversion of propylene (I) into PrOH is achieved by passing (I) into 82% H_2SO_4 at 65°, with periodic distillation of the PrOH formed. A continuous process, based on introduction of (I)–steam mixtures into aq. H_2SO_4 at 115°, is not recommended, owing to corrosion of the reactor by high $[H_2SO_4]$ at this temp. R. T.

Volumetric determination of ethylene oxide. W. Deckert (Z. anal. Chem., 1937, **109**, 166—168).—The nature of the reaction involved (cf. B., 1931, 180; 1936, 77) is discussed. J. S. A.

Destructive catalytic hydrogenation of xylene and solvent naphtha. N. I. Schujkin (J. Appl. Chem. Russ., 1937, **10**, 652—659).—Xylene yields PhMe, C_6H_6, and CH_4 when passed in a stream of H_2 over Ni–Al_2O_3 at 300—400°. Solvent naphtha is also demethylated under similar conditions. R. T.

Synthesis of aminocymene, and its use as an antiknock for motor fuel. N. V. Erschov and E. N. Fedotova (J. Appl. Chem. Russ., 1937, **10**, 869—872).—Aminocymene (I) is prepared from *p*-cymene (II) by nitration at 0°, followed by reduction of the product (Sn–HCl). Crude (II) is best purified by treatment with Na, followed by autoclaving with S at 250°. The antiknock action of (I) is $\not>$ that of NH_2Ph and $\ll$ that of $PbEt_4$. R. T.

Preparation of alkylbenzenes from benzene and olefinic hydrocarbons of cracking benzine in presence of anhydrous ferric chloride. K. S. Kurindin, V. I. Voevodova, and T. A. Rasskazova (J. Appl. Chem. Russ., 1937, **10**, 877—881).—C_6H_6 and cracking benzine containing 38% of ethylenic hydrocarbons yield up to 68% of monoalkylbenzenes in presence of anhyd. $FeCl_3$ at 35—40°; the paraffinic and naphthenic hydrocarbons present take no part in the reaction. R. T.

Rapid analysis of crude and purified anthracene. I. J. Postovski and V. I. Chmelevski (J. Appl. Chem. Russ., 1937, **10**, 759—764).—1 g. of product is boiled for 25 min. under reflux with 0·5—1·2 g. of maleic anhydride (I) and 5 ml. of xylene, 80 ml. of H_2O are added, and the solution is steam-distilled. The residue is titrated with $0{\cdot}5N$-KOH (phenolphthalein), when the anthracene content is given by $181{\cdot}7(A - 0{\cdot}43664C)$, where A is the wt. of (I) taken, and C the no. of ml. of $0{\cdot}5N$-KOH used. R. T.

New reaction for *p*-aminophenol derivatives and a new sensitive reaction for dulcin in presence of saccharin. H. J. Vlezenbeek (Pharm. Weekblad, 1937, **74**, 127—134).—p-$NH_2{\cdot}C_6H_4{\cdot}OH$ and its derivatives (citrophen, metol, salophen, methacetin, phenacetin, phenocoll hydrochloride, dulcin, lactophenine, kryofine " Ciba," glycine, holocaine " Beyer," nirvanine, acoine " Heyden," p-$NHAc{\cdot}C_6H_4{\cdot}O{\cdot}C_3H_5$) give an intense violet coloration when warmed with H_2SO_4 for 1·5—2 min. to 180° and the solution diluted with H_2O, neutralised with NaOH, and treated with I solution or $CuSO_4$. o- and m-$NH_2{\cdot}C_6H_4{\cdot}OH$ derivatives do not give the test, which will detect 1% of dulcin in saccharin. S. C.

Countercurrent extraction of benzoic acid between toluene and water. Performance of spray and packed columns. F. J. Appel and J. C. Elgin (Ind. Eng. Chem., 1937, **29**, 451—459).—The results obtained for the countercurrent extraction of BzOH between H_2O and PhMe are shown graphically and the equiv. height of a theoretical plate, the height of one transfer unit, and the extraction coeff. based on H_2O are calc. The capacity of a spray column depends on the rates of feed, the flow ratio, and the size of drops produced by the entrance nozzle, and of a packed column largely on the rate of feed of the discontinuous phases. D. K. M.

Refining naphthenic acids. A. Rabinovitsch and T. Osenova (Maslob. Shir. Delo, 1934, **10**, No. 12, 41—43).—A 50% solution of the acids in gasoline is treated successively with 4·3 and 3·0% of conc. H_2SO_4 at room temp., the acid tar being removed after each treatment. The residue is treated with 5—10% of an adsorption agent (gumbrine) at 50—60°, filtered, and washed with 5% neutral aq. $ZnCl_2$ or $CaCl_2$ to eliminate traces of H_2SO_4. Ch. Abs. (*e*)

Determination of camphor in alcoholic solution. S. I. Spiridonova (J. Appl. Chem. Russ., 1937, **10**, 765—770).—A turbidimetric method is described. R. T.

Stabilisation of the colour of furfuraldehyde. N. Tschetverikov and M. Lifschitz (Maslob. Shir. Delo, 1934, No. 6, 39—40).—Addition of 0·001—0·0002% of pyrogallol or of saturated aq. NaCl or Na_2CO_3 stabilises the colour for 6—12 months. Ch. Abs. (*e*)

[Products from] wood creosote. Pyrocatechol etc. from wood tar. Indene–coumarone solvent oils. Naphthenic acids. Furfuraldehyde. Conc. carbazole. Fractionation products of naphtha.—See II. **Naphthalic acid.**—See IV. **Gluconic acid.**—See XVIII. **Identifying war gases.**—See XXII.

Patents.

Treatment of [organic] gaseous media. G. C. Forrester (U.S.P. 2,049,608, 4.8.36. Appl., 27.4.34).—Volatile org. compounds are absorbed, after removing suspended solids and H_2O, by a metallic (Mg) perchlorate. $Mg(ClO_4)_2$ containing 0—50 % of H_2O is regenerated by removing org. vapours in vac. and/or by removing carbonaceous material by dissolving in H_2O, filtering, and dehydrating. A. H. C.

Dehydration of organic compounds. S. C. Carney, Assr. to Shell Development Co. (U.S.P. 2,048,178, 21.7.36. Appl., 21.11.30. Renewed 11.1.35).—Aq. org. solutions (alcohols) are dehydrated by treating at >1 atm. with an extractant miscible with the alcohol but not with H_2O, of b.p. $<$ that of the alcohol, and not forming azeotropic mixtures with it at 1 atm. (*e.g.*, a hydrocarbon $\not> C_5$), so that the H_2O : alcohol ratio in the extract is reduced to $<$ the ratio in the H_2O–alcohol azeotrope. The extract is then rectified in presence of the hydrocarbon solvent. Esters, aldehydes, ketones, etc. may be similarly treated. Continuous apparatus is described. A. H. C.

Method of accelerating [organic] chemical reactions. E. F. Spellmeyer (U.S.P. 2,047,839, 14.7.36. Appl., 27.2.32).—It is claimed that hydration and dehydration are greatly accelerated by the passage of an a.c. through the solution. Sucrose can be hydrolysed in the absence of acid, starch can be quantitatively hydrolysed in the presence of H_2SO_4 in 30 min., and Et oleate (97·42%) can be prepared in 1·5 hr. in the presence of H_2SO_4. R. F. P.

Catalytic dehydrogenation of aliphatic hydrocarbons. N. V. de Bataafsche Petroleum Maats., Assees. of O. Beeck, H. P. A. Groll, and J. Burgin (B.P. 467,470, 4.12.36. U.S., 9.12.35).—Straight- or branched-chain aliphatic or *cyclo*aliphatic saturated hydrocarbons of $\not< C_2$ are converted into corresponding unsaturated hydrocarbons by contact (in the vapour phase) at, *e.g.*, 500—800° with dehydrogenation catalysts, *e.g.*, Ni, Co, Pt, V, Cr, Mo, Mg, Zn, oxides, sulphides, chromates, etc. of these, C, SiO_2 gel, and Al_2O_3 (activated by pretreatment with H_2O and/or a hydride of S, Se, Te, at, *e.g.*, 600°), while maintaining the activity of the catalyst at a practical optimum val. by adding a controlled amount of H_2O ($\not> 3\%$), and/or H_2S ($\not> 15\%$), H_2Se, H_2Te. Examples illustrate the dehydrogenation of *iso*butane to *iso*butene by passing the vapours over Al_2O_3, activated C, ZnO, SiO_2 gel, and Cr oxide, or Ni, or these catalysts pretreated with H_2S, together with up to 3 vol.-% of steam at about 500—600°. The conversion is considerably $>$ when H_2O is excluded. N. H. H.

Production of vinylacetylene. A. S. Carter and F. B. Downing, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,838, 28.7.36. Appl., 21.5.31. Renewed 5.6.35).—Vinylacetylene (I) is prepared continuously by passing C_2H_2 into a liquid having p_H 6, and containing in solution a Cu salt and a salt of NH_4 or a *tert.*-amine, at 45—100°, the time of contact being 10—15 sec. (I) is removed from the resulting gas mixture by cooling at $0°/\nless 1$ atm. (*e.g.*, $-60°$ to $-80°$), or by scrubbing with a solvent, the recovered C_2H_2 being recirculated. Apparatus is figured. P. G. C.

Production of esters [and ethers] from halogenated paraffins. W. E. Lawson, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,207, 28.7.36. Appl., 13.3.34).—A paraffin wax containing one Cl per mol. is heated with a metal salt of a carboxylic acid, or an alkoxide, in presence or absence of NaI as catalyst. Examples give the use of KOAc and K stearate, and $C_{12}H_{25}\cdot ONa$, with a chlorinated wax. P. G. C.

Treatment of oxidation products of aliphatic hydrocarbons. Henkel & Co., G.m.b.H. (B.P. 467,328, 26.1.37. Ger., 2.3.36).—The major part of the unsaponifiable constituents of the oxidation products are removed (salted out) after saponification and the remaining part then distilled (180°) from the atomised saponified product, *e.g.*, with superheated steam. A. H. C.

Production of *tert.*-alcohols and products thereof. R. M. Deanesly, Assr. to Shell Development Co. (U.S.P. 2,042,212, 26.5.36. Appl., 11.3.35).—Alcohols are extracted from the solutions obtained by acid hydration of olefines by org. solvents. The production of a motor fuel by treating a mixture of olefines (mainly *iso*butene) and paraffins with aq. H_2SO_4, allowing to stratify, and separating the org. layer is claimed. H. A. P.

Preparation of silicon esters of modified polyhydric alcohols. W. E. Lawson, Assr. to E. I. Du Pont de Nemours Co. (U.S.P. 2,048,799, 28.7.36. Appl., 22.10.31).—Si esters are made by gently boiling a mixture of a modified polyhydric alcohol, having at least one free OH and at least one alkoxy- or acyloxy-group, with a tetra-alkyl silicate [$Si(OEt)_4$] for some hr. The products are useful as adhesives, coating compositions, etc.; they contain no free OH and are sol. in hydrocarbon and ester solvents. One claim covers a linseed-modified glyceryl silicate prepared by interaction of $Si(OAlk)_4$ and modified glycerol having at least one free OH and having the H of at least one OH replaced by the acid radical of linseed oil glyceride. R. G.

Removal of water from aqueous aliphatic acids. Kodak, Ltd. From Eastman Kodak Co. (B.P. 467,481 and 467,559, 12.9.35).—(A) Lower aliphatic acids or acid mixtures (not HCO_2H) are dehydrated in a two-stage continuous rectifying system employing as entraining agent an ether, ketone, ester, or ester–alcohol mixture which has b.p. between 25° < and 30° > the b.p. of the acid to be dehydrated, and forms an azeotrope with H_2O of b.p. <100°. (B) The acids are dehydrated by bringing vapours enriched in H_2O in contact with alcohol–ester mixtures as entraining agents and removing H_2O as a ternary azeotrope. Continuous apparatus in which the entrainer is returned after adjusting the alcohol content by partial re-esterification is described, and the use of PrOH (3—25%)-PrOAc and of BuOH (25—40%)-BuOAc in dehydrating AcOH is claimed. A. H. C.

Synthesis of esters of methacrylic acid. Triplex Safety Glass Co., Ltd., A. C. Waine, and J. Wilson (B.P. 466,504, 28.11.35).—$OH\cdot CMe_2\cdot CN$ is hydrolysed with boiling conc. HCl to give $OH\cdot CMe_2\cdot CO_2H$ (yield 76%), the dry Na salt of the acid methylated (Me_2SO_4 in $COMe_2$ at 40—55°; yield 70%), and the Me ester dehydrated (with $1\frac{1}{4}$ mols. of P_2O_5 and 1% of quinol) to give Me methacrylate in 88% yield. N. H. H.

Manufacture of esters of methacrylic acid. Röhm & Haas A.-G. (B.P. 467,433, 16.12.35. U.S., 14.12.34).—Esters from $CH_2{:}CMe\cdot CO_2H$ and primary monohydric alcohols (of $>C_5$) are prepared by treating the corresponding esters of $OH\cdot CMe_2\cdot CO_2H$ (I) with P_2O_5 (0·33 mol.), in presence of an inert non-hygroscopic volatile org. liquid of b.p. <200°, *e.g.*, (saturated) hydrocarbons or their Cl-derivatives, at about 1 atm. and at moderate temp. (25—120°), and the ester is recovered by distillation. Appropriate esters of (I) with P_2O_5 in PhMe, C_6H_6, or CH_2Cl_2 give *cetyl*, b.p. 170—212°/5 mm. (yield 85%), *lauryl*, b.p. 145—165°/5 mm. (yield 85%), n-*octadecyl*, b.p., 100—210°/5 mm. (yield 87%), n-*heptyl*, b.p. 95—109°/35 mm., n-*octyl*, 110—120°/10 mm., α-*ethylhexyl*, b.p. 136—147°/75 mm., and *phenylethyl*, b.p. 100—120°/2 mm., *methacrylate*. A retarder of polymerisation (quinol, α-$C_{10}H_7\cdot OH$) may be present during distillation. All the esters polymerise very readily to colourless, rubbery masses. N. H. H.

Recovery of organic acid esters [from esterification mixtures]. T. Evans and K. R. Edlund, Assrs. to Shell Development Co. (U.S.P. 2,042,218, 26.5.36. Appl., 4.8.34).—Esterification mixtures, produced, *e.g.*, by dissolution of olefines (C_4H_8) in H_2SO_4–org. acid (AcOH) (I) mixtures, are freed from inorg. acid by extraction with an aq. solution of (I) of such concn. that (I) is not extracted from the org. phase, distillation with H_2O, and separation of the ester from the distillate, the aq. layer being recycled as necessary. H. A. P.

Production of aldehydes. P. K. Frolich and P. J. Wiezevich, Assrs. to Standard Oil Development Co. (U.S.P. 2,042,303, 26.5.36. Appl., 29.5.31).—Aldehydes and halogenated aldehydes are prepared by interaction of a halogenohydrocarbon and a saturated aliphatic aldehyde of lower mol. wt., *e.g.*, MeCl and CH_2O at 200—500°/20—200 atm., in the presence of a solid material which fixes HCl. D. M. M.

Preparation of stable sodium formaldehydesulphoxalate. L. Freedman, Assr. to Winthrop Chem. Co., Inc. (U.S.P. 2,046,507, 7.7.36. Appl., 14.7.34).—Na formaldehydesulphoxalate is rendered stable to storage and suitable for pharmaceutical use by dissolving the technical product in H_2O at <80° together with a smaller amount (5—7%) of a relatively non-toxic alkaline salt sol. in H_2O but insol. in org. solvents readily miscible with H_2O (Na_2CO_3), and pptg. the mixture by pouring into an org. solvent which is miscible with H_2O but is a non-solvent for the alkali salt (EtOH). N. H. H.

1 : 3-Diamino-2-methylpropanol-2 [αα′-diamino-*tert.*-butyl alcohol]. E. C. Britton and H. S. Nutting, Assrs. to Dow Chem. Co. (U.S.P. 2,048,990, 28.7.36. Appl., 7.10.35).—Addition of $CMe(CH_2Cl)_2{\cdot}OH$ to aq. 30% NH_3 at 18—33° affords 65·6% of the theoretical yield of *αα′-diamino*tert.-*butyl alcohol* as a syrupy liquid, b.p. 101—105°/6 mm., m.p. 12°, sol. in H_2O, EtOH, acids, and dil. aq. alkali. A. H. C.

Manufacture of quaternary nitrogen compounds. W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 467,244, 18.12.35).—Quaternary N compounds, suitable for use as wetting agents etc., are prepared by interaction, usually in H_2O or EtOH, of an aliphatic dialkylaminocarboxylic acid with an aliphatic halogenocarboxylic acid (or its salts, esters, or amides). The following intermediates are prepared: *dimethylaminoacet-stearyl-*, *-butyl-*, *-methylstearyl-*, *diethylaminoacetdodecyl-*, b.p. 174°/2 mm., *dimethylaminopropionstearyl-*, and *α-dimethylaminostear-amide*, and *β-dimethylaminopropiondi-*(*β-hydroxyethyl*)*amide*. Examples are given of the condensation of these amides with $CH_2Cl{\cdot}CO_2H$ and its esters and amides, $CHMeCl{\cdot}CO_2H$, and $C_{16}H_{33}{\cdot}CHBr{\cdot}CO_2Na$, etc., to *salts* such as $[C_{18}H_{37}{\cdot}NH{\cdot}CO{\cdot}CH_2{\cdot}NMe_2{\cdot}CH_2{\cdot}CO_2Me]Cl$, $[C_{12}H_{25}{\cdot}NH{\cdot}CO{\cdot}CH_2{\cdot}NMe_2{\cdot}CH(C_{16}H_{33}){\cdot}CO_2Na]Br$, etc. R. F. P.

Preparation of thiuram monosulphides. I. Williams and C. W. Croco, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,043, 21.7.36. Appl., 6.5.31).—Dithiocarbamates and $COCl_2$ in weakly alkaline solution, best at <50°, give esters, $(NRR{\cdot}CS{\cdot}S)_2CO$, which, when heated alone or in solution, give thiuram sulphides, $(NRR{\cdot}CS)_2S$, and COS. $NMe_2{\cdot}CS_2Na$ thus gives the *ester*, m.p. 101°, and thence *tetramethylthiuram sulphide*, m.p. 103°. CS_2, $NH(CH_2Ph)_2$, and $COCl_2$ lead to *tetrabenzylthiuram sulphide*, m.p. 121°. The prep. of oily *dipentamethylene-* and *tetrabutyl-* and cryst. *diphenyldiethyl-thiuram sulphide* is also described. R. S. C.

Process of substitution chlorination. W. D. Ramage, Assr. to Great Western Electro-Chem. Co. (U.S.P. 2,046,411, 7.7.36. Appl., 17.9.34).—Saturated org. compounds (C_6H_6) are chlorinated in aq. or substantially anhyd. media (and in presence of a diluent, *e.g.*, CCl_4) or in the vapour phase by the action of HOCl or Cl_2O, produced *in situ* by contact of Cl_2 with a non-alkaline metal oxide which is easily reduced by C at elevated temp., *e.g.*, oxides of Fe, Zn, Mn. An example describes the dichlorination of C_6H_6. N. H. H.

Production of amino-compounds. I. G. Farbenind. A.-G. (B.P. 466,316, 11.7.36. Ger., 28.11.35).—NH_2-compounds are produced by interaction, at elevated temp. and in presence of solvents or diluents, of the nitriles, amides, and esters of αβ-unsaturated acids, *e.g.*, those of acrylic, methacrylic, crotonic, fumaric, maleic, or itaconic acid, with primary or *sec.* aliphatic, hydroaromatic, or aromatic amines, or with partly or wholly hydrogenated heterocyclic compounds containing at least one NH, in presence of an org. acid (0·5—10%), *e.g.*, HCO_2H, AcOH, $H_2C_2O_4$. Examples are: acrylonitrile with the appropriate base in presence of AcOH at about 120—140° gives the N-β-*propionitrilo*-derivatives of *N*-methylaniline, b.p. 125—135°/2 mm., *N*-butylcresidine, b.p. 160—165°/2 mm., 2-methylindoline, b.p. 140—142°/1 mm., 1 : 2 : 3 : 4-tetrahydroquinoline, b.p. 145—148°/2 mm., and 1 : 2 : 3 : 4 : 10 : 11-hexahydrocarbazole, b.p. 180—200°/2 mm. Similarly, $\alpha\text{-}C_{10}H_7{\cdot}NH_2$ and Et acrylate give *Me* N-1-*naphthyl-β-aminopropionate*, b.p. 180—189°/2 mm., and NHPhMe and $CH_2{:}CMe{\cdot}CO{\cdot}NH_2$ give (?) β-amino*iso*butyrphenylmethylamide, b.p. 170—190°/2 mm., which gives the acid when heated with NaOH. N. H. H.

Production of arylamines of the benzene series. W. L. Foohey and F. W. Peck, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,790, 28.7.36. Appl., 2.6.33).—Nitroarylamines are produced in a form suitable for immediate diazotisation by heating *o*- or *p*-nitro- or polynitro-aryl chlorides with aq. NH_3 (autoclave), releasing excess of NH_3 at 60—75°, and finally filtering at 20—30°. The production of $p\text{-}NO_2{\cdot}C_6H_4{\cdot}NH_2$ from $p\text{-}C_6H_4Cl{\cdot}NO_2$ is specifically claimed and that of *o*-nitro-, 2 : 4-dinitro-, and 4-chloro-2-nitro-aniline is described. A. H. C.

Antioxidants [for use with rubber etc.]. (A) D. Craig, (B, C) W. L. Semon, Assrs. to B. F. Goodrich Co. (U.S.P. 2,048,781 and 2,048,822—3, 28.7.36. Appl., [A] 2.10.34, [B] 9.12.33, [C] 2.6.33).—(A) Compounds NHRR′, where R = 1-indanyl and R′ = aryl or substituted (OH·, NH_2·, alkoxy, or aryloxy) aryl, are antioxidants. The application particularly to rubber compositions (0·5%) of compounds where R′ = Ph, $p\text{-}C_6H_4Me$, $p\text{-}C_6H_4{\cdot}NHPh$, etc. is claimed. (B) Ketones are condensed with 1—2 mols. of an aromatic amine at 80—200° in presence of aq. acid and the intermediate $CR'R''(Ar{\cdot}NHR)_2$ or $NHR{\cdot}Ar{\cdot}CR'{:}R''$ is condensed at ≮200° with the same or a different amine. The prep. of antioxidants by condensing $COMe_2$ with NH_2Ph or $NHPh_2$, using the same bases in the further condensation, is described and rubber compositions containing them are claimed. (C) Rubber compositions are stabilised by incorporating 0·5% of a *p*-diamine of the type $NHR{\cdot}C_6H_3R'{\cdot}NHR''$, where R and R″ are aryl and R′ is a hydrocarbon radical. The application of diamines where R and R″ = Ph and R′ = Ph, *cyclo*hexyl, and Me is claimed. A. H. C.

Manufacture of 3 : 4′-dinitro-4-aminodiphenylamine and of azo dyes therefrom [pigments and ice colours]. I. G. Farbenind. A.-G. (B.P. 457,534, 4.6.35. Ger., 2.6. and 16.7.34).—3 : 1 : 4-$NO_2{\cdot}C_6H_3(NH_2)_2$ is condensed with 4 : 1 : 2-$NO_2{\cdot}C_6H_3Cl{\cdot}SO_3H$ and desulphonated, *e.g.*, with 78% H_2SO_4, to give 3 : 4′-dinitro-4-aminodiphenylamine, m.p. 226—227°, and this is diazotised and coupled with 2 : 3-hydroxynaphthoic arylamides free from SO_3H and CO_2H, *e.g.*, α-naphthylamide (greenish-black), *o*-toluidide (greenish-black), or 2 : 4-dimethoxyanilide (violet-black). C. H.

Nitrated *o*-alkyl-phenolic compounds. J. D. Pollard, Assr. to V. Leonard (U.S.P. 2,048,168, 21.7.36. Appl., 3.8.35).—To prepare dinitro-*o*-alkylphenols the *o*-alkylphenol is heated with 1·5 mols. of H_2SO_4 at 100° until homogeneous and added slowly to 1·05—1·1 mols. of HNO_3 (*d* 1·361) at −10°; the mixture is kept at −10° for $\nless$10 hr., then heated very gradually to 50—70°, and finally at 100°. Thus are obtained 2 : 4-*dinitro*-6-n-, b.p. 157—158°/2 mm., m.p. 17—18°, and -iso-*butyl*-, b.p. 135—140°/1 mm., m.p. 46—48°, -ethyl-, b.p. 130—134°/1 mm., m.p. 35—37° (lit., an oil), -n-*propyl*-, b.p. 159—160°/3·5 mm., m.p. 12—13°, -n-, b.p. 153—154°/1 mm., and -iso-*amyl*-, b.p. 151—152°/1 mm., m.p. 17—18°, -*phenol*. R. S. C.

Production of pure ethers of dinitrophenol. L. G. Wesson, Assr. to V. Leonard (U.S.P. 2,048,172, 21.7.36. Appl., 17.8.35).—Pure, non-irritant, nearly tasteless 2 : 4-dinitrophenyl ethers are obtained from $C_6H_3Cl(NO_2)_2$, ROH, and 80% aq. KOH by washing the impure ether first with dil. alkali and then with a low-boiling hydrocarbon. The prep. of the Et ether, m.p. 54—56°, is detailed. R. S. C.

Preparation of alicyclic carbinol esters of polycarboxylic acids. H. J. Barrett and W. A. Lazier, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,047,663, 14.7.36. Appl., 3.5.33).—Alicyclic carbinol esters of polycarboxylic acids, useful as plasticisers, are derived from polycarboxylic acids such as $(CH_2)_n(CO_2H)_2$, $C_6H_4(CO_2H)_2$, $C_6H_{10}(CO_2H)_2$, $[CH(OH)\cdot CO_2H]_2$, $(:CH\cdot CO_2H)_2$, and mellitic acid, and alicyclic carbinols, $R\cdot C_nH_{2n}\cdot CH_2\cdot OH$ and $(C_nH_{2n}\cdot CH_2\cdot OH)_xR(C_mH_{2m}\cdot OH)_y$, R being a radical containing an at least partly hydrogenated radical, *m* and *n* any positive nos. including 0, *x* 1—3, and *y* 0—2. The acids, anhydrides, chlorides, or simple esters are caused to react with the carbinols, or the alkali salts of the acids to react with the halides of the carbinols, by the usual methods. *Hexahydrobenzyl phthalate*, m.p. 35°, is described. R. F. P.

Preparation of aroyl chlorides of the benzene series. H. W. Anderson, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,768, 28.7.36. Appl., 29.1.34).—Aroyl chlorides are prepared by passing Cl_2 into a heated (40—60°) mixture of an aromatic carboxylic acid, PCl_3, and $POCl_3$ ($POCl : PCl_3 = \nless 1\cdot 6 : 1$ mol.). The example describes the prep. of p-$NO_2\cdot C_6H_4\cdot COCl$. P. G. C.

Chlorination of phthalide and further treatment of the chlorination product. P. R. Austin and E. W. Bousquet, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,047,946, 21.7.36. Appl., 22.9.34).—Cl_2 is passed into mechanically stirred phthalide at 100—150° (130—140°), preferably in ultra-violet light, until 0·75—0·85 atom of Cl per mol. of phthalide has been absorbed. The α-chlorophthalide is distilled or crystallised, or is hydrolysed without purification by slowly adding to approx. 3 pts. by wt. of hot H_2O and heating for 15—30 min.; o-$CHO\cdot C_6H_4\cdot CO_2H$ separates on cooling and is recrystallised from C_6H_6 (yield, 38—68%). Other aromatic aldehydic acids are prepared similarly. A. H. C.

Manufacture of condensation products from substitution products of 2 : 3-hydroxynaphthoic acid. I. G. Farbenind. A.-G. (B.P. 466,358, 26.11.35. Addn. to B.P. 443,583; B., 1936, 685).—Quinazolines are prepared by interaction of substitution products of 2 : 3-$OH\cdot C_{10}H_6\cdot CO_2H$ with o-$NH_2\cdot C_6H_4\cdot CO\cdot NH_2$ (I) or substitution products thereof by the process of the chief patent. Examples are: 2 : 3-hydroxy-6-methoxynaphthoyl chloride (from the acid and $SOCl_2$) in PhMe with (I) under reflux gives the *amide*, m.p. 232°, which by further heating in 4% NaOH gives 2-3′-*hydroxy*-6′-*methoxy*-2′-*naphthyl*-4-*quinazolone*, decomp. >300°. Similarly, the condensation *products* from (I) and the 7-OMe-, decomp. >300°, 6-Me-, decomp. >300°, 6-Br-, decomp. >300°, and 7-Cl-, decomp. >360°, derivatives of 2 : 3-hydroxynaphthoic acid, and from 2-amino-4-methoxy- or 2-amino-4-methylbenzamide and 2 : 3-hydroxy-6- or -7-methoxynaphthoic acid have been prepared. N. H. H.

Preparation of aromatic dithiocarbamates. P. C. Jones, Assr. to B. F. Goodrich Co. (U.S.P. 2,046,875, 7.7.36. Appl., 16.8.35).—Metal salts of *N*-diaryldithiocarbamic acid are prepared by dissolving a diarylamine, *e.g.*, $NHPh_2$, $NHPh\cdot C_{10}H_7$, or halogen, NO_2-, or alkoxy-derivatives of these, or heterocyclic amines, *e.g.*, carbazole, in CS_2 and adding the amide of an alkali or alkaline-earth metal or of Mg. The reaction is conducted at $\ngtr$ room temp. Example: $NHPh_2$ and CS_2 with $NaNH_2$ (10% excess) at the boil for ½ hr. give Na diphenyldithiocarbamate. N. H. H.

Manufacture of naphthenyl esters of polycarboxylic acids. H. J. Barrett and W. A. Lazier, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,047,664, 14.7.36. Appl., 10.5.35).—Di-, H, and mixed mono-naphthenyl esters of polycarboxylic acids are good plasticisers and softeners for lacquers and plastic compositions. The acids may be employed as the free acids, ester, chloride, or anhydride, and the naphthenyl alcohols (prepared by usual methods from petroleum) may be greatly varied, *e.g.*, b.p. 100—143°/20 mm. to 152—175°/1 mm. Among examples, naphthenyl alcohols of b.p. 101—141°/19 mm. (100) with $COCl_2$ (39) in PhMe (78 pts.) at 0° affords a dinaphthenyl carbonate, b.p. 179—205°/4 mm., with o-$C_6H_4(CO)_2O$ at 120° give the naphthenyl H phthalate, and with o-$C_6H_4(CO_2Me)_2$ in PhMe in presence of PbO a dinaphthenyl phthalate. R. F. P.

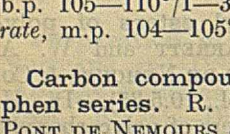
Manufacture of aromatic *p*-amino-aldehydes. D. Hutton, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,006, 21.7.36. Appl., 26.10.34).—Nitro-benzene- or -toluene-sulphonic acid is reduced by Zn dust to the corresponding hydroxylamine and treated with a *p*-dialkylaminoaryl alcohol and 0·05—1 mol. (0·1—0·2) of a primary amine (preferably that corresponding with the NO_2-compound used); the resulting Schiff's base is hydrolysed to the amine-sulphonic acid and *p*-dialkylaminobenzaldehyde. The primary amine functions as catalyst. The alcohol may be prepared *in situ*, *e.g.*, from the amine and CH_2O in acid solution. As examples the prep. of p-$NEt_2\cdot C_6H_4\cdot CHO$ by use of m-$NO_2\cdot C_6H_4\cdot SO_3H$ and $NPhEt_2$ and of p-$NMe_2\cdot C_6H_4\cdot CHO$ by use of 4 : 1 : 2-$NO_2\cdot C_6H_4Me\cdot SO_3H$ and $NPhMe_2$ is detailed. R. S. C.

Manufacture of 4-acetyl-5-*tert*.-butyl-*m*-xylene. W. V. Wirth, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,047,656, 14.7.36. Appl., 1.2.34).—Improved yields of 1 : 3 : 5 : 4-$C_6H_2Me_2Bu^{\gamma}Ac$ are obtained by adding 1 mol. of $AlCl_3$ to a mixture of Ac_2O or AcCl and an excess of 1 : 3 : 5-$C_6H_3Me_2Bu^{\gamma}$; the excess of hydrocarbon serves as solvent and can be recovered by fractional distillation. R. F. P.

Carbon compounds [and dyes] of the anthraquinone series. E. E. Beard, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,189, 28.7.36. Appl., 16.10.31).—Vat dyes are made by condensing 1-aroylaminoanthraquinone-6-carboxyl halides either twice with 1 : 5-diaminoanthraquinone (I) or once with an aroyldiaminoanthraquinone. Among examples (41) there are claimed the condensation of 1-benzamidoanthraquinone-6-carboxyl chloride (II) (10 pts. = 2 mols.) with (I) (3 pts. = 1 mol.) in $PhNO_2$ at 150° (yellow on cotton: brown vat) and (II) with 1-amino-5-benzamidoanthraquinone (yellow on cotton: Bordeaux vat). K. H. S.

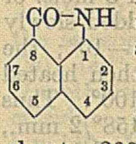
Preparation of ditetrahydrofurfurylamines. H. I. Cramer, Assr. to Wingfoot Corp. (U.S.P. 2,047,926, 14.7.36. Appl., 4.4.34).—Hydrogenation of di-2-furfurylamine at 85° (140—150°)/20 (125) atm. in presence of a base-metal (Ni–kieselguhr) catalyst affords excellent yields of *di-2-tetrahydrofurfurylamine*, b.p. 105—110°/1—3 mm., 119—120°/7·5 mm. (*picrate*, m.p. 104—105°). R. F. P.

Carbon compounds of the 1 : 9-anthrathiophen series. R. N. Lulek, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,214, 28.7.36. Appl., 23.10.31).—1-Thiolanthraquinone-2-carboxylic acid is treated first with $CH_2Cl{\cdot}CO_2H$ to form 1 : 9-*anthrathiophen-2-carboxylic acid* (annexed formula), which is converted into the acid *chloride* by PCl_5, and this (10) is condensed with 1-aminoanthraquinone (7·5) (which may be substituted at 5 by ·NHBz) by heating in $PhNO_2$ (150 pts.) at 130—140° for 1 hr. The *product* dyes cotton from a red vat yellow shades fast to Cl_2, washing, and light. K. H. S.



[Preparation of] carboxylic acid amides derived from aza-compounds. Coutts & Co., and F. Johnson. From I. G. Farbenind. A.-G. (B.P. 462,650, 11.6.35).—Primary and *sec.* amines are heated with enolisable ketocarboxylic acids of monoaza-compounds in which the aza-N is a component atom of a 6-ring. Examples are the 6-*quinolinoylacetyl* derivatives of α-$C_{10}H_7{\cdot}NH_2$, m.p. 185—187°, 1 : 4 : 2 : 5-$NH_2{\cdot}C_6H_2Cl(OMe)_2$, m.p. 205—206°, and 2-aminopyridine. H. A. P.

Manufacture of 4-hydroxynaphthostyril and its substitution products. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 467, 274, 24.12.35).—4-Hydroxynaphthostyril (annexed formula) and its substitution products are produced by heating the mineral acid salts of the corresponding 4-aminonaphthostyrils at about 150—200°, in presence of H_2O. Examples are: 4-aminonaphthostyril (cf. A., 1889, 53) or the appropriate derivative in presence of either HCl or H_2SO_4 and H_2O give 4-*hydroxy-*, m.p. 278° (decomp.), 4-*hydroxy*-N-*methyl-*, m.p. 290°, -N-*ethyl-*, m.p. about 200°, -N-*phenyl-*, m.p. 248—250°, -N-o-*anisyl-*, m.p. 129—130°, -N-p-*anisyl-* m.p. about 242°, -N-3′-*chlorophenyl-*, m.p. about 272°, -N-4′-*chlorophenyl-*, m.p. about 260°, -4′-*phenyl*-N-*phenyl-*, m.p. 208—210°, -N-*naphthyl-*, m.p. about 286°, -N-cyclo*hexyl-*, m.p. about 240°, -*naphthostyril*. Similarly, 2-*chloro-4-hydroxy-*, m.p. 375—380° (decomp.), and 2-*chloro-4-hydroxy*-N-*methyl-*, m.p. 286—288°, -N-*phenyl-*, m.p. about 304°, and 2-*bromo-4-hydroxy*-N-*methyl-*, m.p. about 308°, -*naphthostyril* are obtained. N. H. H.



Preparation of anthraquinone derivatives [and dyes]. A. J. Wuertz, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,042,165, 26.5.36. Appl., 14.9.32).—Anthraquinoneacridonecarboxyl chlorides are produced by interaction of 1-carboxyarylaminoanthraquinone-2-carboxylic acids with chlorinating agents; the derived alkyl- and arylamides are vat dyes. *E.g.*, 1-*p*-carboxyanilinoanthraquinone-2-carboxylic acid (from the 1-Cl-compound and *p*-$NH_2{\cdot}C_6H_4{\cdot}CO_2H$) is stirred with PCl_5 in $PhNO_2$ or $SOCl_2$ in solvent naphtha to give 8 : 9-*phthaloylacridone-3-carboxyl chloride*; the 1- and 2- (or 4-) derivatives are similarly obtained. H. A. P.

Preparation of benzthiazyl disulphides. J. Teppema, Assr. to Wingfoot Corp. (U.S.P. 2,047,923, 14.7.36. Appl., 24.3.31).—Aryl benzthiazyl disulphides, used as vulcanisation accelerators, are prepared by interaction of $NO_2{\cdot}Ar{\cdot}SHal$ with 1-thiolbenzthiazoles and $AlCl_3$ in CS_2 or with the Na salt of the mercaptan alone in EtOH. *E.g.*, 5 : 2 : 1-$NO_2{\cdot}C_6H_3Bz{\cdot}SBr$ (I) with 1-thiolbenzthiazole and $AlCl_3$ or with the Na salt alone affords 2-*benzoyl-4-nitrophenyl benzthiazyl disulphide*, m.p. 122—123°. *o*-$NO_2{\cdot}C_6H_4{\cdot}SCl$, 2 : 4 : 1-$NO_2{\cdot}C_6H_3Cl{\cdot}SCl$, and 2 : 1 : 3-$NO_2{\cdot}C_6H_3Me{\cdot}SCl$ may be used in place of (I). The *compound*, 2 : 4 : 1-$COPh{\cdot}C_6H_3(NO_2){\cdot}S{\cdot}S{\cdot}CS{\cdot}NEt_2$, prepared by interaction of (I) and $NEt_2{\cdot}CS_2Na$, is also an accelerator. R. F. P.

Preparation of mercapto[aryl]thiazole compounds. A. Cambron, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,037,878, 21.4.36. Appl., 7.7.30).—NH_4 salts of thiolarylthiazoles are produced by heating arylamines unsubstituted in an *o*-position with $HCO{\cdot}NH_2$ and S at 170—270°. *E.g.*, NH_2Ph, S, and $HCO{\cdot}NH_2$ when heated in a closed vessel at 190° for 6 hr. give 86% of theory of mercaptobenzthiazole as NH_4 salt. Similar results are obtained with HCO·NHPh and S at 240° (yield 46% of theory), and with *o*- or *p*-$C_6H_4Me{\cdot}NH_2$, or β-$C_{10}H_7{\cdot}NH_2$, $HCO{\cdot}NH_2$, and S. H. A. P.

Manufacture of intermediates for [photographic sensitising] dyes. Kodak, Ltd. (B.P. 466,268—9, 15.8.35).—(A) Substances having a heterocyclic 5- or 6-ring and the group ⁚CH·CHO attached to the C *ortho* to *tert*.-N carrying an alkyl group are made by hydrolysing (alkaline or acid) substances containing the system ·NAlk·(Hal):Ċ·CH:CH·NHAr (Ar = aryl), arylamine and the H halide being eliminated. Examples describe the conversion of 1-acetanilidovinylbenzthiazole methiodide into 1-*formylmethylene*-2-*methylbenzthiazoline* (an oil, affording cyanine dyes); 2-β-anilidovinyl-β-naphthathiazole ethiodide (by fusing 2-methyl-β-naphthathiazole ethiodide with diphenylformamidine) into 2-*formylmethylene*-1-*ethyl*-β-*naphthathiazoline*, m.p. 157—160° (decomp.); 2-β-anilidovinylquinoline methiodide to 2-*formylmethylene*-1-*methyl*-1 : 2-*dihydroquinoline* (m.p. 87—90°); 1-β-acetanilidovinylbenzoxazole ethiodide into 1-*formylmethylene-2-ethylbenzoxazoline*, a viscous mass affording unsymmetrical carbocyanines. (B) Quaternary salts of 1-methylbenzthiazole, 2-methyl-α- or -β-naphthathiazole, or 1-methylbenzselenazole are treated in presence of an acid-binding agent, *e.g.*, C_5H_5N, with acyl halides derived from monocarboxylic acids. The products are aryl-thiazolines or -selenazolines having *N*-alkyl and the group :CH·C(Alk):O attached to C in the μ position of the heterocyclic ring. Thus are obtained 1 : 2-substituted benzthiazolines as follows: 1-*acetylmethylene-2-methyl-*, m.p. 160—162° (from 1-methylbenzthiazole metho-*p*-toluenesulphonate and AcCl); similarly 1-*propionylmethylene-2-methyl-*, m.p. 102—103°, -2-*ethyl*, m.p. 54—57°, -2-*allyl-*, m.p. 75—76°, -2-n-*propyl-*, m.p. 95—96°, and -2-n-*butyl-*, m.p. 58—59°, 1-*acetylmethylene-2-ethyl-*, m.p. 116—117°, 1-*benzoylmethylene-2-ethyl-*, m.p. 123—125°, 1-*trichloroacetylmethylene-2-ethyl-*, m.p. 139—141°, 1-*lauroyl-2-ethyl-*, m.p. 59—61°, 1-*furoylmethylene-2-ethyl-*, m.p. 150—152°, 1-(m-*nitrobenzoyl*)-*methylene-2-ethyl-*, m.p. 239—240°, 4-*chloro*-1-*propionylmethylene-2-ethyl-*, m.p. 150—152°; further 2-*propionylmethylene*-1-*methyl-*, m.p. 172—173°, 2-*acetylmethylene*-1-*ethyl-*, m.p. 182—184°, and 2-*propionylmethylene*-1-*ethyl*-β-*naphthathiazoline-*, m.p. 119—120°, and 1-*acetyl-*, m.p. 99—100°, and 1-*propionyl-methylene-*, m.p. 67—68°, -2-*ethylbenzselenazoline.* K. H. S.

Anthraquinone derivatives [anthraselenazoles]. R. N. Lulek, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,212—3, 28.7.36. Appl., [A] 27.2.30, [B] 29.4.30. Renewed [B] 28.9.33).—(A) 1 : 9-*Anthraselenazole*-2-*carboxylic acid* (I) is made by heating 1-chloroanthraquinone-2-carboxylic acid (120) with the solution obtained by passing H_2Se (67) into 17% KOH (600) and 26—28% aq. NH_3 (800 pts.) at 120—140° for 10 hr. Similarly the 4-*carboxylic acid* is prepared and both are converted (PCl_5) into acid *chlorides.* (B) The chloride of (I) is condensed with 1-amino-5-benzamido- or 6-chloro-1-amino-anthraquinone or 1 : 5-diaminoanthraquinone (twice) in $PhNO_2$ at approx. 130°. The *products* dye cotton in yellow shades from a blue vat. K. H. S.

Separating liquid mixtures. Removal of weak acids from gases.—See I. **Refining hydrocarbons.**—See II. **Urethanes. Benzyl Me and Et sulphones. Diphenylamine derivatives. Pyrene derivatives. Anthraquinone intermediates. Vat dye intermediates.**—See IV. **Catalysts. Gases from CS_2 works.**—See VII. **Polymerisation products. Glycerol monolactate triacetate.**—See XIII. **Morpholines.**—See XX.

IV.—DYESTUFFS.

Determination of the light-fastness of pigments and dyes. R. Toussaint and J. Pinte (Österr. Chem.-Ztg., 1937, **40**, 266—268).—Instead of visual comparison of samples with known standards, the use of a heliostat type of instrument (an "insolameter") for fading exposures, and a colorimeter, is suggested. Both instruments are fitted with photoelectric cells to measure the amount of light used in the fading test, and to determine and enable a numerical val. to be given for the degree of fading. R. J. W. R.

Analysis of dyes. V. Analysis of insoluble azo dyes and coloured varnishes. V. V. Kozlov and A. V. Simanovskaja (J. Appl. Chem. Russ., 1937, **10**, 688—695).—The quinonoid, NO_2-, or azo dye or varnish is boiled with $SnCl_2$ in aq. H_2SO_4, and excess of $SnCl_2$ is determined iodometrically. Oil paints containing pigments of the above types are diluted with C_5H_{11}·OH, and the solution is treated as above. R. T.

Utilisation of naphthalic acid in the dyestuff industry. P. P. Karpuschin and K. I. Ratnikova (Ukrain. Chem. J., 1937, **12**, 122—136).—3-Sulphonaphthalic anhydride, obtained in 94% yield by sulphonating naphthalic acid (I) with 5·5% oleum at 130°, is converted into 3-hydroxynaphthalic anhydride (II) by fusion with KOH (220°; 20 min.). 3-Hydroxynaphthalimide (III) is obtained by heating (II) with aq. NH_3 (120—130°; 3 hr.). (III) yields a green dye, probably *perylene*-1 : 12-*oxide*-3 : 4 : 9 : 10-*tetracarboxylic di-imide*, when heated with KOH for 15 min. at 210—220°. (I) and EtOH–NH_3 (120°; 5 hr.) yield naphthalimide, converted into perylene-3 : 4 : 9 : 10-tetracarboxylic di-imide (IV) by fusion with 90% KOH (300°; 15 min.). The *di*-N-*benzoyl* derivative of (IV) is a purple dye, but of no practical importance. The *di*-N-*hydroxymethyl* derivative of (IV), prepared by heating with paraldehyde for 3 hr. at 40—50°, is a very fast violet dye for cotton. A mixture of (IV) and its $(NO_2)_1$-derivative, obtained by nitration at 20° for 10 min., serves as a fast blue dye for cotton. R. T.

Analysis of indigo vat and reduced indigo products. F. Henesey (J. Soc. Dyers and Col., 1937, **53**, 202).—A weighed portion of the vat is poured into boiling *N*-HCl, more acid added until acid to litmus, and the indigotin collected on a Gooch crucible, washed, and weighed after drying for 1 hr. at 100°. The method is claimed to be quicker and more accurate than sulphonation and oxidation by $KMnO_4$. K. H. S.

Photo-active xanthine dyes. A. Steigmann (Phot. Ind., 1937, **35**, 617—618).—The author's earlier syntheses of panchromatic sensitising xanthine dye are improved by modern methods, and examples are given of better technique in syntheses from erythrosin, fluorescein, or phthalein as starting compounds. J. L.

Philippine annatto dye as a colouring agent. S. S. Tanchico and A. P. West (Philippine J. Sci., 1937, 61, 429—435).—The extraction of annatto and its application to the dyeing of polishes, stains, lacquers, etc. is described. E. H. S.

Dyes and short-wave radiations.—See VI. **Colouring matters in foods.**—See XIX. **Infra-red photography.**—See XXI.

Patents.

Manufacture of intermediates [urethanes] and of azo dyes derived therefrom. E. I. Du Pont de Nemours & Co. (B.P. 459,894, 18.7.35. U.S., 18.7.34).—2 : 3-Hydroxynaphthoic anilide, *o*-toluidide, 5-chloro-*o*-toluidide, or β-naphthylamide is coupled on the fibre with a diazotised 4-amino-2 : 5-diethoxyphenylurethane, $Ar\cdot NH\cdot CO_2Et$ or $Ar\cdot NH\cdot CO_2Me$. C. H.

Manufacture of [azo] dyes and intermediate products therefor. Soc. Chem. Ind. in Basle (B.P. 462,913, 20.9.35. Switz., 29.9.34).—The manufacture by standard methods and use as diazo or coupling components for azo dyes of diacyl derivatives of 1 : 3 : 5 : 7- (I) and 1 : 3 : 8 : 6-$C_6H_4(NH_2)_2(OH)\cdot SO_3H$ (II) are claimed. Examples are the *Ac*$_2$ and *Bz*$_2$ derivatives of (I) and (II), the *di*-m- and *di*-p-*nitrobenzoyl*, and the *di*-m- (III) and *di*-p- (IV) *-aminobenzoyl* derivatives of (II). The *dyes* : (III) → NH_2Ph, *o*-$C_6H_4Me\cdot NH_2$ (blue-red), and → β-$C_{10}H_7\cdot OH$ (yellow-red), 1-amino-3 : 6-disulphonaphthyl *p*-toluenesulphonate (V) → α-$C_{10}H_7\cdot NH_2$ (VI) → (IV) (blue) → 1-phenyl-3-methyl-5-pyrazolone (VII) (green), 2 : 4 : 8-$NH_2\cdot C_{10}H_5(SO_3H)_2$ → (VI) → (III) (blue) → (VII) (green), (V) → (VI) → 1 : 6- + 1 : 7-$NH_2\cdot C_{10}H_6\cdot SO_3H$ → (IV) (hydrolysed, blue), *o*-$NH_2\cdot C_6H_4\cdot CO_2H$, 4 : 2 : 1-$C_6H_3Cl(NH_2)\cdot OH$, 2 : 1 : 5-$C_6H_3(NH_2)(OH)\cdot NO_2$ (VIII), 2 : 1 : 4 : 6-$C_6H_2(NH_2)(OH)(NO_2)\cdot SO_3H$, and 4 : 2 : 1 : 6-$C_6H_2Cl(NH_2)(OH)\cdot SO_3H$ → Bz_2 derivative of (II) (Cu derivatives, violet), and (VIII) → Ac_2 derivative of (II) are described. H. A. P.

Manufacture of monoazo dyes. I. G. Farbenind. A.-G. (B.P. 462,940, 6.5.36. Ger., 9.5.35).—Dyes of good fastness to perspiration and milling are produced by coupling diazotised aminobenzoyl derivatives of *sec.*-amines or carbazoles (excluding other heterocyclic N bases) with *N*-acylated 1 : 8 : x : x-$NH_2\cdot C_{10}H_4(OH)(SO_3H)_2$, the acyl groups being the residue of an aryloxy-aliphatic acid. Examples are the *dyes* : *p*-aminobenz-ethyl-α-naphthylamide, -di-*cyclo*hexylamide, and -di-*n*-butylamide → 1-*o*-chlorophenoxyacetamido-8-naphthol-4 : 6-disulphonic acid (all red). H. A. P.

Manufacture of monoazo dyes. I. G. Farbenind. A.-G. (B.P. 467,053, 30.7.36. Ger., 2.8.35. Addn. to B.P. 462,940; see preceding abstract).—Diazo compounds derived from amines $NRR'\cdot SO_2\cdot C_6H_4\cdot NH_2$, where R, R′ are the same or different aromatic, araliphatic, *cyclo*aliphatic, or aliphatic residues, are coupled with acylated derivatives of *peri*aminonaphtholdisulphonic acids containing the residue of an aryloxy-fatty acid. In the examples, 8 : 1 : 4 : 6-$OH\cdot C_{10}H_4(NH\cdot CO\cdot CH_2\cdot O\cdot C_6H_4Cl\text{-}2')(SO_3H)_2$ is coupled with diazo compounds from 6 : 3 : 1-$C_6H_3Me(NH_2)\cdot SO_2\cdot NBu^a{}_2$, 3 : 1-$NH_2\cdot C_6H_4\cdot SO_2\cdot N(CH_2Ph)_2$, or 4 : 1-$NH_2\cdot C_6H_4\cdot SO_2\cdot NPh\cdot C_6H_{11}$. Wool and silk are dyed in red shades of good fastness to fulling, light, sea-H_2O, and perspiration and the dyes are superior to those of B.P. 313,110 (B., 1929, 674). K. H. S.

Manufacture of acid azo dyes, in particular for the dyeing and printing of animal textile fibres. Comp. Nat. de Mat. Col. et Manuf. de Prod. Chim. du Nord Réunies Etabl. Kuhlmann (B.P. 456,957, 31.3.36. Fr., 2.4.35).—Benzidine-2 : 2′-disulphonic acids, carrying in positions 5 : 5′ alkoxyl, alkyl, or halogen, are tetrazotised and coupled with acetoacetic arylamides. Examples are : dianisidinedisulphonic acid → anilide (greenish-yellow) or *m*-xylidide (rather redder), tolidinedisulphonic acid → *o*-chloroanilide. C. H.

Manufacture of [acid] azo dyes. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 460,224, 23.7.35).—An aminoarylsulphonyl fluoride is diazotised and coupled with a sulphonated coupling component. Examples are : *m*-$NH_2\cdot C_6H_4\cdot SO_2F$, m.p. 30°, made from metanilic acid and FSO_3H, → 1-*p*-sulphophenyl-3-methyl-5-pyrazolone (I) (yellow on wool) or Schäffer acid (orange); *o*-$NH_2\cdot C_6H_4\cdot SO_2F$, m.p. 67°, → 1-(2′-chloro-5′-sulphophenyl)-3-methyl-5-pyrazolone (greenish-yellow); *m*-4-xylidine-5-sulphonyl fluoride, m.p. 105°, → acetyl-γ-acid (red); *m*-4-xylidine-6-sulphonyl fluoride, m.p. 92°, → (I) (greenish-yellow); 3 : 1 : 6-$NH_2\cdot C_6H_3Me\cdot SO_2F$, m.p. 65°, → N.W.-acid (red). C. H.

Manufacture of dischargeable substantive azo dyes. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 458,039, 14.6. and 1.11.35).—An arylamine free from phenolic OH is diazotised and coupled with an aminoaroyl-J-acid, and the product further diazotised and coupled with a salicylic acid (I) or a non-diazotisable 1-aryl-5-pyrazolone-3-carboxylic acid or ester. Examples are : NH_2Ph → *p*-aminobenzoyl-J-acid (II) → (I) (yellowish-red); *m*-$NH_2\cdot C_6H_4\cdot NH\cdot CHO$ → (II) → *o*-cresotic acid (III) (developed with diazotised *p*-$NH_2\cdot C_6H_4\cdot NO_2$, brown); NH_2Ph → *m*-aminobenzoyl-J-acid → (III) (developed as before, redder brown). C. H.

Manufacture of water-insoluble azo dyes. (a) A. Carpmael and (b) W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 463,046 and 463,062, [a] 16.9.35, [b] 20.9.35).—(a) Diazotised 4-amino-1(*N*)-alkyl-(or -aryl-)1 : 8-naphthasultams (I) are coupled in substance or on the fibre with 2 : 3-hydroxynaphthoic arylamides (II) free from H_2O-solubilising groups. Examples of (I) are 4-amino-*N*-methyl, -β-hydroxyethyl, -*n*-propyl-, -ethyl-, -*n*-butyl-, -phenyl-, and -*p*-anisyl-1 : 8-naphthasultam; the shades produced vary according to the coupling component from red-blue to violet, brown, and black. (b) The diazotised 5-carboxyarylamides (III) of 2-aminoquinol dialkyl ethers are coupled as above with (II). Examples of (III) are 2-amino-1 : 4-dimethoxybenzene-5-carboxy-anilide, -*p*-chloroanilide, -*p*-anisidide, -*o*-toluidide, and -α- and -β-naphthylamide, and 2-amino-1 : 4-diethoxybenzene-5-carboxyanilide and -*p*-chloroanilide, the shades produced varying from violet to blue. The products are claimed to have good light-fastness and to be non-bleeding in rubber. H. A. P.

Manufacture of water-insoluble azo dyes [for acetate silk]. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 457,036, 16.4.35).—An arylaminecarboxylic ester is diazotised and coupled with a hydroxyalkylarylamine (including heterocyclic amines), both components being free from SO_3H and CO_2H. Examples are: *p*-$NH_2\cdot C_6H_4\cdot CO_2Et$ → *m*-$C_6H_4Me\cdot N(CH_2\cdot CH_2\cdot OH)_2$ (orange); Me 4-amino*iso*phthalate → β-hydroxyethylcresidine (reddish-orange); *p*-$NH_2\cdot C_6H_4\cdot CO_2\cdot CH_2\cdot CH_2\cdot OH$ → $NPh(C_2H_4\cdot OH)_2$ (orange); *p*-$NH_2\cdot C_6H_4\cdot CO_2\cdot CH_2\cdot CH(OH)\cdot CH_2\cdot OH$ → 3-hydroxy-1 : 2 : 3 : 4-tetahydro-7 : 8-benzoquinoline (pink). C. H.

Manufacture of insoluble azo dyes [for acetate silk]. I. G. Farbenind. A.-G. (B.P. 458,423, 19.6.35. Ger., 11.8.34).—A nitroaniline, which may carry halogen, is diazotised and coupled with a 3-hydroxy-1-alkyl- or -aralkyl-1 : 2 : 3 : 4-tetrahydroquinoline, which may carry halogen or alkyl in position 7. Examples are: *p*-$NH_2\cdot C_6H_4\cdot NO_2$ (I) → 7-chloro-3-hydroxy-1-*n*-butyltetrahydroquinoline (II) (bluish-red); 2-chloro-4-nitroaniline → (II) (bluish-bordeaux); (I) → 3-hydroxy-1-benzyltetrahydroquinoline (red); 6-chloro-2 : 4-dinitroaniline → 3-hydroxy-1-benzyl-7-methyltetrahydroquinoline (bluish-violet). C. H.

Manufacture of azo dyes [for acetate silk]. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 460,276, 23.7.35).—A diazotised arylamine is coupled with a *cyclo*hexylarylamine carrying as *N*-substituent an aliphatic group containing O, both components being free from SO_3H and CO_2H. Examples are: *p*-$NH_2\cdot C_6H_4\cdot NO_2$ (I) → *N*-*cyclo*hexyl-*N*-hydroxyethylaniline (II) (orange); 1 : 2 : 4-$NH_2\cdot C_6H_3Cl\cdot NO_2$ → (II) (red); (I) → $C_6H_{11}\cdot NPh\cdot CH_2\cdot CH_2\cdot OEt$ (reddish-orange). C. H.

[Manufacture of] monoazo dyes [for acetate silk]. H. Jordan and M. A. Dahlen, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,032,093, 25.2.36. Appl., 30.4.32).—An anilinesulphonamide or aminobenzamide is diazotised on the fibre and developed with a suitable coupling component. Examples are *p*-toluidine-*o*-sulphondimethylamide → resorcinol (yellow), β-$C_{10}H_7\cdot OH$ (yellowish-orange), or 2 : 3-hydroxynaphthoic acid (scarlet). C. H.

Manufacture of azo dyes [for acetate silk, resins, or wool]. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 461,965, 22.8.35).—*cyclo*Hexane-1 : 3-diones are coupled with nitro-diazo-components free from *o*-CO_2H, -CO_2R, -OH, -OR, and -OAc. Examples are: *o*-$NH_2\cdot C_6H_4\cdot NO_2$ → *cyclo*hexane-1 : 3-dione (I) (yellow on acetate silk); 3-nitro-*p*-toluidine → 5 : 5-dimethyl*cyclo*hexane-1 : 3-dione (yellow); 2 : 4-dinitroaniline → (I) (yellow pigment). C. H.

Manufacture of [chromable] azo dyes. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 461,884, 22.7.35).—A *cyclo*hexane-1 : 3-dione (5 : 6-dihydroresorcinol) is coupled with a diazotised arylamine carrying an *o*-NH_2, -CO_2H, -CO_2R, -OH, or -OR (R = alkyl), and if desired the dye is converted into a metal complex. Examples are: 4 : 6-dinitro-2-aminophenol → *cyclo*hexane-1 : 3-dione (I) (after-chromed, brown); 6-nitro-2-aminophenol-4-sulphonic acid → (I) (blue-red; after-chromed, brown); Bu^a anthranilate → 5 : 5-dimethyl*cyclo*hexane-1 : 3-dione (yellow for lacquers). C. H

Manufacture of [chromable] monoazo dyes. I. G. Farbenind. A.-G. (B.P. 458,417, 18.6.35. Ger., 20.6.34).—An anthranilic acid free from SO_3H is diazotised and coupled with a 3-alkylpyrazolone carrying in position 1 the group $\cdot Ar\cdot X\cdot Ar'$, where Ar and Ar′ = aryl, and X = O, CO, or $SO_2\cdot NH$. Examples are: 3 : 4 : 6-trichloroanthranilic acid → pyrazolone from *p*-aminobenzenesulphonic *p*-carboxyanilide (single-bath chrome, greenish-yellow); 3-chloroanthranilic acid (I) → corresponding *m*-carboxyanilide (chrome-yellow); (I) → 1-(4′-phenoxy-3′-carboxy)-3-methyl-5-pyrazolone (greenish-yellow). C. H.

Manufacture of monoazo dyes. I. G. Farbenind. A.-G. (B.P. 458,828, 28.6.35. Ger., 29.6.34. Addn. to B.P. 458,417; preceding).—Monoazo dyes suited for the one-bath chrome process are made from *o*-$NH_2\cdot C_6H_4\cdot OH$ or its non-sulphonated derivatives diazotised and coupled to a 3-alkylpyrazolone in which the $N_{(1)}$ is attached to a chain of two C_6H_6 nuclei free from SO_3H but containing CO_2H and linked by the bridge ·O·, ·CO·, or $\cdot SO_2\cdot NH_2\cdot$, *e.g.*, the dye 3 : 1 : 4 : 5-$NH_2\cdot C_6H_2Me(OH)\cdot NO_2$ → 1-4′-chloro-3′-(sulphonanthranilido)phenyl-3-methyl-5-pyrazolone (red by the metachrome process). K. H. S.

Manufacture of [chrome] azo dyes. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 457,525, 29.5.35).—An *o*-hydroxy- or *o*-carboxy-arylamine is diazotised and coupled with a maleic amino- or hydroxy-arylamide, and if desired the product is converted into a metal complex. Examples are: 4-chloro-2-aminophenol-6-sulphonic acid → maleic 6-hydroxy-β-naphthylamide (I) (after-chromed on wool, blue-black); 5-nitro-2-aminophenol → (I) (single-bath chrome, green-grey); 4-chloro-2-aminophenol → maleyl-J-acid (red; after-chromed, reddish-blue); 4-nitro-2-aminophenol-6-sulphonic acid → *m*-$C_6H_4(NH_2)_2$, + maleic anhydride (after-chromed, brown). C. H.

[Manufacture of] azo dyes [pigments and ice colours]. E. F. Hitch, M. A. Dahlen, and M. E. Friedrich, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,031,651, 25.2.36. Appl., 27.7.33).—A diazotised arylamine is coupled in substance or on the fibre with a 2 : 3-hydroxynaphthoic arylamide carrying in the aryl nucleus a CF_3 group. Examples are: 2 : 5-$C_6H_3Cl_2\cdot NH_2$ → *m*-trifluoromethylanilide (I) (orange); 4-nitro-*o*-anisidine → (I) (red). C. H.

Manufacture of azo dyes insoluble in water [pigments and ice colours]. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 460,782, 19.8.35).—A 5-alkylsulphonyl-*o*-aryloxyaniline is diazotised and coupled on a substratum or on the fibre with a 2 : 3-hydroxynaphthoic arylamide other than those carrying $\nless 2$ alkyl groups in the aryl group. Examples are: $NH_2{\cdot}C_6H_3(OPh){\cdot}SO_2Pr^a$, m.p. 125°, → 5-chloro-*o*-toluidide (yellowish-scarlet); $NH_2{\cdot}C_6H_3(OPh){\cdot}SO_2Bu^a$ → 4-chloro-2 : 5-dimethoxyanilide (red); $NH_2{\cdot}C_6H_3(O{\cdot}C_6H_4Cl\text{-}p){\cdot}SO_2Pr^a$ → β-naphthylamide (yellowish-scarlet). C. H.

Manufacture of azo dyes [pigments and ice colours]. A. G. Bloxam. From Soc. Chem. Ind. in Basle (B.P. 457,047, 30.5.35).—An aminoazo compound, carrying *ortho* to the NH_2 an alkoxyalkyl ether group, is diazotised and coupled with a hydroxycarboxylic arylamide, both being free from SO_3H and CO_2H. Examples are: 4-amino-3-β-methoxyethoxyazobenzene (I) → 2 : 3-hydroxynaphthoic anilide (bordeaux); (I) → *p*-chloroanilide on the fibre (garnet-red); 4′-chloro-4-amino-5-β-ethoxyethoxyazobenzene → 3-hydroxy-7 : 8-benzocarbazole-2-carboxylic *p*-anisidide (black). C. H.

Manufacture of (A) diazotising, (B) diazotisable, azo dyes. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 456,535 and 456,756, 14.5.35).—(A) 3 : 3′-Diaminodiphenylurea (I) is monodiazotised and coupled in alkaline medium with M-acid (II) or γ-acid (III) or a 1 : 8-aminonaphtholsulphonic acid (IV), which may already have been coupled acid with a diazo component; or 2 mols. of (I) may be coupled in AcOH with 1 mol. of (II), (III), or (IV). (B) (I) is tetrazotised and coupled in alkaline medium with 1 mol. of (II) or (III) and 1 mol. of J-acid, or with 2 mols. of (II) or (III). Examples are: (A) (I) → (III) [corinth; developed with 1 : 2 : 4-$C_6H_3Me(NH_2)_2$, violet-brown]; (I) → H-acid ← *p*-$NH_6{\cdot}C_6H_4{\cdot}NO_2$ (green; developed with $CH_2Ac{\cdot}CO_2Et$, green); (B) (I) → 2 mols. of (II) or (III) (bordeaux to violet; developed with β-$C_{10}H_7{\cdot}OH$, bordeaux to brown). C. H.

Manufacture of chromable] *o*-hydroxyazo dyes. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 459,949, 14.6.35).—An *o*-aminophenol is diazotised and coupled with J-acid carrying as *N*-substituent a hydrocarbon group, at least one SO_3H being present. Examples are: 4-nitro-*o*-aminophenol → phenyl-J-acid (I) (chrome black); 4-chloro-*o*-aminophenol-6-sulphonic acid (II) → (I) (chrome navy-blue); (II) → *cyclo*hexyl-J-acid (chrome black); 6-nitro-2-aminophenol-4-sulphonic acid → *m*-carboxyphenyl-J-acid (chrome reddish-blue). C. H.

Manufacture of [oil-soluble] azo dyes. I. G. Farbenind. A.-G. (B.P. 457,458, 27.5.35. Ger., 26.5.34).—A mixture of arylamines carrying a nuclear substituent ·CHMeR, where R is alkyl $>C_1$, is diazotised and coupled with a suitable component, both being free from NO_2 and H_2O-solubilising groups. The products are sol. in C_6H_6, linseed oil, BuOAc, etc. Examples are: mixed *o*-, *m*-, and *p*-amino-*sec*.-butylbenzenes (from nitration and reduction of PhBu) → 2 : 3-hydroxynaphthoic arylamide (I) (red); aminobutylbenzenes, b.p. 115—144°/14 mm. (II) (from C_6H_6 and Bu^aCl, nitrated and reduced), → (I) (red), or 1-phenyl-3-methyl-5-pyrazolone (yellow); (II) → 1 : 2 : 5-$NH_2{\cdot}C_6H_3(OMe)_2$ → β-$C_{10}H_7{\cdot}OH$ (blue-violet). C. H.

Manufacture of azo dyes. M. A. Dahlen and R. E. Etzelmiller, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,844, 28.7.36. Appl., 22.6.33).—Insol. azo dyes are made in substance or on the fibre from arylenediamines in which one NH_2 is substituted by a hydroaromatic carboxylic acid, *e.g.*, hexahydrobenzoic acid. Dyes claimed are
p-$NH_2{\cdot}C_6H_4{\cdot}NH{\cdot}CO{\cdot}C_6H_{11}$ →
2 : 3-$OH{\cdot}C_{10}H_6{\cdot}CO{\cdot}NH{\cdot}C_{10}H_7$-β (red),
2 : 5 : 1 : 4-$(OMe)_2C_6H_2(NH_2){\cdot}NH{\cdot}CO{\cdot}C_6H_{11}$ →
2 : 3-$OH{\cdot}C_{10}H_6{\cdot}CO{\cdot}NHPh$ (blue), and
2 : 1 : 4-$NH_2{\cdot}C_6H_3Me{\cdot}NH{\cdot}CO{\cdot}C_6H_{11}$ → diacetoacet-*o*-toluidide (yellow). K. H. S.

Manufacture of azo dyes. C. K. Black, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,286, 28.7.36. Appl., 30.3.33).—An azo dye is made by first coupling 1 mol. of diazotised aminosalicylic acid with *m*-$C_6H_4(OH)_2$ (I) and coupling the product with 1 mol. of diazotised 1 : 2 : 4 : 6-$OH{\cdot}C_6H_2(NH_2)(NO_2)_2$ (II). A similar dye is obtained by coupling 2 mols. of (II) with 1 mol. of (I). The dyes are suitable for dyeing leather in brown shades. K. H. S.

[Azo] compounds for dyeing and printing. E. A. Markush, M. S. Mayzner, and J. Miller, Assrs. to Pharma Chem. Corp. (U.S.P. 2,049,216, 28.7.36. Appl., 1.3.35).—Azo dyes are produced in substance or on the fibre from arylamides of 2 : 3-$OH{\cdot}C_{10}H_6{\cdot}CO_2H$, particularly that from *m*-$C_6H_4Cl{\cdot}NH_2$, and diazotised 2 : 5 : 1 : 4-$(OEt_2)C_6H_2(NH_2){\cdot}NH{\cdot}COPr^a$. Instead of $PrCO_2H$ as acylating agent there may be also used hexoic acid or a dibasic aliphatic acid having 4—6 C, *e.g.*, adipic acid condensed with 2 mols. of *p*-diamine. The diazo compounds may be used as such or as diazoimino-compounds with proline or sol. piperidine compounds, development being effected by acid scission. The dyes or pigments are of blue shades. K. H. S.

Manufacture of monoazo dyes of the pyrazolone series. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 467,602, 20.12.35).—γ-Halogeno-acetoacetic esters are condensed with sulphinic acids and converted by interaction with hydrazines into pyrazolones, which are coupled with diazo compounds so chosen that among the components at least one CO_2H or SO_3H is present. The examples include the dyes 1 : 3 : 2 : 5-$C_6H_2MeCl(NH_2){\cdot}SO_3H$ → 1-phenyl-3-methylsulphonylmethyl-5-pyrazolone (I), 2 : 8-$NH_2{\cdot}C_{10}H_6{\cdot}SO_3H$ → (I), 1 : 2 : 5-$NH_2{\cdot}C_6H_3Cl{\cdot}SO_3H$ → 1-phenyl-3-*p*-tolylsulphonylmethyl-5-pyrazolone (II) and 1 : 2 : 5-$CO_2H{\cdot}C_6H_3(NH_2){\cdot}SO_3H$ → (II). The dyes afford redder shades than those derived from known analogous dyes and the dyeings are even and have very good fastness to light. K. H. S.

Manufacture of disazo dyes [pigments and ice colours]. W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 458,370, 17.6.35).—A 2 : 6-dichloro-4-nitro-4′-amino-2′ : 5′-dialkoxyazobenzene is diazotised and coupled with a 2 : 3-hydroxynaphthoic arylamide, *e.g.*, anilide (blue-black), β-naphthylamide (blue-black), or *m*-nitroanilide (black). C. H.

Manufacture of asymmetrical disazo dyes. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 460,385, 23.10.35).—The diamine from NH_2Ph or *o*-$C_6H_4Me{\cdot}NH_2$ and a *cyclo*hexanone is tetrazotised and coupled with 1 mol. of G-acid and 1 mol. of

N.W.-acid (scarlet on wool or silk). (Cf. B.P. 335,893; B., 1931, 58.) C. H.

Manufacture of polyazo dyes [for leather]. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 456,768, 15.5. and 20.11.35).—The diazodisazo compound made by coupling an aminonaphtholsulphonic acid in either order with a tetrazodiphenyl (I) and a diazo compound is coupled with resorcinol and the product is coupled with 1 or 2 mols. of diazo compounds. Alternatively a suitable nitro- or acylamino-diazo compound may be used in place of (I), the NO_2 being subsequently reduced or the NHAc hydrolysed, and diazotised. Examples are: *p*-$NH_2\cdot C_6H_4\cdot SO_3H$ (alk.) → H-acid ← (acid) benzidine → resorcinol ← 2 mols. of *p*-$NH_2\cdot C_6H_4\cdot NO_2$; *p*-$NH_2\cdot C_6H_4\cdot NO_2$ (acid) → J-acid ← (alkaline) *p*-$NH_2\cdot C_6H_4\cdot SO_3H$, reduced, → resorcinol ← 1 mol. of 4-nitroaniline-2-sulphonic acid and 1 mol. of *p*-$NH_2\cdot C_6H_4\cdot NO_2$. The order in which the 2 mols. of diazo compounds are coupled with the trisazo dye considerably affects the shade of brown produced. C. H.

Manufacture of [black poly]azo dyes [for leather]. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 459,660, 8.7.35).—A tetrazotised 4 : 4′-diaminodiphenyl is coupled acid with 1 mol. of a 1 : 8-aminonaphtholsulphonic acid, and then in either order with a diazotised arylamine or aminoazo compound and with a 4-hydroxy- or 2 : 4-dihydroxyquinoline. Examples are: *o*-nitroaniline-4-sulphonic acid → H-acid ← benzidine → 2 : 4-dihydroxyquinoline (I) (greenish-black) or its 6- or 7-sulphonic acid (greenish-black); sulphanilic acid → H-acid ← mixed benzidine and tolidine → (I) (greenish-black). C. H.

Manufacture of polyazo dyes [for coppering]. Soc. Chem. Ind. in Basle (B.P. 460,378, 30.7.35. Switz., 30.7.34).—A product obtained by condensing cyanuric chloride successively with (*a*) an aminonaphthol, (*b*) an amino-*o*-hydroxycarboxylic acid, and, if desired, (*c*) NH_2R, ROH, or RSH, R being an org. group, is coupled with 1 or 2 mols. of the aminoazo compound: amino-*o*-hydroxycarboxylic acid → a 1 : 2-aminonaphthyl alkyl ether, *e.g.*, 5-aminosalicylic acid (I), or 4-amino-4′-hydroxyazobenzene-3′-carboxylic acid (II) → 2-methoxy-Cleve acid. In the examples (*a*), (*b*), and (*c*) are respectively: J-acid (III), (II), and NH_2Ph; H-acid (IV), 5-*p*-aminobenzamidosalicylic acid (V), and (V); (III), (V), and (II); (III), (III), and cresidine → salicylic acid; (IV), (II), and (II); 1 : 8 : 4 : 6-aminonaphtholdisulphonic acid (VI), (I), and no (*c*) (*i.e.*, Cl); (VI), (II), and NH_2Ph. The coppered shades are green to greenish-blue. C. H.

Manufacture of metalliferous azo dyes. Soc. Chem. Ind. in Basle (B.P. 460,561, 13.7.36. Switz., 12.7.35).—5 : 8-Dichloro- or -dibromo-α-naphthol (I) is coupled with a diazotised arylamine carrying a suitable chelate grouping, and the dye is converted into its metal complex. The example is (I) ← *o*-aminophenol-4 : 6-disulphonic acid (+ Cr, blue-violet on wool). C. H.

Manufacture of [metalliferous pigment] dyes. A. G. Bloxam. From Soc. Chem. Ind. in Basle (B.P. 460,725, 20.8.35).—A metal complex of an *o*-hydroxyazo dye free from SO_3H and CO_2H is treated with a basic dye containing no chelate grouping. Examples are: 4-nitro-*o*-aminophenol (I) → $CH_2Ac\cdot CO\cdot NHPh$ (II), + Co, with Rhodamine 6G extra (III) (orange pigment for lacquers); (I) → 1-phenyl-3-methylpyrazolone, + Co, with (III) (orange); (I) → (II), + Co, with Brilliant-glacier-blue (yellowish-green). C. H.

Manufacture of condensation products [dyes] of the diphenylamine series. I. G. Farbenind. A.-G. (B.P. 467,549, 27.11.36. Ger., 28.11.35).—1-Halogeno-2-nitrobenzene-4-alkylsulphones are condensed with primary amines of the C_6H_6 series. The products are useful for colouring lacquers and dyeing acetate cellulose silk and are distinguished from the known products obtained from 1 : 2 : 4-$C_6H_3Cl(NO_2)_2$ by better fastness to light. In the examples 2 : 1 : 4-$NO_2\cdot C_6H_3Cl\cdot SO_2Me$ affords on condensation with NH_2Ph *2-nitrodiphenylamine-4-methylsulphone*, m.p. 134—135° (yellow), with *p*-$OMe\cdot C_6H_4\cdot NH_2$ *4′-methoxy-2-nitrodiphenylamine-4-methylsulphone*, m.p. 174—175° (yellow). Similarly are obtained *2-nitrodiphenylamine-4-ethyl-*, m.p. 133° (yellow), and *-4-butyl-sulphone*, m.p. 105° (yellow), *4′-hydroxy-2-nitrodiphenylamine-4-ethylsulphone*, m.p. 177° (yellow-orange), and 2-nitro-4-methyldiphenylamine-4-propylsulphone (orange-yellow). K. H. S.

Manufacture of acid dyes of the anthraquinone series. I. G. Farbenind. A.-G. (B.P. 457,106, 20.5.35. Ger., 19.5.34. Addn. to B.P. 401,132; B., 1934, 55).—A 4-halogeno-1-aminoanthraquinone-2-sulphonic acid is condensed with an aminoaralkyl alkyl sulphone. The following are described: nitrobenzyl Me sulphones (*o*-, m.p. 121°; *m*-, 121°; *p*-, 171—172°); aminobenzyl Me sulphones (*o*-, m.p. 117—118°; *m*-, 126°; *p*-, 170°); nitrobenzyl Et sulphones (*o*-, m.p. 84—85°; *p*-, 133—134°); aminobenzyl Et sulphones (*o*, m.p. 113°; *m*-, 105°; *p*-, 113—115°); β-*p*-nitrophenylethyl Me sulphone, m.p. 142—143°, and the amine, m.p. 98—99°; 3-nitro- and 3-amino-6-methoxybenzyl Me sulphone, m.p. 110—111° and 102—103°, respectively. The condensation products give reddish-blue to blue shades on wool. C. H.

Manufacture of [acid] dyes and intermediate products of the anthraquinone series. W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 457,196, 18.4.35).—An α-halogenoanthraquinone, carrying one or two β-SO_2Cl groups, is condensed in one or more stages with a primary or *sec.* aliphatic or aromatic amine; the products are sulphonated, if necessary. Examples are: 1-bromoanthraquinone-2-sulphonyl chloride (I) with taurine or methyltaurine (II), then with *o*-$C_6H_4(NH_2)_2$ and Cu_2Cl_2 to replace the 1-Br (brown on wool); (I) with (II), then with *m*-$NH_2\cdot C_6H_4\cdot NMe_2$ (yellowish-green) or 2-aminodiphenylamine-2′-sulphonic acid (violet-brown; converted into azine with HCl, blue); (I) with $NH(C_2H_4\cdot OH)_2$; (I) with 5-sulpho-3-aminosalicylic acid, then with *o*-$C_6H_4(NH_2)_2$ (brown; after-chromed, green). C. H.

Manufacture of anthraquinone derivatives [wool dyes]. I. G. Farbenind. A.-G. (B.P. 461,998, 29.8.35. Ger., 29.8.34).—A thiolanthraquinone is condensed with a halogenoalkylsulphonic acid to give H_2O-sol. thioethers. Examples are: 1-thiolanthraquinone with $CH_2Cl\cdot CH_2\cdot SO_3H$ (I) in aq. NaOH–EtOH; 1-amino-4-*p*-toluidino-2-thiolanthraquinone with (I) (greenish-blue on wool); 2-chloro-1 : 4-diamino-3-thiolanthraquinone with (I) (bluish-violet); 1 : 4-diamino-2 : 3-dithiolanthraquinone with (I) (blue); 4 : 4′-diamino-3 : 3′-dithiol-1 : 1′-dianthraquinonylamine with (I) (grey). C. H.

Manufacture of acid wool dyes of the anthraquinone series. I. G. Farbenind. A.-G. (B.P. 462,693, 13.9.35. Ger., 14.9.34).—A 4-halogeno-1-aminoanthraquinone-2-sulphonic acid is condensed with a 3 : 4 : 5-trihalogenoaniline, *e.g.*, 3 : 4 : 5-$C_6H_2Cl_3\cdot NH_2$ (blue). C. H.

Manufacture of acid wool dyes of the anthraquinone series. I. G. Farbenind. A.-G. (B.P. 462,694, 13.9.35. Ger., 14.9.34).—A 4-halogeno-1-*cyclo*hexylaminoanthraquinone-6- or -7-sulphonic acid is condensed with an arylamine, *e.g.*, *p*-anisidine (green) or *p*-$NH_2\cdot C_6H_4\cdot NHAc$ (green). C. H.

Manufacture of 1 : 4 : 5-tribenzamido-8-hydroxyanthraquinone [vat dye]. Soc. Chem. Ind. in Basle (B.P. 459,770, 18.6.36. Switz., 19.6.35).—1 : 4 : 5-Triamino-8-hydroxyanthraquinone is tribenzoylated to give a blue vat dye; or the 4 : 5-dinitro-1-amino-compound is benzoylated, reduced, and dibenzoylated. C. H.

Manufacture of vat dyes of the anthraquinone series. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 457,055, 12.7.35).—The dyes of B.P. 389,961 (B., 1933, 583) give clearer shades faster to Cl_2 on halogenation. C. H.

Manufacture of dyes of the anthraquinone series. W. Dettwyler, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,042,423, 26.5.36. Appl., 23.9.35).—Impure dyes produced by fusion of 2-methylanthraquinone and its derivatives with S are freed from S by dissolution in hot (98%) H_2SO_4 (at 120—140°), cooling to $<100°$, filtering from the pptd. S, and pptg. the dye with H_2O (and re-oxidising if necessary). H. A. P.

Manufacture of vat dyes of the dibenzanthrone series. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 456,579, 7.5.35).—Mono- or di-amino-dihydroxydibenzanthrones, in which at least one NH_2 is *ortho* to OH, are converted into oxazoles by condensation with acids etc. or aldehydes in presence of acid agents. The $(NH_2)_2$-compound of B.P. 442,860 (B., 1936, 538) is thus condensed with Bz_2O (greenish-grey), Ac_2O (blue), or anthraquinone-2-carboxyl chloride (yellowish-green); the monoamine with Bz_2O (bluish-green; bluer on alkylation) or *m*-$NO_2\cdot C_6H_4\cdot COCl$ (alkylated, bluish-green). C. H.

Manufacture of vat dyes of the dibenzanthrone series. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 462,659, 6.8.35).—*Bz*-Tri- and -tetra-hydroxydibenzanthrones are alkylated or aralkylated.

Examples include: 1 : 2 : 2′-$(OH)_3$-compound with *p*-$C_6H_4Me\cdot SO_3Me$ (bluish-green); 1 : 1′ : 2 : 2′-$(OH)_4$-compound with *p*-$C_6H_4Me\cdot SO_3\cdot C_2H_4Cl$ (bluish-green). [Stat. ref.] C. H.

Manufacture of [vat] dyes of the indanthrone series. E. I. Du Pont de Nemours & Co. (B.P. 462,548, 10.9.35. U.S., 10.9.34).—The dyes are pptd. in finely-divided state from a vat at 15—35° in presence of a H_2O-sol. condensation product of epi- or di-chlorohydrin and NH_3 or a primary aliphatic amine. C. H.

Manufacture of vat dyes of the anthraquinone series. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 458,099, 12.6.35).—Anthraquinone-1 : 2-2′ : 3′-pyrid-6′-ones [7 : 8-benzo-2-quinolones], carrying in position 6 (*a*) halogen or NO_2, (*b*) NH_2 or NHR (R = alkyl), are condensed (*a*) with primary aromatic or heterocyclic amines, (*b*) with aromatic or heterocyclic halogen compounds; the dyes may be after-treated with $AlCl_3$ or other acid or alkaline condensing agents. Examples are: 6-chloroanthraquinone-1 : 2-pyridone (I) with benzidine (blue-green), 1-aminoanthraquinone (violet-grey; $+AlCl_3$, olive-grey); 6-aminoanthraquinone-1 : 2-pyridone with 3-bromobenzanthrone, +KOH–EtOH (brown). C. H.

Manufacture of vat dyes of the anthraquinone-[acridone] series. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 458,166, 13.6.35).—A 1-*o*-phenoxyanilinoanthraquinone-2-carboxylic acid or chloride is cyclised, *e.g.*, with BzCl in *o*-$C_6H_4Cl_2$, to give a 1-aryloxy-8 : 9-phthaloylacridone. Examples are: Me 1-chloroanthraquinone-2-carboxylate (I) with *o*-$NH_2\cdot C_6H_4\cdot OPh$, cyclised (violet); (I) with 5-chloro-2-aminodiphenyl ether, cyclised (bluish-violet); (I) with 2′-chloro-3′-bromo-2-amino-5′-methoxydiphenyl ether, cyclised (pink). C. H.

Manufacture of dyes. Soc. Chem. Ind. in Basle (B.P. 466,886, 4.11.35. Switz., 8.11.34 and 2.5.35).—1-Aminoanthraquinone and aminoazo compounds both containing at least one reactive NH_2 are combined with a cyanuric halide (I) or analogue thereof; at least one group imparting solubility in H_2O is present in one or both of the components. Further, the azo component may be formed from suitable compounds after the first condensation. Analogues of (I) are, *e.g.*, $COCl_2$, dichloroquinazoline, and tribromopyrimidine. Among examples (13), 4-amino-4′-hydroxy-1 : 1-azobenzene-3′-carboxylic acid (II) is condensed with (I), then with 1-amino-4-(3′-sulpho-4′-amino)anilidoanthraquinone-2-sulphonic acid (III), and then with NH_2Ph. Viscose is dyed yellowish-green of very good fastness to light, and by treatment on the fibre with Cu can be made fast to washing. Similarly (II) and (III) are condensed with 2 : 6-dichloro-4-methylpyrimidine, and 4-amino-1-hydroxyanthraquinone-5-sulphonic acid is condensed with (I) and then with the aminoazo dye 1 : 2 : 4-$OMe\cdot C_6H_3(NH_2)\cdot SO_3H \rightarrow$ 5 : 2 : 7-$OH\cdot C_{10}H_5(NH_2)\cdot SO_3H$ and then with NH_2Ph. Cotton and viscose are dyed in yellowish-red shades. K. H. S.

Manufacture of dyes of the anthracene series. W. W. Groves. From I. G. Farbenind. A.-G. (B.P.

467,650, 24.12.35).—Aceanthrenone (I) is condensed in alkaline solution with an isatin and the product heated with a caustic alkali. The products (constitution not yet known) are substantive dyes for vegetable fibres. In the examples, (I) (22) and isatin (16) are mixed in EtOH (600) and the whole is boiled with aq. NaOH (*d* 1·5, 60 pts.) for 24 hr.; the product (II) is isolated as a red-brown powder by diluting with H_2O and acidifying. (II) (15) is heated with KOH (150) and EtOH (120 pts.) at 110—120° rising to 150—160° and finally to 180—200°. The product separates from the melt as a green mass and is purified by dissolving in H_2O. Cotton and viscose silk are dyed in very clear green shades. Similar dyes are obtained from 5 : 7-dichloro- and 6-methyl-isatin.

K. H. S.

Manufacture of vat dyes of the anthraquinone series. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 467,157, 6.12.35).—A 4 : 5-anthraceno- or anthraquinono-2 : 1 : 3-triazole has a cyclic radical R having one or two isocyclic non-hydrogenated rings attached to position 2. R carries either: (*a*) a reactive halogen, which may be part of a carboxyl halide group or a NO_2-group capable of reacting with an NH_2-derivative of a compound capable of being vatted; (*b*) an NH_2 which can react with a halogen or NO_2-derivative of a compound capable of being vatted. Dyes made from anthracenotriazoles are oxidised to the anthraquinone derivatives. Radicals capable of being vatted include anthraquinone, anthrapyrimidines and -pyridines, pyrazolanthrones, dibenzanthrones, azabenzanthrones, etc. Among examples, 1-(4'-*nitrobenzene*)*azo-2-aminoanthracene*, m.p. 240°, is converted (CrO_3) into *4'-nitrophenyltriazoloanthraquinone*, m.p. 325°, and reduced to the 4'-NH_2-compound (I), m.p. 356°. (I) is condensed with, *e.g.*, anthraquinone-2-carboxyl chloride (yellow on cotton; violet vat), 1-aminoanthraquinone-2-carboxyl chloride (red on cotton; violet vat), 1-chloroanthraquinone (bordeaux on cotton; red vat), or 2-bromo-1-cyanoanthraquinone (brown on cotton; red vat). Similarly 1-(3'-*nitrobenzene*)*azo-2-aminoanthracene*, m.p. 250—251°, is oxidised to *3'-nitrophenyltriazoloanthraquinone*, m.p. 304°, and this is reduced to the 3'-NH_2-compound, m.p. 299°, which affords yellow to brown dyes on condensation as above. 1-(4'-*Carboxybenzene*)*azo-2-aminoanthracene*, m.p. 280—283°, affords *phenyltriazoloanthraquinone-4'-carboxylic acid*, m.p. above 360°, converted (PCl_5) into the *acid chloride*, which is condensed with amines, *e.g.*, 1 : 4-diaminoanthraquinone (brown on cotton; blue vat) or 4-amino-1 : 9-anthrapyrimidine (yellow on cotton; blue vat). Similarly 4-chlorophenyltriazoloanthraquinone is made and condensed with amines, *e.g.*, 1-aminoanthraquinone (bordeaux on cotton; red vat), 2-amino-1 : 9-anthrapyrimidine (red on cotton; red-violet vat), or amino-4 : 5 : 8 : 9-dibenzpyrene-3 : 10-quinone (brownish-grey on cotton; red-violet vat).

K. H. S.

Manufacture of anthraquinone derivatives. A. G. Bloxam. From Soc. Chem. Ind. in Basle (B.P. 467,183, 11.12.35).—Amino*iso*thiazolanthrones or aminoanthradi*iso*thiazoles are acylated with an anthraquinonecarboxylic acid not having a group containing N in the ring which does not contain the CO_2H. In examples, 5-amino-1 : 9-*iso*thiazolanthrone (I) (5) dissolved in $PhNO_2$ (200) is heated at 175° for ½ hr. with anthraquinone-2-carboxyl chloride (II) (5·7 pts.); the *product*, m.p. 375°, dyes cotton yellow from a dark brown vat. A *product* of m.p. 385° is obtained if the 1-carboxyl chloride is used. Similarly, (I) is condensed with 1-chloro-, 1-amino- (*product*, m.p. 371°; red on cotton), and 1-benzamidoanthraquinone-2-carboxyl chloride. Further, (II) is condensed with 4 : 8-diamino-1 : 9 : 5 : 10-anthradi*iso*thiazole (brown-yellow on cotton) and also with 4-amino-1 : 9-*iso*thiazolanthrone affording a *product*, m.p. 400°.

K. H. S.

Manufacture of vat dyes and intermediates. A. G. Bloxam. From Soc. Chem. Ind. in Basle (B.P. 466,968, 13.2.36).—Diphthaloylpyrenes are made by condensing $\nless$2·5 mols. of *o*-$C_6H_4(CO)_2O$ (I) with 1 mol. of pyrene (II) in a single stage. The products may be subsequently halogenated. In the examples, (I) (45) and (II) (20·2) are added to $AlCl_3$ (315), KCl (65), and NaCl (45 pts.) at 112—117° and heated 6·5 hr. at 140—145°; the product, a *diphthaloylpyrene* (III), m.p. 442—445°, dyes cotton reddish-yellow from a violet-black vat. Further, (III) is treated with SO_2Cl_2 in $PhNO_2$ for 20 hr. at 62—66° or with Br for 15 hr. at 92—96°; cotton is dyed yellow or yellow-brown from a violet vat.

K. H. S.

Manufacture of indigoid dyes of the pyrene series and of intermediates therefor. I. G. Farbenind. A.-G. (B.P. 459,891, 18.7.35. Ger., 18.7.34).—3-Cyanopyrene-4-sulphonyl chloride, m.p. 267—268°, is converted by way of the mercaptan and the thioglycollic acid into the thioindoxyl (I) and the thioindigo (dark blue vat dye). The anils (II) formed from (I) by condensation with aromatic NO-compounds give the thioisatin (III) on hydrolysis. (I), (II), and (III) undergo the usual condensations to give indigoid dyes, which are improved by halogenation; *e.g.*, the *O*-acetate of (I) with 5 : 7-dichloroisatin (bordeaux), (I) with 5 : 7-dichloroisatin chloride (navy-blue), or with 5 : 7-dichlorothioisatin *p*-dimethylaminoanil (bluish-violet), or with acenaphthenequinone (bordeaux).

C. H.

Manufacture of indigoid dyes. A. G. Bloxam. From Soc. Chem. Ind. in Basle (B.P. 460,384, 22.10.35 and 26.2.36).—A 4-halogeno- and/or 4 : 5-dihalogeno-7-alkoxyisatin α-chloride or anil is condensed with an α-$C_{10}H_7$·OH, and, if desired, halogenated, or the products obtained separately from the 4-halogeno- and 4 : 5-dihalogeno-compounds are mixed, and, if desired, halogenated. Examples are: the α-chloride of 4 : 5-dichloro-7-methoxyisatin, m.p. 272—274°, with 4 : 1-$C_{10}H_6$Cl·OH (I) (blue), or with α-$C_{10}H_7$·OH, dichlorinated (blue); the α-chloride of 4-chloro-5-bromo-7-methoxyisatin, m.p. 272°, with (I) (greenish-blue); the α-chloride of chlorinated 4-chloro-7-methoxyisatin, m.p. 265—268°, with (I) (blue).

C. H.

Manufacture of indigoid dyes. Soc. Chem. Ind. in Basle (B.P. 460,627, 15.7.36. Switz., 15.7.35).—The product from an isatin α-chloride or anil and a 5-alkoxy-α-naphthol is halogenated, with or without isolation, preferably in a diluent, *e.g.*, C_6H_6, $PhNO_2$, $C_2H_2Cl_4$, or AcOH. Examples are: 5-chloro-7-methylisatin α-chloride with 1:5-$OH{\cdot}C_{10}H_6{\cdot}OMe$ (I), $+SO_2Cl_2$ (blue); 5-bromo-4:7-dimethylisatin α-chloride with (I), + SO_2Cl_2 and $SbCl_5$ (greenish-blue). C. H.

Manufacture of indigoid vat dyes. A. G. Bloxam. From Soc. Chem. Ind. in Basle (B.P. 467,447, 21.12.35).—Vat dyes are made by condensing 2-oxythionaphthenes (or their reactive 1-derivatives) which have alkyl groups at 3:6 and one or two halogens at 4:5 with indigoid dye components, *e.g.*, isatin, indoxyl, acenaphthenequinone. In the synthesis 2:5:1-$C_6H_3Me_2{\cdot}SO_2Cl$ is chlorinated to 2-*chloro*-p-*xylene*-6-*sulphonyl chloride*, b.p. 130—133°/4 mm., which is reduced and converted into 3-*chloro*-2:5-*dimethylphenylthioglycollic acid* (I), m.p. 119—120°, and is further chlorinated to the 3:4-Cl_2-compound, m.p. 110—111°, which is ring-closed to 4:5-*dichloro*-3:6-*dimethyl*-3-*oxythionaphthene*, m.p. 227—228° (II). Ring-closure of (I) affords 5-*chloro*-3:6-*dimethyl*-2-*oxythionaphthene*, m.p. 115° (III). Among examples, (II) (247) is condensed with the 2-(*p*-dimethylamino)anil of 6-chloro-4-methyl-3-oxythionaphthene (330·5) in boiling C_6H_6 (4000 pts.); cotton is dyed from a yellow vat in vivid rose shades of very good fastness to washing, Cl_2, and kier-boiling. Similarly cotton is dyed blue-violet from a yellow vat by the condensation product of (III) with 5:7-dibromoisatin chloride. K. H. S.

Manufacture of black sulphur dyes. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 462,561, 6.11.35).—A mixture of (*a*) a *p*-hydroxyphenylnaphthylamine, which may carry halogen or CO_2H in the Ph group, (*b*) an indophenol or leucoindophenol derived from an amine of the C_6H_6, $C_{10}H_8$, or carbazole series, and preferably also (*c*) an aromatic NO_2- or NH_2-compound carrying OH or further NO_2 or NH_2, is thionated with alkali polysulphide. Examples are: *p*-$OH{\cdot}C_6H_4{\cdot}NH{\cdot}C_{10}H_7$-β (I), 3-*p*-hydroxyanilinocarbazole (II), and *p*-$NH_2{\cdot}C_6H_4{\cdot}NO_2$ with Na_2S_5 in Pr^aOH with later addition of $NaNO_2$; 5-β-naphthylaminosalicylic acid, (II), and 1:2:4-$C_6H_3Me(NH_2)_2$; (I) and indophenol from $NHPh_2$ and *p*-$NH_2{\cdot}C_6H_4{\cdot}NO$. C. H.

Manufacture of polymethine dyes [for acetate silk]. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 458,405, 13.6.35).—Compounds with reactive Me or CH_2 groups are condensed with an aminoaldehyde, $NRR'{\cdot}Ar{\cdot}CHO$, in which R = halogeno- or hydroxy-alkyl, R′ = H, alkyl, halogeno-, hydroxy-, or alkoxy-alkyl, aralkyl, or aryl, or R may be alkyl and R′ aryl. Examples are: $C_2H_4Cl{\cdot}NBu^a{\cdot}C_6H_4{\cdot}CHO$-*p* with $CN{\cdot}CH_2{\cdot}CO_2Et$ (I) (greenish-yellow dye, m.p. 111—113°, for acetate silk); $C_2H_4Cl{\cdot}NMe{\cdot}C_6H_4{\cdot}CHO$-*p* (II) with (I) (greenish-yellow, m.p. 108°); $N(C_2H_4Cl)_2{\cdot}C_6H_4{\cdot}CHO$-*p* (III) with (I) (m.p. 171°); 4:4′-$EtO{\cdot}C_6H_4{\cdot}NMe{\cdot}C_6H_4{\cdot}CHO$ (IV) with (I) (orange-yellow, m.p. 90—91°) or $CH_2(CN)_2$ (orange, m.p. 107—109°); $OH{\cdot}C_2H_4{\cdot}NMe{\cdot}C_6H_4{\cdot}CHO$-*p* with (I) (greenish-yellow, m.p. 93°); $N(C_2H_4Cl)(C_2H_4{\cdot}OH){\cdot}C_6H_4{\cdot}CHO$-*p* with (I) (greenish-yellow, m.p. 136—137°); (II) with 1-phenyl-3-methyl-5-pyrazolone (orange, m.p. 154°); (III) with 2-methylene-1:3:3-trimethylindoline (phosphotungstic acid lake, bluish-red); (III) with thioindoxyl (orange, m.p. 214°); (IV) with 2-methylene-3:3-dimethyl-1-ethyl-α-naphthindoline (violet). C. H.

Manufacture of dyes, and sensitising of photographic silver halide emulsions. Gevaert Photo Producten N.V. (B.P. 457,450, 24.5.35. Austria, 21.7.34).—A quaternary alkyl salt of 2:5-dimethylthia-, -oxa-, or -selena-diazole is condensed (*a*) with an ortho-ester, a diarylformamidine, $OEt{\cdot}CH{:}CH{\cdot}CH(OEt)_2$, or $NPh{:}CH{\cdot}CH{:}CH{\cdot}CH_2{\cdot}CH{:}NPh,2HCl$; or (*b*) with an alkylquinolinium iodide, or with a diarylformamidine followed by an alkylquinaldinium iodide; or (*c*) with a *p*-dialkylaminobenzaldehyde. Examples are: 2:5-dimethylthiadiazole ethiodide (I) with $\frac{1}{3}$ mol. of $CH(OEt)_3$ (sensitises to 680 mμ, max. at 590 mμ); (I) with quinoline ethiodide (max., 500 mμ); (I) with diphenylformamidine, then with quinaldine ethiodide (sensitises to 660 mμ). [Stat. ref.] C. H.

Manufacture of pigment dyes [phthalocyanines]. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 459,780, 11.6.35).—The *o*-$C_6H_4(CN)_2$ (etc.) (I) is heated with a suitable metal compound in a C_5H_5N or quinoline base diluted with a larger proportion of another diluent. The metal compound is first converted into its C_5H_5N or quinoline complex, the $C_6H_4(CN)_2$ in $PhNO_2$, PhOH, $C_6H_3Cl_3$, etc. is added, and the mixture is heated. C. H.

Manufacture of [phthalocyanine] colour lakes. J. Y. Johnson and A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 460,147, 16. and 23.7. and 23.9.35. Addn. to B.P. 457,796; B., 1937, 264).—A phthalocyaninesulphonic acid in aq. solution is treated in substance or on cellulose fibre with an org. base or basic dye. Examples are: sulphonated Cu phthalocyanine (I) with *cyclo*hexylamine (bluish-green), $C_{12}H_{25}{\cdot}NH_2$, Rhodulin-blue 6 G or Brilliant-green extra (bluish-green); cotton padded with (I), rinsed, and treated with aq. Methylene-blue BB (blue). C. H.

Improvement of properties of phthalocyanine dyes. Coutts & Co., and F. Johnson. From I. G. Farbenind. A.-G. (B.P. 460,152, 23.7.35. Cf. B.P. 454,858; B., 1936, 1198).—Phthalocyanines are used as substrata for the pptn. of vat dyes by oxidation of leuco-compounds, of azo pigments by coupling suitable components, and of lakes. Examples are: diazotised 1:4:2-$NH_2{\cdot}C_6H_3Cl{\cdot}NO_2$ coupled with acetoacetic *o*-chloroanilide in presence of Cu phthalocyanine (I) and the product from $C_{18}H_{37}{\cdot}OH$ and $(CH_2)_2O$ (green); 2-chloro-*p*-toluidine-5-sulphonic acid → 2:3-hydroxynaphthoic acid, mixed with (I) and laked with $CaCl_2$ (violet). C. H.

Manufacture of pigment dyes [phthalocyanines]. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 457,526, 29.5. and 28.8.35).—An aromatic *o*-dinitrile, or a compound yielding the dinitrile under reaction conditions, is heated with an acid amide (except amides of *o*-dicarboxylic or *o*-cyanocarboxylic acids), and, if desired, a substance supplying metal. Examples are blue pigments from *o*-$C_6H_4(CN)_2$ with $HCO{\cdot}NH_2$, NH_2Ac, $HCO{\cdot}NH_2 + Cu_2Cl_2$ or Zn dust, *o*-$C_6H_4Me{\cdot}SO_2{\cdot}NH_2 + NiCO_3$, $CO(NH_2)_2 + Ca_2Cl_2$. C. H.

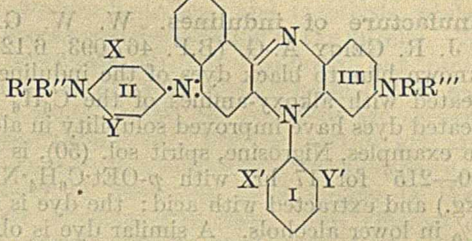
Manufacture of colouring matters [phthalocyanines] from *o*-arylene dicyanides. A. R. Lowe, and Imperial Chem. Industries, Ltd. (B.P. 460,594, 31.7.35).—An *o*-arylene dicyanide of the C_6H_6 or $C_{10}H_8$ series is heated with a little ethanolamine; *e.g.*, *o*-$C_6H_4(CN)_2$ with 0·13 pt. of $N(C_2H_4{\cdot}OH)_3$ (I), b.p. >206°/14 mm., or 1 : 2-$C_{10}H_6(CN)_2$ with 0·02 pt. of (I), or 4 : 5-dichlorophthalodinitrile with 0·01 pt. of (I). C. H.

Manufacture of [phthalocyanine] colouring matters. M. Wyler, and Imperial Chem. Industries, Ltd. (B.P. 464,126, 10.7., 6.11., and 25.11.35).—Metal phthalocyanines are produced by heating *o*-$C_6H_4(CO_2H)_2$ or its substituted derivatives or their anhydrides, H esters, amides, imides, or NH_4 salts, or *o*-$CN{\cdot}C_6H_4{\cdot}CO_2H$, its NH_4 salts, or ester, with urea or a product of thermal decomp. thereof (except NH_3) and a metal or metal compound at 200—300° (220—240°). $NH_2{\cdot}SO_3H$, $NH(SO_3H)_2$, and $N(SO_3H)_3$ may optionally be added. *E.g.*, Cu phthalocyanine is produced by heating *o*-$C_6H_4(CO)_2O$ (18 pts.), urea (18 pts.), and $CuCl_2$ (4 pts.) at 200—220° for 1 hr. H. A. P.

Manufacture of colouring matters [phthalocyanines]. M. Wyler, and Imperial Chem. Industries, Ltd. (B.P. 464,673, 8.7.36. Addn. to B.P. 464,126; preceding).—In the manufacture of metallic phthalocyanines by melting together *o*-$C_6H_4(CO)_2O$ (I) or 1 : 2-$CN{\cdot}C_6H_4{\cdot}CO_2H$, or certain derivatives of either, with urea the yield is improved by adding H_3BO_3 in small amounts. In one example urea (130) and H_3BO_3 (5) are melted together and heated to 150°, and (I) (100) and $CuCl_2$ (20) are added; after baking at 200° the melt is worked up and provides Cu phthalocyanine (65 pts.). A green powder is obtained if 1 : 2 : 3- or 1 : 2 : 4-$C_6H_3(CO_2H)_3$ is used instead of (I). K. H. S.

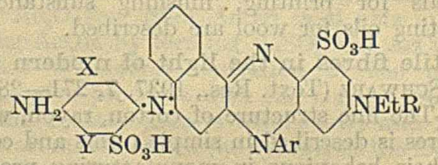
Manufacture of phthalocyanines. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 468,043, 31.12.35).—Greenish-blue to bluish-green phthalocyanines are prepared by heating aroylphthalonitriles (or compounds capable of conversion into them), preferably in presence of metals (*e.g.*, Cu, Ni, Co, Fe, Sn) or their salts, and sometimes with a liquid diluent. They are fast pigment dyes which can be pasted from H_2SO_4, by dissolution followed by pptn. with H_2O, without change of shade. They may be sulphonated and the sulphonic acids converted into alkaline-earth salts. Examples describe the prep. of *dyes* from 3 : 4-dicyanobenzoquinone and its 4′-Cl-, 4′-Me, and 4′-Ph derivatives and 3 : 4-$C_6H_3(CN)_2{\cdot}CO{\cdot}C_{10}H_7$-α and -β. F. M. H.

Manufacture of acid wool dyes [of the phenosafranine series]. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 457,448, 27.4.35).—A naphthophenosafranine dye



in which R = alkyl, R′ and/or R″ = H, alkyl, or hydroaryl, R‴ = alkyl or hydroaryl, and (I) and (III) may carry neutral substituents, is sulphonated in rings (I) and (II), and, if desired, where R′ or R″ = H the product is alkylated, aralkylated, or acylated. In examples, X = X′ = Y = Y′ = Me, R = R‴ = Et, R′ = R″ = H (sulphonated and benzylated, blue); X = X′ = Y′ = Me, Y = H, R = R‴ = Et, R′ = H, R″ = Et (sulphonated, greenish-blue); X = X′ = Y′ = Me, Y = H, R = R‴ = Bu^a, R′ = R″ = H (sulphonated and benzylated, blue). C. H.

Manufacture of safranine dyes. I. G. Farbenind. A.-G. (B.P. 461,267, 14.8.35. Addn. to B.P. 431,708; B., 1936, 12).—The dyes of the prior patent are aralkylated; if the dye carries alkyl in any of positions 11—15, the naphthophenazine system must contain SO_3H. Examples are the benzylation of naphthophenazine dyes



in which R = Et, X = Y = Me, Ar = Ph (greenish-blue); R = Ph, X = Y = Me, Ar = *o*-C_6H_4Me (greenish-blue); R = CH_2Ph, X = Y = Me, Ar = Ph (blue); R = Et, X = Me, Y = H, Ar = 2-*m*-xylyl (blue); R = Et, X = Y = Cl, Ar = Ph (greenish-blue). C. H.

Manufacture of indulines. W. W. Groves. From J. R. Geigy A.-G. (B.P. 467,085, 11.11.35).—Alkoxy-substituted primary amines of the C_6H_6 or $NHPh_2$ series or components from which the latter can be formed are used in place of NH_2Ph in the induline melt. Further, instead of $PhNO_2$ as an oxidising agent mono- or poly-nitroalkoxydiphenylamines are used in conjunction with alkoxyanilines. The shade and yield of dye are also controlled by adding to the melt salts of Co, Ni, Sn, Cd, Hg, Sb, Sr, Fe, Cu, Cr, or Al. The dyes have improved solubility in solvents and cellulose ester lacquers and are fast to sublimation, oils, and light. Among examples (11), *o*-$C_6H_4Cl{\cdot}NO_2$ (40), $FeCl_3$ (3), and *p*-$OEt{\cdot}C_6H_4{\cdot}NH_2$ (I) (125 kg.) are heated at 190—195° for 18 hr. and the melt is extracted with acid; the dye dissolves in EtOH or $OH{\cdot}CHMe{\cdot}CO_2Et$ in the ratio 1 : 9 without residue or deposition on keeping and colours cellulose ester lacquer greenish blue-grey to black. A similar dye is obtained by heating

o-NO_2·C_6H_4·NH_2 (52), p-OEt·C_6H_4·NH_2,HCl (52), (I) (110), $Cu(OAc)_2$ (1·5), and $Fe(OAc)_3$ (1·5 kg.) at 180—185° for 18 hr. K. H. S.

Manufacture of indulines. W. W. Groves. From J. R. Geigy A.-G. (B.P. 467,093, 6.12.35).—The known blue to black dyes of the induline series are heated with alkoxy-amines of the C_6H_6 series; the treated dyes have improved solubility in alcohols. In the examples, Nigrosine, spirit sol. (50), is heated at 210—215° for 17 hr. with p-OEt·C_6H_4·NH_2 (I) (180 kg.) and extracted with acid; the dye is sol. up to 10% in lower alcohols. A similar dye is obtained from Induline, spirit sol. (30), and (I) (100 kg.) when heated at 145° for 15 hr. K. H. S.

Manufacture of dye compositions [for colouring organic solvents, lacquers, or waxes]. J. Y. Johnson. From I. G. Farbenind. A.-G. (B.P. 459,797, 12.7.35).—The dyes are mixed with highly chlorinated diphenyls (>40% Cl). C. H.

Azo dyes. Anthraquinone dyes. Compounds [dyes] of the 1 : 9-anthrathiophen series.—See III. **Azo dyes on the fibre. Dye compositions. Colouring compositions. Dye printing pastes.**—See VI.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Recent textile problems. E. Franz (Angew. Chem., 1937, 50, 467—473).—Recent developments in synthetic fibres, synthetic washing agents, thickening materials for printing, finishing substances, and lubricating oils for wool are described. A. G.

Textile fibres in the light of modern science. E. R. Schwarz (Text. Res., 1937, 7, 271—287, 310—326).—The fine structure of cotton, rayon, wool, and silk fibres is described in simple terms and correlated with their behaviour in manufacturing processes. A. J. H.

Optics and the textile industry. E. R. Schwarz (J. Opt. Soc. Amer., 1937, 27, 44—50).—A review. H. J. E.

Testing [strength of cotton] yarns. A. G. Scroggie and M. Castricum (Text. Res., 1937, 7, 211—212). A. J. H.

Purification of retting water. D. Carbone (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 456—461).—Waters from retting linseed and broom are purified by dilution and irrigation. The odour, which is not destroyed, is absorbed to some extent by pptd. $CaCO_3$, and almost completely by SO_2 and active Cl (NaOCl). Such waters contain no NO_2' or NO_3' but abundant NH_3, which has no action on deodorising reagents. W. L. D.

Spontaneous fibrous urticacea from Ethiopia. E. Debenedetti and F. Pancirolli (Boll. Staz. Sperim. Ind. Carta Fibre Tess., 1937, 32, 178—184).—The plant, which is probably *Urtica simensis*, Hochstetter, and very similar to ramie, is described. The fibre extracted from it is compared with ramie fibre. O. J. W.

Wool [structure]. R. Haller (Textilber., 1937, 18, 5—6).—The influence of fibre structure on the chemical and dyeing properties of wool is discussed with reference to the protective action of the epithelial scales as shown in the Pauly and Sieber staining tests for damaged wool. Night Blue (I) and Cotton Red 10B (II) form similar highly colloidal aq. solutions, but (I) stains normal wool deeply and (II) only if the wool is partly de-scaled. Chlorination of wool (1% Cl, on wt. of wool) much assists its disintegration when steeped in conc. aq. NH_3 (cf. B., 1937, 586). A more rapid disintegration method consists in steeping the wool overnight in a 0·5% aq. solution of a pancreas enzyme prep. (Ferment A.-G. of Basle). A. J. H.

Action of light on wool. I. Titration curves of intact and exposed wools. P. R. McMahon and J. B. Speakman (Trans. Faraday Soc., 1937, 33, 844—849).—The acid titration curves of root wool (not exposed to light) and of tip wool (exposed to light) are practically identical, but the alkali titration curves differ considerably. Under the influence of light and air the ·S·S· linkings are hydrolysed to ·SH groups which react with NaOH, whilst the main peptide chains are not hydrolysed. The data show that wool combines with little alkali below p_H 10. C. R. H.

Reactivity of the sulphur linkage in animal fibres. IV. Formation of ·CH:N· linkages in setting processes. J. B. Speakman and J. L. Stoves (J. Soc. Dyers and Col., 1937, 53, 236—242; cf. B., 1937, 24).—The possibility of the formation between the peptide chains, during permanent setting, of ·CH:N· linkings (by decomp. of R·S·OH groups formed by hydrolysis of the S·S linking, to aldehydes and subsequent condensation with basic side-chains) instead of ·S·NH· linkings (cf. A., 1936, 1396), has been examined. Comparison is made of the amounts of set persisting in fibres set with 2% borax (p_H 9·2), 1% $Na_2S_2O_5$, and 0·1M-Na_2SO_3 solutions and then boiled with (*a*) 5% aq. $NaHSO_3$ (I), and (*b*) 0·1N-HCl followed by (I). In every case the no. of linkings stable to the HCl and $NaHSO_3$ treatments indicates that the main reaction occurring during setting is the formation of ·S·NH· linkings. However, when the setting agent is alkaline, side reactions do give rise to ·CH:N· linkings and this is greatest with fibres set at low extension in aq. borax. R. J. W. R.

State of sulphur in oxidised wool. M. Harris and A. L. Smith (J. Res. Nat. Bur. Stand., 1937, 18, 623—628).—Under conditions necessary for the hydrolysis of proteins, part of the disulphoxide groups present in oxidised wool revert to the disulphide, resulting in exalted vals. for the cystine (I) content of wool, as determined by Lavine's method (cf. A., 1936, 596). Colorimetric determination of (I) by treatment with β-naphthoquinone-4-sulphonate is accurate to ±0·2% at 23—24°. F. N. W.

Unshrinkable wool in knitted goods. A. J. Hall (Hosiery Times, 1937, 11, No. 99, 22, 25).—The practical application of the "Dri-sol" unshrinkable wool process (SO_2Cl_2 is used instead of Cl_2) to yarns and knitted garments is described. A. J. H.

Cocoon thread from silkworms reared under dry and wet conditions. T. Nakahama and S. Nishimura (J. Agric. Chem. Soc. Japan, 1937, 13, 400—409).—When mature silkworms were kept at 26·6—28·3° in atm. of R.H. 64% and 90% respectively no difference was observed in size and wt. of cocoons, proportion of silk layers to total wt. of cocoon, and depth and lustre of silk layer. The conversion of cocoons into thread under "dry" conditions was > that under "wet" conditions. Determinations of sericin-*B*, pptd. at p_H 4·1, and sericin-*A*, pptd. by EtOH after removal of -*B*, showed that more -*B* was produced in each cocoon layer under "wet" conditions. No sex difference was observed between the amounts of -*A* and -*B*. J. N. A.

Acetate silk. W. COLTOF (Diss., Delft, 1934, 363 pp.).—The velocity of hydration of Ac_2O in AcOH (H_2SO_4 catalyst) increases rapidly with the concn. of catalyst. It is more rapid in mixtures rich in Ac_2O than in those containing relatively large amounts of H_2O and the reaction is irreversible. Acetylsulphuric acids are also formed in Ac_2O–AcOH mixtures and the kinetics of this reaction are discussed. Cellulose is unchanged by either AcOH or Ac_2O–AcOH mixtures even after pretreatment with H_2SO_4 in AcOH below 150°; above this temp. profound decomp. takes place but no acetylation. It does not absorb H_2SO_4 from either H_2O or 100% AcOH solutions, but from technical AcOH containing small amounts of H_2O, both H_2O and H_2SO_4 are rapidly absorbed at 20°, the max. absorption (3% H_2SO_4) being observed after 1 hr. Meanwhile the Cu no. gradually increases, due to progressive hydrolysis. For complete and rapid acetylation and the production of a uniform product it is necessary to obtain uniform distribution of the catalyst and to regulate the temp. between carefully controlled limits by cooling. Provided these requirements are fulfilled it is immaterial in which order the reagents are mixed. The quality of the cellulosic starting material is a most important factor in determining the result of acetylation; in this connexion, sulphite-cellulose is generally unsatisfactory, and the purest forms of cellulose give the best results. Hydrocelluloses acetylate much more readily than does cellulose, the reaction is much more difficult to control, and the primary acetates undergo hydrolysis much more readily with the formation of products less sol. or insol. in $COMe_2$ or $CHCl_3$. Regenerated and imperfectly hydrolysed celluloses, owing to their colloid chemical peculiarities, are unsuitable for acetylation and react only with great difficulty. Cellulose with a high Cu no. is unsuitable, the degree of association being low; the reaction is unusually violent, whilst impure cellulose acetylates either not at all or very irregularly. The most satisfactory material is a natural cellulose with a low Cu no. and a high degree of association; the latter can be checked conveniently by means of the η of a solution in CuO–NH_3. Experiments on the effects of varying the amounts of reagents show that H_2SO_4 acts purely as a catalyst, combining with both cellulose and Ac_2O prior to acetylation. Once the catalyst has combined with the micelle, the latter swells, all the OH groups are activated and rapidly acetylated, and finally the H_2SO_4, which is combined as a monosulphate ester, is gradually replaced by Ac. The amount of free H_2SO_4 in the medium gradually increases with time, whilst at one stage during acetylation the product is completely sol. in H_2O. During coagulation with H_2O both free and combined H_2SO_4 catalyse hydrolysis and acetolysis, whilst free H_2SO_4 accelerates degradation of the micelle. Higher temp. accelerate all the reactions, but especially degradation (acetolysis) of the micelle. With reduced ratios of Ac_2O : AcOH the reactions are slower, and less degradation occurs, but the mixture gels and the fibre structure is insufficiently broken down. The proportions of reactants, good mixing (a Werner–Pfleiderer machine was used), and efficient temp. control, which can be regulated at the optimum (about 22°) by partly freezing the AcOH–H_2SO_4–cellulose mixture before adding the Ac_2O, are most important factors. The duration of the reaction must be sufficient to allow all the OH groups to be acetylated and the combined H_2SO_4 replaced, but unduly prolonged action leads to excessive degradation and consequent loss of valuable material. Acetylation in other media (CCl_4, C_6H_6) indicates that the best medium is AcOH–H_2SO_4. Acetylations with AcCl are also described. Experiments with $NaHSO_4$, Me_2SO_4, CH_2SO_4, and NH_2Ph,H_2SO_4 prove that these catalysts are effective only at higher temp. and only in so far as they are able to afford H_2SO_4 under these conditions. Acetates made with $NaHSO_4$ contain large amounts of combined Na, which is very difficult to remove by washing. H_3PO_4 has no catalytic action, whilst $ZnCl_2$ and $Zn(OAc)_2$ are much less effective than is H_2SO_4. Barnett's catalyst (SO_2 + Cl_2) or SO_2Cl_2 fails completely to bring about acetylation in Ac_2O free from AcOH, and acts in media containing AcOH by forming H_2SO_4 and AcCl. The importance of correct hydration of the primary acetate to give products with the correct properties for making acetate fibre is emphasised and from a study of various factors on the hydrolysis the following empirical formula for calculating the composition of the secondary acetate from a fully acetylated cellulose is given: $x = 62{\cdot}5 - (1/15{\cdot}3) \times kc^{\frac{1}{2}}(t - 25)d^{\frac{1}{2}}$, where x = AcOH content of the secondary acetate, k = g. of H_2SO_4 per 10 g. of air-dry cellulose, c = wt.-% of H_2O, d = time of hydration in hr., and t = temp. Indirect hydration with 95% AcOH at higher temp. offers no advantages over the direct method. The main difficulty during hydration in technical practice is to avoid local heating and consequent hydrolysis. This may be overcome to some extent by partly freezing the reaction mixture. The secondary acetate is much more easily re-acetylated than the original cellulose. The solubilities of acetyl- and ethylcelluloses in >200 solvents and various mixtures are recorded and the results correlated with the physical and chemical consts. of the solvents and the resultant solutions. The chief factor in determining solubility is the OAc content of the acetate. The swelling and eventual solubility results from the collaboration of two types of groupings in the solvent, which must exist in suitable proportions, and which act by virtue of their affinities for the OH and ether groups in the cellulose derivative, respectively. Measurements of η on numerous solutions are also discussed.

Improved methods for the analysis of cellulose acetates are described. The purity is determined by dissolving 6 g. in 100 c.c. of $COMe_2$ and centrifuging the solution; good products are almost completely sol. and the resultant solutions may be used directly for measuring η. H_2O is determined by drying in a vac. over P_2O_5 at 1 mm. An apparatus is described for the determination of the OAc content; 0·5 g. is dissolved in 50 c.c. of C_5H_5N in an atm. free from CO_2, 10 c.c. of $0{\cdot}1N$-KOH are added gradually drop by drop (10 min.), and the mixture is stirred mechanically for 20 min., 50 c.c. of H_2O are then added and stirring is continued for 1 hr., after which a further 50 c.c. of H_2O are added and stirring is continued for 30 min. The excess of KOH is then titrated with N- and finally with $0{\cdot}1N$-HCl (phenolphthalein). The method is accurate to 0·2%. Acid hydrolysis gives less accurate results. H_2SO_4 is determined by pptn. with $BaCl_2$ after saccharification with saturated HCl at $<0°$. Stability of cellulose acetate towards dry heat in air and boiling H_2O is also discussed. Types of laboratory apparatus for spinning acetate fibre by both wet and dry methods are described and the relationships between denier no., diameter, and porosity of the threads and the conditions of spinning worked out. A special study has been made of the *d* of typical acetate fibre (Celanese) and experimentally spun fibres and an apparatus is described for measuring it and the porosity at various temp. in air, H_2, and He. The apparent *d* in air $>$ in H_2 $>$ in He. The differences are ascribed to adsorption of the gas by the fibre. The mechanical properties of the fibres are also measured and discussed. "Blinding" is shown to be due to hydrolysis to form OH groups on the outer layers of the fibre.

A study has been made of the dyeing of acetate silk both before and after saponification, with an extensive series of dyestuffs representative of practically all classes. The dyeing properties depend greatly on the porosity and the OH content of the fibre. It is suggested that a dissolution phenomenon, depending on the constitution of the dyestuff and on the rate of esterification of the silk, is followed by an irreversible coagulation of the dyestuff, the latter depending on the intermicellar structure of the fibre. By superficial saponification with alkalis it is possible to obtain successive layers differing completely from the original acetate, which bring about a complete change in the dyeing properties of the thread as a whole. Unsaponified and partly saponified fibres can be dyed without impairing either the mechanical properties or the lustre. The dyeing of unsaponified fibre slightly reduces the porosity, but no such change is observed with superficially saponified fibres. S. C.

Acetate staple-fibre rayon. III. H. LOHMANN and P. BRAUN (Textilber., 1937, **18**, 345—347; cf. B., 1937, 655).—The creasability of similar yarns of wool, acetate, viscose, and cuprammonium staple-fibre rayons, compared by Hall's method (B., 1930, 1023), decreased in the order named, the crease angles being 90°, 50—60°, 29—41°, and 24°, respectively. Curves showing the rate of loss of H_2O from the various yarns, and also from fabrics consisting of wool (80%) and the rayons (20%), when transferred from air of 90% R.H. to air of 60% R.H. at 20—22° are similar except in so far as they indicate the abnormally low H_2O content of acetate yarns. Viscose and cuprammonium yarns retain initially much more H_2O than the other two, but dry more rapidly. Acetate rayon (charmeuse) fabric was shown to be softer than similar viscose and cuprammonium rayon fabric by measurement of the amounts of $CaCO_3$ rubbed off a chalk wedge by passing strips of the fabrics over it under standardised conditions. A. J. H.

Distinction of viscose and cuprammonium rayon. A. HERZOG and H. RÜCKERT (Textilber., 1937, **18**, 485—486).—S may be detected in unbleached viscose (*a*) microscopically, using dark-ground illumination; (*b*) by the discoloration of Hg on shaking with an extract of the fibre in pure CS_2; (*c*) from the N_2 bubbles formed around the Hg on evaporating the extract and adding a 2% solution of NaN_3 in $0{\cdot}1N$-I solution; (*d*) by forming $Na_2S_2O_3$ by the action of NaOH and Na_2SO_3, and liberating N_2 with the NaN_3 solution; (*e*) by pptg. S as black crystals with picric acid, or (*f*) as yellow crystals by the action of HNO_3 on the CS_2 extract. Bleached viscose gives much weaker reactions with NaN_3. If CNS′ is absent originally, this ion may be formed from KCN and NaOH and detected by $FeCl_3$. J. G.

Preparation of crude straw cellulose. I. General composition of rice straw. S. NAGATA (J. Cellulose Inst. Tokyo, 1937, **13**, 192—196).—Analyses of the stem and sheath are given. The extract with 95% EtOH is very high because the H_2O present causes the dissolution of sugar-like substances. The amount extracted with 72% H_2SO_4 (lignin) depends on the temp. and duration of the treatment; previous boiling with dil. H_2SO_4 diminishes the amount of the 72% H_2SO_4 extract which is pptd. by dilution. Previous boiling also diminishes the yields of furfuraldehyde and of cellulose. A. G.

Homogeneity of native celluloses and their derivatives. III. Composition of the substance comprising the transverse elements (QSE) [of fibres]. A. SAKOSTSCHIKOV and D. TUMARKIN (Textilber., 1937, **18**, 522—525).—Analyses of the transverse elements isolated from raw cotton, unbleached Canadian hemp, processed cotton linters, and firwood pulp by the method previously described (B., 1936, 828, 1145) are tabulated. More wax, ash (due mainly to SiO_2), and OMe were found in the elements than in the corresponding fibres. Pentosans were absent in all cases, and the N content in the elements from the hemp was $<$ that from raw cotton but $>$ that from wood pulp. Elementary analysis of the elements from cotton gave C 49·90, H 5·73, N 9·55, and O 34·82%; in the other cases the data were similar to those for lignin. The Et_2O-sol. yellow wax from the transverse elements of raw cotton had m.p. 83—85°, *d* 0·902, sap. val. 2·5, I val. 12·75, acid val. 6·7, C 78·63, H 13·50, N (Dumas) 2·30%, and O nil. J. G.

Surface of cellulose and its dyeing properties. E. BRODA and H. MARK (Österr. Chem.-Ztg., 1937, **40**, 277—281).—*X*-Ray evidence for the structure of cellulose surfaces and adsorption, especially of dyestuffs, on these surfaces are discussed. The dyeing of acetate silk is in accord with the theory of dyestuff adsorption. J. W. S.

Cellulose sponges. J. Lagelez (Papeterie, 1936, **58**, 873—874; Pulp and Paper Mag. Canada, 1937, **38**, 501—502).—The method of making cellulosic material spongy is described. A conc. solution of viscose is mixed with cotton, flax, or hemp and a sol. inorg. salt, and the mass suitably heated. The moulded paste is stabilised and freed from salt (thus obtaining the necessary porosity) by treatment with 10% AcOH. Several advantages over natural and rubber sponges are claimed. H. A. H.

Determination of the carboxylic acid group in oxycelluloses. S. M. Neale and W. A. Stringfellow (Trans. Faraday Soc., 1937, **33**, 881—889).—To 1 g. of the sample, washed with HCl until free from cations and then with H_2O until neutral, are added 20 c.c. of NaCl (50 g./litre) and 20 c.c. of 0·02N-NaOH. After keeping in the cold for 0·5 hr., four drops of bromocresol-purple are added, and the solution is titrated with 0·02N-HCl; it is boiled and CO_2-free air passed through it only towards the end of the titration. The method is applied to various oxycelluloses. Using a glass electrode, measurements have been made of the p_H of NaCl solutions in contact with oxycelluloses, and from the data vals. for the ionisation const. of the CO_2H groups have been calc. The vals. increase with increasing no. of CO_2H groups. The methods of Lüdtke (B., 1935, 142, 1087) and of Schmidt *et al.* (A., 1935, 201) are adversely criticised. C. R. H.

Nitration of cellulose. III. Nitration by mixtures of nitric acid with organic acids and anhydrides. Cellulose trinitrate. A. Bouchonnet, F. Trombe, and (Mlle.) G. Petitpas (Bull. Soc. chim., 1937, [v], **4**, 1085—1092; cf. B., 1937, 424; A., 1937, II, 278).—Cellulose is nitrated to a high N content by HNO_3 mixed with AcOH, $EtCO_2H$, or Pr^aCO_2H. A very stable trinitrate is obtained by using HNO_3–AcOH–Ac_2O, and extracting the product with EtOH. E. W. W.

Properties and uses of ethylcellulose. W. Koch (Ind. Eng. Chem., 1937, **29**, 687—690).—The prep. and properties (compatibility, solubility, lacquer-formulation data, etc.) of commercial ethylcellulose (47—48% OEt) are described and tabulated, and its uses in lacquers, plastics, electrical insulating and impregnating materials, flexible coatings for paper, leather, etc. are outlined. S. S. W.

Evaluation of ethylcellulose by load–elongation curves. Plasticisers. S. L. Bass and T. A. Kauppi (Ind. Eng. Chem., 1937, **29**, 678—686).—Information on toughness, flexibility, and hardness, as well as on ultimate tensile strength and elongation, of ethylcellulose (I) films containing various plasticisers (P) in differing amounts is obtained from a study of their load–elongation curves. A preliminary examination of the behaviour of six representative P for (I) showed that curves for films containing 15 and 40% of P, on the (I) content, sufficiently characterised the effects of the individual P in normal lacquers and in flexible coating compositions, respectively, and the corresponding details for 18 commercial P are summarised and discussed. General conclusions are drawn as to the functions and desirability of P in conjunction with (I). S. S. W.

Chemical investigations of wood substances. VII. Fundamental investigation of wood thinnings and their application for cellulose manufacture. Wood constituents of wood thinnings. K. Nishida, R. Miyama, and H. Hashima (J. Cellulose Inst. Tokyo, 1937, **13**, 186—191).—Full analyses are given of 36 samples of wood belonging to 5 different species. These indicate that *Cryptomeria japonica*, Don. (Kuroshinsugi), *Chamæcyparis obtusa*, Z. & Z. (Hinoki), and *Pinus densiflora*, S. & Z. (Akamatsu), are suitable for cellulose manufacture, *Pinus thunbergii*, Parl. (Kuromatsu), for paper, and *Cryptomeria japonica*, Don. (Masugi), for paper or rayon. A. G.

Pulp woods of Manchoukuo. I. Introduction. M. Shikata. **II. Chemical analysis of the pulp woods produced in Manchoukuo.** M. Shikata and S. Fukuwatari. **III. Fibre length of the pulp woods produced in Manchoukuo.** M. Shikata, S. Fukuwatari, and T. Shikata (Rep. Inst. Sci. Res. Manchoukuo, 1937, **1**, 83—102, 103—128, 129—138).—I. The economics of the subject and the distribution of the forests and pulp woods are discussed.

II. Full chemical analyses of samples of 8 pulp woods (spruce, fir, pine, larch, birch, aspen, and *Tilia amurensis*) are tabulated.

III. Measurements of the distribution of fibre lengths in the pulps prepared from the annual rings of the above woods (and oak) by the NaOH process enable the woods to be classified as follows: (*a*) fibre length range 1·5—5·0 mm. (*Picea jezoensis*, *Abies nephrolepis*, and *Larix dahurica*); (*b*) 0·75—4·0 mm. (*A. holophylla* and *Pinus koraiensis*; (*c*) 0·3—2·0 mm. (*Betula mandschurica*, *Quercus mongolica*, and *Populus Simoni*). The distribution curves of mixtures of these pulps are the resultants of those of the constituents. Vals. as in (*a*) are considered desirable. J. G.

Resin in coniferous woods. I. R. Trendelenburg and O. Schaile (Papier-Fabr., 1937, **35**, 221—230).—Investigation of the residue (bulk-density val., d) after bone-drying freshly-cut pine trunks of different species gave an average of 440 kg. per solid m. of wood, with extreme variations of 330—650. The loss on drying was 10·2%. The average d at the top of the trunk was 370, which increased to 482 at the bottom, where the uniformity of the wood in this respect was considerably $<$ at the top. Changes in d are parallel with those of the ring widths, and the relation of the d of heart- to sap-wood varies mainly with the age of the tree and the location in the trunk, except towards the bottom of the trunk, where the high resin content of the sapwood makes it heavier than the heartwood. The average resin content of the trunk decreases very rapidly up to a height of 3 m. from the ground; this is due entirely to changes in the heartwood, the sapwood having a practically const. resin content at all trunk heights. On storage the sapwood resin content is considerably reduced, whereas there is practically no change in that of the heartwood. D. A. C.

Needles of coniferous trees—a raw product for new wood-chemistry processes. F. Solodki (Lesochim. Prom., 1935, 4, No. 8, 16).—Conifer needles yield per 1000 kg. up to 100 kg. of high-grade fibre suitable for cloth manufacture, as well as vitamin-*C*, tar, oils, etc. Ch. Abs. (*e*)

Value of automatic temperature control in production of groundwood pulp. C. D. DeMers (Paper Trade J., 1937, **105**, TAPPI Sect., 12—14).—The advantages of fitting a pulp-grinding temp.-control unit to a hydraulic magazine-type grinder include increased production, decreased power consumption, more uniform freeness of stock, and longer life of grinding stones. In practice, grinding temp. have increased from about 55° to about 80° during the past 9 years, and the need for automatic temp. control is now more pressing. H. A. H.

Pulping of pines. I. H. Boas (New Zealand J. Sci. Tech., 1937, **18**, 756—761).—Resinous pines give a satisfactory alkaline cook for kraft pulp. Acid cooking is less satisfactory owing to formation of pitch and low penetration into heartwood, whilst fungoid blueing of timbers is a drawback. The fine pulp particles, containing most of the resin, may be separated either by flotation or by partial screening. W. L. D.

Factors in soda losses in alkaline pulping [of wood]. G. A. Day (Paper Trade J., 1937, **105**, TAPPI Sect., 16—18).—Causes of the loss of Na compounds during pulp and sludge washing, lime reburning, black-liquor incineration, and cleaning processes are analysed, and remedies suggested in some cases. Spray furnaces show high stack losses, not through mechanical entrainment of particles, but because of actual volatilisation. H. A. H.

Riffling of groundwood pulp. R. I. Wynne-Roberts (Paper Trade J., 1937, **105**, TAPPI Sect., 27—30).—Factors affecting the efficiency of dirt removal by rifflers in the manufacture of groundwood pulp are discussed, and suitable features of design indicated. H. A. H.

[Laboratory] pebble-mill beating [of wood pulp] under vacuum and pressure. F. D. Bates, jun. (Paper Trade J., 1937, **105**, TAPPI Sect., 40—41).—No differences in strength or freeness are effected by beating bleached sulphite pulp in vac. or at 60 lb. pressure, by comparison with beating it at atm. pressure. H. A. H.

Designing a plant for bleaching sulphite pulp. W. L. Savell (Paper Trade J., 1937, **105**, TAPPI Sect., 21—26).—Practical considerations affecting the selection of materials, design of plant, and choice of bleaching process (whether one- or two-stage, continuous or intermittent) are discussed. H. A. H.

Standard methods of testing sulphite spent liquor. Verein d. Zellstoff- u. Papierchemiker u. Ing., Memo. No. 14 (Papier-Fabr., 1937, **35**, 283—288).—Methods described for the complete evaluation of sulphite spent liquor include qual. tests based on the reactions of ligninsulphonic acid, determination of the calorific val. of the bone-dried residues (100°), inorg. constituents, reducing and fermentable sugars and tannins (by absorbtion in hide powder), as well as the physical properties of the liquor. Tables are given showing the relation between *d* and bone-dried residues, and *d* and the f.p. of liquors, from different types of cooks. D. A. C.

Instrumentation studies. X. Inst. Paper Chem. (Paper Trade J., 1937, **105**, TAPPI Sect., 35).—A correction. H. A. H.

Maturing of paper. A. I. Macnaughton (Paper Maker, 1937, Internat. No., 20, 22, 24, 6).—Humidifying apparatus for maturing a moving web of paper to a specified moisture content is described. Paper which has once been matured is not so reactive to moisture as is unmatured paper. In practice it is found advisable to add slightly more than the requisite amount of moisture and to allow the paper to dry out. H. A. H.

Evolution of sized-paper drying. F. W. Partsch (Paper Trade J., 1937, **105**, TAPPI Sect., 14—15).—The development of festoon drying of tub-sized papers is briefly sketched. H. A. H.

Cleanness of paper. F. K. Becker (Paper Trade J., 1937, **105**, TAPPI Sect., 19—20).—The removal of dirt from paper stock by screening and contrifuging methods is briefly discussed. H. A. H.

Mineral constituents of paper. J. E. Aitken (Proc. Tech. Sect. Papermakers' Assoc., 1936, **17**, 235—248).—A no. of inorg. substances used in various stages of the manufacture of different types of paper are discussed, and the effects of some of them on paper properties are elaborated. The mineral ash constituents of Spanish and North African (Oran) esparto are compared. H. A. H.

Evaluating the printing qualifications of paper. M. S. Kantrowitz and R. H. Simmons (Paper Trade J., 1937, **105**, TAPPI Sect., 5—10).—Numerous standard tests for evaluating those physical and structural properties of paper which are known to affect its printability are reviewed. H. A. H.

Cobb sizing tester [for paper]. L. Egy (Pulp & Paper Mag. Canada, 1937, **38**, 499—501).—An apparatus for conducting the Cobb gravimetric method of determining the sizing degree of paper (cf. Codwise, B., 1936, 268) is described. The test is claimed to be particularly suitable for heavy hard-sized papers where the time element is too long to afford a practical measure of sizing, and for making direct comparisons between thick and thin papers. H. A. H.

Determination of sizing degree and water-permeability of papers. A. Noll and K. Preiss (Papier-Fabr., 1937, **35**, 213—219).—A paper disc (60 mm. diameter) is clamped in an Al funnel-shaped vessel, which is then immersed to a const. depth in a bath of distilled H_2O at 20°, so that the H_2O is uniformly in contact with the bottom side of the paper. A 1 : 1000 powered mixture of fluorescein and calcined Na_2CO_3 is used as indicator, the determination being made under ultra-violet light. The method gives satisfactory duplication and differentiation between different paper qualities; with machine-finished papers the wire side was only slightly less resistant to H_2O-penetration, but with supercalendered papers the difference between top and wire side was mostly very marked. The function of sugar in dry indicators used in H_2O-penetration tests is discussed; it is shown to be replaceable by both H_2O-sol. and -insol. substances (*e.g.*, NaCl, flour, bentonite). D. A. C.

The Zeiss comparison microscope in paper microscopy. B. Schulze (Papier-Fabr., 1937, 35, 219—220).—A microscope is described which enables two slides to be viewed simultaneously (×18 or ×30) through a single eye-piece. D. A. C.

Bagasse.—See II. **Fibres and short-wave radiations.**—See VI. **Western hemlock bark.**—See XV.

Patents.

Deburring or carbonisation of textile materials. J. Pelissier (B.P. 467,342, 16.12.35. Fr., 3.1.35).—The vegetable material in a mixed vegetable–animal fabric is removed by continuous circulation of heated HCl gas, the treatment chamber having been previously evacuated and the HCl being continuously passed through a dehydrating agent. B. M. V.

Drying of artificial tubular products produced from animal fibrous material. Naturin Ges.m.b.H. (B.P. 466,743, 14.10.36. Ger., 15.10.35).—After extrusion, the inflated product made from swollen and shredded hide or sinews is conveyed as a continuous tube supported on rollers or belts of low heat-conductivity material through a drying channel, into which hot dry air is blown. The temp. of the air is so adjusted that the temp. of the product from acid and alkaline fibrous pastes are $\ngtr 27°$ (25°) and $\ngtr 22°$, respectively. F. R. E.

Manufacture of artificial filaments, yarns, and the like. Brit. Celanese, Ltd., H. Dreyfus, R. W. Moncrieff, and F. B. Hill (B.P. 466,802, 5.12.35).—In order to improve its tenacity, a yarn having a basis of an org. derivative of cellulose is stretched $\nless 40\%$ of its original length by passing through steam or hot H_2O during its travel from the feed to the take-up devices, which impart a low twist in the yarn. F. R. E.

Production of cuprammonium silk by the stretch-spinning process. (a) W. Ostermann, W. Höfinghoff, (a, b) W. Kumichel, (c) E. Sellner, Assrs. to Amer. Bemberg Corp. (U.S.P. 2,046,575—7, 7.7.36. Appl., [a] 15.11.29, [b] 3.4.30, [c] 6.11.30. Ger., [a] 19.11.28, [b] 22.5.29, [c] 7.11.29).—The spinning vessel consists of an outer casing containing a cone-shaped insertion having various kinds of aperture through which the precipitant diffuses to the outer casing, thus causing circulation of the precipitant in the spinning vessel. F. R. E.

Manufacture of rayon. W. H. Furness, Assr. to New Process Rayon, Inc. (U.S.P. 2,047,466, 14.7.36. Appl., 24.2.32).—Cellulose is dissolved in the min. proportions of $Cu(OH)_2$ and aq. NH_3 and, after removal (in vac.) of the excess of NH_3 over that required to keep the cellulose in solution, the whole is diluted with H_2O to form a spinning solution containing about 4% of cellulose. During spinning, the composition of the pptg. bath (aq. NaOH) is maintained const. by addition of aq. NaOH at the rate of its withdrawal by the thread. F. R. E.

Fibrous esterification of cellulose. C. J. Malm and C. L. Fletcher, Assrs. to Eastman Kodak Co. (U.S.P. 2,047,278, 14.7.36. Appl., 19.5.33).—Cellulose is treated with an esterification bath containing, in addition to the esterifying agents, a liquid petroleum distillate (b.p. 40—210°) as the non-solvent, together with sufficient chlorinated hydrocarbon (C_2HCl_3) as homogeniser. The resulting ester is insol. in the esterification bath. F. R. E.

Preparation of high-viscosity organic esters of cellulose. Kodak, Ltd., Assees. of C. J. Malm (B.P. 467,160, 5.9.35. U.S., 5.9.34).—After pretreatment with AcOH, together with $EtCO_2H$ and/or $PrCO_2H$, if desired, but in absence of a catalyst, cellulose is esterified in a bath containing a fatty anhydride in a solvent which is mainly AcOH but in which 5—23% of the acyl content is EtCO or PrCO, and a H_2SO_4 catalyst content calc. on the wt. of cellulose of 4—8% at 31—35° or $\ngtr 20\%$ at $\nless 10°$. The use of the esters in making laminated glass is claimed. F. R. E.

Esterification process [for cellulose]. A. Hoche (U.S.P. 2,046,821, 7.7.36. Appl., 9.9.35).—Cellulose acetate is produced when moist cellulose (300% H_2O) containing about 2% of HNO_3 is treated (for $\frac{1}{4}$—1 hr.) with MeCHO vapour, produced by passing the gases generated by the action of H_2O on crude CaC_2 into dil. H_2SO_4 (1—20%) and HgO (1—15 g./litre) and heating the mixture to 60—70°. Apparatus is illustrated. N. H. H.

Manufacture of shaped articles of cellulose derivatives. Brit. Celanese, Ltd., and W. H. Moss (B.P. 466,856, 5.12.35).—A solid cellulose ester composition is moulded by pressure while its surface is in contact with a surface having a basis of a cellulose ether, or *vice versa*. The moulded article is then easily separated. F. R. E.

[Manufacture of] wrapping materials. C. Joseph, Assr. to Sylvania Industrial Corp. (U.S.P. 2,038,114, 21.4.36. Appl., 14.7.34. Ger., 14.4.31).—Glassine, parchment paper, cellulose acetate, regenerated cellulose, or gelatin sheets used for wrapping are made opaque to ultra-violet light without impairing their visual transparency by incorporation of non-glucosidic OH-, CO_2H-, alkyl, alkoxy-, or NH_2-derivatives of coumarin, their salts, or esters, *e.g.*, Et umbelliferonylacetate. H. A. P.

Wrapping material. W. F. Kallock, Assr. to Eastman Kodak Co. (U.S.P. 2,047,269, 14.7.36. Appl., 15.6.32).—Cellulose ester sheets, one side of which may have been moistureproofed, are coated on the other side with a composition which will permanently adhere to a moistened surface coated with a H_2O-sol. adhesive (*e.g.*, gummed labels). The composition is applied in an org. solvent and consists of a H_2O-insol. resin which is sol. in the solvent and a material which is sol. in both the solvent and H_2O (*e.g.*, 5% C_6H_6 solution of a 3 : 2 mixture of vinyl acetate and resorcinol). The sheets are then dried. D. A. C.

Wood pulp making. P. A. Paulson (U.S.P. 2,047,488, 14.7.36. Appl., 21.5.34).—Sulphite pulp is produced continuously by feeding (screw conveyor) the chips into the top of a vertical cylindrical digester, the pulp being discharged from the bottom through a const.-level tank to a screening system. Fresh acid is introduced into the digester near the top, and hot gases and steam are injected through ports spaced circumferentially around the lower end of the digester. The relief gases are passed to an absorbing tower through a heat exchanger which warms acid from the absorbing tower; the acid passes to a separator, the gases evolved in which are re-introduced to the digester, and the residual hot liquor passes back through the heat exchanger to the acid absorber. D. A. C.

[Machine for] preparation of fibrous materials for spinning. H. B. Stocks (B.P. 468,945, 8.10.35).

Manufacture of [elongated] bodies or articles from pulp or other fibrous material. Smith, Stone, & Knight, Ltd., and T. P. Smith (B.P. 467,565, 16.12.35).

Insulator.—See I. **Bitumenised felts.**—See VI. **Recovery of caustic hydroxide.**—See VII. **Plasticiser.**—See XIII. **Sheet materials. Elastic fabrics.**—See XIV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Removal of iron from water for use in chrome dyeing. Collé (Textilber., 1937, **18**, 520—521).—The presence of $>0{\cdot}1$ mg. of Fe per litre may cause degraded shades, patchiness, or spots. The CaO–NaOH H_2O-softening process ppts. and removes Fe, but if the Fe is present as $Fe(HCO_3)_2$ it can be converted into $Fe(OH)_3$ and CO_2 by aëration on percolating coke filters impregnated with a suitable catalyst (*e.g.*, Mn or Sn oxides), and then removed on sand filters. The acidity due to the resulting CO_2 may, however, dissolve more Fe (*e.g.*, from pipes) and should be removed by means of a marble filter, which converts it into $Ca(HCO_3)_2$. Addition of 0·25% of $K_2Cr_2O_7$ to the bath prevents or minimises in most cases the harmful influence of Fe, and similar conditions exist in the metachrome process. A list of 23 of the most Fe-resistant colours is given. J. G.

[Prevention of] uneven dyeing of khaki shades with indanthrene [vat] dyes. E. Fischer (Textilber., 1937, **18**, 455—456).—Details of procedure (*e.g.*, desizing, scouring, drying, or even removal of excess of H_2O before dyeing, addition of dyes in several portions, and after-oxidation) for dyeing in a jigger cotton fabric woven from hard-spun yarn with a mixture of Indanthrene Khaki GG and 3RT and Indanthrene Khaki Red Brown RR are discussed. A. J. H.

Reactions and function of stannous chloride in the brightening process of Turkey-red dyeing. W. Hees (Textilber., 1937, **18**, 525—527).—Experiments described indicate that, in presence of Na_2CO_3, $SnCl_2$ first forms $Sn(OH)_2$ and that this can react with a soap solution to form a Sn oleate soap, which is split by alkaline hydrolysis into a Sn hydroxide–fatty acid complex. This is adsorbed and protects the colour lake, without, however, becoming part of it (as in Liechti's theory), and it contributes to the characteristic handle and gloss of the final product. If pressure is used (*e.g.*, 1·5 atm. at 110°) the $NaSnO_2$ also formed in this reaction produces Na_2SnO_3 and Sn; this involves loss of Sn from the reaction system, and weakening of the fibre by reduction to hydrocellulose. Without pressure (at 85—90°), however, $Sn(OH)_2$ (which can participate further in the reaction), H_2, and Na_2SnO_3 are produced. J. G.

Constitution and affinity for cotton of disazo dyes from substituted diaminodiphenyls. H. H. Hodgson and P. F. Holt (J. Soc. Dyers and Col., 1937, **53**, 175—177).—Dyes were made from $2:6\text{-}OH{\cdot}C_{10}H_6{\cdot}SO_3H$, $1:8:3:6\text{-}OH{\cdot}C_{10}H_4(NH_2)(SO_3H)_2$, and $5:2:7\text{-}OH{\cdot}C_{10}H_5(NH_2){\cdot}SO_3H$ by coupling with each of the seven diamines derived from Ph_2: $4:4'\text{-}(NH_2)_2\text{-}$, $4:4':3:3'\text{-}$, $3:3':4:4'\text{-}$, $3:2':4:4'\text{-}$, and $2:2':4:4'\text{-}(NH_2)_2Cl_2\text{-}$, $4:4':3:3'\text{-}(OMe)_2(NH_2)_2\text{-}$, and $3:3':4:4'\text{-}(NH_2)_2(SMe)_2\text{-}$. All dyes had excellent affinity for wool; affinity for cotton was in the order $4:4'\text{-} > 3:3'\text{-}, 3:2'\text{-} > 2:2'\text{-}(NH_2)_2$, the last being very low. Shades were displaced towards the yellow in the same order and the dyes containing SMe were yellower than those from OMe, suggesting chelation between SMe and the *o*-N:N linking since *p*-$NH_2{\cdot}C_6H_4{\cdot}SMe$ gives redder dyes than does *p*-$OMe{\cdot}C_6H_4{\cdot}NH_2$. The greater affinity of the dyes from the 4 : 4′-diamines is ascribed to greater length of conjugate chain and the small affinity of the 2 : 2′-azo derivatives of Ph_2 to the possibility that the two rings are not co-planar. K. H. S.

Effect of dyeing on strength and spinning properties of wool. H. R. Hirst and P. E. King (J. Soc. Dyers and Col., 1937, **53**, 198—202).—The investigation was carried out to determine to what extent the spinning properties of loose wool are modified by treatment and by dyeing, and whether certain dyes tend to impair the strength and elongation. A bulk lot of blended greasy Australian wool was scoured and divided into 20-lb. lots, which were treated or dyed by standard methods. Yarns decreased in val. when spun from undyed treated wool, in the order: grey, untreated $>H_2SO_4>$AcOH, HCO_2H, and $Na_2SO_4>Na_2SO_3$. Dyes used were Eriochrome Yellow 2GI, Red B, Brown R, Blue S, Metachrome Brown B, natural and synthetic indigo, and indigo topped with Alizarine Blue OCR. Results were too inconclusive and differences too small to decide whether wool of high quality dyed blue or brown gives the better spin. K. H. S.

Changes in textile fibres and dyes under the influence of short-wave radiations. H. J. Henk Textilber., 1937, **18**, 521).—These changes, which involve the formation of oxycellulose, follow the laws of photochemistry and are not catalytic, although catalysts (*e.g.*, Mn, Fe, TiO_2, Cr, Cu, and Al) may accelerate them; they are inhibited in absence of air. Irradiation alters the physical properties of wool, which also becomes more sol. in NaOH and H_2O, and there is evidence of destruction of the NH_2 group; darker dyeings are obtained with NH_2-dyes and unsymmetrical indigoid dyes and brighter shades with S dyes and symmetrical indigoid dyes. The effects of irradiation on dyes depend on the chemical constitution (OH, NH, and NH_2 groups being most easily affected), and on the nature of the fibre on which the colour occurs. J. G.

Identification of dyes on textile fibres. E. Clayton (J. Soc. Dyers and Col., 1937, **53**, 178—197).—A series of 14 tables is given for the identification of classes of dyes on (*a*) wool and silk, (*b*) cellulosic fibres. It is pointed out that the tables follow closely Green's scheme (B., 1905, 1034; B., 1907, 1083) expanded to cover dyes now in commerce. A new reducing agent for testing patterns is made from Formosul (20) in H_2O (150) and $(CH_2{\cdot}OH)_2$ (50 g.). Notes are given on the extraction of dyes from the fibre with $(CH_2{\cdot}NH_2)_2$ which has a very powerful effect and can remove, *e.g.*, co-ordinated Cr lakes, Primuline Red, basic and S dyes. Separation of mixtures by chromatographic adsorption on a column of adsorbent (usually Al_2O_3) is described. K. H. S.

Miscellaneous applications of dyes. F. Hill (J. Soc. Dyers and Col., 1937, **53**, 233—236).—The use of dyes in the colouring of various materials, including foodstuffs, soaps, polishes, cosmetics, inks, horticultural products, and aluminium, is outlined. R. J. W. R.

Applications of colorimetry in the dyeing and allied industries. G. S. Fawcett (J. Soc. Dyers and Col., 1937, **53**, 225—233).—The Lovibond tintometer and the principles on which it is based are described. The instrument is suitable for determining the fastness of dyed materials, and other uses in the textile trade are outlined. R. J. W. R.

Printing [and dyeing] of [cellulose] staple-fibre rayon mousseline fabric. G. Hasse (Textilber., 1937, **18**, 374—377).—Suitable methods (with practical difficulties) and dyes are described for desizing, bleaching, and colouring fabrics consisting of viscose staple fibre alone or mixed with cotton. Impregnation of the fabric with aq. alkali (KOH) of *d* 1·030—1·045, followed by keeping for 1 hr., then washing, souring, and washing, generally facilitates subsequent level colouring. Satisfactory printed effects are obtained with vat, azoic, Indigosol, and Rapidogen dyes. Level shades with vat dyes are more difficult to obtain on the pure than on the mixture fabrics, and in pale shades the cotton acquires a deeper shade than the viscose fibres unless the fabric has been pretreated with aq. KOH. Direct dyes capable of being made fast to washing by diazotisation and developing are used for dyeing dark shades. Sirius and Sirius Fast dyes are faster to washing on viscose than on cotton. The presence of cotton in a viscose fabric is detected by the characteristic swelling of each fibre in 2*N*-NaOH and also by dyeing the fabric in a soap liquor containing Diamine Field Grey KG and Rhodamine B extra (cotton becomes pale brown, viscose dark grey). A. J. H.

Discharge [printing] of mode shades on viscose–acetate rayon mixture fabrics. R. Gehe (Textilber., 1937, **18**, 454—455).—The dyeing of solid blue, navy-blue, green, brown, and black shades on viscose–acetate rayon crêpe fabrics with named Celliton (I.G.) dyes (for acetate rayon) capable of being satisfactorily discharged with Decrolin (I.G.—a $Na_2S_2O_4$ product) and various direct dyes (for viscose) is briefly described. The recent introduction of Celliton Blue 5G allows (together with Celliton Yellow 3GN and Rubine BL) the production of non-bronzy navy-blue and black shades. Addition of Rongalite C to the Decrolin assures a clearer discharge of the direct dyes. After discharging it is necessary to wash the fabric very thoroughly since dye decomp. products are obstinately retained by acetate rayon. A. J. H.

Substitution of glycerin by urea, hexamethylenetetramine, sodium phosphate, etc. in cloth printing. H. Gerber (Textilber., 1937, **18**, 527–528).—$CO(NH_2)_2$, $CS(NH_2)_2$, $NH{:}C(NH)_2$ (I), $(CH_2)_6N_4$, and anhyd. $NaPO_3$ are equal in dispersive, wetting, and plasticising powers to glycerin (II), but are more rapid in action and, with the exception of $(CH_2)_6N_4$, dry out more completely. (I) can be used only in an alkaline medium and is particularly suitable for vat dyes; if desired it can replace the more injurious NaOH. $(CH_2)_6N_4$ is preferable to (II) where hygroscopicity is an advantage, and $NaPO_3$ will ppt. basic dyes. J. G.

Theory of chlorination of wool for printing. E. Justin-Mueller (Textilber., 1937, **18**, 452—453).—Treatment of wool with acidified (HCl) aq. NaOCl under mild conditions as used for increasing its affinity for dyes prior to printing converts the labile S into $SOCl_2$, which then promotes condensation of NH_2-acid decomp. products (simultaneously formed by oxidation of the wool, especially on the fibre surface) to form a protective film of metakeratin (I) on each fibre; the SO_2 thereby formed is immediately oxidised by the HOCl to form H_2SO_4. The (I) film gives the wool fibres increased tensile strength and much increases their rate of wetting. Wool samples, (*a*) not chlorinated, (*b*) chlorinated under the optimum conditions, and (*c*) excessively chlorinated, sank in H_2O in 158—400, 8—40, and 25—105 min., respectively. This rapid wetting is attributed also to changes produced by the $SOCl_2$ in the natural residual fatty substances present in the wool during chlorination. Treatment of wool with aq. acids, alkalis, H_2O_2, $NaHSO_3$, and Na_2SO_3 also reduces its labile S content ($Na_2S_2O_3$ is formed by treatment with H_2O_2, $NaHSO_3$, and Na_2SO_3) and per-keratin instead of (I) is formed so that the wool is impoverished and acquires a very harsh handle. A. J. H.

Colloresin DK—a synthetic thickening agent as the solution of special [textile printing] problems. M. Kerth (Textilber., 1937, **18**, 378—381).—The special uses of Colloresin DK (B., 1928, 890), an alkyl ether of cellulose (I.G.) (sol. in cold, insol. in hot, H_2O), in printing are described; numerous typical recipes are given. A. J. H.

Modern mercerising processes. T. von Keresztes (Österr. Chem.-Ztg., 1937, **40**, 268—270).—The principles and factors underlying mercerisation are outlined and various processes for yarn and piece goods described briefly. R. J. W. R.

Mercerisation of mixture yarns [of cotton and viscose staple fibre]. W. Hees (Textilber., 1937, **18**, 367—370, 446—448).—Physical changes produced by mercerising (wet and dry) 8 samples of

50/50 to 84/16 mixtures of Egyptian and American cottons and viscose staple fibres spun from ripened (Snia) and non-ripened (Vistra) viscose solutions were determined. The lustre of yarns (especially those containing unripened viscose fibres) is increased by mercerisation. All yarns had increased tensile strength after mercerisation, especially those containing $>$50% of cotton; also all had decreased extensibility, this decrease being specially marked for yarns containing ripened viscose fibres and with more conc. NaOH. Differentiation between the two types of fibre after mercerisation is facilitated by first steeping the fibre mixture for 3—5 min. in an aq. solution containing KI (66%) and I (33%) followed by washing in cold H_2O and steeping in H_2O at 80° until the cotton loses its blue colour. Then, under the microscope (mounting in H_2O is advised), the cotton is yellow due to staining of protoplasmic impurities and the viscose fibre is deep blue. Mercerisation (especially wet) characteristically flattens the latter so that their cross-sections change from round to elliptical; the ripened viscose fibre is affected $>$ the unripened. The appearance of both fibres before and after mercerisation in polarised light (described) allows the effect of mercerisation on the fine structure of the viscose fibre to be measured.

A. J. H.

Adsorption of oxygen by mercerised cotton. D. J. SALLEY (Text. Res., 1937, **7**, 133—144).—Absorptions by four mercerised cottons having Fe and ash contents of 0·001 and 0·042; 0·010, 0·047; 0·023, 0·112; and 0·090, 0·160%, respectively, were measured at −192°, −78°, 0°, 35°, 56°, 80°, 100°, and 110°, and the corresponding "rate curves" are given. At −192° adsorption attains equilibrium immediately (allowance is made for the deviation of O_2 from a true gas at this low temp.) and the ash has no appreciable influence; no adsorption within several hr. was detected at −78°. Within 0—110° adsorption occurs with a measurable but decreasing velocity; the initial velocity increases with rise of temp. to 80° although the total O_2 adsorption simultaneously decreases. Above 80° oxidation of the cotton occurs and the rate and total amount of O_2 adsorbed increase with rise of temp. The influence of the Fe was irregular, but a high ash content favours more rapid oxidation. Between 0° and 80° the temp. coeff. of the velocity of adsorption corresponds with an activation energy of 5000 g.-cal., but at $>$80° the apparent activation energy is 18,000 g.-cal. At −192° the adsorption of O_2 is $>$ that of N_2. A. J. H.

Sized rayon threads. GERSTNER and J. WALTHER (Textilber., 1937, **18**, 289—291, 357—359).—The effects of various starch, protein, and drying oil sizes (compositions not stated) on the changes in tensile strength, extensibility, smoothness, and resistance to chafing produced in sized viscose and cuprammonium warp yarns by weaving were investigated with the aid of various testing machines (described). The effects differ irregularly (see tables); the same size may be harmful on one and beneficial on the other rayon. Smoothness produced by sizing does not necessarily protect the warp thread in weaving.

A. J. H.

Analysis of proofed sailcloth. G. DURST (Textilber., 1937, **18**, 372—373).—A typical sailcloth contains Al_2O_3 (6), soap (13), stearin (19·5), varnish (5·5), glue (45), potato starch (25), Japan wax (25), paraffin (16), and lithopone (20 g.) per sq. m. In analysis the original wt. of the cloth is determined by removing fats with light petroleum or $CHCl_3$, starch with malt extract, glue with pancreas extract, and varnish by boiling for 2 hr. with a solution containing Na_2CO_3 (5%) and NaOH (0·35); 14% is added to the wt. of the residual fabric to allow for its partial dissolution in the alkali boil. Fats in the cloth are determined by extraction with light petroleum, or Et_2O + HCl, or $CHCl_3$ (this gives the max. extract), starch by hydrolysis, glue by a Kjeldahl N determination (glue = 5·5 × N after corrections of 0·27 and 0·37% for usual N content of cotton and hemp fabric, respectively), and mineral weighting by ashing the fabric (n pts. of lithopone yield 0·925n pts. of ash). Qual. methods of analysis are briefly described.

A. J. H.

Silk weighting. H. J. HENK (Textilber., 1937, **18**, 451).—The main and minor reactions which occur in the Sn-weighting of silk are discussed with special reference to the accompanying loss of tensile strength. Part of the $SnCl_4$ which penetrates the silk is therein hydrolysed to $Sn(OH)_4$ and the resulting HCl may then form H_2SnCl_6 with that part of the $SnCl_4$ which has combined additively with the silk fibroin with consequent impoverishment of the fibre. Formation of Na_2SnO_3 by reaction of $Sn(OH)_4$ and NaOH formed in the phosphate bath [$Sn(OH)_4 + Na_2HPO_4 = Sn(OH)_2{\cdot}HPO_4 + 2NaOH$] may lower the tensile strength of the silk. Also harmful to the silk is the deposition on it of difficultly removable cryst. "flecks" of $Sn_3(PO_4)_2$. The presence of metallic Sn is dangerous since it may cause colloidal Sn compounds within the silk to become cryst. $Ca_3(PO_4)_2$ and $Mg_3(PO_4)_2$ ppts. (formed when hard H_2O is used) are undesirable but less dangerous for they may be removed by treatment with aq. solutions of acids or soap. The final treatment of the weighted silk with aq. Na silicate should be at $\not>$55° otherwise H_2SiO_3 may be formed with consequent lowering of the tensile strength; formation of cryst. Sn silicates is a main cause of silk impoverishment. Use of hard H_2O in the Na silicate bath produces deposition of difficultly sol. $(SiO_2)_2,Na_2O,Ca(\text{or } Mg)O$ compounds which show as white "flecks" on the silk after subsequent dyeing. A. J. H.

Effect of sizing, weaving, and abrasion on physical properties of cotton yarn. W. T. SCHREIBER, M. N. V. GEIB, and O. C. MOORE (J. Res. Nat. Bur. Stand., 1937, **18**, 559—563).—Yarns sized with white-potato starch have greater strength, less elongation, lower permanent set, greater uniformity in physical properties, and better weaving qualities than unsized yarns. A method for testing sized yarns is described. H. J. E.

Light-fastness of dyes.—See IV. **Acetate silk. Dyeing properties of cellulose. Bleaching pulp.**—See V. **Soap-like colloidal electrolytes.**—See XII.

PATENTS.

Treatment [dyeing] of cellulose derivatives. R. L. SIBLEY, Assr. to MONSANTO CHEM. CO. (U.S.P. 2,049,087, 28.7.36. Appl., 26.9.32).—Dyes insol. in H_2O, free from acidic groups and suitable for dyeing cellulose acetate, are dispersed to form a dye-bath by treating with the product obtained by sulphonating the condensation product of $Bu^{\alpha}OH$ with o-$C_6H_4Ph{\cdot}OH$ (I). In the example, (I) containing 15% of the *p*-isomeride (907) is boiled with BuOH (800) for 2 hr.; after cooling to 75°, 93% H_2SO_4 (4000 pts.) is added, and the mixture heated at 80—85° for 4 hr., the upper layer drawn off, limed out, and converted into the Na salt, which is used as the dispersing agent. $Pr^{\alpha}OH$, $Bu^{\beta}OH$, *n*-amyl and *n*-octyl alcohol, $CH_2Ph{\cdot}OH$, and *cyclo*hexanol are also mentioned as suitable for the condensation. K. H. S.

Dyeing fibrous materials with vat dyes. J. A. CARP'S GARENFABRIEKEN N.V. (B.P. 467,662, 16.11.35. Holl., 2.10.35).—At least 20% of the vat consists of a H_2O-sol. org. substance (EtOH, NH_2Ac, $Pr^{\beta}OH$, $COMe_2$) which is a solvent for the salts of the leuco-base of the dye. The process is applicable to all fibrous materials other than cellulose esters or ethers. P. G. C.

Development of [azo and vat] dyes. D. W. BISSELL, Assr. to NAT. ANILINE & CHEM. CO. (U.S.P. 2,047,543, 14.7.36. Appl., 16.12.33).—Printed fabrics are produced by applying an aq. printing paste containing a H_2O-sol. metal salt of an aromatic nitrosoamine and a H_2O-sol. metal salt of a coupling component, both reagents being free from solubilising substituents (CO_2M, SO_3M), together with, if desired, a vat dye and a suitable reducing agent, treating the print with steam containing 0·5—25% of CO_2, and, if necessary, oxidising the vat dye. Examples illustrate the application to cotton fabric of the (Na) nitrosoamines of m-$C_6H_4Cl{\cdot}NH_2$ and 2 : 4-$NO_2{\cdot}C_6H_3Cl{\cdot}NH_2$ with (Na) 2 : 3-hydroxynaphthoic anilide and *o*-toluidide (I), respectively, and 1 : 4 : 2-$C_6H_4MeCl{\cdot}NH_2$ with (I) and Indanthrene Green and $OH{\cdot}CH_2{\cdot}SO_2Na$. N. H. H.

Production of azo dyes on the fibre. COMP. NAT. DE MAT. COL. ET MANUF. DE PROD. CHIM. DU NORD RÉUNIES ETABL. KUHLMANN (B.P. 459,766, 9.5.36. Fr., 29.6.35 and 28.2.36).—A mixture of an ice-colour coupling component and a diazo component in the form of its Schiff's base with an aldehyde containing solubilising groups is applied to the fibre and the colour is developed with nitrous acid; or $NaNO_2$ is added to the mixture and the colour is developed with acid. Examples of Schiff's bases are those from : p-$C_6H_4Me{\cdot}NH_2$ and Na benzaldehyde-2 : 4-disulphonate (I) or -2-sulphonate (II); m-$C_6H_4Cl{\cdot}NH_2$ and o-$CO_2H{\cdot}C_6H_4{\cdot}CHO$ (m.p. 172—173°); 4-chloro-*o*-toluidine (III) and (II) or salicylaldehyde; 6-benzamidocresidine and (II); 4-benzamido-2 : 5-diethoxyaniline and (I) (giving with 2 : 3-hydroxynaphthoic anilide a deep blue); (III) and Na acetaldehydedisulphonate; (III) and glucose [m.p. 124—125° (decomp.), giving with acetoacetyl-*p*-toluidine a yellow]. C. H.

Increasing the reactivity of naturally or artificially shaped articles or materials consisting of or containing protein substances [wool etc.]. ACETA GES.M.B.H. (B.P. 463,043, 16.9.35. Ger., 15.9.34).—The reactivity of materials containing protein, especially towards reagents of an acid character (particularly acid dyes), is increased by treatment with alkylene oxides, sulphides, or imines. *E.g.*, wool (1 pt.) is treated for 8 hr. at 40° with 40 pts. of a 1% aq. solution of propylene oxide (I). The affinity for acid dyes is increased and for basic dyes decreased, whilst the product is more easily acetylated and more resistant to attack by textile pests than untreated material. Gaseous (I) or 10% aq. glycide solution gives similar effects. Other examples include the action of $(CH_2)_2O$ and (I) on silk, horn, leather, and casein. R. J. W. R.

[Manufacture of] dye preparations and printing pastes. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 462,384, 28.6.35).—The addition of the product from oleyl chloride and sarcosine to printing pastes prevents chipping of the roller or doctor; sulphite-cellulose liquor or $Na_2P_4O_7$ is preferably also present. C. H.

[Manufacture of] colouring compositions [for cellulose acetate]. BRIT. CELANESE LTD. (B.P. 461,214, 11.2.36. U.S., 11.2.35).—A H_2O-insol. colouring matter is compounded with dextrin and a sulphonated aliphatic alcohol $>C_5$, *e.g.*, 1 : 4-di-(methylamino)anthraquinone with dextrin and the Na salt of sulphonated lauryl alcohol. C. H.

Manufacture of [nitrosoamine] dye compositions. J. G. KERN, Assr. to NAT. ANILINE & CHEM. CO., INC. (U.S.P. 2,048,745, 28.7.36. Appl., 19.1.35).—The stability of metallic *iso*diazotates (nitrosoamines) is increased by treating them in a hot solution with an equal mol. of a non-coupling aryl- or aralkyl-sulphonate. A condensation product separates on cooling which is more stable than the known metallic *iso*diazotates. Among examples, the Na *iso*diazotate (640) derived from 2 : 5-$C_6H_3Cl_2{\cdot}NH_2$ is dissolved in H_2O (1500—2000) with 1 : 4 : 2-$C_6H_3Cl_2{\cdot}SO_3Na$ (321 pts.) at 75—80° and stirred for 2 hr.; the product crystallises on cooling. Similarly the Na *iso*diazotate of m-$C_6H_4Cl{\cdot}NH_2$ is treated with p-$CH_2Cl{\cdot}C_6H_4{\cdot}SO_3Na$ in MeOH or that from 1 : 2 : 5-$OMe{\cdot}C_6H_3(NH_2){\cdot}NO_2$ with 1 : 4 : 2 : 5-$C_6H_2Cl_2(SO_3Na)_2$. The products are used to make mixtures with azo coupling components for use in dyeing and printing. K. H. S.

Colouring compositions. BRIT. CELANESE, LTD. (B.P. 466,298, 7.2.36. U.S., 9.2.35).—Org. dyes insol. in H_2O and free from metals are milled with H_2O to a slurry, which is converted into "standard paste" by adding a natural H_2O-sol. gum with continuation of milling until gum and dye are dispersed one in the other. The dyes belong to the azo, polyarylmethane, unreduced indophenol, or indigoid classes or basic derivatives of the anthraquinone series. Typical gums are gum tragacanth, gum Shiraz (I), gum karaya, and gum arabic used in mixtures with British gum (II). In the example, 1-methylaminoanthraquinone (25) is milled for 24 hr. with H_2O (69); to this is added a mixture of (I) (80) with (II) (20 lb.) and a homogenous paste produced by milling for 24 hr. The products are used to make printing pastes and stencilling compositions for textiles by mixing with H_2O, more gum and $OH\cdot CH(CH_2\cdot OH)_2$, $(CH_2\cdot OH)_2$, or one of their derivatives. K. H. S.

Manufacture of dye printing pastes. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 464,283, 11.10.35).—The use as thickening materials of H_2O-sol. interpolymerides of H_2O-sol. vinyl ethers, *e.g.*, the Me or mono- or poly-ethylene glycol ethers, and H_2O-insol. vinyl compounds, *e.g.*, vinyl Et, Pr, Bu, or higher alkyl ethers, $CPh{:}CH_2$, vinyl sulphides, vinylcarbazoles, is claimed. H. A. P.

Textile printing [assistants]. C. J. SALA, Assr. to E. I. DU PONT DE NEMOURS & CO. (U.S.P. 2,047,650, 14.7.36. Appl., 15.8.30).—Improved vat dye printing pastes are produced by incorporating in the pastes about 60 wt.-% of glycol, its mono- or di- (Me, Et) -ethers, or mixtures of these, as printing assistants. Examples are printing pastes of Ponsol Blue GD, Sulphanthrenes Blue 2BD, and Orange R with $(OH\cdot CH_2\cdot CH_2)_2O$ and H_2O. N. H. H.

Process of mercerising. D. H. POWERS and L. H. BOCK, Assrs. to RÖHM & HAAS CO. (U.S.P. 2,040,065, 5.5.36. Appl., 3.7.33).—Cellulose materials are treated with dil. aq. solutions of quaternary benzylammonium hydroxides to give improved finishes, *e.g.*, lustrous, linen-like, and permanent calendered effects. Improved mercerisation may also be obtained by addition of small amounts (*e.g.*, 1%) of these bases to mercerising caustic liquor. Examples include the use of dimethyl-, trimethyl-, triethyl-, dimethyldi-, and dimethylphenyl-benzylammonium hydroxides. R. J. W. R.

Moistureproofing compositions and articles produced therefrom. BRIT. CELLOPHANE, LTD. (B.P. 467,901, 21.12.35. U.S., 21.12.34).—Coating compositions for transparent flexible sheets or films etc. are rendered waterproof by incorporating a stable org. compound of m.p. $\nless 37°$, a gum or resin, and a plasticiser. A wide range of compounds is exemplified, the most efficient of which (on the permeability rates given) are (one of each class given): $(C_{17}H_{35})_2CH\cdot OH$, $C_{29}H_{59}\cdot CO_2H$, $(C_{16}H_{33})_2O$, $C_{17}H_{35}\cdot CO_2C_2H_4\cdot O\cdot C_{18}H_{37}$, $CO(C_{11}H_{23})_2$, $C_{17}H_{35}\cdot CO\cdot NHBu^a$, $C_{30}H_{61}Cl$, $(C_{18}H_{37})_2Hg$, $(C_{18}H_{37})_2S$. (Cf. B.P. 283,109; B., 1929, 715.) P. G. C.

Treatment [finishing] of cellulosic materials. BLEACHERS ASSOC., LTD., W. KERSHAW, and C. J. WHITELEGG (B.P. 462,824, 16.9.35).—Cotton, linen, or regenerated cellulosic fabrics are impregnated with solutions of regenerated or modified cellulose (I) or a cellulose ether (*e.g.*, methyl- or glycol-cellulose) in caustic alkali and then mercerised to give stiff linen-like and organdie finishes. (I) is obtained by degradation of cellulose with aq. NaOH under the action of heat and pressure until the cuprammonium fluidity is >30. The reagent may be pptd. on the fabric by acids, salts, etc. before mercerisation, or may be applied to fabrics prior to bleaching. Examples include the treatment of cotton with 2—5% of glycolcellulose in 5—10% aq. NaOH, and the impregnation of unbleached cotton with a 5% solution of (I) in 10% NaOH followed by treatment with aq. $Ca(OH)_2$ and kier-boiling. R. J. W. R.

Production of stiffened fabrics and articles of wearing apparel. BRIT. CELANESE, LTD. (B.P. 463,079, 27.9.35. U.S., 27.9.34).—Stiffened fabrics and fabric articles are prepared by the use of an intermediate layer of non-thermoplastic fabric, coated or impregnated with a finely-divided H_2O-insol. cellulose derivative [*e.g.*, cellulose acetate (I)] and a carbohydrate derivative [methyl- (II) or ethyl-cellulose, starch acetate, etc.] as an adhesive which swells or dissolves in H_2O; a plasticiser may also be present. Adhesion is obtained by applying heat and pressure in the presence of a liquid (*e.g.*, EtOH containing 20% of H_2O) which swells or dissolves both the cellulose derivative and the adhesive. *E.g.*, cotton fabric impregnated with a dispersion of (I) (20), (II) (28, as 5% aq. solution), o-$C_6H_4(CO_2Me)_2$ (2) in H_2O (50 pts.) is used as the inter-layer. R. J. W. R.

Manufacture of bitumenised felts. M. O. SCHUR and W. L. HEARN, Assrs. to BROWN CO. (U.S.P. 2,049,978, 4.8.36. Appl., 4.1.33).—The strength of bitumenised felts containing cellulose fibre is improved by spraying with H_2O; one face of the sheet may be protected with, *e.g.*, a linseed oil paint. S. M.

Dyeing etc. apparatus.—See I. **Quaternary N compounds.**—See III. **Azo dyes. Phthalocyanine lakes.**—See IV. **Securing surfaces together.**—See XIV. **Dyeing leather.**—See XV.

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Intensification of the tower sulphuric acid process. L. I. MARKOV (J. Chem. Ind. Russ., 1937, **14**, 190—192).—Oxidation of NO and SO_2 takes place only in the liquid phase, indicating that the optimum conditions of H_2SO_4 production would be such as would not involve elimination of oxides of N from the acid, and at temp. < those ordinarily applied in the tower process. R. T.

Experiments on oxidation space in the intensive tower process, at the Vojkov works. I. N. KUZMINICH and E. J. TURCHAN (J. Chem. Ind. Russ., 1937, **14**, 10—18).—The inclusion of extra space for oxidation of NO leads to economy in HNO_3, and permits more intensive production. The cooling surface needed for the process may be reduced by making certain adjustments in the temp. régime. R. T.

Regeneration of oxides of nitrogen in the tower sulphuric acid process. V. N. SCHULTZ (J. Chem. Ind. Russ., 1937, **14**, 18—23; cf. preceding abstract).—Polemical, against Kuzminich. The val. of the extra oxidation space is contested. R. T.

Calculation of working conditions of Gay Lussac towers. V. N. SUTSCHKOV (J. Chem. Ind. Russ., 1937, **14**, 192—201).—Formulæ are derived. R. T.

Formulæ for use in the tower [sulphuric acid] process. K. M. Malin (J. Chem. Ind. Russ., 1937, **14**, 202—207).—Mathematical. R. T.

Optimum catalysis conditions in the manufacture of sulphuric acid [by the contact process]. F. S. Serra (Chim. et Ind., 1937, **37**, 1056—1068).—If $2a$ is the vol.-% of SO_2, b is that of O_2, x is the fraction of a converted, and k_1 and k_2 are functions of the temp., then $2at\sqrt{(k'_1k_2)} = L[a - (1 - K^{\frac{1}{2}})x]/[a - (1 + K^{\frac{1}{2}})x]$, where $k'_1 = k_1(b - x)$ and $K = k_2/k'_1$. Using this equation combined with Knietsch's experimental results, vals. of k'_1 and k_2 for various temp. and given $[SO_2]$ and $[O_2]$ are calc. From these the optimum temp. for given gas composition can be deduced, and, further, the time of contact required for a given conversion. The initial optimum temp. is about 520° and it should fall gradually as conversion proceeds. A further table shows the effect of varying gas concn. for a given temp. and yield in the time required. The only assumption in these calculations is that the reaction is a reversible one in a homogeneous system, and the good agreement with experiment suggests that the catalysis cannot be explained by adsorption or any effect depending on surface. The true explanation of the catalytic action of Pt must rather be sought in the structure of the atom. C. I.

Application of pre-catalysts in making contact sulphuric acid. I. E. Adadurov, A. N. Tzeitlin, and T. L. Fomitscheva (J. Appl. Chem. Russ., 1937, **10**, 807—820).—As_2O_3 in SO_2-O_2 mixtures is removed by passing the gas over a CuO,MnO_2 catalyst containing 5% of BeO, at 350°. The catalyst undergoes inactivation when it contains $>0.1\%$ of As_2O_5; it may be regenerated by extraction with 15% KOH, from which As can be removed by pptn. with $Ca(OH)_2$. R. T.

Production of sulphuric acid by the Stupnikov three-tower system. S. D. Stupnikov (Trans. VI Mendeleev Congr., 1935, 1932, 2, [1], 361—364).—The process is described. Its advantages are based on the acceleration of the regeneration of NO to NO_2. Ch. Abs. (e)

Production of sulphuric acid in the process of smoke abatement at electric centralisations. B. L. Schneerson (Trans. VI Mendeleev Congr., 1935, 1932, 2, [1], 371—373).—The SO_2 from low-grade coal (S 2·9—4·6%) was oxidised in presence of Mn sulphoxide or $MnCl_2$. 18—25% H_2SO_4 was obtained. 70% H_2SO_4 was obtained by oxidation of the SO_2 in a high-tension field. Ch. Abs. (e)

Coal pyrites as raw material for production of sulphuric acid. E. A. Sleptzov (Trans. VI Mendeleev Congr., 1935, 1932, 2, [1], 366—369).—Coal pyrite (C 9·91%) could be successfully added to Ural pyrite in the production of 60% acid. Conc. coal pyrite (C 5—6, S 42·7%) could be used alone. Ch. Abs. (e)

Cause of coloration of nitric acid during its production. I. E. Adadurov and V. I. Konvisor (Ukrain. Chem. J., 1937, **12**, 221—244).—The variations in colour of HNO_3 during its production are due to presence of varying amounts of blue N_2O_3 and yellow NO_2; in addition considerable amounts of NO may be present in the liquid phase, and lead to absorption of O_2 from the gaseous phase. At 760 mm. absorption of NO, and consequently of O_2, rises with falling temp., but the velocity of oxidation of $HNO_2 \propto$ temp. It is concluded that in factory practice the best results would be obtained by cooling the upper part of the absorption column, and maintaining the temp. at 20—22° in the lower part. R. T.

Preparation of chromic acid and chrome plating. S. T. Lee and W. C. Kung (Sci. Rep. Nat. Univ. Peking, 1937, **2**, 1—13).—The yields in the production of CrO_3 from $K_2Cr_2O_7$ and H_2SO_4 or from $CaCrO_4$ and H_2SO_4 are low, and the products are unsuitable for Cr plating unless further purified. The action of HNO_3 on $K_2Cr_2O_7$ (cf. B., 1936, 591), however, yields a product suitable for plating solutions. Optimum conditions for bright deposits of Cr on Cu are obtained with 250 g. of CrO_3 and 1·302 g. of H_2SO_4 (98%) per litre at 40° and a c.d. of 6·56—16·8 amp./sq. dm. J. W. S.

Increasing the productivity of the [sodium ferrite] drum in Loewig's process for production of sodium hydroxide. V. I. Sokolov (J. Chem. Ind. Russ., 1937, **14**, 443—444).—The productivity of the drum is increased, and the fuel expenditure diminished, by fitting two burners in place of one. R. T.

Electrolysis of potassium chloride in Siemens-Billiter tanks. S. N. Schojchet, S. E. Zaslavski, and I. P. Liberman (J. Chem. Ind. Russ., 1937, **14**, 113—119).—Electrolysis of aq. KCl proceeds more rapidly than does that of aq. NaCl, owing to the greater η of the latter. The p.d. is smaller, and the yield greater, in the electrolysis of KCl than of NaCl. The optimum [KCl] is 32—33%. R. T.

Regeneration of ammonia by means of unslaked lime in the ammonia-soda process. V. R. Teraschkevitsch and R. I. Baranova (J. Chem. Ind. Russ., 1937, **14**, 585—589).—The velocity of reaction of CaO with NH_4Cl is $>$ that of $Ca(OH)_2$, and the vol. of NH_3 evolved in the pre-limer is 3 times as great. R. T.

Purification of brine used in the ammonia-soda process, on a semi-industrial scale. G. P. Soloviev (J. Chem. Ind. Russ., 1937, **14**, 32—34).—Ca and Mg salts are removed from aq. NaCl by treatment with an 18—37% excess of $Ca(OH)_2$ and a 2·5% excess of Na_2CO_3, followed by sedimentation, with siphoning off of the sediment. R. T.

Purification of brine for the ammonia-soda process. V. E. Vorontschichin (J. Chem. Ind. Russ., 1937, **14**, 325—331).—A comparison of the cost of removing $Ca^{\cdot\cdot}$ and $Mg^{\cdot\cdot}$ from aq. NaCl, using a no. of methods, shows that the most economical consists in adding partly electrolysed aq. NaCl (11·5% NaOH in 16·5% NaCl). R. T.

Ferromolybdenum catalysts of ammonia synthesis. M. J. Rubanik, T. V. Zabolotzki, and M. T. Rusov (J. Chem. Ind. Russ., 1937, **14**, 484—485).—The activity of an 8 : 2 : 0·2 Fe-Mo-Al_2O_3 catalyst is $>$ that of Fe-Al_2O_3 catalyst, and is greater when the constituents are fused in an electric arc than when they are calcined at a lower temp. Inclusion of Al_2O_3 in Fe–Mo catalysts does not raise their activity, but prevents inactivation. R. T.

Influence of conditions of reduction on the activity and structure of iron catalysts for ammonia synthesis. V. P. Kamzolkin and V. D. Livschitz (J. Chem. Ind. Russ., 1937, **14**, 93—98).—The optimum temp. for the activity of Fe catalysts prepared by reduction of Fe_3O_4 varies irregularly with the temp., pressure, and rate of flow of the reducing gas. R. T.

Equilibria and kinetics of ammonia synthesis at ultra-high pressures. N. P. Kurin (J. Chem. Ind. Russ., 1937, **14**, 86—92).—NH_3 synthesis does not take place in the gaseous phase at any pressure or at temp. up to 1100°; the reaction takes place exclusively at the surface of the heating element, the nature of which is immaterial at high temp. and pressure (SiO_2, asbestos, Fe, Ni, Cu, Au, Pt, Mo, W), whilst at lower temp. those materials which tend to yield unstable intermediate compounds with N_2 give higher yields. R. T.

Absorption of ammonia by lignite. G. V. Kagan and I. V. Proschtschin (Ukrain. Chem. J., 1937, **12**, 169—182).—The absorptive capacity of lignite for NH_3 is increased by pretreatment with Cl_2 or O_2, at 100°. Sorption of gaseous NH_3 is $>$ that of aq. NH_3. R. T.

Calculation of a heat exchange of a contact apparatus for oxidation of ammonia. B. M. Aganin (J. Chem. Ind. Russ., 1937, **14**, 508—509).—Mathematical. R. T.

Platinum–rhodium and platinum catalysts for oxidation of ammonia, prepared by cathodic sputtering. V. A. Klevke (J. Chem. Ind. Russ., 1937, **14**, 98—99).—The time during which catalysts prepared by covering porcelain, SiO_2, fireclay, or asbestos with a film of Pt or Pt–Rh (by sputtering from a cathode, at low pressures) retain their activity $\propto$ thickness of the film; the loss of Pt per ton of HNO_3 produced is 0·7—0·8 g., and of Pt–Rh 0·1—0·12 g. Catalysts of this type are not industrially suitable. R. T.

Agglomeration of salts of the rock-salt type. F. A. Henglein and H. Maul (Chem. Fabr., 1937, **10**, 274—278).—Granules of salts, *e.g.*, NaCl, KBr, may be formed by allowing drops of H_2O (or a solution of the salt) to fall on a layer of the powdered salt, drying, and sieving (B.P. 269,209; B., 1927, 831). At first a pasty nucleus is formed, with a loosely adherent coating. On drying slowly, the H_2O is distributed through this layer, and binds it. The strength and shape are improved: (1) by using finely powdered salts ($<$2500 mesh/cm.^{2}), (2) (less effectively) by admixture of fine material, (3) by sintering the final product at a temp. up to the m.p. of the salt (800° for NaCl), (4) by the use of a wetting agent, which causes rapid penetration of H_2O from the nucleus to the surrounding layer, (5) by using salt solutions, or, preferably, (6) preheating the salt to 150°. The method may be applied to other salts, but those containing H_2O of crystallisation, *e.g.*, Na_2SO_4, should be tested individually. I. C. R.

Salt reserves of Lake Elton, and their utilisation. M. A. Klotschko (J. Appl. Chem. Russ., 1937, **10**, 828—844).—A method for the evaluation of the salt reserves of the lake is described. A scheme for the prep. of Mg and Na salts from the brine, involving isothermal evaporation in the summer and fractional crystallisation in the winter, is described. R. T.

Electrochemical production of sodium chlorate. P. H. Groggins, A. L. Pitman, J. McLaren, and F. H. Davis (Chem. Met. Eng., 1937, **44**, 302—307).—Trials with a plant producing 100 lb. of $NaClO_3$ per day, working on the batch method, are described. After a batch was finished it was settled at 80—90° for 6—12 hr., filtered through sand, and conc. in jacketed, agitated vac. stills. The liquor, now containing NaCl in suspension, was filtered and crystallised and the crystals were centrifuged, washed, and dried in hot air. NaCl was added to the cell to maintain concn. during electrolysis and $CaCl_2$ and $K_2Cr_2O_7$ to inhibit corrosion and reduction. Production costs for a full-scale plant are calc. to be 4·9 cents per lb. of $NaClO_3$, including overhead charges. Considerable saving would result from the use (as weed-killer) of cell liquor as such without crystallisation. C. I.

Preparation of sodium nitrite from soda and dilute and concentrated oxides of nitrogen. M. A. Miniovitsch (J. Chem. Ind. Russ., 1937, **14**, 108—112).—The residual gas obtained after absorption of oxides of N for HNO_3 production, and containing 1·5—2% of NO and 7—8% of O_2, is scrubbed with conc. aq. Na_2CO_3 at 20—40°, to yield a solution containing $NaNO_2$ 22—32, $NaNO_3$ 2—4, and $Na_2CO_3 + NaHCO_3$ 4—8%. More Na_2CO_3 is then added, and the operation is repeated with 8·5—9·5% NO, to yield a final solution containing $NaNO_2$ 42—45, $NaNO_3$ 2·5—4·5, and $Na_2CO_3 + NaHCO_3$ 0·1—0·3%. Absorption of the conc. NO is $\ngtr$30—40%; the residual gas is used for HNO_3 production. R. T.

Purification of effluent from sodium sulphide manufacture. V. F. Postnikov, A. A. Astascheva, and T. I. Kunin (J. Appl. Chem. Russ., 1937, **10**, 639—651).—The effluent, containing 0·7—3% of Na_2S, may be purified by passing air in presence of FeS or CuS; at room temp. the products are chiefly $Na_2S_2O_3$ and Na_2SO_3, whilst at 80° Na_2SO_4 is also produced. The velocity of the reaction at higher temp. is $>$ at lower, and is inversely $\propto$ $[Na_2S]$. Complete elimination of H_2S by passing flue gas is possible, with low temp. and flow velocity, and high $[CO_2]$. Chemical methods, depending on the use of $FeSO_4$, $CaOCl_2$, or $CaOCl_2 + CaO$, are not practicable. The most economical method consists in passing flue gas–air mixtures, containing O_2 3·6, CO_2 13·6, and N_2 82·8%, at 80°. R. T.

[Utilisation of] ferrophosphorus, obtained as a by-product of preparation of phosphoric acid. J. I. Michailenko and A. P. Kreschkov (J. Chem. Ind. Russ., 1937, **14**, 346—353).—89—93% of the P present in Fe phosphide is recovered as Na_3PO_4 by heating with FeS_2 (700—800°; 2 hr.), extracting the melt with HNO_3 or HCl, pptg. Fe with aq. NaOH or NH_3, filtering, and concentrating the filtrate. Equally good results are achieved by fusion with $NaNO_3$–$NaOH$ or –Na_2CO_3, and somewhat higher yields (95—96%) by fusion with Na_2SO_3. R. T.

(A) Production of sodium and potassium ferrocyanides from black cyanide. (B) Production of sodium ferrocyanide from the cyanide melt obtained by nitrogen fixation with sodium carbonate. (C) Salt equilibria in aqueous solutions of sodium ferrocyanide, chloride, carbonate, and sulphate at 25°. (D) Solubility in the system sodium ferrocyanide–sodium chloride–water at 80°. N. A. FLEISCHER and N. A. OSOKOREVA. **(E) Solubilities in system potassium ferrocyanide–potassium carbonate–potassium sulphate–water at 25°.** N. A. FLEISCHER and E. F. PLAKSINA. **(F) Vapour pressure of sodium ferrocyanide.** A. G. BERGMAN and V. S. EGOROV. **(G) Crystals of sodium ferrocyanide.** M. P. GOLOVKOV (Trans. State Inst. Appl. Chem. U.S.S.R., 1935, No. 26, 16—23, 23—38, 38—47, 48—51, 52—55, 55—56).—(A) A solution of black cyanide is treated with 3% excess of $FeSO_4,7H_2O$ at 80°, the filtrate is mixed with 5% excess of KCl, the $K_2CaFe(CN)_6$ is filtered off, decomposed with a 5% excess of K_2CO_3 at 90°, filtered from $CaCO_3$, and $K_4Fe(CN)_6$ cryst. from the filtrate. In producing $Na_4Fe(CN)_6$ (I) a 5% excess of Na_2CO_3 is used. Separation of cryst. (I) is accelerated by the presence of NaCl. (I) is completely dehydrated at 50—60°.

(B) The optimum results were obtained by adding $CaCl_2$ to the solutions before or after treatment with $FeSO_4$, filtering off the $CaCO_3$ and $CaSO_4$, and crystallising the filtrate.

(C) Solubility data at 25° are recorded for the systems (I)–Na_2CO_3–Na_2SO_4–H_2O, (I)–Na_2CO_3–NaCl–H_2O, and (I)–Na_2SO_4–NaCl–H_2O. The separation of (I) is more complete from a ternary or quaternary system containing NaCl.

(D) Solubility data are given (80°).

(E) Solubility data are given. With increasing [K_2CO_3] the solubilities of K_2SO_4 and $K_4Fe(CN)_6$ are greatly reduced.

(F) (I),$10H_2O$ exists up to 81°. At $>81°$ it yields the anhyd. salt without decomp.

(G) Cf. Ansheles and Golovkov, A., 1937, I, 171.

CH. ABS. (*e*)

Tests of the compressibility and bearing strength of potash salt. H. P. GREENWALD and H. C. HOWARTH (U.S. Bur. Mines, Tech. Paper, 1937, No. 575, 32 pp.).—Carlsbad (U.S.) potash salt, a heterogeneous 1 : 1 mixture of sylvite (KCl) and halite (NaCl), failed under test at a pressure of 4180 lb./sq. in. (3·7-in. cube). Lower pressures applied continuously caused slow compression, followed by flaking of the faces, with plastic flow from the centre. The bearing strength over a long period probably is $\not>$1800 lb./sq. in. (4000 lb./sq. in. for the halite of the roof). By gradual reduction of the mine pillars the roof should subside slowly without serious rupture, and bend rather than break. Mining methods are suggested. I. C. R.

Separation of potassium chlorate from mother-liquor by adding excess of potassium chloride. R. S. NOVAKOVSKAJA (J. Chem. Ind. Russ., 1937, **14**, 207—209).—Residual $KClO_3$ in the mother-liquors is reduced to 6—8% by adding a 25—50% excess of KCl and cooling to 0°. R. T.

Crystallisation [of potassium chlorate] with water-cooling. E. N. BOGOJAVLENSKI and L. G. CHAZIN (J. Chem. Ind. Russ., 1937, **14**, 209—211).—A method of cooling the solutions is described. R. T.

Explosiveness of potassium and sodium chlorates. I. F. BLINOV (J. Chem. Ind. Russ., 1937, **14**, 119—121).—$NaClO_3$ or $KClO_3$ cannot be detonated in absence of combustible material, whence it is concluded that wood should not enter into the construction of apparatus or containers used for their prep. or storage. R. T.

Explosiveness of ammonium nitrate–ammonium sulphate mixtures. I. F. BLINOV (J. Chem. Ind. Russ., 1937, **14**, 337—341).—Mixtures containing $<$40% of NH_4NO_3 cannot be detonated. Paraffining (to reduce hygroscopicity) affects the explosiveness of the mixtures to only an insignificant extent. R. T.

Occurrence, properties, and preparation of limestone and chalk for whiting. H. WILSON and K. G. SKINNER (U.S. Bur. Mines, 1937, Bull. 395, 160 pp.).—American and English whitings are compared (photomicrographs given) and the results of laboratory tests are given. D. K. M.

Reaction between silica, kaolin, or calcined kaolin and lime. P. P. BUDNIKOV and D. P. BOBROVNIK (Ukrain. Chem. J., 1937, **12**, 190—196).—The products obtained at 600° from CaO and SiO_2, kaolin, or kaolin burned at 600—1200° contain 0·45—1·12% of free CaO. The chief product is $2CaO,SiO_2$. R. T.

Influence of magnesia on the operation of a [calcium] carbide furnace. C. AALL (Compt. rend., 1937, **204**, 1340—1342; cf. B., 1937, 235).—Addition of $\not>$10% of MgO (as dolomite) raises the furnace temp. The carbide produced is abnormally porous and contains $<$1·2% of MgO and 0·5—0·6% of Mg. The proportion of MgO volatilised is increased. The energy yield is lower the greater is the quantity of dolomite added. The consumption of coke is increased, but that of $CaCO_3$ is lowered initially, increasing subsequently. The attack of the furnace lining is greater. MgO is reduced to Mg in the fusion zone. The Mg reacts subsequently with CO, forming MgO and C, and with O_2, forming MgO. H. J. E.

Production of calcium carbide using peat coke. V. A. PARIJSKI (J. Chem. Ind. Russ., 1937, **14**, 589—590).—Peat coke may advantageously replace ordinary coke under conditions of cheap labour and dear electrical energy. The quality of the CaC_2 obtained is somewhat better than from ordinary coke. R. T.

Nitrification of calcium oxide to yield technical calcium cyanamide. V. F. POSTNIKOV, A. C. BRONNIKOV, and I. P. KIRILLOV (J. Appl. Chem. Russ., 1937, **10**, 821—827).—CaO in technical $CaCN_2$ is removed by passing 1 : 5 NH_3–CO over a mixture of crude $CaCN_2$ and Al_2O_3 or C catalysts at

700—800°, or by passing HCN over the $CaCN_2$ at the same temp. R. T.

Preparation of calcium arsenate from white arsenic by oxidation with calcium oxychloride. S. A. Katz and A. I. Streltzova (J. Chem. Ind. Russ., 1937, **14**, 435—438).—A 5% aq. suspension of As_2O_3 is oxidised by adding a 20% suspension of $CaOCl_2$, containing 30% of available Cl, at 25—30°. $Ca_3(AsO_4)_2$ is pptd. from the resulting solution by $Ca(OH)_2$ at 95—98°. R. T.

Attempts at reworking calcium acetate powder in the Ishevski chemical plant. I. F. Chistov, S. N. Vschivtzev, and M. M. Vschivtzeva (Lesochim. Prom., 1935, 4, No. 8, 18—20).—The $Ca(OAc)_2$ powder obtained was of inferior quality. Ch. Abs. (*e*)

Preparation of grey powder [calcium acetate] in primitive plants. L. M. Rosenfeld (Lesochim. Prom., 1935, 4, No. 2, 13—17).—Tar-H_2O was treated with freshly pptd. $Ca(OH)_2$ to a slightly acid reaction, the liquid decanted, fractions of b.p. <100° were distilled off, and the remaining liquid was treated with tar (10 : 4) under agitation, filtered, and conc. Ch. Abs. (*e*)

Preparation of barium chlorate from sodium chlorate. S. S. Schraibman (J. Chem. Ind. Russ., 1937, **14**, 353—357).—35·4% $BaCl_2$ is added to conc. aq. $NaClO_3$ (1·83 equivs.), both at 70—80°, and the clarified solution is cooled; $Ba(ClO_3)_2$ separates in good yield. R. T.

Connexion between temperature of ignition of dolomite and amount of heat evolved when water is added to the product. P. P. Budnikov and L. G. Gulinova (J. Appl. Chem. Russ., 1937, **10**, 797—806).—The heat of reaction of H_2O with burnt dolomite rises abruptly when the temp. of ignition rises from 700° to 850°, corresponding with conversion of $MgCO_3$ into MgO; a second rise occurs at 1000°, due to production of CaO. An abrupt fall in heat of reaction takes place at 1300°, and a practically non-reactive product is obtained at 1500°. R. T.

Production of magnesite from dolomite in plant conditions. A. I. Liberman (Stroit. Mat., 1935, No. 5, 30—37).—A description is given of plant and process for producing magnesite by separation from dolomite milk used for the defecation of molasses at a sugar plant. Ch. Abs. (*e*)

Specifications for delivery and testing of caustic magnesia (burned magnesite) for plaster. Anon. (Chem.-Ztg., 1937, **61**, 348—349).—Specifications as to chemical composition, grain form and size, *d*, setting qualities, and mechanical properties of the resulting mortar are discussed. J. S. A.

Preparation of crystalline magnesium sulphate from serpentines. S. V. Terpugov and A. M. Tiktina (J. Chem. Ind. Russ., 1937, **14**, 332—337).—91% of the MgO and 41% of the sesquioxide content of powdered serpentine (I) is dissolved by H_2SO_4 (*d* 1·15) at 95° (2 hr.). The resulting suspension is filtered, and coarsely powdered (I) is added to neutralise excess of acid, and incidentally to ppt. part of the dissolved Fe. The remaining Fe is pptd. together with Ni by Na_2CO_3 at 95°, to yield a ppt. containing up to 16% of NiO. The filtrate is conc. and cooled, when $MgSO_4,7H_2O$ (II) separates. The mother-liquor yields (II) contaminated with Na_2SO_4 when further conc. The yields per ton of (I) are: (II) 2, impure (II) 0·22, residue containing 60% of active SiO_2 0·48 tons, and Ni 0·96 kg. R. T.

Magnesium silicophosphate. N. E. Pestov (J. Chem. Ind. Russ., 1937, **14**, 185—190).—Black serpentine, dunite, or olivinite is decomposed by 21% H_3PO_4 at 60—80°, to yield $MgHPO_4$ and active SiO_2; the product is non-hygroscopic, and contains P_2O_5 30—32 (92—98% assimilable), MgO 14—15, active SiO_2 12—15, free H_3PO_4 1—3, and H_2O 4—8%. When a higher proportion of H_3PO_4 to serpentine is used the product contains $MgH_4(PO_4)_2$, which is unsuitable as a fertiliser owing to its hygroscopicity. R. T.

Recovery of alumina and fertilisers from Chinese alunite. III. (B) Extraction with alkali. G. Hohorst and H. Hsianglin. **III. (C) Solubility of alunite in sulphuric acid.** G. Hohorst and S. P. Wen. **(3) Extraction with ammonia. (4) Treatment with sulphur dioxide. (5) Extraction with lime.** G. Hohorst, H. Hsianglin, F. Y. Liu, R. Chou, and S. P. Wen (J. Chem. Eng. China, 1937, 4, 21—28, 29—36, 37—40, 41—43, 44—50, 51—58; cf. B., 1937, 236).—Chinese alunite contains Al_2O_3 19, K_2O 5, SiO_2 41%. Best extraction of unignited alunite requires grinding to 80-mesh and the use of a large excess of KOH at 80°. The Al_2O_3 contained 1·2% of SiO_2 and the method is not likely to be economical. Alunite ground as above and ignited at 550° is fully extracted with 25% H_2SO_4 at 60—80° for 2 hr. and the Al_2O_3 is obtained free from SiO_2, but it contains up to 10% of Fe_2O_3 which involves a corresponding loss of H_2SO_4. Alunite roasted at 550—600° and extracted with aq. NH_3 gives a mixture of $(NH_4)_2SO_4$ and K_2SO_4; on treatment with $Ca(OH)_2$ NH_3 is evolved and 90% of the K_2SO_4 recovered by crystallisation, the $CaSO_4$ being treated with NH_3 and CO_2 to yield $(NH_4)_2SO_4$. This process yields an Al_2O_3 contaminated with SiO_2 and Fe_2O_3. If the alunite is treated with SO_2 and the latter completely boiled out of the liquor an Al_2O_3 containing SiO_2 0·2% and Fe_2O_3 0·18% is obtained. The above process can be simplified by direct extraction with $Ca(OH)_2$, treatment with aq. NH_3 being omitted. The requirement of $Ca(OH)_2$ is 60% of the theoretical. Recovery of K_2SO_4 is >90%. The residue is treated with NH_3 and CO_2 as above and then with SO_2 to dissolve Al_2O_3, the Al solution is filtered and boiled and the ppt. heated to 900° to remove all SO_2, and the Al_2O_3 is washed with aq. SO_2; it is then pure enough for electrolysis. The yield of Al_2O_3 is 68%. C. I.

Greek bauxite and its decomposition. A. A. Delyannis (Metall u. Erz, 1937, **34**, 282—287).—The average composition of the bauxite deposits at Distomon is: SiO_2 1·5—3·5, Fe_2O_3 20—25, TiO_2 2·5—3·5, H_2O 11—13, Al_2O_3 56—62%. Many parts of the deposits afford mineral which yields only a relatively small proportion of its Al_2O_3 to treatment with aq. NaOH in an autoclave; this is attributed to a high content of diaspore. All grades of Greek bauxite can, however, be satisfactorily treated by roasting with Na_2CO_3 ($Al_2O_3 : Na_2O$ in charge = 1 : 1·3) at 1100—1150°; on leaching the product with H_2O >90% of the Al_2O_3 can be recovered from the aq. extract by treatment with CO_2. A. R. P.

Utilisation of by-products from alumina manufacture. E. Herrmann (Chem.-Ztg., 1937, **61**, 493—496).—Methods of utilisation in use, and described in patent literature, are reviewed. High-Fe residues are of val., *e.g.*, in gas purification, as a catalyst, and in pigment and earthenware production, and high-SiO_2 residues in the production of, *e.g.*, cements, refractories, mineral wool. I. C. R.

Preparation of cryolite from sodium and aluminium sulphates. N. S. Nikolaev and V. L. Milaschevitsch (J. Chem. Ind. Russ., 1937, **14**, 429—435).—13% HF is added to a solution containing Na_2SO_4 15, H_2SO_4 0·6, and $Al_2(SO_4)_3$ 11·8%, at 90°, the solution is agitated at 95° for 40 min., allowed to settle during 25 min., the aq. layer is decanted off, and the sediment of Na_3AlF_6 (I) is filtered, washed, and dried. (I) is thus obtained in 90% yield; it contains SO_4'' 1·7, Fe_2O_3 0·5%, SiO_2 nil. The HF is freed of H_2SiF_6 by adding a slight excess of Na_2SO_4, whereby SiF_4 is quantitatively pptd. as Na_2SiF_6. R. T.

Recovery of titanium dioxide from Dniepropetrovsk titaniferous sands. A. T. Tschorni (Ukrain. Chem. J., 1937, **12**, 137—143).—Ilmenite and titanomagnetite are separated electromagnetically from the sand, the concentrate is evaporated to dryness at 100° with twice its wt. of 80% H_2SO_4, and the residue extracted with an equal wt. of H_2O, at 95—97°. The cooled extract is filtered and the filtrate boiled under reflux with excess of Fe (7 hr.), when the entire Ti content is pptd. as TiO·OH, contaminated with $TiO{\cdot}SO_4$. 95% TiO_2 is thus obtained in 15% yield. R. T.

Conditions of preparation of copper sulphate from impure electrolyte. V. A. Aglitzki and A. K. Scharova (J. Chem. Ind. Russ., 1937, **14**, 591—600).—Impure electrolyte at 80° is allowed to percolate, together with air, through a layer of granulated Cu, until the free $[H_2SO_4]$ falls to 0·6—1%; when the initial $[H_2SO_4]$ is high the electrolyte should be diluted, to give a final [Cu] of $\ngtr$9%. The filtered solution is conc. at 95°, and allowed to cool rapidly to 60°, and then slowly, during 7—8 days, when large crystals of pure $CuSO_4$ are obtained. R. T.

Drainage water from mines as a source of copper sulphate. N. I. Chitarov (J. Chem. Ind. Russ., 1937, **14**, 50—54).—The H_2O pumped out of various Cu pyrites mines contained 0·003—0·6% of Cu. R. T.

Flotation of boric acid and borates from Inder boracites. A. I. Andreeva and S. A. Kuzin (J. Appl. Chem. Russ., 1937, **10**, 845—852).—Saturated solutions of H_3BO_3 (I) and $MgSO_4$ or $MgSO_3$ are agitated, when much of the (I) separates with the foam, leaving $\nless$1·5% of (I) in the residual solution. Borax (II) may similarly be separated from Na_2SO_4, but more complete separation is achieved by adding sufficient H_2SO_4 to convert (II) into (I). R. T.

(A) Rational technological conditions for the melting out of sulphur by the autoclave method. (B) Influence of kerosene on coalescence of sulphur, in the autoclave method. N. F. Ljamin (J. Appl. Chem. Russ., 1937, **10**, 630—634, 635—638).—(A) In the autoclave method for extraction of S from ores by fusion with H_2O, the degree of mineralisation of the H_2O does not affect the results. The higher yields are obtained when the fragments of ore are 10 cm. in diameter; the presence of dust or smaller granules greatly lowers the yield.

(B) The yield of sulphur is raised by 12—18% by adding 0·7—0·9% of kerosene to the ore. The beneficial effect of kerosene is ascribed to formation of a film on the S droplets, which do not then wet the surface of the inert materials present. R. T.

Recovery of sulphur from smelter gases. M. P. Applebey (J.S.C.I., 1937, **56**, 139—146T).—Details are given of the processes developed by the I.C.I. and Bolidens Gruvaktiebolag for the recovery of SO_2 and S from smelter gases. In the former process the SO_2 is conc. by dissolving in basic Al sulphate solution, and subsequently heating the solution to regenerate pure SO_2. This process is being operated by the Outokumpu Oy in a Cu smelter at Imatra. The Boliden process consists in mixing part of the smelter gas with air and passing it through a gas producer; the reducing gas obtained reacts with fresh smelter gas in presence of a catalyst, with formation of S.

Obtaining sulphur from dissociation of gases by the contact oxidising method. D. V. Bezuglui (Trans. VI Mendeleev Congr., 1935, 1932, **2**, [1], 355—356).—The gas (20—30% H_2S) is oxidised by atm. O_2 in presence of active C as a catalyst. Animal charcoal used in the sugar industry gave better results than did charcoal. Ch. Abs. (*e*)

Combined treatment of waste from pyrites flotation to obtain sulphur, sulphurous gas, and briquettes for the blast-furnace process by the Unichim method. F. F. Wolf (Trans. VI Mendeleev Congr., 1935, 1932, **2**, [1], 349—353).—Waste from pyrites flotation for Cu (H_2O 8—10%) is briquetted with a binder [best, $Ca(OH)_2$] and burned in a shaft kiln. The hot SO_2 and N_2 evolved in the lower zone decompose FeS_2 in the upper zone into FeS and S. When FeS reaches the lower zone it forms SO_2 and Fe_2O_3 or Fe_3O_4. The briquette contains very little S and is transferred to the blast furnace. The gas contains 14% of SO_2. Ch. Abs. (*e*)

Flash-roasting of pyrites concentrates in sulphite pulp manufacture. H. Freeman (Chem. Met. Eng., 1937, **44**, 311—313, and Canad. Chem. Met., 1937, **21**, 209—210).—The efficiency of conversion of S into SO_2 in rotary burners averages 88%, the loss being principally as SO_3. For the efficient combustion of pyrites flotation concentrates to SO_2 rapid cooling of the gases from 1000° to 400° is required. In flash-roasting, the pyrites fines are forced with air through a ball mill into the combustion chamber, which is a vertical cylinder. The necessary gas-cooling is effected in a H_2O-tube boiler. Slagging in the combustion chamber is caused only by imperfect combustion. The S efficiency of such a unit over a period reaches 94% and the S content of the cinders is 0·5%. C. I.

Production of liquid sulphur dioxide for automatic refrigerators. N. N. Otvagin (J. Chem. Ind. Russ., 1937, **14**, 521—525).—A known method of production of liquid SO_2 is described. R. T.

Contact oxidation of sulphur dioxide to sulphur trioxide under pressure. A. M. Ginstling (J. Chem. Ind. Russ., 1937, **14**, 512—516).—The following reactions take place at $<$600°: (1) $3Fe_2O_3 + SO_2 \rightarrow Fe_3O_4 + SO_3$; (2) $4SO_2 + 2O_2 + 2Fe_3O_4 \rightarrow 2FeSO_4 + 2Fe_2O_3 + 2SO_3$; (3) $2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$. At 600—610° the reactions are: (4) $6SO_2 + 3O_2 + 2Fe_2O_3 \rightarrow 2Fe_2(SO_4)_3$ (I); (5) $2(I) \rightarrow 2Fe_2O_3 + 6SO_3$. When the reaction proceeds first at $<$600° and then at $>$600°, the reactions (6) $6FeSO_4 \rightarrow (I) + 2Fe_2O_3 + 3SO_2$, and (7) $2FeSO_4 + 2SO_3 \rightarrow (I) + SO_2$ also take place. Since reactions (3), (5), and (6) are inhibited by high pressure and excess of SO_2, which favour reaction (7), the apparent activity of the catalyst must fall with time, owing to accumulation of (I). Periodic lowering of the pressure is suggested. R. T.

Change in properties of silica gel during washing, as a result of changes in its sub-microstructure. V. K. Markov and N. A. Nagornaja (J. Appl. Chem. Russ., 1937, **10**, 853—860).—The pore diameter of SiO_2 gel pptd. from an acid medium rises when the gel is washed with dil. aq. alkali; at the same time the adsorptive capacity (C) for H_2O vapour falls. The reverse changes take place when the alkaline gel is washed with dil. acid. When the gel is dried at 100° the val. of C is $<$ at room temp., and this is also related to the greater pore diameter, due to smaller γ of H_2O at the higher temp. Sorption of H_2O by coarsely-porous gels is due largely to capillary condensation, whilst in finely-porous gels a preponderating rôle is played by adsorption on the adsorbent surfaces. R. T.

Making hydrogen by contact methods. G. Klein, N. Kaminski, and P. Junitschman (Maslob. Shir. Delo, 1935, 152—157).—In making H_2 from water-gas the contact mass accumulates S as Fe sulphides in the reduction stage. Low operating temp. favour H_2S formation. Ch. Abs. (*e*)

"Refining" of spent hydrogen. A. Moschkin and V. Zvereva (Maslob. Shir. Delo, 1934, **10**, No. 11, 23—24).—The reaction $CO + H_2O = CO_2 + H_2O$ is carried out with a catalyst containing 90% of Fe. The catalyst is regenerated *in situ* by blowing air. The method reduces the CO content of spent hydrogenation gas to 0·5%. Ch. Abs. (*e*)

Application of *i–x* diagrams to separation of helium from nitrogen. M. Rueman and A. Fedoritenko (J. Chem. Ind. Russ., 1937, **14**, 28—31).—Pure He may be obtained by fractional distillation of N_2–He mixtures, but it is not possible thus to prepare He-free N_2. R. T.

Preparation of neon–helium mixtures. V. I. Romanov and V. G. Fastovski (J. Chem. Ind. Russ., 1937, **14**, 105—108).—Apparatus serving for production of Ne–He mixtures containing $\not>3\%$ of N_2 is described. R. T.

Manufacture of oxygen and oxygen-enriched air. M. Gomonet (Rev. Mét., 1936, **33**, 560—565).—A modified Frankl process for the liquefaction of air is applied to the production of O_2. It consists in replacing tubular heat exchangers by more efficient regenerators capable of a heat-exchange efficiency of 99·5%. Examples of the use of O_2-enriched air in blast-furnace practice are briefly described. W. P. R.

Ozone-catalytic method under semi-industrial conditions. L. I. Kaschtanov (J. Chem. Ind. Russ., 1937, **14**, 365—369).—When flue gas–O_3 mixtures are passed through 0·025% $MnSO_4$, 90% of SO_2 is recovered as H_2SO_4. The activity of the catalyst is unaffected by PhOH or rise in $[H_2SO_4]$, and polythionic acids are not formed. R. T.

Absorption of chlorine by water in a packed tower. F. W. Adams and R. G. Edmonds (Ind. Eng. Chem., 1937, **29**, 447—451).—The solubility of Cl_2 in H_2O has been calc. from published data at 0—110°/0—5000 mm. Hg partial pressure, using a gas-law deviation chart for hydrocarbons of approx. the same crit. ratio. The absorption coeffs. are calc. from published data on Cl_2 dissolution in H_2O in counter-current flow in a packed tower. These show that the absorption is controlled by the H_2O film and that the coeff. is $\propto V^{0{\cdot}8}$, where V is the H_2O velocity. D. K. M.

Organic impurities in commercial bromine. M. S. Roshdestvenski and L. M. Broude (J. Appl. Chem. Russ., 1937, **10**, 722—731).—Di- and tribromo-acetamide and -acetic acid, bromal, and $CHBr_3$, but not MeCl, MeBr, $CHCl_3$, CH_2Br_2, or CNBr, were present in a sample of crude Br. R. T.

Conversion of carbon monoxide in presence of substances binding carbon dioxide. F. P. Ivanovski, E. D. Schorina, and I. G. Dreitzer (J. Chem. Ind. Russ., 1937, **14**, 567—576).—CO–H_2–H_2O mixture is passed over burnt dolomite (850—900°) at 525—575°, when the CO_2 from the reaction $CO + H_2O \rightarrow CO + H_2$ is absorbed, to yield $MgO,CaCO_3$ and give a gas containing $\not>$0·05—0·1% of $CO + CO_2$. The activity of the burnt dolomite is not enhanced by incorporating oxides of heavy metals. R. T.

Carbon dioxide from power plant flue gas. J. W. Martin and D. H. Killeffer (Ind. Eng. Chem., 1937, **29**, 632—636).—Addition of NH_3 to the absorption stage of a plant stripping CO_2 from flue gas is claimed to give a more efficient recovery, especially with low $[CO_2]$, and hence leading to smaller plant for a given output. The product is claimed to be sufficiently pure for the conversion into CO_2 snow which is to be used by the food industies. Some figures obtained from a pilot plant having a capacity of ½ ton of CO_2 per day are given. F. J. B.

Carbon dioxide scrubbing by amine solutions. L. B. Gregory and W. G. Scharmann (Ind. Eng. Chem., 1937, **29**, 514—519).—Owing to the necessity for expanding the plant at Baton Rouge for the scrubbing of 18% of CO_2 from raw H_2 as prepared for the hydrogenation plant, investigation of the possibilities of $NH_2{\cdot}C_2H_4{\cdot}OH$ (I) and $(NH_2{\cdot}CH_2)CH{\cdot}OH$ (II) as scrubbing agents, in place of the $N(C_2H_4{\cdot}OH)_3$ (III) then used to reduce the CO_2 content to 0·5% in 6,000,000 cu. ft. of H_2 per day, was undertaken in a pilot plant. This consisted of a simple scrubber tower, 11¾ in. in diameter, 35 ft. high, packed with Raschig rings (in place of the plates and bubble caps of the large-scale plant) and suitable for operation up to 500 lb./sq. in., followed by a flash separator and an actifier tower, and the necessary heat exchangers operated at atm. pressure. (I) and (II) were twice as effective as (III) from the viewpoint of CO_2 absorption and speed. Corrosion of mild steel was encountered and it was shown that this was associated with the oxidation of the amines and could be obtained by the rigorous exclusion of O_2 from the plant. F. J. B.

Rate of carbon dioxide absorption by carbonate solutions in a packed tower. C. S. Comstock and R. F. Dodge (Ind. Eng. Chem., 1937, 29, 520—529).—The effects of the concn. of solution, temp., rates of liquor and gas flow, % CO_2 in the gas, degree of conversion into bicarbonate, and the p_H of the solution on rate of absorption of CO_2 in solutions of Na_2CO_3 and K_2CO_3 were studied in a 3-in. tower packed with small glass rings. It is shown that the K_2CO_3 solution can be made to absorb 2·5 times as much CO_2 as the Na_2CO_3 solution, but that otherwise there is little gain under comparable conditions. The coeff. of rate of absorption is increased speedily with rising temp., but owing to the variation in the other conditions the rate of absorption in a given case passes through a max. The effects of the remaining factors are summed up in the empirical equation $K_Ga = [(0{\cdot}0127 + 0{\cdot}000090s) - 0{\cdot}000001237s^{1{\cdot}9}\log_{10} z](p_H - 8{\cdot}0)$, where s is the liquor rate in litres/min./sq. m. and z is the η of the solution in centipoises. Consideration of the data obtained shows that to strip 18% CO_2 gas mixtures down to 1%, using carbonate solutions, would require heights and diameters of packed towers of absurdly large dimensions and operated at the optimum temp. range of 50—60°. F. J. B.

H_2 from coke-oven gas. S from coke-oven gas. —See II. **Carbonate meter.**—See IX. **Corrosion by moist NH_3. Effect of NaOH on Cu at high temp. Flash roasting. Effect of metals on Zn–H_2SO_4 reactions. Determining Al_2O_3. Ra.** —See X. **Electrolysis.**—See XI. **$Ca(PO_3)_2$ fertilisers. P and K fertiliser materials. Ammophos. Determining H_2O in superphosphate. Analysis of fertilisers.**—See XVI.

Patents.

Production of sulphuric acid by the contact process. C. B. Clark, Assr. to Amer Cyanamid Co. (U.S.P. 2,044,419, 16.6.36. Appl., 18.5.33).—Sludge H_2SO_4 (from the refining of petroleum) is heated in a rotating tube furnace and the gas produced, containing SO_2, CO_2, H_2O, and hydrocarbons, is freed from the last two constituents by cooling, mixed with a suitable proportion of filtered gas from pyrites burners (containing an excess of air), and passed over the heated contact mass. L. C. M.

Manufacture of light metals [sodium etc.] by electrolysis. E. I. Du Pont de Nemours & Co., and R. E. Hulse (B.P. 462,828, 16.9.35).—Metals are recovered from a mixture of Ca, Na, $CaCl_2$, NaCl, CaO, and Na_2O (obtained in the purification of crude Na) by introducing it into the electrolyte (NaCl + $CaCl_2$) in the cathode compartment of a Downs cell employed in the production of Na. L. C. M.

Electrolytic production of metals [sodium]. E. I. Du Pont de Nemours & Co. (B.P. 463,663, 4.10.35. U.S., 4.10.34).—In the manufacture of Na by electrolysis of a fused mixture of NaCl and $CaCl_2$, the amount of Ca in the product is lowered from $\nless 3$ to 0·15—0·2% by discharging it upwards from the electrolytic zone at 600° through a vertical conduit with cooling fins, so that the temp. at the outlet is 100—250° ($\nless 200°$). L. C. M.

Recovery of caustic hydroxide from waste solutions. H. W. Casey, Assr. to J. C. Alexander (U.S.P. 2,040,805, 12.5.36. Appl., 1.9.33).—Liquor from rayon manufacture, containing 17·5% of NaOH and colloidal org. material, is passed through a multistage dialyser. L. C. M.

Purification of gases [nitrogen–hydrogen]. F. Porter, Assr. to Atmospheric Nitrogen Corp. (U.S.P. 2,043,263, 9.6.36. Appl., 20.2.31; cf. B., 1925, 957).—Traces of CO are removed from the H_2–N_2 mixture required for NH_3 synthesis by scrubbing with ammoniacal aq. CuCl in several steps in which the ratio $NH_3 : Cu^I$ increases as the CO content of the gas decreases. The CuCl solutions are separately regenerated by heating under pressure in presence of O_2 to oxidise the CO to CO_2, the $(NH_4)_2CO_3$ content being reduced to normal by exchanging a portion of a later solution for a portion of an earlier one. D. M. M.

Decomposition of ammonia. J. L. Pearson, and Imperial Chem. Industries, Ltd. (B.P. 462,531, 7.8.35).—An apparatus for the thermal decomp. of NH_3 consists of a vertical alloy-steel coil containing catalytic material (*e.g.*, a reduced mixture of Fe_2O_3 with Al_2O_3 + MgO) which is maintained at 540—570° by the radiation from a central electric heat; the gases produced impart their heat *via* an interchanger to fresh NH_3. L. C. M.

Manufacture of alkali-metal salts. A. E. A. S. Cornelius (B.P. 462,632, 28.4.36. Nor., 1.5. and 3.7.35).—In the production of salts from alkali chlorides, H_2O, and acidic oxides, *e.g.*, SiO_2, ZnO, Al_2O_3, MnO_2, B_2O_3, etc., the oxide is heaped so as to divide the furnace chamber (at 1100°) into two parts. At one side the chloride vapour with steam is introduced; the mass of oxide soon becomes porous and increases in vol., while the salt fuses as it is formed and is tapped off from the bottom of the furnace. Unchanged chloride which passes through the mass of oxide condenses in the cooler part of the chamber, and is revaporised and returned. L. C. M.

Production of alkali-metal nitrates. Coutts & Co., and F. Johnson. From I. G. Farbenind.

A.-G. (B.P. 463,811, 25.11.35. Addn. to B.P. 419,232; B., 1935, 146).—In the process of the prior patent, other heated gases (*e.g.*, air at 400°) are used in place of steam. L. C. M.

Production of nitrates. C. F. Weston, Assr. to Atmospheric Nitrogen Corp. (U.S.P. 2,041,504, 19.5.36. Appl., 6.10.31).—Gases containing NO_2 (*e.g.*, from the oxidation of NH_3) are brought in contact with aq. Na_2CO_3 until the solution becomes slightly acid with HNO_3; the residual $NaNO_2$ is then oxidised by aëration of the hot liquor. L. C. M.

Treatment of nitrate-bearing material. E. F. Freed, Assr. to Compania Salitrera Anglo Chilena (U.S.P. 2,040,548, 12.5.36. Appl., 29.12.33).—A mixture of crude $NaNO_3$ with CaO or $CaCO_3$ is heated at 500—900°; the residue is leached, yielding aq. NaOH and $Ca(OH)_2$, which is used again, and the N oxides after passing through a dust precipitator are absorbed in H_2O and the solution is treated with $CaCO_3$. The aq. $Ca(NO_3)_2$ produced is used in the removal of SO_4'' from caliche leach solution. L. C. M.

Formation of tetrathionate solutions. L. Rosenstein (U.S.P. 2,039,555, 5.5.36. Appl., 25.10.30).—Aq. $Na_2S_2O_3$ 18 + $NaHCO_3$ 28 g. per litre is oxidised electrolytically, yielding aq. $Na_2S_4O_6$, which may be employed to remove H_2S and mercaptans from petroleum distillates. L. C. M.

Manufacture of potassium sulphate. I. L. Clifford, and Imperial Chem. Industries, Ltd. (B.P. 464,040, 10.10.35).—A mixture of KCl (95%) 860, and Na_2SO_4 820, with KCl 360 + glaserite (I) 90 recovered from mother-liquor (*A*), is stirred with mother-liquor (*B*) 4000 at 30°; (I) crystallises, and the liquor is evaporated, NaCl which separates from the hot solution is collected, and the liquor cooled, whereby (I) 90 + KCl 360 are deposited. (I) is then stirred at 30° with H_2O 1300 and mother-liquor (*C*) 1300, yielding impure K_2SO_4 1100 and mother-liquor (*B*) 4000; the K_2SO_4 is then recrystallised by dissolving in liquor (*C*) 7700 and blowing in steam 1200, filtering, and allowing the solution to cool slowly. Pure K_2SO_4 1000 and mother-liquor (*C*) 9000 pts. are obtained. L. C. M.

Production of ammonium sulphate. H. Heimann, Assr. to Bayerische Stickstoff-Werke, A.-G. (U.S.P. 2,044,167, 16.6.36. Appl., 13.4.34. Ger., 11.11.31).—S, or an oxidisable compound containing S (*e.g.*, pyrites, ZnS, or spent gas purification material), is autoclaved at $>100°$ (150—205°) with aq. NH_3 in an atm. of O_2 at 20—40 atm. pressure. L. C. M.

Flaking of amorphous solids [alkali meta- and pyro-phosphates]. R. E. Zinn, Assr. to Victor Chem. Works (U.S.P. 2,041,448, 19.5.36. Appl., 5.9.33).—Flakes approx. 0·001 in. in thickness are produced by pouring the fused phosphate at 700° between cooled rollers rotating at 1200 r.p.m. L. C. M.

Manufacture of ammonium phosphates. J. J. Phillips (U.S.P. 2,040,563, 12.5.36. Appl., 24.10.33).—Aq. H_3PO_4 and/or $NH_4H_2PO_4$ is brought in contact with gases containing NH_3, and cryst. $(NH_4)_2HPO_4$ separated. L. C. M.

Manufacture of a low-consistency hydrated lime. F. C. Welch, Assr. to Western Lime & Cement Co. (U.S.P. 2,044,553, 16.6.36. Appl., 23.5.32).—$Ca(OH)_2$ requiring the min. of H_2O to produce a workable paste is prepared by slaking CaO with aq. $CaCl_2$ (44—110 g./litre). L. C. M.

Manufacture of magnesium oxide and chloride. R. B. MacMullin, Assr. to Mathieson Alkali Works, Inc. (U.S.P. 2,039,653, 5.5.36. Appl., 16.5.32).—Calcined dolomite is heated at 300—500° with NH_4Cl in an atm. of N_2, and the product treated with steam and/or O_2 at 400—700°. The resulting mixture of $CaCl_2$ and MgO is carbonated by treatment with H_2O and flue gases, then filtered from $CaCO_3$, boiled, filtered from $MgCO_3$, which is returned to the process, and evaporated until $MgCl_2,6H_2O$ crystallises. L. C. M.

Manufacture of magnesium hydroxide. L. Mellersh-Jackson. From Marine Chemicals Co., Ltd. (B.P. 467,543, 21.10.36).—$Mg(OH)_2$ of high chemical and physical activity may be prepared (in a hydrous form, whereby rapid separation from the mother-liquor may be effected) from dil. solutions, *e.g.*, sea-H_2O, by mixing the brine [preferably after treatment to remove $Ca(HCO_3)_2$ etc.] with a slight excess of milk-of-CaO, diluted, *e.g.*, with used brine (to a concn. of 0·3—0·5 lb. of CaO per gal.), and, preferably after hydraulic classification and screening (0·002—0·005-in. mesh), in a tank submerged below the surface of a settling tank, at a rate controlled so that agglomerated flocks (0·03—0·25 in.) are formed, which flow, without disintegration, into the settling tank. I. C. R.

Manufacture of magnesium carbonate. G. Antonoff (B.P. 463,551, 26.9.35).—MgO 1 kg. is suspended in H_2O 90 litres and treated with CO_2 2·4 kg. at 50 lb./sq. in.; the clear liquid (87·5 litres) is drawn off and excess of CO_2 is removed by evacuation. A very light product (apparent *d* 0·05—0·06) is obtained by adding the aq. $Mg(HCO_3)_2$ to a suspension of MgO 0·85 kg. in H_2O 525 litres. L. C. M.

Manufacture of magnesium products. H. H. Chesny, W. H. Farnsworth, and P. D. V. Manning, Assrs. to Marine Chemicals Co., Ltd. (U.S.P. 2,041,047, 19.5.36. Appl., 23.7.32).—Brine (*d* 1·61) containing $MgCl_2$ 8·6, $CaCl_2$ 13·8, and NaCl 5% with traces of impurities is treated with CaO 0·01 wt.-% and steamed to remove $Fe(OH)_3$; seed crystals of $Mg(OH)_2$ are added to the filtered liquor, which is then heated to 60° and treated with dry, finely powdered $Ca(OH)_2$. The suspension is thickened, and the $Mg(OH)_2$ collected and washed. L. C. M.

Production of cryolite. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 463,092, 6.1.36).—NH_4F is treated with Na_3AlO_3; *e.g.*, a solution of $Al(OH)_3$ (64% Al_2O_3) 78 in aq. 29% NaOH 415 is added to one of NH_4F 222 in H_2O 300 g. The temp. rises to 50—55°, and NH_3, expelled by steaming, is used to produce fresh NH_4F; the ppt., collected, washed, and dried, contains Al 12·8 and F 53·8%. L. C. M.

Treatment of zinc-bearing ores and recovery of zinc oxide. T. A. Mitchell and R. L. Sessions, Assrs. to Hughes–Mitchell Processes, Inc. (U.S.P. 2,040,867, 19.5.36. Appl., 31.10.32).—The roasted ore is treated with dil. H_2SO_4, the suspension is filtered from insol. material and treated with aq. $CaCl_2$, yielding aq. $ZnCl_2$ which is combined with $ZnCl_2$ obtained by treating the insol. residue with Cl_2; $CaCl_2 + Ca(OH)_2$ is then added, and the pptd. Zn(OH)Cl treated with aq. Na_2CO_3, yielding $Zn_2(OH)_2CO_3$, which is ignited to produce ZnO. L. C. M.

Manufacture of zinc sulphide. Hercules Powder Co., Assees. of D. G. Morrow (B.P. 463,359, 18.5.36. U.S., 21.5.35).—In the purification of illuminating gas, aq. NH_3 is used to remove H_2S and CO_2; the gases regenerated from the liquor by heating are scrubbed successively with H_2O, aq. $FeSO_4$, and straw oil, to remove NH_3, $(CN)_2$, and org. S compounds, passed over active C, and absorbed in aq. $Zn(NO_3)_2$ containing an excess of NH_3 at 50—80° (60—70°). The pptd. ZnS is collected, washed, and dried, while NH_3 is recovered by heating the liquor, and NH_4NO_3 by crystallisation. L. C. M.

Chromate-ion reaction. [Preparation of lead chromate.] W. J. Harshaw, Assr. to Harshaw Chem. Co. (U.S.P. 2,044,244, 16.6.36. Appl., 17.1.33).—An aq. slurry of PbO or $PbCO_3$ containing <5 (0·5—3)% of, *e.g.*, HNO_3, AcOH, HBF_4, H_2SiF_6, HCl, or $HClO_3$ is treated with aq. H_2CrO_4 with agitation. The process allows the colour of the $PbCrO_4$ to be controlled. L. C. M.

Production of titanium dioxide. W. J. Tennant. From Titan Co., Inc. (B.P. 462,998, 30.10.35).—The hydrolysis of aq. $Ti(SO_4)_2$ is aided by addition of solid Na titanate, prepared, *e.g.*, by kneading a mixture of rutile 100, NaOH 100, H_2O 33, and Na_2CO_3 25 pts., drying, and calcining for 30 min. at 600—650°; the product is purified by leaching with dil. H_2SO_4 and H_2O. In the hydrolysis, 0·05—0·2 of the crude or 0·01—0·1 pt. of the purified product is used per 1 pt. of TiO_2. L. C. M.

Production of titanium dioxide. L. G. Jenness, Assr. to Intermetal Corp. (U.S.P. 2,044,753, 16.6.36. Appl., 17.6.32).—White TiO_2 of particle size 0·2—0·4 μ is obtained by adding $TiCl_4$ to aq. HCl (*d* 1·16) until a dry, granular, yellow powder corresponding with $Ti(OH)Cl_3,0{\cdot}5H_2O$ is obtained; this, when heated at 100—300°, yields TiO_2, which is classified by a Dorr machine or by air separation in order to separate particles of the desired size. L. C. M.

Production of titanium dioxide. B. W. Allan (U.S.P. 2,040,823, 19.5.36. Appl., 22.6.34).—Aq. $Ti(SO_4)_2$, containing TiO_2 201, H_2SO_4 437, and Fe 46 g./litre, obtained by decomp. ilmenite with H_2SO_4, is treated with aq. NaOH (800 g./litre) sufficient to neutralise all the H_2SO_4 except that combined with the Fe; the temp. rises to 108°, and the mixture sets on cooling to a solid gel containing 6·6% of TiO_2. Aq. $Ti(SO_4)_2$ (similar to the above) is hydrolysed by addition of approx. 4 g. of gel/litre. L. C. M.

Manufacture of titanium dioxide and products containing it. J. E. Pollak. From N. V. Industr. Maats. voorh. Noury & van der Lande (B.P. 463,966, 8.10.35).—TiO_2 of pigment quality is produced by hydrolysis of aq. $Ti(SO_4)_2$ or $TiCl_4$ (obtained, *e.g.*, by decomp. ilmenite with H_2SO_4) in presence of 0·1—10 mol.-% of Sn^{IV}, either as $SnCl_4$ or $Sn(SO_4)_2$, or as dispersed hydrated SnO_2. L. C. M.

Titanium compound and its manufacture. C. J. Kinzie and D. S. Hake, Assrs. to Titanium Alloy Manufg. Co. (U.S.P. 2,040,854, 19.5.36. Appl., 9.7.34).—Claim is made for the prep. of "Ti carboxide" (? Ti_2OC_2) by heating a mixture of rutile (97·6% TiO_2) with petroleum coke (⅛-in. mesh) 37·59 and sawdust 0·27 wt.-% in a resistance furnace at 1700—2200° until evolution of gas ceases; on cooling, a friable, spongy mass is obtained, which is sol. in aq. H_2SO_4 and yields $TiCl_4$ when treated with Cl_2. L. C. M.

Agglomeration of fine phosphate rock. H. A. Curtis, Assr. to Tennessee Valley Authority (U.S.P. 2,040,081, 12.5.36. Appl., 21.9.34).—Spheroidal masses suitable for furnacing are obtained from fines (<10-mesh) by treatment in a pugging mill with aq. 30—50% H_2SO_4 (8—14) or aq. 25—40% H_3PO_4 (6—8 wt.-%) followed by drying in a rotary dryer. L. C. M.

Production of metal carbonyls practically free from sulphur. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 463,116, 26.9.35).—$Ni(CO)_4$ prepared from Ni matte is freed from S by passage over heated absorbent material, *e.g.*, Ag, Cu, Fe, or Ni sponge, active C, SiO_2 gel, or kieselguhr, at approx. 200 atm. L. C. M.

[Preparation of] catalysts. J. L. de Roos (B.P. 467,381, 4.8.36. Holl., 1.8.35).—Catalysts of high heat-conductivity, suitable for the dissipation of heat in exothermal reactions, are prepared by mixing with the powdered catalytic material $>$ an equal wt. of metallic powder, preferably moulding (into tablets) under pressure, and heating in a practically inert atm. to a temp. at which the metallic medium assumes the dense structure of a regulus. The use of a V_2O_5–Al catalyst, *e.g.*, V_2O_5 (1 pt.) mixed with Al (1·15 pts. by wt.), moulded under pressure (3000 atm.), and heated in an electric furnace for 6 hr. at 600°, for oxidising $C_{10}H_8$ to $C_6H_4(CO_2H)_2$, is also claimed. I. C. R.

Adsorbent [activated silica gel]. H. J. Wollner, Assr. to Gen. Chem. Co. (U.S.P. 2,044,341, 16.6.36. Appl., 4.11.32).—Flint clay (45% SiO_2) is calcined at 650°, ground, digested with aq. 40% H_2SO_4, washed, dried, roasted at 600°, and treated with boiling aq. 20% Na_2CO_3; after cooling, the liquor is carbonated and the SiO_2 gel collected, washed thoroughly with H_2O, dil. H_2SO_4, and H_2O, dried, and ground to 100-mesh. It contains H_2O 18, H_2SO_4 7·2, and Na_2SO_4 0·8%. L. C. M.

Treatment [roasting] of arsenical pyrites and the like. R. Sibille (B.P. 463,922, 15.9.36).—Pyrites is subjected to a preliminary oxidising treatment at a low temp. (350—400°) with preheated air, and the gases evolved, containing As_2O_3, are passed through the main roasting furnace in countercurrent to the pyrites charge; the As_2O_3 is retained by the Fe oxides and SO_2 free from As is obtained. L. C. M.

Treatment of sulphur-bearing ores. I. Hechenbleikner, Assr. to Chem. Construction Corp. (U.S.P. 2,039,645, 5.5.36. Appl., 4.10.32).—Pyrites etc. is roasted in a rotating tube furnace divided into 3—4 compartments; the calcine is sifted and the unsintered fines (3 pts.) are mixed with fresh ore (1 pt.) and re-roasted. Gas containing 12% of SO_2 is produced. L. C. M.

Recovery of sulphur. R. F. Bacon, Assee. of J. Wilbur (B.P. 463,122, 463,438—9, and 463,685, 28.9.35. U.S., 18.10.34).—Pyrites is burned with excess of air either in the molten state or in fine suspension, and the gas containing SO_2 at $>1000°$ (cooled by heat exchange with incoming air) is reduced by (A) passage over a porous charge of pyrites + carbonaceous material at 500—900°, (B, C) treatment in a heated reaction chamber with a gaseous suspension of pyrites or slack, or (D) passing over a bed of incandescent coke. The gases are then passed through a dust collector and the S is condensed at 115—150°. L. C. M.

Production of sulphur trioxide. W. Büsching (B.P. 467,298, 28.5.36. Fr., 19.6.35).—The use of pressures >5 atm. for the production of SO_3 from SO_2 and O_2 (V catalyst) at rates considerably > those possible at lower pressures is claimed. For $>98\%$ yield, if the pressure is increased from 1 to 10 atm. the gas rate may be increased 16·4 times. The SO_3 produced is absorbed by H_2SO_4 while the gases are under pressure. I. C. R.

Regeneration of alkaline washing liquids laden with hydrogen sulphide. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 467,644, 21.12.35).—The amount of H_2S retained in a gas-washing liquor after regeneration is reduced, and the efficiency of the washing process increased so that practically all the H_2S is removed, by mixing with it a liquid of similar composition which has been used for CO_2 removal, and heating to remove the mixed gases. Where recovery of substantially pure H_2S and CO_2 is desired, the wash liquids are separately preheated and may then be mixed, or part may be used for a first stage of the respective gas-washing processes. (Cf. B.P. 427,394, 444,327, and 457,343; B., 1935, 793; 1936, 583; 1937, 344.) I. C. R.

Recovery and utilisation of gases which escape from carbon disulphide works. Montecatini Soc. Gen. per l'Ind. Min. ed Agric. (B.P. 467,805, 1.2.37. It., 1.2.36).—The gases are energetically cooled to −40° to −60° to separate CS_2, washed if necessary with solutions to fix the CO_2 and COS, and the pure H_2S remaining is used for any desired purpose, *e.g.*, prep. of NH_4 or other sulphide. D. M. M.

[Alloy] articles to resist attack by solutions containing free chlorine or hypochlorous acid, its salts or solutions thereof. Stahlwerke Röchling Buderus A.-G. (B.P. 465,999, 16.9.36. Ger., 16.9.35, 23.1. and 6.8.36).—A suitable alloy comprises Fe with Cr 20—30, Mo 1·8—10, Ti 0·5—3·5, Si 0·2—3·0, Mn 0·4—0·6, C $<0·5$ or $<1·2\%$. The Ti may be replaced by V, Ta, U, Nb, Ce, B, Zr, and/or W totalling > is necessary to combine with all the C. Cu $\ngtr 3\%$ may be present. B. M. V.

Purification of carbon dioxide. R. H. McKee (U.S.P. 2,039,330, 5.5.36. Appl., 8.7.30).—Natural gas containing hydrocarbons and $>50\%$ of CO_2 is liquefied at 900 lb./sq. in. and treated with an absorbent, *e.g.*, activated charcoal, SiO_2 gel, paraffin wax, or heavy oil. L. C. M.

Acid sludge.—See II. **MgS.**—See X.

VIII.—GLASS; CERAMICS.

Corrosion in glass furnaces above the melt. H. Jebsen-Marwedel (Glastech. Ber., 1937, **15**, 131—136).—Factors contributing towards failure of refractories above the melt are examined. The extent of attack is dependent on the type and structure of the refractory, the furnace atm., the glass produced, the occurrence of alkali vapour, etc. Photographs illustrate the major points. C. L. M.

Felspar in glass. E. Arnot (Sprechsaal, 1937, **15**, 374).—The introduction of Al_2O_3 into the batch by the use of felspar gives a glass very resistant to corrosion by H_2O and alkalis and to thermal shock. The use of felspar, however, needs careful readjustment of the other constituents (especially CaO) because Al_2O_3 raises the softening temp. and increases the tendency towards devitrification. Unless the melting temp. can be raised the amount of felspar added should be $\ngtr 10\%$ of the wt. of sand in the batch. Felspar causes frothing during the melting process but in limited amounts this has the advantage of accelerating the "fining" process. The use of a small amount of Al_2O_3 or its hydrate in addition to the felspar suppresses the frothing. J. A. S.

Bibliography on decolorising of glass. M. Schrero and F. C. Flint (Bull. Amer. Ceram. Soc., 1937, **16**, 236—246).—The bibliography covers publications by Tech. Dept. Carnegie Library (Pittsburgh), Ceramic Abstracts (Amer. Ceram. Soc.), and Soc. Glass Tech. (England). J. A. S.

Commercial-scale glass equipment. W. A. Kates (Ind. Eng. Chem., 1937, **29**, 398—401).—Modern production methods permit glass to be extruded, drawn into tubes, fusion-welded, press-moulded, and cast, being at high temp. similar to the modern synthetic plastics, and after suitable heat-treatment being scarcely more fragile. The production of the one-piece glass tubes 4⅝ in. diameter and 12 ft. long is indicative of the possible use for commercial-scale plant. The advantages of its corrosion-resistance and transparency are stressed and it is claimed that heat-transfer units, fractionating columns, pumps, etc. have been constructed. F. J. B.

Surface cracks in glasses. E. N. da C. Andrade and L. C. Tsien (Proc. Roy. Soc., 1937, A, **159**, 346—354).—The attack of Na vapour at 350° produces on hard glasses a series of fine lines which cannot be attributed to scratches. The lines are not found in freshly drawn glass, but are frequent on the same glass after it has been kept some hr. They are believed to be fine surface cracks which arise spontaneously as suggested by Griffith (Phil. Trans., 1920, A, 221, 163). Etching by HF develops scratches and drawing marks, but not the Griffith cracks.

G. D. P.

Deformation of glass in various gases at high temperatures. I. Sawai and I. Kubo (Z. anorg. Chem. 1937, **232**, 423—426; cf. B., 1937, 545).—The changes in the ratio width/height of an elliptical glass (Na_2O–CaO–SiO_2) rod at 500—1100° in air, CO_2, and SO_2 were studied. In all cases the ratio decreased at first to a min. near 700°. In air it then increased continuously, but in CO_2 a max. was reached at 800°. Absorption of CO_2 increases γ. In SO_2 the changes were slow but similar to those in CO_2 on long heating. SO_2 reacts with glass, increasing γ, and an efflorescence of Na_2SO_4 was observed on cooling. F. J. G.

Transformation points of glasses. P. Bary and J. Herbert (Compt. rend., 1937, **204**, 1809—1811; cf. A., 1925, ii, 190, 280).—The plasticity of a glass between the two transformation temp. T_1 (at which it becomes readily deformable) and T_2 (at which it becomes fluid) $\propto$ log (T/T_1). T_2 can be approx. predicted if T_1 is known. A. J. E. W.

Influence of the heating bath on the thermal shock-resistance of glasses. H. Schönborn (Sprechsaal, 1937, **70**, 301—302).—Tests were made by the method of repeated heating and cooling over a fixed temp. interval. The thermal shock-resistance vals. obtained by heating in an oil-bath were $\gg$ those obtained with a water-bath. The former leaves a film of oil on the glass which reduces the effective thermal shock of the cold-H_2O quenching bath. This effect must be considered in comparing various test results. J. A. S.

Effect of alumina on the surface tension of molten glass. C. W. Parmelee and C. G. Harman (J. Amer. Ceram. Soc., 1937, **20**, 224—230).—The surface tensions of a no. of Na_2O–CaO–MgO glasses (max. bubble pressure method; error $<\pm 0{\cdot}5\%$) increased linearly from approx. 318 dynes/cm. for 2% Al_2O_3 to 336 dynes/cm. for 7·5% Al_2O_3, in the temp. range 1200—1400°. The temp. coeff. of surface tension was −0·017 dyne/cm./degree. Volatilisation of alkali from the surface greatly affected the surface tension, and the use of acid in preparing the sample of glass powder may cause errors. The suspended-sphere method of determining d was not satisfactory for viscous glasses. J. A. S.

Reactions between glasses and phosphate solutions. J. B. Brown and A. S. Watts (J. Amer. Ceram. Soc., 1937, **20**, 245—250).—A solution containing KH_2PO_4 2·46, K_2HPO_4 7·69, NaCl 5·30, KCl 9·30 g./litre is markedly corrosive towards glass but becomes inactivated by keeping in contact with the glass at room temp. for some months or after a few hr. with glass powder at 80°. The effect, which is not accompanied by appreciable change in p_H, is due to the dissolution from the glass of small amounts of Na, K, and Mg silicates. A solution may be inactivated by the addition of very small amounts of Na_2SiO_3 or by making it up with H_2O that has been in contact with glass. Dilution of an inactivated glass partly restores its activity. J. A. S.

Spectrographic studies on ancient glass. Chinese glass, from pre-Han to T'ang times. P. D. Ritchie (Tech. Studies, 1937, **5**, 209—220).—Following a historical review of the antiquity and composition of Chinese glass, data for spectrographically discovered elements in 45 specimen objects are tabulated and discussed. N. M. B.

Rapid modified method of analysis of soda-lime glass. M. B. Vilensky (Bull. Amer. Ceram. Soc., 1937, **16**, 234—236).—SiO_2 is determined in one sample by a standard method. A second sample is decomposed with HF + $H_2C_2O_4$, after which the CaO is separated by single pptn. and weighed as $CaSO_4$. The R_2O_3 group is removed from the first filtrate with aq. NH_3 and BaO from the second. From aliquot portions of the final filtrate MgO and the alkalis may be pptd. with 8-hydroxyquinoline.

J. A. S.

Deflocculation and "temporary stiffening" of clay slips. G. Keppeler and H. Schmidt (Sprechsaal, 1937, **70**, 221—222, 235—237, 247—250, 259—262, 269—270, 285—286, 297—299).—The deflocculation and thixotropic behaviour of slips of Zettlitz kaolin, Kärlich blue clay, one Na- and two Ca-bentonites are studied. In addition to full analytical, physical, and X-ray examinations, measurements were made of slip viscosities (flow-type method) and the effect of chemical additions, the H_2O content of filter-cake made at various pressures, and the thixotropy or reversible "gelling" of slips. The pressure necessary to force the slip through a standard orifice was taken as a criterion of the degree of thixotropy and a simple test apparatus is described. p_H was the chief factor controlling the properties of a slip. Alkali (NaOH) had only a slight deflocculating effect on the bentonites and the blue clay but caused a marked increase in thixotropy. The reverse effects were observed with kaolin. Addition of protective colloids enhanced the effect of the alkali and, with the exception of the kaolin, reduced the thixotropy. The kaolin exhibited no thixotropy. The p_H vals. corresponding with max. fluidity and gelling were independent of the bases used. With increasing p_H a coarsely dispersed clay passes successively through the stages of max. deflocculation, thixotropy, and finally re-flocculation. Piperidine and other org. bases have the same effect as NaOH, thus showing that the OH ion itself is the active agent. The behaviour of a clay depends chiefly on the surface factor of the particles and not on their mineralogical character. *E.g.*, the blue clay and kaolin have similar structures but have different slip properties, whereas the blue clay and bentonite have different structures but similar properties. Thixotropy is a function of high colloidal particle content. Filter-pressing tests showed that the H_2O content of the cake is lowest when the slip has the max. fluidity (deflocculation). J. A. S.

Mechanical properties of powders. (A) Influence of capillary pressure on drying of clay.

V. S. Veselovski and I. A. Seljaev. (B) **Relationship of the mechanical properties of clay to its state of aggregation.** V. S. Veselovski and V. N. Pertzov. (C) **Effect of moisture on the mechanical properties of clay paste.** V. N. Pertzov (Kolloid. Shurn., 1936, 2, 417—423, 467—474, 475—477).—(A) The capillary pressure of liquid contained in the pores of a paste tends to diminish its vol. Hence shrinkage during drying of aq. clay paste is greater at 20° than at 70°, and also $>$ in vapours of NH_2Ph or EtOH. The influence of capillary-active substances is more marked when NaOH is added to the paste, but less so when the clay is peptised by Na_2SiO_3.

(B) Variation of the rate and vol. of sedimentation of clay suspensions and of the strength (θ) and deformability (Δ) of clay pastes with the amount of NaOH or Na_2SiO_3 added is measured. The rate of sedimentation and θ show a min., and the vol. of sedimentation and Δ show a max., in 0·1—0·2% NaOH solution.

(C) The effort, f, necessary for cutting through a clay paste cylinder, and the max. compression, δ, of a clay paste sphere which does not cause cracks, are measured. δ increases linearly, and f decreases hyperbolically, with increasing H_2O content. The relationship of δ and f to the thickness of liquid layer between the clay particles is discussed. J. J. B.

Regulating the plastic properties of clay. A. V. Tereschtschenko and I. E. Dudavski (Ogneuporui, 1935, 3, 127—134, 208—216, 298—304).—The properties vary with the cation of the sorbed complex. Saturation with Na increases the plastic properties. Al produces a clay of very high H_2O content with an insignificant increase in plasticity. In general, ions of lower valency give a higher plasticity. Ch. Abs. (e)

Puzzuolanas. N. Parravano and V. Caglioti (Chim. e l'Ind., 1937, 19, 241—251).—The composition and the microscopical and X-ray structures of 32 puzzuolanas from different sources have been determined. The natural puzzuolanas correspond approx. with $3SiO_2,R_2O_3,(R'' + R'_2)O$, where $R = Al$, Fe, $R'' = Ca$, Mg, and $R' = Na$, K. Under certain conditions of formation the puzzuolanas contain, in addition to the cryst. constituents, a vitreous phase, which has a porous structure and physical and chemical properties appertaining to a gel rather than to a glass. Measurements have been made of the rate of absorption of CaO (and of the heat evolved) by puzzuolanas and by various gels. These show that puzzuolanas can be regarded as gels which have been heated for a long time at high temp. The origin of the amorphous constituents is discussed.

O. J. W.

Ceramic linings for chemical equipment. P. C. Kingsbury (Ind. Eng. Chem., 1937, 29, 402—405).—Tiles of chemical stoneware, when fired to the min. porosity which permits satisfactory jointing, set in a suitable cement, and backed preferably by a rubber coating, give a corrosion-resistant lining which also stands up well to abrasion and other mechanical abuse. The use of Na_2SiF_6 in place of Na silicate as a bond for the carefully graded inert filler in acid-proof cements should facilitate the construction of such linings. Synthetic resin, litharge and glycerol, and S cements are considered, and the addition of synthetic rubber as a plasticiser to the last is mentioned. The necessity for thorough drying and warming before jointing, as well as substantial construction and foundations to carry the wt., is stressed.

F. J. B.

Primary North Carolina kaolins and laboratory experiments in refining to produce a material suitable for use in vitreous whiteware. R. E. Gould, A. J. Hedquist, and W. B. Boyd (J. Amer. Ceram. Soc., 1937, 20, 178—192).—Examination of the physical and chemical properties of 51 samples of the crude clays showed that the refined clays may partly replace the English china clays and the admixture of Florida kaolin may make the complete replacement possible. The methods of purification depended largely on the control of p_H. J. A. S.

Development of a true porcelain or china-type vitreous dinnerware body using American materials. R. E. Gould and A. J. Hedquist (J. Amer. Ceram. Soc., 1937, 20, 192—196).—A satisfactory cone 14 (reducing fire) body had the composition N. Carolina kaolin 33, Florida kaolin 10, felspar 20, quartz 35, dolomite 2%. A cone 14 glaze for cone 010 biscuit was 0·30 K_2O, 0·35 CaO, 0·35 MgO, 0·95 Al_2O_3, 9·50 SiO_2 and a cone 5—7 glaze for cone 14 biscuit was 0·0545 KNaO, 0·4455 PbO, 0·5000 CaO, 0·2700 Al_2O_3, 2·7000 SiO_2, 0·3203 B_2O_3. The body had good workability, green strength, and fired properties. J. A. S.

Casting of all-kaolin bodies of true porcelain and china types. A. J. Hedquist, R. E. Gould, and E. W. Wilson (J. Amer. Ceram. Soc., 1937, 20, 197—202).—The casting properties of the body described in the preceding abstract, when deflocculated with $Na_2SiO_3 + Na_2CO_3$, were typical of a body low in colloid content, *i.e.*, high casting rate, poor draining and mould release, and low green strength. Modifications of the body (additions of ball clay, bentonite, etc.) necessary to attain good casting properties affected the colour of the body adversely. The use of colloids such as agar-agar, flour, glycerin, etc. was not successful but excellent results were obtained with alkali tannates and gallates. J. A. S.

Plastic forming of vitreous bodies of true porcelain or china type, using American kaolins as plastic constituents: new method of manufacturing straight flat ware. R. E. Gould (J. Amer. Ceram. Soc., 1937, 20, 202—206).—The body previously described was easily worked into hollow and flat ware by the usual methods but the flat ware distorted badly in the kiln. A new method of placing the flat ware (with rings and supports of the same body) is described. J. A. S.

Experimental electrical firing of true porcelain and china-type bodies made from American materials for the determination of suitable schedules. R. E. Gould and A. J. Hedquist (J. Amer. Ceram. Soc., 1937, 20, 207—214).—Extensive laboratory firing tests were carried out in various atm. and with a range of heating schedules. The production of a white translucent ware requires an initial oxidising period followed by a reducing period just previous to vitrification. The reducing atm. applied before vitrification may increase the firing range from cone 11—12 to cone 11—17 but has no effect on the firing of the body if applied after vitrification. Too rapid a firing schedule or too low a vitrification temp. renders it difficult to burn out the carbonaceous matter. Thicker ware and closely packed (*e.g.*, flat) ware needs a slower firing schedule than does "hollow" ware. J. A. S.

Raw material requirements in the whiteware and glass industries. E. H. Fritz (Bull. Amer. Ceram. Soc., 1937, **16**, 231—233)—The quality and uniformity of and substitutes for the present-day raw materials are discussed. The uses of nepheline syenite, pyrophyllite, talc, etc. are considered. J. A. S.

Glazing, engobing, and "smoking" of tiles. E. Schondorff (Tonind.-Ztg., 1937, **61**, 585—587, 599—601, 609—612).—The theory and practice of the techniques are described and certain faults are illustrated with photographs. J. A. S.

Effect of the "freezing" test on the strength of tiles. O. Drögsler (Tonind.-Ztg., 1937, **61**, 577—578).—Bending, compression, and impact strength tests were made on a series of tiles before and after repeated freezing. Some materials show a decrease of 20% of the original strength after 25 freezings. It is recommended that strength tests always be made (in the H_2O-saturated state) after the freezing test. Whole tiles are more sensitive to frost than are small test-pieces. J. A. S.

Control of crystalline glazes. F. H. Norton (J. Amer. Ceram. Soc., 1937, **20**, 217—224).—The crystallisation of a porcelain tile ZnO glaze was studied over a range of accurately controlled temp., the no., size, and form of the crystal centres being measured. Four types of crystal ($2ZnO,SiO_2$?) were formed by the choice of suitable temp. The process of crystallisation consists of nucleus formation followed by crystal growth, the two stages occurring simultaneously or separated by a temp. interval. The formation of nuclei follows the Arrhenius law of temp.-reaction rate. The usual type of Zn compound crystal forms nuclei so rapidly that controlled crystallisation can be attained only by redissolution of a proportion of the nuclei at a high maturing temp. followed by growth at a lower temp. A crystal cooled below a certain temp. does not continue to grow if reheated but on the contrary is redissolved. The growth is confined to the thickness of the glaze and therefore large crystals are easier to grow in the hexagonal than in the isometric system. The process of "seeding" the glaze at the growing temp. enables crystals to be formed in specified locations. Dissolution of the body in the glaze may greatly modify crystallisation. J. A. S.

Technique of hard-fire lustre glazes. Anon. (Keram. Runds., 1937, **45**, 273—275, 288—291, 299—300).—A full description of the prep. and processing of a series of glazes (940—1200°) is given. J. A. S.

Integral expansion of vitreous enamels between the softening point and room temperature. J. E. Rosenberg and A. Langerman (J. Amer. Ceram. Soc., 1937, **20**, 236—244).—A closed ring of 20-gauge steel enamelled on the outside tends to close in when it is split at one point, owing to the stress between the enamel and the steel. The tangential force required to restore the original circle is measured by direct loading between the open ends. A linear relationship is derived between the stress (F) in the ring and the average coeff. of expansion (between the softening point of the enamel and room temp., ΔT) of the enamel (α_e) relative to that of the steel (α_s), *i.e.*, $\alpha_e - \alpha_s$. The function $(\alpha_s - \alpha_e)\Delta T.E_e$, where E_e is the elastic const. of the enamel, is characteristic of the enamel and is called the "thermoelastic constant." The results are consistent with the vals. of α_e determined by the interferometer method. Allowance must be made for the fact that the softening point as determined from the interferometer expansion curve is > the temp. at which the enamel becomes viscous enough to act as a solid layer. A higher firing temp. and especially a rapid cooling rate both increase F. F decreased after the ring had been kept at room temp. for 4 weeks. J. A. S.

Backing up refractories with insulating material. G. E. Grimshaw (Steel, 1937, **100**, No. 15, 89—94; No. 16, 51—59).—The method of insulating the back walls and roofs of furnaces, and the types and properties of the various insulating materials employed, *e.g.*, asbestos, are described. R. B. C.

Refractories. R. S. Hutton (Amer. Inst. Min. Met. Eng., Tech. Publ. 817, June, 1937, 14 pp.).—A comprehensive review of recent developments is given. R. B. C.

Local slag attacks on furnace refractories. H. Jebsen-Marwedel (Feuerungstech., 1937, **25**, 78—79).—The liability to attack by molten slag depends on how the various kinds of refractory employed are arranged in the furnace. Photographs show that attack occurs when sillimanite is used above SiO_2 in a glass-melting furnace, but not *vice versa*. R. B. C.

Dust prevention in the refractory industry. Rademacher (Feuerungstech., 1937, **25**, 132—133).—Methods employed in SiO_2 brick factories to prevent escape of SiO_2 dust into the atm. are described. R. B. C.

Grog refractories high in iron for glass-tank furnaces. P. P. Budnikov (Ogneuporui, 1935, **3**, 250—255).—Addition of ≯40% of Fe compounds to refractories increases the chemical stability towards fused glass owing to mullitisation. ≮30% of Al_2O_3 must be present and the product fired at 1350—1380°. Ch. Abs. (*e*)

Silica brick bonded with chalk. I. S. Kainarski (Ogneuporui, 1935, **3**, 270—273).—Chalk (CaO 54·6, MgO 0·59, SiO_2 2·23, $Al_2O_3 + Fe_2O_3$ 0·14, ignition loss 42·34%) was substituted for CaO and gave a brick with superior mechanical properties. Ch. Abs. (*e*)

Grading, porosity, and permeability to air of sillimanite bricks. F. H. Clews and A. T.

Green (Trans. Ceram. Soc., 1937, 36, 266—273).—The greatest packing d was given by the mixture of grades $-4+8$ (mesh) 34, $-8+20$ 4, $-20+40$ 9, $-40+60$ 7, $-60+80$ 10, -80 36%. Min. permeability was obtained with <200-mesh "fines" and a max. d with a high proportion of "fines." A hand-made 10% ball clay mix had a min. porosity of 27·8%. Increase in moulding pressure decreased porosity and permeability, especially with a high proportion of fines. Considerable crushing of particles occurs during the pressing operation. J. A. S.

Structural brick from waste from magnesite production. V. V. Belovodski and N. A. Golutschko (Ogneuporui, 1935, 3, 256—260).—Waste dust obtained by burning metallurgical magnesite in rotating tubular kilns (about 10% of the total output), when treated with aq. $MgCl_2$ and moulded with a filler (gas-producer slag, quartzite, etc.), gave a brick suitable for industrial structural work. Ch. Abs. (e)

Production of corundum in a blast furnace by way of aluminium sulphide. A. S. Mikulinski (J. Chem. Ind. Russ., 1937, 14, 126—130).—An adaptation of Haglund's method is described. R. T.

Thermal-conductivity coeffs. of refractories. Spun glass for heat insulation.—See I. **Selection of coal. Analysis of graphite crucible.**—See II. **By-products from making Al_2O_3.**—See VII. **Glass content of Portland cement clinker.**—See IX. **Glass-lined steel.**—See X. **Mol. physics of insulators.**—See XI. **Synthetic glasses.**—See XIII.

Patents.

Apparatus for use in tempering glass. Amer. Securit Co., Assees. of L. V. Black (B.P. 466,037, 20.11.35. U.S., 4.12.34).—Suspending means for circular plates of glass are described. B. M. V.

Method of annealing glass-to-metal seals. Westinghouse Electric & Manufg. Co., Assees. of H. Scott (B.P. 465,931, 21.9.36. U.S., 15.10.35).—A joint composed of hard glass with expansion of $<6\cdot0 \times 10^{-6}$ per ° C. and strain point (θ) 450—500° and an Fe alloy with inflexion temp. <450° is cooled from the m.p. of the glass to about $\theta - 100°$, the temp. being chosen so that the total contractions of glass and metal are equal, and the joint is held at that temp. for 2—24 hr. to release the stresses before cooling to room temp. B. M. V.

Manufacture of safety glass. W. W. Groves. From Chem. Forschungsges. m.b.H. (B.P. 467,700, 11.6.36).—To avoid inclusion of air bubbles the plasticised binder (polyvinyl acetate etc.), free from volatile solvents, is placed between the glass sheets in the form of a cylinder or sphere; spreading ensues when the whole is pressed. S. M.

Soldering of ceramic materials. Siemens & Halske A.-G. (B.P. 466,049, 11.2.36. Ger., 9.3.35).—Ceramic articles are soldered to like or metal articles with hard solder at >300°, the joint being capillary if possible. Ni, Fe, or Ag, Cu–Sn, Cu–Zn, or Ag with $\frac{1}{2}$—10% of Cu are claimed to be suitable solders. B. M. V.

Means for supporting and placing of pottery and other goods during firing processes. W. E. Maddock (B.P. 467,373, 18.6.36).—"Pillar rings" are formed so as to support the ware in a lower position than has hitherto been usual. B. M. V.

Manufacture of abrasive articles. Carborundum Co. (B.P. 467,434, 16.12.35. U.S., 20.3.35).—In the manufacture of a mouldable mix or granular flowing material from abrasive grains, a powdered binder, and a plasticiser, the binder comprises an alkyd or phenol–CH_2O resin and the plasticiser an alkyd or glycerin–$C_6H_4(CO)_2O$ resin dissolved in dil. NH_3; the latter resin is normally soild or semi-solid. B. M. V.

Plastic.—See XIII.

IX.—BUILDING MATERIALS.

Degree of burning and quality of [Portland cement] clinker. G. Mussgnug (Zement, 1937, 26, 1—7, 22—25).—Hard-burning reduces the SO_3 content of clinker made from materials containing S. Regarding this as an index of degree of burning (B), and keeping other factors const., no increased combination of CaO is obtained by burning beyond the sintering point. The d of the clinker is unaltered, but its bulk d rises with increased B. Setting time increases with B, even when $CaSO_4$ is introduced during grinding to produce cement of const. SO_3 content (2·8%). No significant variation in soundness was observed with varying B. The highest early tensile strengths are obtained with low B, but at longer ages a higher B is better; compressive strength falls with increasing B, but the fall is much less at higher ages. When SO_3 content is equalised by adding $CaSO_4$, the optimum B is higher at higher ages. The optimum strength of mortar is obtained with moderately hard burnings. High B increases the proportion of H_2O required to make a plastic mortar. A max. of shrinkage is obtained with a moderately high B. The heat evolution in setting is lower for high B, but the difference is less marked when the SO_3 content is equalised. The time of max. temp. rise varies with setting time. Alkali content is not appreciably altered with B. Photomicrographs indicate that more $3CaO,SiO_2$ is present with high B and more $2CaO,SiO_2$ with low B. With cements of high B the formation of $Ca(OH)_2$ on shaking with H_2O is small and almost ceases in 12 hr., but with low B it is much greater and continues rapidly even after 12 hr. G. H. C.

Puzzuolanas and puzzuolanic cements. (A) Q. Sestini. (B) C. Vittori (Chim. e l'Ind., 1937, 19, 257—258).—Polemical (cf. B., 1936, 552). O. J. W.

Estimating the efficiency of [cement] pulverisers. R. Wilson (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 810, 15 pp.).—The method depends on the measurement of the surface of the pulverised material by a turbidimetric method (particles <60 μ) and by sieve analysis after crushing a weighed amount of 20—28-mesh clinker by a plunger driven in by the impact of a falling ball. In this way the clinker is crushed by a process closely akin to that of the ordinary pulverising mill, so that by comparing the results of this test with those obtained in a commercial mill the efficiency of the latter may be computed. A. R. P.

Action of sea-water on Portland cement harbour constructions of Black Sea ports. K. KRASOVSKI (Ukrain. Chem. J., 1937, **12**, 114—121).—Deterioration of Portland cement after prolonged immersion in sea-H_2O is associated with fall in Ca and rise in Mg and SO_4'' contents. Ca sulphoaluminate and $Mg(OH)_2$ are present in considerable amount in deteriorated cement. R. T.

Properties of mortars and concretes containing Portland–puzzuolanic cements. R. E. DAVIS, J. W. KELLY, G. E. TROXELL, and H. E. DAVIS (J. Amer. Concr. Inst., 1935, **7**, 80—113).—A discussion. CH. ABS. (e)

Free shrinkage and shrinkage cracking [of concrete]. INST. CIVIL ENG., REPT. RESEARCH COMM. (J. Inst. Civil Eng., 1936—37, No. 7, 272—273).—The effects of shrinkage, rate of hardening, and creep on the possibility of cracking of concrete structures are discussed. T. W. P.

Method for approximating the glass content of Portland cement clinker. W. LERCH and L. T. BROWNMILLER (J. Res. Nat. Bur. Stand., 1937, **18**, 609—622).—The heat of dissolution in a mixture of 420 g. of $2N$-HNO_3 and 5 ml. of 48% HF was determined on the original clinker and on specimens which had been annealed under conditions producing complete crystallisation. The difference is due mainly to the latent heat of crystallisation of the glass in the original clinker, and is used to measure the glass content. Data are recorded for the latent heats of crystallisation of all possible glass compositions obtainable from melts at 1400° in the system CaO–Al_2O_3–SiO_2–Fe_2O_3 for $Al_2O_3 : Fe_2O_3$ ratios of 0·64—3·24. *X*-Ray and microscopical data for the glasses are recorded. H. J. E.

Comparison of methods for measuring heat of hydration of cements. F. M. LEA (J. Inst. Civil Eng., 1936—37, No. 7, 275—278).—The heat of dissolution, adiabatic calorimeter, and semi- and non-adiabatic calorimeter methods are compared from data on 6 cements. The first method gives more closely agreeing results in tests by different laboratories but the second gives test conditions more comparable with those of practical experience. T. W. P.

Testing of puzzuolanic cements. F. M. LEA (J. Inst. Civil Eng., 1936—37, No. 7, 278—281).—Puzzuolanic cement mortars made to a dry consistence give misleading results; plastic mortars should be used for standard testing. A method for controlling consistence is given, together with a suggested standard method for determining the usefulness of a puzzuolana in increasing strength at long ages and in improving sulphate-resistance. Two sets of plastic mortar briquettes are made and cured for 1 day at 18°. The first (*a*) is then cured for a further 2 days at 18°, and the second (*b*) is cured for a further 1 day in H_2O at 50°, followed by 1 day at 18°. The ratio of strengths of $(a - b) : (a + b)$ should be $>0·25$—0·3 for a good puzzuolana. T. W. P.

Test methods for road-building cements. O. GRAF (Tonind.-Ztg., 1937, **61**, 620—622).—Provisional test methods for cross-bending strength and shrinkage tests are described. J. A. S.

Cement–mineral colours based on sodium silicate. A. V. ZNAMENSKI and G. V. SIPOVSKI (Stroit. Mat., 1935, No. 5, 49—53).—A mixture of water-glass (*d* 1·13) and 16 wt.-% of ceresite (I) was mixed with cement and applied to a concrete surface. The covering adheres to the surface. The (I) renders it elastic and eliminates hair cracks; sand also eliminates these. The optimum composition was: 50° liquid sol. glass 20·2, (I) 1·0, sand 48·3, cement 24·2, H_2O 6·3%. 4·8—9·7% of a mineral colour may be added. CH. ABS. (e)

Work of the first Moscow stone-casting plant. S. M. ROSENBLIT and L. J. PAPILOV (Stroit. Mat., 1935, No. 5, 3—12).—A review of methods of producing chemically-resistant stone and of the properties of the products. CH. ABS. (e)

Carbonate meter. E. H. ELLIS, D. RAPKIN, and N. RUDOLF (J.S.C.I., 1937, **56**, 213—214T).—A device is described which enables the $CaCO_3$ in gypsum and plasters to be determined quickly with an accuracy of 0·1%. Readings are taken on a dial of a pressure gauge worked by the excess pressure developed in a metal container. The method is applicable in any reaction in which a gas is evolved provided that the gas is sparingly sol. in the liquid medium.

Manufacture of an insoluble road composition from molasses. H. D. SEN and K. C. JOSHI (J. Sci. Tech. India, 1936, **2**, 8—24).—A surfacing composition is prepared from molasses (58·5), CaO (9·3), and asphalt (32·2%). Precise adjustment of the mixture to give a suitably alkaline and insol. resin is described. The cost of the composition is half that of asphalt. A suitable sealing coat is given by an emulsion with boiling H_2O. F. R. G.

Treatment of roads with sodium silicate. S. TACCONI (Strade, 1937, **19**, 269—272; Road Abs., 1937, **4**, No. 215).—Details of the practical treatment are given. Hard limestone (dolomite) is suitable, but the stone should be clean and free from clay. The ratio $Na_2O : SiO_2$ in the Na silicate should be 1 : 3·4 to 1 : 3·5; the solution should have *d* 1·32—1·36. The treated roads are relatively dustless and the surfaces have a light colour. T. W. P.

Perminal W and calcium chloride treatment of haulage roads. H. PRICE (Trans. Inst. Min. Eng., 1937, **93**, 252—260).—Results obtained in the use of Perminal and $CaCl_2$ for allaying and subsequently consolidating mine roadway dust are discussed. The use of Perminal is not essential for dusts containing a high proportion of limestone. H. C. M.

Selection of wood for industrial uses. R. P. A. JOHNSON (Trans. Amer. Soc. Mech. Eng., 1937, **59**, 253—258).—A discussion. R. B. C.

Action of timber fireproofing compounds. N. A. RICHARDSON (J.S.C.I., 1937, **56**, 202—205T).—

Existing theories of the action of so-called fireproofing compounds do not entirely account for the effect. Experiments show that the presence of fireproofing salts increases the amount of charcoal formed, thus reducing the amount of combustible gases evolved, and it is suggested that the action is one of chemical dehydration. Salts which have no fireproofing properties have little effect on the yield of charcoal. With effective salts the wt. of charcoal formed varies with the concn. Most of the effective salts decompose on heating, yielding some free acid, whilst stable salts containing the same acid radical are not effective.

Fireproofing of wood. T. R. TRUAX, C. A. HARRISON, and R. H. BAECHLER (Proc. Amer. Wood Pres. Assoc., 1935, 231—245).—Tests on impregnation with compounds of the type MNH_4PO_4 (M = Mg, Zn, Ba, Ca, Mn, Co, or Ni) are described. $MgNH_4PO_4 + (NH_4)_2HPO_4$ was less effective than an equal amount of $(NH_4)_2HPO_4$. Data are summarised. CH. ABS. (*e*)

Report of Committee IV on [wood] preservatives. R. E. WATERMAN *et al.* (Proc. Amer. Wood Pres. Assoc., 1934, 17—52).—Specifications for creosote (I) and (I)–coal-tar solutions and the method for determining H_2O in (I) have been revised. Tests on impregnated piling are described. A method for sludge determination in (I)–petroleum mixtures by hot-centrifuging is described. CH. ABS. (*e*)

Possibilities of open-tank impregnation of Kempas and other timbers in Malaya. A. V. THOMAS (Malay Forester, 1935, 4, 42—46; Rev. Appl. Mycol., 14, 484—485).—Absorption of 7 lb. per. cu. ft. of timber of a 1 : 1 mixture of creosote and Diesel fuel oil was adequate for timber preservation. CH. ABS. (*e*)

Corrosion of wood and its prevention. B. T. IV and E. N. RASSADINA (Lesochim. Prom., 1935, 4, No. 1, 22—28).—Wood resistant to cold AcOH may be prepared by pressure-impregnation with "Resinite 1" (from PhOH and CH_2O). Impregnation with Shungur natural bitumen of 50° softening point produces wood resistant to conc. H_2SO_4. Wood resistant to HCl can be obtained by pressure treatment with "petroleum bitumen No. 3" and with Bakelite prepared by the Davuidov method. CH. ABS. (*e*)

Toxicity of hydrogen cyanide to certain wood-boring insects. E. A. PARKIN and J. R. BUSVINE (Ann. Appl. Biol., 1937, 24, 131—143).—*Lyctus* larvæ are more sensitive to HCN at 25° than at 20° and are more susceptible than the beetles or *Anobium* larvæ. A. G. P.

Toxicity [towards wood organisms] in relation to the position and number of chlorine atoms in certain chlorinated benzene derivatives. I. HATFIELD (Proc. Amer. Wood Preserv. Assoc., 1935, 57—66).—2 : 3 : 4 : 6-$C_6HCl_4\cdot OH$, 2 : 4 : 5-$C_6H_2Cl_3\cdot OH$, and 2-chloro-*o*-phenylphenol and their Na salts showed the greatest toxicity towards the blue-staining and wood-destroying organisms used. The toxicity could not be related to the structure. CH. ABS. (*e*)

Determination of particle size. Dusts.—See I. **Selection of coal. Recovery of bitumen. Testing ductility of bituminous substances.**—See II. **Wood substances.**—See V. **Testing caustic MgO. By-products from making Al_2O_3.**—See VII. **Slag utilisation.**—See X.

PATENTS.

Hydraulic cement. DEWEY & ALMY, LTD., From DEWEY & ALMY CHEM. CO. (B.P. 466,229, 12.2.36).—The grinding of cement clinker is improved by addition at the mill of a small quantity of an agent which will peptise or disperse the cement particles; the agent may be in solution or dispersed in H_2O. Examples are lignin compounds, isethionic ester of oleic acid, $C_{10}H_6Bu\cdot SO_3H$, ligninsulphonate with $N(C_2H_4\cdot OH)_3$, etc. T. W. P.

Concrete and hydraulic cement. DEWEY & ALMY, LTD. (B.P. 466,639, 23.7.36. U.S., 24.7.35).—Lignin compounds ($\not>0\cdot2\%$) are mixed with the concrete to peptise and disperse the cement particles. Suitable material (Na or Ca ligninsulphonate) may be obtained from the wastes from paper mills. T. W. P.

Means for forming a suspension of cementitious material in air. [Cement gun.] G. E. WESTBERG and H. R. A. WESTBERG (B.P. 465,796, 11.11.35).—The actual mixing device comprises a helical conveyor for the pulp, the air being introduced through the hollow shaft of the helix. B. M. V.

Treatment of slag. T. BARTHOLOMEW (U.S.P. 2,044,199, 16.6.36. Appl., 9.9.32).—Briquettes suitable for building purposes etc. are produced by running the molten slag into cold metal moulds, and discharging the briquettes as soon as the outer crust has solidified (after 5—30 sec.); they are then annealed and cooled slowly. L. C. M.

Composition for absorbing vibration and sound. J. M. BYERS (U.S.P. 2,047,576, 14.7.36. Appl., 13.10.34).—A composition consisting of particles of polymerised tung oil set in an adhesive binder (*e.g.*, emulsified asphalt) may be used as a lining or facing for walls, containers, etc. T. W. P.

Composite surfacing materials. A. E. H. DUSSEK (B.P. 465,598, 8.11.35).—70—86 vol.-% of aggregate (granite 61, sand 25%) is mixed with 9—15% of bitumen (9%, containing fillers) and 5—15 (5)% of ground or broken waste vulcanised rubber, the whole being heated and mixed at such a temp. (150—160°) that the bitumen is melted but the rubber not decomposed. A final dressing of ground rubber may be rolled into the coating while still warm. B. M. V.

Preparation of paving composition. B. H. WAIT and R. T. HALLER (U.S.P. 2,049,985, 4.8.36. Appl., 8.3.34).—Coarse mineral aggregate is mixed in the hot, dry condition with hot bituminous cement, and then cold fine aggregate is added in sufficient amount to break up the adhesion between the hot coated particles. Fluxing oil and powdered asphalt are then added, the fluxing oil to coat the particles of cold aggregate, and the pulverised asphalt to combine and blend with the fluxing oil and the bituminous cement to form a friable mixture. H. C. M.

Slabs, blocks, or tiles of asbestos cement or like compositions. Turner & Newall, Ltd., and E. R. Harrap (B.P. 466,727, 15.1.36. Addn. to B.P. 430,016).

[Apparatus for] moulding of asbestos–cement articles. T. F. K. Brown, H. E. Chick, and L. G. Green (B.P. 465,922, 18.10.35).

Manufacture of waterproof pavements, roofs, floors, or the like. W. B. Ranson (B.P. 467,425, 16.12.35).

Drying wood etc.—See I.

X.—METALS; METALLURGY, INCLUDING ELECTROMETALLURGY.

Flotative properties of magnetite. W. E. Keck and P. Jasberg (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 801, 17 pp.).—Magnetite is readily floated with NH_4 laurate, Na oleyl sulphate, and (best of all) Na oleate, flotation being markedly increased by addition of terpineol. With saturated fatty acids flotation increases with the no. of C but in all cases the corresponding unsaturated acid gives better results. Increase or decrease of p_H by addition of NaOH or H_2SO_4 has a strong depressing effect. Na silicate, $Al(NO_3)_3$, and $Zn(NO_3)_2$ are also strong depressants, whereas $Cu(NO_3)_2$ and $Pb(NO_3)_2$ are strong activators and Co, Mn, and Ni salts are almost inert. Small quantities of $Fe(NO_3)_3$ activate flotation with Na oleate but large quantities almost completely prevent it. Other Fe^{III} and Fe^{II} salts give alternate cycles of activation and depression, as also do Cu and Pb salts with an excessive amount of Na oleate. A. R. P.

Physical properties of magnetite and its possible uses as an industrial material. R. S. Dean and C. W. Davis (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 795, 11 pp.).—Recent journal and patent literature dealing with the magnetic properties of magnetite and their application in the construction of electrical apparatus is reviewed. Various minor uses depending on its *d* and optical reflectivity are briefly discussed. A. R. P.

Damping down and restarting blast furnaces. Bongarçon (Rev. Ind. Min., 1937, No. 387, 80—86).—The problems involved are discussed. R. B. C.

Production of iron in rotary furnaces. F. Eulenstein and A. Krus (Stahl u. Eisen, 1937, 57, 6—11).—The process described is used for the production of Fe from the Fe pyrites deposits at Meggen which also contain 7% Zn. The ore, dead-burnt in a Dwight–Lloyd plant, is mixed with CaO and coal and led into a short rotary furnace fired with coal dust and preheated air. Partial reduction of Fe and volatilisation of Zn occur first and full reduction of Fe is completed in the later stages. By regulating the amount of coal dust added for reduction, the final C content of the reduced Fe can be adjusted to any desired val. W. P. R.

Utilisation of slag in the Birmingham district, Alabama. J. R. Cudworth and J. C. Mead (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 796, 9 pp.).—The slags produced in the blast furnaces in this district average SiO_2 37—34·5, Al_2O_3 12·4—11·4, CaO 44·1—45·6, MgO 4·5—6·2, FeO 0·5—0·8, S 1·5%. Granulated slag is crushed with CaO to pass 200-mesh for use as slag cement; this is sometimes mixed with sand and aggregates for sale as ready-mixed concrete. Air-cooled slag is used in the prep. of aggregates and slag sand as well as for railway ballast, slag bricks and blocks, and roofing felt. The basic open-hearth slag with 8% P is used as a soil conditioner. A. R. P.

Manufacture of iron and steel castings in green sand. C. J. Dadswell, T. R. Walker, and F. Whitehouse (Foundry Tr. J., 1937, 56, 329—333).—The advantages and disadvantages of green-sand moulding, sand control, moulding practice, etc. are discussed. R. B. C.

Pig iron. R. C. Tucker (Foundry Tr. J., 1937, 56, 347—349).—Its properties and their evaluation are discussed. R. B. C.

Heat-treatments of whiteheart malleable cast iron. J. V. Murray (Metallurgia, 1937, 16, 47—50).—A study of the mechanical properties and microstructure of an Fe, annealed at 980—1000° and then heat-treated at various temp. up to 900°, shows the need for accurate control. A wide range of usefulness for this material is suggested. S. J. K.

Freezing of cast iron. A. Boyles (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 809, 60 pp.).—The mechanism of freezing in hypoeutectic cast Fe was studied by quenching small melts at various temp. during slow cooling. Primary austenite is pptd. as dendrites which continue to grow until the eutectic temp. is reached. Crystallisation of the eutectic begins at various centres which grow equally in all directions, forming a cell-like structure. Segregation takes place in two stages: (*a*) between the primary dendrites and the liquid, and (*b*) from the crystallisation centres outward into the boundaries of the cells. Constituents formed during the freezing of the eutectic occupy the interstices of the dendrites. Graphite flakes and phosphide eutectic are thus restricted by the size and distribution of the dendrites. Alloys of Fe, C, and Si freeze in the same manner as does cast Fe, but their structure is modified. Additions of Mn and S to such alloys produced normal structures. By melting cast Fe under reduced pressure and remelting it in H_2 the change from a modified to a normal structure could be altered at will. This is attributed to the introduction and removal of H_2. On the basis of this evidence a hypothesis is proposed to explain the phenomenon of modification in cast Fe. R. B. C.

Primary etching of grey cast iron. H. Jurich (Giesserei, 1937, 24, 341—343).—The primary dendritic structure of cast Fe can be clearly brought out by etching with a hot mixture of conc. H_2SO_4 and HCO_2H or H_3BO_3, both additions serving to protect the surface from excessive oxidation during etching. H_3BO_3 is preferable to HCO_2H when the graphite is very finely distributed through a fine dendritic network. Both reagents rapidly blacken localities in which enrichment of P and S has occurred. A. R. P.

Treatment of iron structures with phosphoric acid. H. A. J. Pieters (Verfkroniek, 1937, **10**, 124).—The structure is brushed over with 33% H_3PO_4. If it is required to paint the surface, it is washed on the next day with milk-of-CaO to neutralise free acid. Pb_3O_4 primers are used. The H_3PO_4 treatment affords marked protection against rusting. D. R. D.

Influence of cathode polarisation on the velocity of corrosion of iron and steel by electrolyte solutions, and the application of cathodic protection against corrosion. B. P. Artamonov (J. Chem. Ind. Russ., 1937, **14**, 516—520).—The application of known methods is described, and the theoretical aspects of the problem are discussed. R. T.

Rapid electrodeposition of iron from ferrous chloride baths. C. Kasper (J. Res. Nat. Bur. Stand., 1937, **18**, 535—541).—Ductile Fe may be deposited from a bath containing 5*N*-$FeCl_2$ and 0·1*N*-HCl at 106° and with a c.d. of 20 amp./sq. dm. Fe^{III} salts reduce the cathode efficiency and tend to cause brittle deposits. Under any given conditions softer deposits are produced by increasing the acidity or raising the temp., or by decreasing the c.d. (max. c.d. = 85%). At lower concns. or with additions of KCl the deposits are brittle. Additions of HBO_2 or of $CaCl_2$ to the bath have no effect on the properties of the deposits. The harder deposits are finer-grained and contain more O than the softer ones. Diaphragms made of blue-asbestos cloth are satisfactory. H. J. E.

Basic open-hearth process [for steel]. H. I. Geiger (Steel, 1937, **100**, No. 13, 38—41, 80—82; No. 14, 39—44; No. 15, 64—68; No. 17, 48—52, 78—81).—The development of the process is reviewed. R. B. C.

Graphitic steel for tools and dies. F. R. Bonte and M. Fleischmann (Met. Prog., 1937, **31**, 409—413).—The properties of Graph-sil, a graphitic steel containing approx. 1% of Si, and of Graph-mo, containing C 1·45, Mn 0·35, P 0·008, S 0·015, Si 0·75, and Mo 0·25%, are described. R. B. C.

Improvement of railway-tyre steels. M. Vitzeni (Rev. Mét., 1936, **33**, 665—670).—The process consists of: (*a*) deoxidation of the steel in the furnace with 11% Fe–Si when the composition as regards S and P is satisfactory. It is emphasised that the amount of Fe–Si added should be sufficient completely to deoxidise the slag as well as the molten steel; (*b*) improvement of the dimensions of the mould in which the tyre section is cast so that shrinkage cavities are always centrally located in the upper portion of the ingot. W. P. R.

Micrography and hardness tests on a plain 1·7% carbon steel after various heat-treatments. [J.] Seigle (Rev. l'Ind. Min., 1937, 281—292, 327—339).—After slow cooling a 1·7% C steel has a cementite–pearlite structure, the cementite forming the outlines of cells of pearlite and being also present as needles in the interior of the cells. After quenching from 1150° in cold H_2O the structure consists of a heterogeneous mixture of austenite, martensite, and cementite and the metal has a min. hardness; quenching in boiling H_2O gives a martensite + austenite structure, as also does air-quenching. Heating at 900° and H_2O-quenching trebles the hardness as compared with that of metal quenched from 1150°; a similar effect is obtained by reheating the latter to 450°. Max. hardness with a martensite or troostite structure is obtained by heating at 950°, cooling slowly to 725°, and quenching. A. R. P.

New metal for deep stampings. A. H. Hayes and R. O. Griffis (Rev. Mét., 1936, **33**, 594—597).—A new material, assumed to be a mild steel, and characterised by an absence of yield point, stretcher strains after cold-work, and appreciable ageing effects, is discussed. W. P. R.

Formation of inclusions in steel. H. Wentrup (Tech. Mitt. Krupp, 1937, **5**, 131—152).—A review. E. S. H.

Quality of steels employed in the construction of autoclaves. C. Berthelot (Rev. Mét., 1937, **34**, 238—249).—The properties of steels suitable for the construction of high-temp. autoclaves in the chemical industry are: adequate strength, good creep-resistance, stability of structure at the operating temp., and resistance to embrittlement by H_2 and corrosion by H_2S. In general, additions of Cr, Mo, V, and W improve the properties of steels with low C content, and the Cr steels are particularly useful for hydrogenation plant. The possibility of coating plain C steels with special alloy steels is discussed. W. P. R.

Acid-resisting steels in the chemical industry. H. Hougardy (Chem. Fabr., 1937, **10**, 281—283).—The properties and applications in chemical industry of the (German) "Remanit" series of ferritic and martensitic steels (Cr 18, Mo 1·2—1·8%) and austenitic steels (Cr 18, Ni 8, Mo 0—2·5; Cr 16—18, Mn 8—10%) are discussed. I. C. R.

Production and fabrication of stainless steel. H. Kikkawa (Japan Nickel Rev., 1936, **4**, 592—602).—Melting, forging, heat-treatment, and manipulation of 18% C–8% Ni stainless steel are described. W. P. R.

Recent developments of stainless steel. Y. Kawakami (Japan Nickel Rev., 1936, **4**, 603—635).—A comprehensive review containing an extensive table of compositions, properties (mechanical), and applications of a large variety of stainless steels. W. P. R.

Metallography of rustless steels. Van den Bosch and Vialle (Rev. Mét., 1936, **33**, 654—664, 721—726).—Examples of macroscopic and microscopic structures developed in rustless steels by certain reagents are given. The reagents described are not in general use and include (*a*) Kalling's reagent ($CuCl_2$ 5 g., conc. HCl 100 c.c., EtOH 100 c.c., H_2O 100 c.c.), (*b*) $FeCl_3$ 5 g., conc. HCl 50 c.c., H_2O 100 c.c.: both are used for macroscopic structures. Honda's reagent [$K_3Fe(CN)_6$ 10 g., KOH 10 g., H_2O 100 c.c.] is useful for identifying carbides in austenitic stainless steels, and an electrolytic $H_2C_2O_4$ etch is used in the Bureau of Standards. W. P. R.

Uses of stainless steel. B. Katsura (Japan Nickel Rev., 1936, **4**, 636—667).—A review. W. P. R.

Application of stainless steel in dentistry. H. Ohara (Japan Nickel Rev., 1936, **4**, 686—692). W. P. R.

Properties of stainless steels. T. Murakami (Japan Nickel Rev., 1936, **4**, 572—591).—A review, containing a useful table of the effect of 50 different corrosive reagents on a plain C, a 13% Cr, and an 18% C–8% Ni steel. W. P. R.

Metallurgical problems in the construction of hydrogenation tubes and [oil-]cracking chambers. C. Berthelot (Rev. Mét., 1936, **33**, 566—573, 619—626, 677—690, 727—746).—The severity of the conditions which such plant must satisfy is reviewed and the behaviour of various steels discussed. The action of H_2 depends on the pressure and temp., and the harmful effects are caused by decarburisation of the steel surface and intercryst. fissuring. In addition, the tubes are subject to creep stresses, which may be sufficiently high to cause failure or merely to complicate design. Amongst the properties which must be considered are stability of structure at high temp., thermal conductivity, coeff. of expansion, and weldability. Cr and Mo are two useful elements which form stable carbides, and when added to steel confer useful immunity against H_2 embrittlement. The satisfactory performance of calorised tubes against oxidation, H_2S attack, and H_2 embrittlement is reported. W. P. R.

Glass-lined steel equipment. P. S. Barnes (Ind. Eng. Chem., 1937, **29**, 378—379).—The coating of steel with complex fused borosilicates is briefly considered in relation to design. Ample and uniform thickness of the steel is stated to be desirable from the viewpoint of minimising warpage when heated and movement when subjected to pressure variation. F. I. B.

Tests on spring materials considered as a basis for design calculations. R. Mossoux (Rev. Mét., 1936, **33**, 609—611).—The two important properties of materials for springs are elastic limit and resistance to fatigue. W. P. R.

Evolution of gas on annealing [steel] sheets. H. Monden and K. Skroch (Stahl u. Eisen, 1936, **56**, 1532—1535).—Large amounts of gas are evolved on box-annealing sheets of C and alloy steels. The gas contains principally H_2, CO, and CO_2, the CO_2 being formed by oxidation of the C in the steels by O_2 in the box or scale. At 700—800° there is an apparent absorption of H_2 as indicated by a negative pressure being developed in the annealing box. By returning the previously formed gases to the annealing box a bright surface without tarnished edges can be obtained on the sheets without introduction of special reducing gases. W. P. R.

X-Ray and microscopical studies on the nitrided layer in nitriding steels. G. Hägg (Ing. Vetensk. Akad. Handl., 1937, No. 143, 16 pp.).—X-Ray, microscopical, and hardness tests on nitrided soft Fe and Cr–Al and Cr–V steels indicate the existence of the phases α, β, ε (microscopically identified), and ζ belonging to the Fe–N system. R. B. C.

Mode of penetration of nitrogen into ferrite and its hardening effect. H. De Rycker (Rev. Mét., 1936, **33**, 585—587).—When nitriding steels with NH_3 nitrides of the alloying elements, such as Al or Cr, which are already in solid solution in the ferrite, are formed and a supersaturated solution of the nitrides in ferrite results. Rise of temp. causes the nitrides to coalesce and be pptd., and the hardness is thus destroyed. The nitriding temp. must not be too high if max. hardness is to be attained, nor too low for the nitrides of the alloying elements to be formed. W. P. R.

Scaling of steels heated with rich gas. W. Heiligenstaedt (Gas- u. Wasserfach, 1936, **79**, 925—932).—A series of experiments designed to elucidate the difference in the results obtained by Murphy and Jominy (cf. B., 1932, 264) and by Schroeder (cf. B., 1932, 938) were carried out by heating specimens of electrolytic Fe, mild and medium C steels in the flue gas from town coke-oven gas burned under varying conditions to give excess of air or CO in the combustion products. Tests were carried out up to 1250°. The influence of the time of heating in the gaseous mixtures, the materials tested, and of the temp. are plotted in the form of curves and the constitution of the scale is discussed. W. P. R.

Chemical behaviour of hydrogen [or steel melts] at high temperatures. J. Ciochina (Chim. et Ind., 1936, **36**, 261—269).—Decarburisation and desulphurisation of cast Fe and steels at 700—1650° by the action of H_2 containing 0·5% of O_2 have been studied. The rate of decarburisation depends partly on the C content of the metal, being faster for the high-C steels. By passing H_2 through molten steel complete decarburisation was effected, but neither the S nor the P content was effected. This was unexpected as it had been shown that almost complete removal of S could be obtained by the action of H_2 on solid steel at 1480°. W. P. R.

Oxygen in steel. R. Castro (Bull. Soc. d'Encour., 1936, **135**, 677—693).—A comprehensive review of the modes of occurrence of O in steel and the rôle it plays in determining abnormality, grain size, structural hardening, deformation hardening, and hot-shortness. W. P. R.

Effect of water vapour on hot metal. A. G. Hotchkiss (Met. Prog., 1937, **31**, 375—379).—The effects of H_2O in gases, *e.g.*, H_2, N_2, CO, and CO_2, used in bright-annealing furnaces to protect the metal during and after heat-treatment are discussed. R. B. C.

Caustic embrittlement of boiler plates. R. Rath (Chaleur et Ind., 1937, **18**, 115—116).—Caustic embrittlement (*E*) was studied by removing selected rivets and replacing them by removable pins. The rivet hole was polished and examined for cracks by means of etching. Data on the prevention of *E* by addition of Na_2SO_4 or Na_3PO_4 to the boiler-H_2O are discussed. R. B. C.

Pickling experiments with strip steel. O. Vogel (Korros. u. Metallschutz, 1937, **13**, 41).—A series of photographs taken at one-day intervals showing the progressive effect of dil. HCl on strip steel is given. R. B. C.

Theories of inhibition. Explanation of the action of inhibitors in acid corrosion of metals. W. Machu (Korros. u. Metallschutz, 1937, **13**, 20—33).—A crit. discussion. R. B. C.

General consideration of pickling prior to galvanising [of steel]. H. Bablik (Korros. u. Metallschutz, 1937, **13**, 34—40).—Available knowledge of the phenomena of pickling is summarised. R. B. C.

Demonstrating the protective action of pickling inhibitors. O. Vogel (Korros. u. Metallschutz, 1937, **13**, 40—41).—An apparatus suitable for lecture purposes is described. R. B. C.

Tinning of steel strip by electrodeposition. I. Electrodeposition and polishing of thin coatings of tin on steel. D. J. Macnaughtan, W. H. Tait, and S. Baier. **II. Effect of deformation on the protective value of hot-dipped and electrodeposited tin coatings on steel.** D. J. Macnaughtan and J. C. Prytherch (J. Electrodep. Tech. Soc., 1937, **12**, 45—64, 65—80).—I. Satisfactory continuous plating of strip was obtained in an alkaline stannate bath with either Sn or insol. anodes, and in an acid bath. The latter gives more rapid plating and is used cold, whereas the former must be heated. Speeds of plating comparable with hot tinning appear feasible. Polishing tests indicate that pptd. chalk and Vienna CaO are most suitable for polishing the matt deposits, but remove 7—20% of the Sn, according to the roughness. Scratch-brushing removes less Sn but gives a duller finish.

II. The increase in porosity caused by stretching smooth matt deposits from an acid bath is approx. the same as for hot-dipped coatings, whilst deposits from an alkaline bath superimposed on hot-dipped coatings are better. " Alkaline " deposits alone and rough matt " acid " deposits are unsuitable for uses involving deformation. C. E. H.

Welding high-tensile boiler steels. H. Aysslinger (Wärme, 1937, **60**, 220—225).—Data obtained with a sheathed electrode are discussed. Tensile, bending, and impact tests showed that the weld was as strong as the unwelded metal. No after-heating was necessary. R. B. C.

Rôle of nitrogen in welds. A. Portevin and D. Séférian (Rev. Mét., 1936, **33**, 705—720; 1937, **34**, 225—237).—The absorption of N by Fe during welding is dependent on several factors and, in general, very little absorption ($\ngtr$0·02%) occurs in O_2–C_2H_2 welding. In arc-welding, 0·15—0·20% N_2 is absorbed and the amount is determined by the voltage and length of the arc (increasing with size of arc), by the gaseous atm., and by thickness of the coating in covered electrodes. No N_2 is absorbed if Fe is melted in an atm. of N_2 and the absorption during arc-welding is caused by dissociation of mol. N_2 into at. N at the temp. of the arc. A modified constitutional diagram is given in which the limit of the α-solid solution at the eutectoid temp. (590°) is 0·13% N. The increased hardness and decreased ductility caused by pptn. of Fe_4N in quenched welds are shown by means of ternary diagrams. The influence of alloying elements, Al, Cr, Mo, Ti, U, V, Zn, is discussed and a means of obtaining welds with a fine grain size in Cr steel is described. Ti appeared to cause a diminution of the amount of N_2 absorbed, and a second nitride was formed in V-bearing steels. W. P. R.

Transformation kinetics of austenite. VI. Decomposition of austenite in carbon steels. F. Wever and H. Hänsel (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1937, **19**, 47—56; cf. B., 1933, 469).—Transformation isotherms for the range 150—700° have been determined magnetically and the influence of initial temp. investigated. The results are compared with those obtained formerly with Ni–Cr steels. E. S. H.

Thermomagnetic investigation of heterogeneity of solid solutions. P. Chevenard (XIV Congr. Chim. ind. Paris (1934), 1935, **1**, 19 pp.; Chem. Zentr., 1936, i, 2298).—Results given for an austenitic Fe–Ni–Cr–C alloy are correlated with the effects of pretreatment on the heterogeneity. The mechanical properties are improved, and the sources of fissure corrosion are eliminated, by the use of new Fe–Ni alloys richer in Ni and containing additions of Cr, Al, Mo, and Ti. J. S. A.

Carrying out the slag-print process. H. Dienbauer (Berg u. Hüttenmänn. Jahrbach, 1937, **85**, 25—27).—The method developed by Niessner (cf. B., 1937, 574) for revealing oxide and non-metallic inclusions in steels is described. Gelatin paper moistened with 5% HCl is placed for a few min. over the surface of the specimen and then developed in aq. $K_4Fe(CN)_6$. The comparative prints illustrated show that better colour definition is obtained by adding NaCl to the HCl. R. B. C.

Effect of specimen form on resistance of metals to combined alternating stresses. H. J. Gough and H. V. Pollard (Proc. Inst. Mech. Eng., 1936, **132**, 549—572).—The fatigue limit of solid specimens of ductile steels under the influence of combined alternating plane flexural and torsional stresses can be represented by an ellipse quadrant $f^2/f_1^2 + q^2/q_1^2 = 1$, where f and q are the bending and torsional stresses at the fatigue limit under the combination, and f_1 and q_1 are the fatigue limits under simple bending and torsion, respectively. The same form of ellipse quadrant applies to hollow specimens, although owing to stress redistribution effects the fatigue limits are influenced by the form of the specimen, being, in general, < for solid specimens. W. P. R.

Influence of salt baths on creep tests [on steels]. W. Schneider and K. Linden (Arch. Eisenhüttenw., 1936—7, **10**, 353—358).—When a steel specimen is kept for a long time in an alkali nitrate–nitrite bath at 450—550° either with or without load and then tested at room temp. in the tensile machine the tensile strength is unaltered, the yield point raised, and the impact val. and elongation are reduced to very low figures. This embrittlement of the metal is shown to be due to absorption of N from the salt bath and the consequent enrichment of the surface layers in nitride; this explains the erratic results obtained in creep tests when the metal is heated in a salt bath, since the fine dispersion of nitride needles tends to prevent creep. With alloy steels, especially those containing a little Cr, intercryst. corrosion occurs in the salt bath and the creep limit is therefore reduced; with high-Cr steels, however, neither corrosion nor nitriding takes place. A. R. P.

Influence of preliminary time of heating and loading on the results of creep tests. R. Mailänder and W. Ruttmann (Arch. Eisenhüttenw., 1936—7, **10**, 359—368).—Tests on plain and alloyed steels at 300—550° in the air and in salt baths have shown that prolongation of the time of heating and loading before the actual test is made reduces the rate of elongation and therefore increases the val. obtained for the creep limit. This effect is more marked with specimens heated in a salt bath than in those heated in air, due to the nitriding action of the salt bath (cf. preceding abstract). A. R. P.

Rapid photometric determination of copper and nickel in steels. K. Dietrich and K. Schmitt (Z. anal. Chem., 1937, **109**, 25—31).—The steel is dissolved in 1 : 1 HNO_3. An aliquot portion is treated with aq. NH_3, and pptd. $Fe(OH)_3$ removed by filtration. Cu is determined by photometry of the blue Cu–NH_3 colour, using filtered light. Ni is determined from the colour produced by oxidation of the dimethylglyoxime (I) complex by means of OBr′. Br–H_2O, 12% aq. NH_3, and 1% (I) are added successively, and the solution is photometered using light of $\lambda = 530$ mμ. J. S. A.

Spectrographic determination of alloying constituents [in steels]. O. Schliessmann and K. Zänker (Arch. Eisenhüttenw., 1936—7, **10**, 345—352).—The necessary apparatus and technique are described and the effect of time of exposure on the line intensities in the region 2300—3700 A., using AgBr–eosin emulsion plates, has been determined. Sparking in H_2 improves the abs. and relative sensitivity of the C lines but darkens the background and renders more difficult the determination of alloying metals. A modified electrical arrangement for exciting the spark is described which improves the reproducibility of the results. A. R. P.

Application of the polarograph in the ironworks laboratory. I. Determination of copper, nickel, and cobalt in presence of each other in steels. G. Thanheiser and G. Maassen (Mitt. Kaiser-Wilh. Inst. Eisenforsch., 1937, **19**, 27—46).—Procedure is described and results are given for several steels. E. S. H.

Determination of sulphur and silicon [in iron and steel] by a combined method. H. T. Brown (Ind. Chem., 1937, **13**, 273).—The sample is boiled with HCl, and the H_2S evolved pptd. as CdS and determined with I. To the HCl solution HNO_3 and H_2SO_4 are added, the whole is evaporated to dryness and heated, and the Fe redissolved in HCl. If the SiO_2 is not white it is again treated with HCl to dissolve residual Fe. C. I.

Influence on the accuracy of sulphur determinations in cast iron, steel, etc., using sulphur-determination apparatus with rubber-tubing gas leads. P. Schong (Chem.-Ztg., 1937, **61**, 349—350).—Appreciable amounts of S may be picked up from the rubber connexions. Glass-to-glass joints, or tested rubber, should be used. J. S. A.

Principles of magnetite testing [of steels]. P. Bricout (Rev. Mét., 1936, **33**, 638—640).—Although measurement of abs. magnetic vals. is extremely difficult, magnetic testing for control of quality of products is rapid, economical, and reliable. W. P. R.

Materials for permanent magnets. H. Neumann (Arch. Tech. Mess., 1937, No. 69, 38—42T).—A review. R. B. C.

Preparation of ferrocerium or of pyrophoric metal. H. Fölsch (Österr. Chem.-Ztg., 1937, **40**, 302—304).—An account is given of the industrial manufacture of Ce and its alloys (cf. B., 1936, 322). C. R. H.

[Smith] alloy 10. H. E. Koch (Heat Treat. Forg., 1937, **23**, 141—146).—This alloy contains Cr 37·5, Al 7·5, and Fe 55·0% and is employed for heating elements in electric furnaces. R. B. C.

Acid-resistance of iron–nickel base alloys. M. Schmidt and L. Wetternik (Korros. u. Metallschutz, 1937, **13**, 184—189).—Fe–Ni, Fe–Ni–Mo, Fe–Ni–Cu, and Fe–Ni–Mo–Cu containing Ni 28—60, Mo 0—20, and Cu 0·5% were investigated. Immersion tests were made in 3·9 and 8·0% HCl and in 29·8% H_2SO_4. Susceptibility to cracking and embrittlement by acid attack were determined by means of bend tests after immersion of strip samples for 2 months in 0·4% HCl and 16·4% H_2SO_4. Data are tabulated and discussed. R. B. C.

"Kawasaki Hakkinko"—a steel with extreme resistance to heat and acid. Y. Taguchi (Japan Nickel Rev., 1936, **4**, 668—685).—The steel contains C 0·19, Si 1·8, Mn 1·0, Ni 17, Cr 25, Mo 0·2% and possesses excellent resistance to H_2 embrittlement. W. P. R.

Selective converting [of copper bullion]. H. R. Potts (Metal Ind. [Lond.], 1937, **50**, 673—675).—Au and Ag have a greater affinity for Cu than for "white metal" (Cu_2S). In converting the white metal, the blow is stopped when conversion is partly complete, and the remaining Cu_2S poured off. The Cu left in the converter contains most of the Ag and nearly all the Au of the original charge. C. E. H.

Production of copper from brass and gunmetal scrap. E. J. Kuhlmeyer (Metallwirts., 1937, **16**, 220—224).—The method is based on the vaporisation of Zn from the scrap. A rotary drum furnace for treating 500 kg. of scrap gunmetal is described. Methods adopted for separating Zn, Sn, and Pb, and Sn and Pb from Cu, are described. R. B. C.

Flow in cold-drawing of profile bars of various metals. H. Unckel (Z. Metallk., 1937, **29**, 95—101).—The mechanism of flow of square and rectangular rods of Cu, Al, and brass has been investigated by the method of insertions (see B., 1936, 1159). Photographs of drawn rods of these metals show that flow takes place in a characteristic manner for each metal. Expressions have been derived for the stress distribution during drawing. A. R. P.

Temperature changes in the stretching of metal [copper, nickel, and steel] rods. G. Tammann and H. Warrentrup (Z. Metallk., 1937, **29**, 84—88).—During the stretching of a metal rod the temp. falls in the elastic range, but rises rapidly in the plastic range; with annealed Cu, Ni, or steel this rise in temp. increases exponentially with the increase in the internal stress produced by stretching. If the metal is first stretched beyond its elastic limit, the stress released, and the metal again stretched, the transition between elastic and plastic ranges is sharply marked on the temp.–time curve, but with soft metal it is impossible to detect this point since the exponential curve approaches so closely to the other curve (fall in temp. in elastic range) that the two cannot be differentiated. A. R. P.

Effect of sodium hydroxide on copper at high temperatures. A. S. Perry (Ind. Eng. Chem., 1937, **29**, 677).—It is recorded that the increase in the corrosion rate of Cu at 200 lb./sq. in. and 195° is $\propto$ the [NaOH] up to 2·0 g./litre except in the case of the solution which contains 1·5 g./litre, when the corrosion rate is unexpectedly and inexplicably low. F. J. B.

Corrosion-testing methods for copper alloys. D. K. Crampton and N. W. Mitchell (Metal Ind. [Lond.], 1937, **51**, 35—39).—H_2O-line and alternate-immersion tests are described and sources of error are detailed. The tensile test is favoured as a means of indicating the extent of corrosion. C. E. H.

Effect of the addition of small percentages of iron and silicon to a high-purity 4% copper–aluminium alloy. M. L. V. Gayler (J. Inst. Met., 1937, **60**, Advance copy, 99—122).—In 4% Cu–Al alloys containing Fe $\not>$0·6 and Si $\not>$1% the following phases have been detected micrographically: $CuAl_2$, α-FeSi, β-FeSi, and Si. At 500° Si has a small solubility in the Al matrix and on slow cooling to 190° it is pptd. together with $CuAl_2$. As little as 0·1% Fe inhibits room-temp. age-hardening of quenched 4% Cu–Al alloy but has no effect on artificial ageing at $>$100°; 0·6% Fe, however, markedly reduces the hardening obtainable by artificial ageing and this effect is not inhibited by addition of up to 1% Si. High-temp. age-hardening appears to be due to pptn. of Si as well as of $CuAl_2$. A. R. P.

Copper-rich nickel–aluminium–copper alloys. I. Effect of heat-treatment on hardness and electrical resistivity. W. O. Alexander and D. Hanson (J. Inst. Met., 1937, **61**, Advance copy, 275—291).—Cu alloys with Al up to 8·5 and Ni up to 10% consist of α-solid solution when quenched from 800°. Between 750° and 550° a sharp decrease in solubility takes place and this continues at a slower rate to room temp., at which only 1·5% Ni and 0·2% Al remains in solution. Max. hardening capacity of quenched alloys occurs with a 4 : 1 Ni–Al ratio and by reheating at about 550°. Hardness and resistivity changes during hardening treatments at various temp. are shown in numerous tables and graphs. A. R. P.

Effect of manganese on "annealing-brittleness" of cupronickel. B. K. Bose (J. Inst. Met., 1937, **60**, Advance copy, 187—195).—The brittleness produced by annealing 75 : 25 Cu–Ni alloy at $>$700° is shown to be due to pptn. of graphite at the grain boundaries. With 0·1% of C in the alloy addition of 1% of Mn not only prevents this brittleness but also increases the ductility and Izod val. The Mn, however, does not prevent absorption of C during melting, nor does it affect the amount of free graphite in the annealed alloy. A. R. P.

Cadmium–silver–copper alloys for engine bearings. C. F. Smart (Trans. Amer. Soc. Met., 1937, **25**, 571—602).—The properties of various Cd–Ag–Cu alloys are tabulated. Severe engine tests showed that these alloys have approx. three times the life of babbitt bearings. R. B. C.

Corrosion of brass in a moist ammonia atmosphere. J. Czochralski and H. Schreiber (Korros. u. Metallschutz, 1937, **13**, 181—183).—The changes in tensile strength undergone by cold-worked brass (Cu 60, Zn 40%; Cu 67, Zn 33%) and tombac (Cu 80, Zn 20%; Cu 85, Zn 15%) when strips were stored over aq. NH_3 for several days were measured. Complete deterioration occurred after a few hr. R. B. C.

Nickel oxide in the metallurgy of nickel. W. Lange and E. J. Kohlmeyer (Metallwirts., 1937, **61**, 598—602).—Oxidation of molten Cu–Ni alloys by means of an O_2 or air blast first produces NiO, which is sol. to a considerable extent in Ni-rich melts. On saturation of the melt with O_2 a slag consisting mainly of Cu_2O and NiO separates; its f.p. must be close to the temp. at which primary NiO separates from the oxidised melt. There appears to be a limiting Ni content above which practically complete removal of Ni by oxidation is not possible. After solidification, the metal layer contains no Cu_2O. C. E. H.

Use of nickel in non-ferrous alloy castings. J. O. Hitchcock (Metal Ind. [Lond.], 1937, **50**, 659—664, 710—713).—The casting and mechanical properties of the Ni-silvers and of the bronzes and Al alloys containing Ni are reviewed in some detail. Bearing metals, Cu–Ni, Zn-base, Ni–Cr, and Ni–Mo–Fe alloys are considered briefly. C. E. H.

Influence of annealing atmosphere on the surface structure and the bending properties of nickel sheet. H. Winterhager (Metallwirts., 1937, **16**, 671—673).—The effects of CO_2, H_2, O_2, and Cl_2 were investigated at temp. between 600° and 900° and for times up to 12 hr. CO_2 has an appreciable effect only after a long time, forming a uniform outer layer, probably of Ni carbide with some NiO. H_2 has no influence. Prolonged heating in O_2 has a detrimental effect, and subsequent treatment with H_2 causes embrittlement. Cl_2 has a marked action on Ni, producing volatile chlorides; its attack is somewhat reduced by previous annealing in CO_2 at 900°. C. E. H.

Toughness (tenacity) at low temperatures of materials containing nickel. R. Hanel (Z. Ver. deut. Ing., 1937, **81**, 410—414).—Ni and its alloys with uniform solid solutions are still tough at −192°. Steels, especially C steels, become brittle at 100° to −180°, depending on their composition. Rustless steels containing a high % of Cr are brittle at room temp., whilst 5% Ni steel is still tough at −190°. Vals. for other types of steel fall between these two limits. R. B. C.

Rate of oxidation of metals at elevated temperatures. Nickel, copper, iron, and brass. A. Krupkowski and J. Jaszczurowski (Rev. Mét., 1936, **33**, 646—653).—A method is described in which the gain in wt. of the specimen is measured *in situ* in the furnace while oxidation is in progress. The results confirm the parabolic law $w^2 = kt$, where $w =$ wt. of O_2 absorbed in mg./sq. cm. and $t =$ time in hr. The limiting factor which determines the rate is the diffusion through the oxide layer formed. Evidence for the formation of a Cu oxide other than Cu_2O is given by the results obtained. W. P. R.

Magnetic method for measuring the thickness of nickel coatings on non-magnetic base metals. A. Brenner (J. Res. Nat. Bur. Stand., 1937, **18**, 565—583).—The force of attraction between a small magnet, forming part of a magnetic balance, and Ni coatings on non-magnetic base metals is $\propto$ the thickness of the Ni (0·0005—0·025 mm.) and may be used to measure this thickness to within 10—15%. The permeability of Ni varies with the conditions of deposition, but a uniform val. was obtained by annealing specimens for 15—30 min. at 400°. Fe and Co in the Ni produce small positive errors. Thin, decorative Cr coatings over the Ni have no appreciable effect on the thickness measurements. The method is applicable to Ni-plated brass plumbing fixtures. H. J. E.

Cathodic current distribution in electrolytes. II. Nickel baths. E. Mantzell (Z. Elektrochem., 1937, **43**, 174—186; cf. A., 1936, 799).—Different types of Ni-plating bath were studied with reference to polarisation and current distribution at the cathode. It was found better to improve efficiency by increasing conductivity (κ) through the addition of suitable electrolytes, *e.g.*, chlorides and sulphates, rather than by increasing c.d. In rapid plating baths, the drop in efficiency through increasing c.d. without increasing κ was very noticeable, nor could much improvement be obtained by raising the temp. or increasing $[NiSO_4]$. Great improvement was observed on addition of NaCl or Na_2SO_4 at low c.d. In rapid plating baths with $p_H > 3$, the current yield was $>90\%$ for all vals. of c.d. used. Metal distribution at the cathode was independent of the current yield at such p_H vals., but at lower p_H vals. the interdependence of these two factors was very noticeable. C. R. H.

Testing and stripping of electrodeposits. III. Nickel, cobalt, and nickel–cobalt. E. B. Egeberg and N. E. Promisel (Met. Clean. Finish., 1937, 9, 375—382; cf. B., 1937, 686).—The technique adopted is described. R. B. C.

Extraction of chromium from electroplating waste liquors containing chromates. O. Wittmann and R. Wohlfahrt (Chem.-Ztg., 1937, **61**, 496).—Solutions are reduced by $NaHSO_3$ (solid or in solution), made alkaline with 10% Na_2CO_3, boiled for 3—5 min., and allowed to cool. The ppt. which settles is used for Cr recovery. I. C. R.

Effect of cast structure on the rolling properties of zinc. L. Northcott (J. Inst. Met., 1937, **60**, Advance copy, 123—138).—Variations in the casting temp. between 440° and 600° have no effect on the structure, *d*, tensile strength, notched-bar impact val., or rolling properties of Zn ingots cast in the Durville machine. In ingots made by directional solidification the strength of columnar Zn crystals is four times as great in the direction of growth as at right angles thereto. Mechanical tests of various types show that the metal is weakest along the basal plane. The columnar structure is broken up by hot-working and after a min. of 40% reduction the metal can be cold-rolled satisfactorily, since by this treatment internal stress is relieved and the metal is almost completely recryst. to produce an equiaxial structure. Provided that the plane of growth of a columnar crystal aggregate is in the plane of rolling, the ingot may be cold-rolled from the start if the initial passes are relatively light and the direction of rolling between successive passes is varied according to a definite crystallographic plan. Failure of Zn during working at relatively low temp. takes place by intercryst. cracking, especially along the basal planes of the crystals. Addition of 0·75% of Cd to Zn greatly refines the crystal structure but raises the recrystallisation temp. so that complete cold-rolling is impossible. Zn ingots can be rolled during cooling after casting if the rolling is started in the temp. range 350—100°. A. R. P.

Electrodeposited coatings on zinc die-castings. K. Altmannsberger (Metallwirts., 1937, **16**, 525—527).—Notes on polishing, degreasing, and plating with Cu, Ni, and Cr, and on the testing of electrodeposits, are given. R. B. C.

Testing zinc coatings. L. Kenworthy (J. Inst. Metals, 1937, **61**, 225—243).—From comparative tests on various methods of determining the wt. and distribution of Zn coatings on Fe and steel it is concluded that Britton's electrolytic method (B., 1936, 238) gives the most accurate results. Chemical stripping methods are unsatisfactory when an intermediate Fe–Zn alloy layer is present but can be used to determine uniformity of distribution. Structure is best determined by micrographic examination and porosity by the ferricyanide test. A. R. P.

Cadmium–zinc solders. A. Schaefer (Metallwirts., 1937, **16**, 61—63).—Their properties and the joints obtained are described. R. B. C.

Effect of small amounts of iron, cobalt, and nickel etc. on the behaviour of zinc towards sulphuric acid. H. Winter (Metallwirts., 1937, **16**, 521—522).—The favourable effects of traces of Cd and Pb and the unfavourable effect of Fe on the corrosion-resistance of Zn to 18% H_2SO_4 were con-

firmed. Fe was less detrimental than Co or Ni. Sn and Ge accelerated the rate of dissolution of Zn.
R. B. C.

Electrodeposition of tin from acid sulphate solutions. A. W. Hothersall and W. N. Bradshaw (J. Electrodep. Tech. Soc., 1937, **12**, 113—128).—Without addition agents Sn deposits are loose and discontinuous. Compact adherent coatings are obtained by adding a crude sulphonic acid (which also stabilises the solution), an aromatic OH-compound, and a colloid. The preferred solution contains (per litre): Sn 30, free H_2SO_4 50—100, $OH\cdot C_6H_4Me\cdot SO_3H$ (I) 100, gelatin 2 or lysalbic acid 1, and β-$C_{10}H_7\cdot OH$ (II) 1 g. Na_2SO_4 and $OH\cdot C_6H_4\cdot SO_3H$ are less effective stabilisers than (I). The properties of the bath are little impaired by prolonged use, provided that the gelatin and (II) are periodically renewed.
C. E. H.

Decoration of tinplate by printing and varnishing. W. E. Hoare (Tech. Publ. Internat. Tin Res. and Dev. Counc., 1937, *B*, No. 4, 24 pp.).—A review of current practice, with special reference to the pretreatment of the tinplate surface and the effects due to imperfections on the surface.
E. S. H.

Effect of cold-work and annealing on hardness of tin–antimony, tin–antimony–copper, and tin–antimony–silver alloys. R. E. Leyman (Tech. Publ. Internat. Tin Res. and Dev. Counc., 1937, *A*, No. 53, 18 pp.).—The Sn-base alloys are hardened by slight or moderate cold-rolling, but softened on more severe rolling. Annealing after rolling causes further softening in most of the alloys, but those containing 3% of Cu or 0·5—3% of Ag recover some of their lost hardness. The Sn–Sb–Ag alloys examined are hardened by quenching from 200°, but the increased hardness disappears in 100 days at room temp., and rapidly at 100°.
E. S. H.

Britannia lead refinery, Northfleet, Kent. J. O. Betterton and H. P. Wagner (Bull. Inst. Min. Met., 1937, No. 391, 18 pp.).—The refinery is designed to treat the output of the Mt. Isa smelter, and has a capacity of 72,000 tons per annum. The crude Pb contains As 0·05, Sb 0·3, Cu 0·9%, and Ag 89 oz./ton. As and Sb are first removed in a 320-ton softener maintained at 650°; the slag obtained contains 20% of Sb and is smelted directly to antimonial Sb, whilst the softened bullion is passed to the usual desilverising kettle, the drosses from which, after pressing and retorting to recover the Zn, contain 4000—5000 oz. of Ag per ton. Zn is removed from the desilverised Pb by treatment with Cl_2 at 380°, the $ZnCl_2$ being purified by circulation through a Zn–Pb bath and cast into slabs for marketing. The final purification of the Pb is effected by stirring it with NaOH and air, which removes the last traces of Sb and Zn. The Ag-rich bullion from the retorts contains Cu 4 and Zn 2% and is cupelled to obtain Ag 998-fine and argentiferous PbO, which latter is smelted to crude Pb in a reverberatory using SiO_2 as flux to obtain a high ZnO–low PbO slag, the slag being worked up from time to time together with other residues by smelting in a small cupola.
A. R. P.

Metallography and mechanical properties of lead. B. Jones (J. Inst. Met., 1937, **60**, Advance copy, 37—54).—Owing to the structural changes which occur in rolled Pb at ordinary temp. mechanical tests can give results of little significance unless these changes can be controlled. From experiments designed to show the relation between degree of reduction, grain growth, and recrystallisation in rolled Pb it is shown that coarse grain growth is caused by crit. straining of very fine "as rolled" structures and does not occur in Pb having a medium fine grain unless the strains set up are sufficient to produce recrystallisation. Structures produced by grain growth are well-defined, rarely twinned, and often give rise to intercryst. cracking, whereas those produced by recrystallisation are confused and highly twinned. This latter type of structure has been shown by experience to be the most desirable, and it has recently been found possible to produce metal of this type consistently on a commercial scale (no details given).
A. R. P.

Influence of small additions [of other metals] on the recovery temperature, grain size, and hardness of lead. E. Jenckel and H. Hammes (Z. Metallk., 1937, **29**, 84—94).—The influence of up to 0·1% of Pt, Pd, Se, Au, Ba, Li, K, Na, Mg, Ca, Te, Zn, Hg, Tl, Sn, Sb, and Bi on the grain size of cast, rolled, and annealed Pb, and on the hardness and recovery temp. of rolled Pb, has been determined. An appreciable increase in the recovery temp. is produced only by metals to the left of Zn in the above list, *i.e.*, metals which form intermetallic compounds with Pb; Te, Ca, and Li are the most effective, 0·1% raising the recovery temp. to about 160°. K, Ca, and Li almost treble the cast hardness and Mg, Ca, and Li have the max. grain-refining effect.
A. R. P.

Lead extrusion phenomenon. B. Jones (Nature, 1937, **139**, 1071—1072).—Pronounced lines are frequently observed in etched sections cut through lap welds in Pb sheet (cf. B., 1937, 59). They appear to be due to a surface skin of oxide on each layer of metal used in building up the weld.
L. S. T.

Lead-lined equipment. E. Mantius and H. F. Freiherr (Ind. Eng. Chem., 1937, **29**, 373—377).—Important details in connexion with the fabrication of chemical and hard (Sb 6—10%) Pb are explained. The min. of joints to be burned, but subject to a max. wt. of 3000 lb. for one sheet, the use of protective brick linings (especially above 93°), the flanging of the lining at joints and burning of the Pb outside the vessel, are important suggestions. The casting of greater thicknesses than are finally required, and the removal of the surplus mechanically, followed by a pressure roller, are adopted to minimise the porosity of homogeneous Pb linings which are attached to the base metal without preliminary tinning.
F. J. B.

Gold extraction on the rand. L. Andrews (Engineering, 1937, **143**, 657—659).—The plant and its operation are described.
A. G. P.

Gold dredging in California and methods devised to increase recovery. E. S. Leaver and J. A. Woolf (Amer. Inst. Min. Met. Eng., 1937, Tech.

Publ. 792, 18 pp.).—Increased Au recoveries have been obtained by jigging followed by crushing of the concentrates and gravity separation, by flotation of the tails using K amylxanthate, Aerofloat, and cresol, and by treatment of the tails with residuum from petroleum refineries, preferably after mixing it with 10% of charcoal. Agitation of the tailings with the residuum–charcoal mixture followed by settling gives a scum containing about 70% of the Au, which can be recovered by diluting the scum with kerosene and allowing the charcoal–Au mixture to settle; this residue is burned to recover the Au and the liquid is distilled to recover the kerosene and residuum. A. R. P.

Cyaniding in gold extraction. R. Badesco (Compt. rend., 1937, **204**, 1307—1309).—A mathematical treatment of the extraction process. H. J. E.

Stabilising agglomerated slimes for cyanide leaching. O. C. Shepard and C. F. Skinner (Amer. Inst. Min. Met. Eng., Tech. Publ. 790, 1937, 12 pp.).—The porosity and permeability of finely-ground ores to leach liquors are greatly increased by moisture-agglomeration, max. permeability being obtained with 10—18%, and a runny mud of low permeability with 22%, of moisture; beds of moisture-agglomerated slimes therefore subside and become practically impervious when flooded with leach solution. If the dry powder is mixed with CaO and the mixture moisture-agglomerated with Na_2CO_3 solution, sufficient time of contact being allowed to convert the CaO into $CaCO_3$, the glomerules become stabilised and leach satisfactorily by percolation, giving an extraction equal to that of agitation-leaching. A. R. P.

Hardening of gold–nickel alloys. W. Gerlach (Z. Metallk., 1937, **29**, 102—103).—When a supersaturated Ni–Au alloy is reheated at 400° it decomposes into a Ni-rich phase of great magnetic hardness and a non-magnetic Au-rich phase by heterogeneous pptn.; at the same time a small part of the alloy undergoes a homogeneous pptn. characterised by a slight displacement of the Curie point of the undecomposed solid solution. Magnetisation–, remanence–, and coercivity–temp. curves are given for various periods of heating at 411° for the 50 : 50 Ni–Au alloy quenched from 950°. A. R. P.

Dental amalgams. M. L. V. Gayler (J. Inst. Met., 1937, **60**, Advance copy, 173—185).—The changes which occur in dental amalgams during setting are produced by complex reactions which probably are not completed and depend on the composition of the dental alloy, the method of mixing and manipulation, and the particle size. If the alloy consists of Ag_3Sn these reactions if allowed to attain equilibrium can be represented : $Ag_3Sn + Hg \rightarrow \beta_1 + \gamma_2$, and $\beta_1 + \gamma_2 \rightarrow \beta_1 + \gamma_1 + \gamma_2$ (cf. A., 1937, I, 455). With a deficiency of Sn ($<25\%$) expansion occurs on setting and with an excess ($>27\%$) contraction. The presence of up to 5% of Cu in the dental alloy has relatively little effect on the vol. changes in setting. A. R. P.

Methods of testing for corrosion of magnesium and of non-protected ultra-light alloys. J. Cournot and (Mlle.) L. Halm (Compt. rend., 1937, **204**, 1333—1334).—Data are recorded for the attack of Mg, and a series of Al–Zn–Mn and Al–Mn alloys, on alternating and total immersion in 0·03% aq. NaCl. H. J. E.

Corrosion of magnesium alloys by ethyl petrols. M. Prot and N. Goldowski (Génie Civil, 1937, **110**, 487—488).—Mg alloy containing Mg 98·4, Mn 1·5, Fe 0·06, and Si 0·02% was not corroded by a standard aviation ethyl petrol previously shaken with H_2O for 48 hr. The wash-H_2O, however, was very corrosive and contained traces of HBr. R. B. C.

Polarographic analysis of magnesium alloys. H. C. Gull (J.S.C.I., 1937, **56**, 177—179T).—The application of the polarograph to the analysis of Mg alloys is described and methods for the determination of Al, Zn, Mn, and Pb are worked out in detail. The accuracy is ±2% of the quantity to be determined. In the form of apparatus described, the usual photographic recording arrangement is replaced by a d.-c. amplifier and recording pen which enables records to be obtained directly in ink. H. C. G.

Spectrographic analysis of magnesium alloys. H. K. Whalley (J.S.C.I., 1937, **56**, 180—183T).—Mg alloys were analysed by comparison of spectrograms of samples and similar alloys of known composition. From a series of widely differing exposures the intensities of particular lines at an arbitrary standard exposure were obtained by interpolation, thus overcoming the major difficulty of the abs. reproducibility of successive exposures. The blackening of the Mg line 2916 A. was taken as a measure of the exposure, and with it was compared the blackening of certain " impurity " lines. Although the λλ of the lines chosen for comparison were separated from Mg 2916 by approx. 400 A. consistent results were obtained. The accuracy of the method, when applied to alloys containing 4—5% of Al, and small quantities of Cu, Zn, and Mn, is about ±5%.

Influence of hydrostatic pressure on the hardening of duralumin. G. Tammann and H. Hartmann (Z. Metallk., 1937, **29**, 88—89).—Age-hardening of duralumin is retarded by hydrostatic pressure above 3000 kg./sq.cm. and the hardness obtainable is reduced. This is attributed to a reduction of 0·6% in the vol. of the metal, which obstructs the collection of the foreign atoms in the lattice preparatory to pptn. of the new phase. A. R. P.

Elimination of gaseous impurities from aluminium. G. Chaudron (Metal Ind. [Lond.], 1937, **50**, 655—658).—The gas content of Al treated with H_2, CO, CO_2, and N_2 at various temp. has been determined by the author's spark extraction method, which gives complete extraction. The porosity of ingots cast in vac. was also examined. The solubility of the hydrides, carbonyls, and nitrides of Al increases with increasing temp. but is appreciable even at and < m.p. Practical methods of degasification remove only sufficient gas to prevent the formation of cavities on casting, but leave a considerable amount in solution. In practice the metal must not be over-heated or subjected to contact with products of combustion. C. E. H.

Remelting aluminium in the foundry. H. Röhrig (Metal Ind. [Lond.], 1937, **51**, 5—8).—An account is given of the practical methods employed in melting Al alloy scrap. C. E. H.

Corrosion of aluminium vessels in breweries. W. Vinz (Korros. u. Metallschutz, 1937, **13**, 90—91).—The cause of corrosion was traced to contact with Cu. R. B. C.

Mechanical properties of single and multiple aluminium crystals. G. Welter and T. Mojmir (Metallurgia, 1936, **15**, 49—53).—Results of tensile tests on single crystals and polycryst. Al specimens are reported. W. P. R.

Progress in the development and application of aluminium and its alloys. G. A. Anderson (Metallurgia, 1936, **15**, 33—36).—The exceptional corrosion-resisting and remarkable cold-working properties of Al of 99·99% purity render it of service commercially. The production of free-cutting Al alloys by additions of Bi, Sb, Pb, or Sn, of high-tensile alloys, and the making of Al reflectors by anodic treatment are discussed. W. P. R.

Influence of small amounts of titanium on the mechanical properties of some aluminium casting alloys. T. H. Schofield and C. E. Phillips (J. Inst. Met., 1937, **60**, Advance copy, 139—143).—Since $TiCl_4$ is used for degassing Al and its alloys before casting and Ti is added as a grain-refining element, the effect of up to 0·1% Ti on the tensile, elastic impact, and fatigue properties of " Y " alloy, 7% Cu–Al, and Cu–Zn–Al (L5 alloy) has been determined. The results, shown in graphs, indicate that Ti has only a relatively small, but generally beneficial, effect. A. R. P.

Structure and characteristics of aluminium alloys. H. C. Hall (Metal Ind. [Lond.], 1937, **50**, 705—709; **51**, 9—12).—The constitution, microstructure, mechanical properties, and casting properties of the various classes of Al alloys are discussed in relation to their applications and manufacturing methods. C. E. H.

Theory of age-hardening. M. L. V. Gayler (J. Inst. Met., 1937, **60**, Advance copy, 55—72).—From a review of data obtained in age-hardening duralumin and Be–Cu and Ag–Cu alloys it is suggested that hardening takes place by two processes, diffusion and pptn., the second overlapping the first and both taking place within wide temp. limits, which are different for every alloy system, at rates which depend on the temp.; when this is close to the lower limit both processes occur very slowly, and when it is near the upper limit the first takes place so rapidly that it is undetectable. In both processes the physical properties pass through max. or min. depending on the ageing temp., the characteristics of the first process being gradually replaced by those of the second; this explains the softening which an alloy aged at a low temp. undergoes when subsequently aged at a higher temp. Curves are given showing the characteristic hardening effects obtained on ageing at different temp. between the upper and lower limits. A. R. P.

Selection and production of aluminium casting alloys. A. von Zeerleder (Giesserei, 1937, **24**, 317—319).—In selecting an Al alloy for casting due regard must be paid to the thickness of the walls of the casting since the strength of sand-castings decreases rapidly with increasing thickness of wall, eutectic alloys on an Al–Si basis showing this effect least. Insertion of chills opposite the thickest parts of the casting overcomes this defect to some extent. In using scrap it is best to melt this separately under an appropriate flux and cast the metal into large ingots so as to allow escape of gas during solidification and the impurities to segregate towards the top or bottom, only the best metal being added to the casting charge. Cast Fe crucibles give the best melts but the crucible must be coated internally every day with, *e.g.*, a paste of clay 50, H_2O 45, and water-glass 5%. If the metal is to be cleaned with flux before casting, the flux used must be absolutely anhyd. and the charge must not be heated above 800°, otherwise there is danger of gas adsorption. A. R. P.

Alcoa alloy 24S. T. W. Bossert (Met. Prog., 1937, **31**, 42—45).—Wrought Al alloys of high strength developed in America, viz., Alcoa alloy 17S, and its successor 24S (Al 93·7, Mg 1·5, Cu 4·2, and Mn 0·6%), are described. R. B. C.

Aluminium alloys *versus* stainless steels for aircraft. W. L. Sutton (Met. Prog., 1937, **31**, 46—52).—A discussion. R. B. C.

Determination of alumina in presence of metallic aluminium. G. B. Brook and A. G. Waddington (J. Inst. Met., 1937, **61**, Advance copy, 245—256).—The sample is heated in a mixture of dry H_2 and HCl at 250° to volatilise all the metal as $AlCl_3$. The residue is ignited in air at 900°, weighed, and tested for Fe after fusion in $KHSO_4$. The Al in the sublimate can be determined by dissolving it in H_2O, evaporating the solution to dryness, and calcining the residue. A. R. P.

Radium recovery at Port Hope. M. Pachon (Canad. Chem. Met., 1937, **21**, 211—213).—The treatment of pitchblende for the recovery of Ag and the production of Ra salts (90% purity) and U salts is described. D. K. M.

Modern trends in [ore] classification. C. K. McArthur (Amer. Inst. Min. Met. Eng., 1937, Tech. Publ. 815, 8 pp.).—Closed-circuit grinding is discussed from the point of view of proper ball-mill pulp flow rather than circulating load ratio; ball-mill efficiency has been markedly increased by loading up to 30 tons/cu. ft. of effective vol. per day, using a heavy-duty classifier for the actual loading of the mill. For handling heavy tonnages the ball mill should have a large diameter and large feed and outlet openings, the pick-up openings and scoop lips should be so designed that they dig the feed from the launder, and the classifier should be sufficient to carry an adequate sand load and remove the settled particles systematically; in addition the make-up H_2O should be fed from a const.-head tank and properly sloped, preferably rubber-lined, launders should be used. The results obtained in large-scale experimental runs on these principles in an American mill are tabulated and discussed. A. R. P.

Mineral separation based on thermal properties. H. Kirchberg (Metall u. Erz, 1937, **34**, 301—318).—The method is based on differences in the sp. heats of minerals; if a mineral mixture is heated slightly and then spread in a thin layer on a solid medium the m.p. of which is $<$ the temp. of the mixture the particles will sink to different depths according to their sp. heats. For effective separation the individual mineral particles must be "free" and their sizes roughly equal, hence careful grading is necessary. A suitable medium must be sufficiently strong at just $<$ m.p. to hold the particles in the position to which they sink, must have a m.p. as near room temp. as possible, and must have a low sp. heat, latent heat, and heat-conductivity. Good results have been obtained with snow and paraffin wax in laboratory tests on sulphide mixtures and on mixtures of sulphides and non-metallic minerals. The theoretical principles of the process are investigated in detail and its practical possibilities briefly discussed. A. R. P.

Laboratory apparatus for the magnetic separation of minerals. B. Granigg (Metall u. Erz., 1937, **34**, 280—282).—A small laboratory magnetic separator with automatic magnetic conveyor is described and illustrated. A. R. P.

Selectivity modifier in non-sulphide [ore] flotation. W. T. MacDonald (Min. & Met., 1937, **18**, 285—286).—In floating non-metallic minerals with oleic acid addition of $Na_6P_6O_{18}$ (I) together with salts of metals which react differently with the mineral surfaces affords many useful separations; thus with $FeSO_4$ and $Pb(NO_3)_2$ in the pulp addition of (I) gives a good separation of chromite from a limestone gangue. With suitable salts it is possible to separate two minerals having either a common cation (*e.g.*, witherite and baryte) or a common anion (*e.g.*, calcite and witherite). With a fatty acid collector (I) has given concentrates containing 31% of Cu with $>$90% extraction in the treatment of an ordinary chalcopyrite ore. A. R. P.

Flotation. IX. Adsorption of xanthates by activated carbon and graphite and its relation to the theory of flotation. I. W. Wark and A. B. Cox (J. Physical Chem., 1937, **41**, 673—677; cf. B., 1935, 671).—The adsorption of K xanthates by sugar charcoal decreases with increasing p_H, part of the $K^{\cdot}$ being adsorbed. Graphite adsorbs xanthate ions but not $K^{\cdot}$, and it is inferred that the flotation of graphite by xanthates is not due to the metallic impurities. F. R. G.

Hydrolysis of rock-forming minerals. A. Brammall and J. G. C. Leech (Bull. Inst. Min. Met., 1937, No. 391, 3 pp.).—Moistening the fine dust of many alkali-containing silicate minerals with H_2O results in slow hydrolysis with liberation of alkali. Sericite, muscovite, and other basic micas yield an appreciable amount of $Al(OH)_3$, $Fe(OH)_3$, $Fe(OH)_2$, and $Mg(OH)_2$ to very dil. acid or saline solutions. A. R. P.

Flash-roasting and its applications. F. R. Milliken (Min. & Met., 1937, **18**, 279—282).—A brief description is given of the pyrite flash-roasting plant at a Canadian paper mill and of the ZnS concentrate flash-roaster at Deming, N.M. The pyrite process is cheaper than S burning for making SO_2, and in addition a good supply of steam is obtained from the waste heat; the cinder obtained contains S 0·3% and Fe 65% and could be used for making sponge Fe. Flash-roasting ZnS costs only 5 s. per ton, but the product (ZnO), being light and dusty, is more difficult to handle than that obtained by hearth-roasting. Possible extensions of the flash-roasting process are indicated. A. R. P.

Multistage [ore] roaster for testing purposes. V. Přistoupil (Chem. Fabr., 1937, **10**, 229—231).—An ore (pyrites) roaster with a roasting surface area of 1 sq. m. and capacity of 40—75 kg./24 hr., which gives results reproducible on a large scale, is described. It is constructed of sheet Fe, and is divided into 5 stages by horizontal plates. Heat is supplied by gas flames within the hollow walls, and by electric heating elements under the floor of each stage. Ore is fed continuously through the successive stages in the usual way. The roaster gas is of normal composition, *e.g.*, 6% of SO_2. I. C. R.

Metals in vacuum tubes. J. Delmonte (Met. Prog., 1937, **31**, 518—523).—The types commonly employed, *e.g.*, Mo, W, Ta, Ni, and Pt, for various parts, *e.g.*, anodes and cathodes, are discussed. R. B. C.

Relative wear of some hard metals. R. B. Freeman (Met. Prog., 1937, **31**, 281—284).—Data for the sliding wear-resistance of stellite, white cast Fe, Cr–Al–Mo steel, etc. are given. R. B. C.

Influence of service conditions on metal components of industrial plant. J. N. Greenwood (Soc. Chem. Ind. Victoria, 1936, **36**, 1174—1181).—The influence of metallic texture, static and alternating stress, fatigue phenomena, and intercryst. corrosion on the failure of metals is reviewed. J. S. A.

Resistant metals. C. R. Vincent (Ind. Eng. Chem., 1937, **29**, 389—393).—It is shown that the economic limitations to the uses of metals and alloys other than mild steel and cast Fe where problems of corrosion, operation at high temp., abrasion, etc. arise can be modified advantageously by suitable alteration to the design and fabrication. In general, the fabrication by welding of sheet and standard rolled sections is claimed to give lighter permissible sections as well as cheaper manufacturing costs. The provision of steel or cast Fe supporting members to deal with purely mechanical stresses is satisfactory if the designing and method of attachment of the lining are correctly carried out. F. J. B.

Mechanical properties of some metals and alloys broken at ultra-high speeds. D. W. Ginns (J. Inst. Met., 1937, **61**, Advance copy, 263—273).—When the tensile test is carried out at such a speed that the yield point is reached in 0·001 sec. and fracture occurs in 0·005 sec. the vals. obtained for the former may exceed the normal vals. by

$>100\%$; the max. stress is also increased considerably, but the elongation and reduction in area show little change and the type of fracture obtained is identical with that obtained in the slow test. Vals. for all these properties are tabulated for numerous steels, Cu and Al alloys. A. R. P.

Permeability of metals to hydrogen. C. J. Smithells (Nature, 1937, **139**, 1113).—The permeability of Fe, Ni, Mo, Pt, Cu, and Al to H_2 at 1000°, for which data are tabulated, varies only by a factor of approx. 10, but at low temp. rates of diffusion are very different. For work at high pressure, lining steel vessels with a thin layer of one of the less permeable metals, such as Cu or Ni, should be a much more effective method of reducing permeability than an increase in thickness of the steel. L. S. T.

Physical methods of metallurgy. B. Chalmers (Metal Ind. [Lond.], 1937, **50**, 597—600, 645—648; **51**, 31—34).—The principles and applications of optical interference and electron diffraction methods are reviewed. Methods available for investigating local variations in the composition of alloys are discussed. C. E. H.

Problems of the internal physics of [metallic] materials. G. A. Homès (Rev. Mét., 1936, **33**, 641—645).—Use of *X*-ray spectroscopy for the study of the crystal state is briefly discussed. W. P. R.

Complex methods for study of metallic alloys. L. Dlougatch (Rev. Mét., 1936, **33**, 612—618).—Various examples of the correlation of tests in order to evaluate the suitability of an alloy for definite purposes, or in order to explain particular properties, are given. W. P. R.

Industrial apparatus for determining thermal conductivities of metals up to 900°. G. Ranque, P. Henry, and M. Chaussain (Rev. Mét., 1936, **33**, 602—608).—The thermal conductivity, *k*, is measured by observing the temp. gradient in a metal rod cooled at one end by H_2O and heated at the other end electrically and measuring the power input to maintain a const. temp. For Cu, *k* is const. up to 575°; for Ni, up to the Curie point, after which it increases. For Fe, *k* decreases with rise in temp., but the rate of decrease changes at the transformation temp. For 18/8 stainless steel *k* increases with rise in temp. W. P. R.

Thermal-autostabilisation method for creep tests of long duration at elevated temperatures. G. Ranque and P. Henry (Rev. Mét., 1936, **33**, 598—601).—The Rohn method for carrying out creep tests on metals is described. W. P. R.

Influence of the state of stress produced by the shape of the specimen on the endurance limit in alternate-bending tests. W. Kuntze (Arch. Eisenhüttenw., 1936—7, **10**, 369—373).—The effect of notches, sharp corners, and edges on fatigue limit vals. is investigated mathematically. A. R. P.

***X*-Ray determination of elastic tension [in alloys].** R. Glocker (Arch. Tech. Mess., 1937, No. 69, 30—31T).—A portable *X*-ray tube and camera are described. R. B. C.

Influence of the springing of the machine on the occurrence of the yield point in the tensile test. E. Siebel and S. Schwaigerer (Metallwirts., 1937, **16**, 701—702).—Contrary to the views of Welter (B., 1936, 374, 502; 1937, 680) and Späth (B., 1936, 328), the decrease in stress at the yield point is found to occur irrespective of the degree of springing of the machine. It is accompanied by a marked increase in the rate of deformation. C. E. H.

Upper and lower yield points. W. Späth (Metallwirts., 1937, **16**, 697—701).—The influence of the characteristics of the tensile testing machine and the method of loading is discussed in the light of recent investigations. The decrease in stress at the yield point is considered to be a characteristic of the machine rather than of the material under test. C. E. H.

Magnetic losses at low flux densities in 35 Permalloy sheet. W. B. Ellwood and V. E. Legg (J. Appl. Physics, 1937, **8**, 351—358).—Data are recorded and discussed. H. J. E.

Effect of vibrations on the tensile properties of metals. G. Welter and A. Bukalski (Engineering, 1937, **144**, 4—5).—Transverse vibrations sensibly reduce the tensile strength of steel, brass, Al, and duralumin wires. These results were confirmed with test-pieces except with duralumin, which gave variable results according to the length of the piece. Mg alloys of the elektron type also showed decreased tensile strength. Probably for each metal there is a crit. vibration period giving max. effect. C. I.

Methods of finishing metallographic specimens. H. R. Power (Met. Clean. Finish., 1937, **9**, 429—432).—The types of abrasive and polishing wheels etc. employed are discussed. R. B. C.

The corrosion problem and the engineer. F. Hudson (Metallurgia, 1937, **16**, 51—54).—The factors controlling corrosion are summarised and their mode of operation is discussed. S. J. K.

Theory of corrosion phenomena. V. Relation between the setting-up of a potential, corrosion, and corrosion-passivity of metals in aqueous solutions. W. J. Müller (Korros. u. Metallschutz, 1937, **13**, 144—157; cf. A., 1936, 1474).—The application of the local-current theory of potential to the corrosion of metals in aq. solutions free from air, or containing air or oxidising agents, is discussed. R. B. C.

Theory of corrosion phenomena due to oxygen dipolarisation. F. Todt (Korros. u. Metallschutz, 1937, **13**, 157—162).—A discussion. R. B. C.

Electrochemical study of corrosion of metals. J. B. Chloupek and V. Z. Daneš (Korros. u. Metallschutz, 1937, **13**, 124—128).—The local element is reproduced on a macroscopic scale described, the conditions are maintained const., and the e.m.f. and electrochemical characteristics of the element are determined, from which conclusions regarding the relative corrosion-resistances of metals are deduced. A non-polarising electrode ($Ag|Ag_2SO_4|$saturated Na_2SO_4) of const. potential is employed as cathode. R. B. C.

Technique of potential measurements in corrosion research. F. Müller (Korros. u. Metallschutz, 1937, **13**, 109—113).—Two methods of measuring e.m.f. by means of thermionic valves are described. R. B. C.

Soviet-Russian investigations of the corrosion protection of chemical plant. M. von Pohl (Korros. u. Metallschutz, 1937, **13**, 97—102).—Summaries of eleven papers of Russian origin on various aspects of corrosion protection are given. R. B. C.

[Corrosion] behaviour of metallic materials in the tanning and leather industry. R. Lauffmann (Korros. u. Metallschutz, 1937, **13**, 81—86).—A review covering 1932—5. R. B. C.

Corrosion protection of refrigerating plants. E. Belani (Korros. u. Metallschutz, 1937, **13**, 94—95).—Preventive methods are reviewed. R. B. C.

Photomicrographic equipment for investigating corrosion [of metals]. A. Kufferath (Korros. u. Metallschutz, 1937, **13**, 189—191).—Two camera attachments for a standard microscope are described. One is used for taking photomicrographs of, *e.g.*, surface-etching phenomena, the other for taking kinephotomicrographs of rapid corrosion caused, *e.g.*, by gases. R. B. C.

Colorimetric detection of [metallic] corrosion by means of p_H indicators. N. Goldowski (Korros. u. Metallschutz, 1937, **13**, 128—131).—The metal surface is treated with 1% aq. NaCl containing gelatin and an indicator (mixture of cresol-, phenol-, and naphthol-phthalein, Me-red, and bromomethyl-blue). According to the p_H val., various colour changes take place. The method of applying the test is described, and photographs showing the nature of the corrosion occurring between Al and duralumin and at duralumin welds etc. are given. R. B. C.

Application of potential measurements to the study of metallic corrosion. L. Guitton (Korros. u. Metallschutz, 1937, **13**, 131—144).—Measurements were made of the potentials of Sn, Zn, Ni, Al, stainless steel, etc. in various acids, *e.g.*, HCl, H_2SO_4, and HNO_3, and of the solubilities of the metals in the acids. The relationships between the two series of data, and the abnormal dissolution behaviour of certain metals, *e.g.*, Al and Sn in HCl, Zn in H_2SO_4, and Ni and Cu in HNO_3, are discussed. R. B. C.

Velocity of melting [of metals]. G. Tammann (Metallwirts., 1937, **16**, 626—629).—Recent work by the author and collaborators is described. The velocity of melting of a metal, alone and in contact with others with which it forms eutectics, is determined only by the rate of supply of heat. The latter is influenced by experimental conditions and by the thermal conductivity of the metal. The composition of the liquid formed when heating in contact the two metals of a eutectic system can be calc. from the phase diagram when the two metals have approx. the same thermal conductivity. C. E. H.

Cupola practice. W. Spiers (Foundry Tr. J., 1937, **56**, 327—328).—The operation of cupolas is discussed. R. B. C.

Centrifugal casting of non-ferrous metals and its importance in the economising of foreign [non-German] raw materials. H. Roeder (Metallwirts., 1937, **16**, 703—704).—Improved properties due to centrifugal casting permit a reduction in the Sn content of bronzes for many purposes. C. E. H.

Physical factors in the casting of metals. C. H. Desch (Metallurgia, 1937, **16**, 65—66).—Factors controlling the production of a casting include η, γ, the evolutions of gases, formation of oxide films, freezing range, vol. changes, the thrust of growing crystals, and the degree of prior superheating of the metal. S. J. K.

Die-castings for automotive parts. C. R. Moxon (J. Soc. Auto. Eng., 1937, **41**, 293—302T, 314T).—The various types of alloy employed are summarised. R. B. C.

Ingot mould life. J. Shaw (Foundry Tr. J., 1937, **56**, 308—310).—Various factors, *e.g.*, composition and wall thickness, influencing the above are discussed. R. B. C.

Non-ferrous foundry sand control. G. K. Eggleston (Metal Ind. [Lond.], 1937, **51**, 40—44).—The characteristics of moulding sands are discussed in relation to their practical application, and a system of testing and conditioning is suggested. In order to obtain good permeability together with a smooth mould surface, a fine sand with a uniform grain size is necessary. C. E. H.

Testing foundry sands. W. Y. Buchanan (Foundry Tr. J., 1937, **56**, 406—408, 423—425).—Methods and apparatus for measuring the permeability, strength, flowability, and hardness of moulding sands are critically reviewed. An index of ramming is proposed to define the hardness of a test-piece. Dilatometric tests on various samples of sand are described. Additions of coal dust, sawdust, clay, or silt only slightly affected the expansion curves of sand heated between 0° and 1100°. Such expansion does not appear to cause scab formation on Fe castings. R. B. C.

Control tests for moulding sands. W. G. Reichert (Rev. Mét., 1936, **33**, 529—542).—Moisture, permeability, grain size, and bonding tests for moulding sands are described. W. P. R.

Heat-conductivity of mould materials. F. Hudson (Metal Ind. [Lond.], 1937, **50**, 573—575).—Compositions with a graphite, steel grit, or carborundum basis have much better conductivity than moulding sands, together with adequate strength. The conductivity of the carborundum mixture exceeds that of steel plate. C. E. H.

Oil core sands and their testing. H. Nipper (Foundry Tr. J., 1937, **56**, 368—369, 386—387).—A review. R. B. C.

Arc welding of steels other than mild steels. F. Meunier and D. Rosenthal (Rev. Mét., 1936, **33**, 588—593).—The hardness and microstructures in the fusion and transition zones of welds in steels containing 0·1—0·4% C are given. W. P. R.

New applications of the oxy-acetylene flame to metallurgical practice. R. de Lempdes (Rev. Mét., 1936, 33, 556—559).—The removal of surface defects from castings and forgings by means of the O_2–C_2H_2 blowpipe, and the possibility of surface heat-treatment by the same means, are described. W. P. R.

Filler metal for oxy-acetylene welding. M. Mercer (Rev. Mét., 1936, 33, 553—555).—The composition of welding rods is an important factor in determining the quality of welds. The losses of various constituents have to be determined before the correct composition can be ascertained, and these vary with different classes of steel. In general, the C loss is approx. 30% and Si varies from 47 to 69%. W. P. R.

Application of welding wires, showing an austenitic structure, to the welding of unalloyed and low-alloyed (non-austenitic) steels. K. L. Zeyen (Tech. Mitt. Krupp, 1937, 5, 89—102).—Technique is described. E. S. H.

Designing welded chemical equipment. W. Spraragen (Ind. Eng. Chem., 1937, 29, 366—372).—Advantages of welded fabrication of chemical plant from rolled sections of a wide range of metals and alloys over production by casting are discussed. Modern methods of overcoming erstwhile defects such as weld decay, residual stresses, etc. by additions to the metal, suitable heat-treatment, choice of process, and modification in design are described. The possibility of applying thin corrosion-resisting metal linings by resistance-welding is noted, and also that the quality of the weld is becoming increasingly independent of the skill of the welder. F. J. B.

Soldering pipe threads to prevent oil leaks. W. J. Hart (Power Plant Eng., 1937, 41, 425).—A method is illustrated. R. B. C.

Metal-spraying processes and some characteristics of the deposits. E. C. Rollason (J. Inst. Met., 1937, 60, Advance copy, 7—35).—American, English, and French types of metal-spraying pistols are described, their performances compared, and the structures of deposits of various metals obtained from them under various conditions examined. The evidence obtained indicates that the metal particles are more or less completely melted in the flame, according to the type of pistol used, and cool relatively slowly in the air stream so that, when the pistol is close (1—3 in.) to the article, they strike this in a molten condition, forming splashes which interlock together and exhibit columnar crystallisation with discontinuous oxide films and cavities at the edges of the laminations; at greater distances from the nozzle the particles are cooled below their f.p. and splashes are not formed but the particles are deformed by their own kinetic energy into a laminated coating enclosing fine pores. Deposits produced by powder spraying are more porous than those produced by the wire or molten-metal processes, but afford adequate corrosion protection to Fe and steel, especially when the sprayed deposit is subsequently painted with a good oil paint which fills up the pores, and these act as a good anchorage for the paint film. Data are given in tables and graphs for the porosity and hardness of Zn, Al, Si–Al, Sn, Cu, 18 : 8 Cr–Ni steel, mild steel, and Pb coatings produced under various conditions, and some applications of sprayed coatings are discussed. A. R. P.

Examining surface condition of plated and polished [metal] surfaces. S. Bousky and E. J. Abbott (Met. Clean. Finish., 1937, 9, 425—428, 432).—The Profilometer, by means of which the surface roughness of ground steel or Ni plate etc. can be measured, is described. R. B. C.

Cleaning [metals] before plating. F. A. Maurer (Metal Ind. [Lond.], 1937, 50, 633—635).—Practical methods are reviewed and their respective applications are discussed. C. E. H.

Preparation of metal surfaces for painting. L. A. Jordan (Chem. and Ind., 1937, 361—371).—Scale may be removed from Fe surfaces by prolonged natural weathering, mechanical wire-brushing, sand-blasting, or chemical methods. Centrifugal methods of projecting the sand are less costly than the usual air-blast methods, and replacement of sand by steel shot minimises the danger of silicosis. In pickling with dil. HCl or H_2SO_4 it is usual to add a protective agent or pickling inhibitor (size, basic N compounds, etc.) to prevent dissolution of the metal itself. Use of hot H_3PO_4 baths (H_3PO_4 40, MeOH 5, H_2O 55%) enables subsequent washing to be avoided, the residual phosphate layer itself exerting a certain protective action and providing a good " key " surface for paint application. Protection by Bonderising, Parkerising, tinning, galvanising, Sherardising, electroplating, metal spraying, etc. is described. The oxide film which forms on Al is often itself adequate to protect the underlying metal, but before painting Al must always be degreased, whether oxidised or not. Anodising thickens the natural Al_2O_3 film and affords the best possible protection. The exceptional ease of oxidation of Mg, and the failure to develop oxidising treatments similar to those successful with Al, have led to the development of " chromate treatments," which produce sparingly sol. films of mixed Cr and Mg oxides with Cr chromate. Selenising is probably the most efficient of all preparatory methods for Mg, since the Se film is self-healing on account of the presence therein of Mg selenide, which on decomp. by H_2O forms H_2Se which is easily oxidised with redeposition of Se in the film. The importance of careful selection of suitable paint and attention to correct application after prep. of the surface is stressed. F. C. B. M.

Microscopical method of studying electrodeposits. P. Jacquet (Compt. rend., 1937, 204, 1320—1322; cf. A., 1936, 571).—A review. The importance of the structure of the support in determining that of the deposit is emphasised. H. J. E.

Ball mills. Dusts. Chemical policemen.—See I. **Fuels in metallurgy. Cupola cokes. Slag for gas purification. Light-metal gas flasks. Mineral oils. Cutting lubricants.**—See II. **Applications of dyes.**—See VI. **Catalysts for NH_3 synthesis. Cr plating. Recovering S. O_2-en-**

riched air [for blast furnaces].—See VII. **Refractories. Slag attacks on refractories.**—See VIII. **Electric furnaces for Al alloys. Conductivity of Al. Electrolysis.**—See XI. **Plastic Fe. Plastics and corrosion. Corrosion of Fe.**—See XIII.

Patents.

Treatment of metal [steel strip]. A. R. Stargardter, Assr. to Gillette Safety Razor Co. (U.S.P. 2,041,029, 19.5.36. Appl., 4.9.31).—A hardening and tempering apparatus is described, in which the temp. of the heating and cooling zones are controlled electromagnetically by the variation in the permeability of the steel. L. C. M.

Thermal treatment of quenched and hardened steels. H. Styri, Assr. to SKF Industries, Inc. (U.S.P. 2,041,649, 19.5.36. Appl., 24.8.34).—Alloy steels containing, *e.g.*, C 1, Cr 1, and Mo 0·3 or Mn 1% are stabilised against dimensional changes by quenching from above the crit. temp. range, and tempering at 210—260° (250°) until complete shrinkage has occurred and the metal begins to expand again (2—20 hr.). L. C. M.

Slag and agitation heat-treatment for metals. E. L. Crosby, Assr. to Detroit Electric Furnace Co. (U.S.P. 2,040,167, 12.5.36. Appl., 29.12.33).—A charge of scrap metal (*e.g.*, Fe scrap and steel borings) is mixed with slag-forming materials (*e.g.*, $CaCO_3$) and melted in an indirect arc furnace, which is rocked so as thoroughly to mix the metal and slag; the current is then cut off, the slag taken off, the temp. raised to 1590°, the remaining slag which rises is skimmed off, and the refined metal poured. L. C. M.

Treatment of austenitic steel. E. C. Bain and R. H. Aborn, Assrs. to U.S. Steel Corp. (U.S.P. 2,044,743, 16.6.36. Appl., 4.5.35).—The corrosion-resistance of austenitic Ni–Cr steels is increased by cold-working, followed by heat-treatment at $>$820°, but at $<$ the temp. of complete recrystallisation for a time sufficient to ppt. all C in excess of the solubility limit and to ensure uniform redistribution of Cr. L. C. M.

Nitriding [of steel etc.]. L. B. Lindemuth, Assr. to Nitralloy Corp. (U.S.P. 2,039,487, 5.5.35. Appl., 28.5.29).—The interiors of internal-combustion engine cylinders etc. are hardened by fitting them into a tube and circulating through them a rapid current of heated NH_3 by means of a pump. L. C. M.

[Bright] annealing. R. J. Wean (U.S.P. 2,040,679, 12.5.36. Appl., 15.10.35).—A stack of metal sheets is heated to annealing temp. under a bell furnace; when the latter is raised, the stack is surrounded by an envelope of inert gas discharged from orifices at the base while a shield is lowered over it to prevent oxidation during cooling. L. C. M.

Production of gases [for bright annealing]. A. B. Kinzel, Assr. to Union Carbide & Carbon Corp. (U.S.P. 2,042,665, 2.6.36. Appl., 22.6.33).—H_2–N_2 mixtures suitable for bright annealing are produced continuously by thoroughly mixing a hydrocarbon fuel with air and burning in presence of an oxidation catalyst to produce a gas containing N_2 free from $>$ traces of CO, O_2, and hydrocarbons, while another part is thermally cracked in absence of air, steam, or gases containing O_2 to produce H_2 free from $>$ traces of O_2 and hydrocarbons; the two gases are then passed through a heat exchanger to equalise temp. and mixed so as to contain $\not>15\%$ of H_2, CO_2 being removed by washing with a basic solution and H_2O by freezing and drying. D. M. M.

Immunising of [imparting corrosion-resistance to] metal articles. R. B. McCauley (B.P. 463,258, 21.6.35).—Fe and steel surfaces are coated (*e.g.*, by using the mixture in the form of an electric weld rod) with a molten composition containing one or more of Cu, Cr, Mn, Sn, W, Co, Ni, Al, Sb, Fe, Cd, Hg, As, Mo, Zn, or Bi with P $\not<0·5\%$; *e.g.*, an alloy of Cu with Fe 37 and P 20·5% (m.p. 1040°) may be used. L. C. M.

Decarburisation of iron and alloys thereof. Dr. A. Wacker Ges. f. Elektrochem. Ind. G.m.b.H. (B.P. 465,497, 13.11.35. Ger., 23.11. and 1.12.34).—The metal is blown in a pear-shaped converter with O_2-enriched air at $<$ 1 atm., the air being introduced into the hottest point to increase its pressure rapidly. A. R. P.

Metal-working process. W. E. Sanders, Assr. to Gen. Motors Corp. (U.S.P. 2,040,957, 19.5.36. Appl., 28.4.33).—Fine-grain steel bars, *e.g.*, for gear-wheel blanks, are produced by forging coarse-grain steel stock at 1180—1320° while compressed between dies. L. C. M.

Manufacture of [metal] articles resistant to gaseous corrosion. Soc. d'Electro-Chimie, d'Electro-Métall., et des Aciéries Electr. d'Ugine (B.P. 462,380, 4.6.35. Fr., 2.6.34).—Articles of alloys, *e.g.*, steels, containing elements, *e.g.*, Cr or Al, in insufficient proportions to impart corrosion-resistance at high temp. are preheated in O_2 at $>$ atm. pressure; the treatment produces a highly resistant, impervious oxide film. L. C. M.

Manufacture of (a) a tool, (b) an abrasive cutting tool, (c) a cutting tool. F. O. Jacques, Assr. to (a) Central Tool Co., (b, c) L. S. Moulthrop, and (c) S. Harrington (U.S.P. 2,041,345—7, 19.5.36. Appl., [a] 2.6.32, [b, c] 23.2.33).—(a) A dental tool is made by immersing the end of a steel rod in molten stellite and subsequently grinding the hard alloy coating. (b) In a diamond cutting tool, the diamonds are set in a steel body by surrounding them with a powdered mixture of Co with Cr, Mo, or W (stellite), which is then sintered under pressure. (c) Tools with stellite cutting edges are compacted by sintering under pressure. L. C. M.

Composite ferrous bodies. P. A. E. Armstrong and R. R. Rogers (U.S.P. 2,044,742, 16.6.36. Appl., 27.11.34).—Tube, sheet, etc. of Fe coated on one side with stainless steel is produced by electroplating the pickled stainless steel body with Ag, Cu, Ni, or Co, then with the desired thickness of Fe, and heating it at 925° in an inert atm. to weld the layers together. L. C. M.

High-tensile structural steels. United Steel Cos., Ltd., T. Swinden, and L. Reeve (B.P. 463,572, 8.10.35).—Claim is made for steels of tensile strength 33—45 tons/sq. in., containing C 0·08—0·35 (0·15), Mn 0·35—1·75 (1·44), Cr 0—1·9 (0), Cu 0—1 (0·2), and Si 0—0·6 (0·16)% with Ti 2·05—3·5 × C% (0·37), which are normalised at 900° and air-cooled. L. C. M.

Manufacture of metals [steels and alloy steels]. R. Perrin (B.P. 463,132, 20.6.35).—A charge of molten steel is separated from slag and covered with a fresh slag poor in FeO (*e.g.*, containing SiO_2 55 and FeO 0·7%); it is then deoxidised by addition of Si and/or Mn, and Al, in quantity determined by previous experiment, is added as a grain-restrainer. L. C. M.

Treatment of sheet metal. H. W. Nieman, Assr. to Bethlehem Steel Co. (U.S.P. 2,040,442, 12.5.36. Appl., 30.11.32).—Tinned mild steel sheet, free from tendency to "flute" or "stretcher-strain," is produced by cold-rolling to gauge, annealing, tinning, and flexing 4 or 5 times by passing the strip around rollers at successively diminishing temp. from 400° to 270°. L. C. M.

Treatment of steel. M. G. Fowler and L. M. Barker, Assrs. to Phelps Dodge Corp. (U.S.P. 2,040,515, 12.5.36. Appl., 6.10.32).—Surface checking of steel containing $>1\%$ of Cu is prevented by heating in an oxidising atm. to 1100—1150°, and cooling to $\not<1050°$ before forging. L. C. M.

Corrosion-resistant [iron] alloys. R. B. McCauley (B.P. 463,311 and 464,095, [A] 21.6.35, [B] 5.7.35).—Acid-resisting Fe alloys containing P 5—25, Si $\not>0·5$, and one or more of As, Bi, Cd, Cr, Cu, Mn, Mo, Sb, Sn, W, V, or Zn 0—30, with (A) Ni and/or Co 4—70 or (B) Cu 4—70%, are claimed. L. C. M.

(A) Alloy steels and welding rods. (B) Welding of alloy steels. Electro Metallurg. Co., Assees. of (A) F. M. Becket and (A, B) R. Franks (B.P. 463,716—7, 4.7.35. U.S., [A] 28.7.34, [B] 23.2.35. [B] Addn. to B.P. 419,680; B., 1935, 155).—(A) The use of steels containing Cr 2—30 (or Cr 12—30 and Ni 5—30), C 0·01—0·5 ($\not>0·3$), Si 0·7—2·5%, and Nb $\not<4$ ($\not<10$) × C is claimed. (B) In the welding of steels containing Cr 2—35, or Cr 12—35 and Ni 6—35%, a flux is employed containing felspar, CaF_2, borax, SiO_2, and Si with 25—75 wt.-% of Nb_2O_3. L. C. M.

Manufacture of magnetic materials. Heraeus-Vacuumschmelze A.-G. (B.P. 463,901, 6.4.36. Ger., 8.4.35).—Alloys containing Ni 35—60, Fe 65—40, and of Cu, Mn, Ti, and/or Al 0—16 pts. are cold-worked (elongation 20—100 ×), annealed at 900—1200° for $\not>30$ (<1) min., and again cold-worked (elongation 1·06—1·35 ×). L. C. M.

Non-magnetic steel alloys. Ltd. Co. (formerly Skoda Works, Plzen) (B.P. 462,252, 20.6.35. Czechoslov., 25.6.34).—The alloys contain Fe $\not<50$, Si 0·8—5, C 0·35—2, Cr 0·5—4, Al 0·5—4, with Mn 5—15 and Ni 0·5—4 or Mn 15—30 and Ni 4—12%. [Stat. ref.] L. C. M.

Determination of the physical characteristics of metals [high-pressure steel tubes]. F. N. Fossati, Assr. to Standard Oil Co. of California (U.S.P. 2,041,058, 19.5.36. Appl., 22.1.34).—Deterioration of high-pressure still-heads of Ni 8, Cr 18% steel is observed *in situ* by comparison of its magnetic permeability with that of a standard tube. L. C. M.

(A) Alloy. (B) Lead bronze composition. (C) Copper-base composition. A. R. Lytle, Assr. to Union Carbide & Carbon Corp. (U.S.P. 2,040,053—5, 5.5.36. Appl., [A] 31.10.33, [B, C] 12.12.35).—Claim is made for Cu weld rod alloys, containing (A—C) Pb 8—18 (12—15), Sn 6—10 (8—10), and Si 0·25—5 (0·5—1·25) with (B, C) Zn 0·5—6 (3—5) and (C) P 0·5—3%. L. C. M.

(A) Treatment of mixed oxides of lead, tin, and zinc. (B) Treatment of brass and bronze secondary metals. J. O. Betterton and A. J. Phillips, Assrs. to Amer. Smelting & Refining Co. (U.S.P. 2,040,825—6, 19.5.36. Appl., [A] 13.11.33, [B] 7.12.33. Renewed [B] 10.11.34).—(A) Bronze residues are melted and blown in a converter; the Cu is separated from the mixture of SnO_2, PbO, and ZnO, which is heated with C in a reducing atm. at 960—1370° (1290—1320°), when Zn is volatilised and Pb + Sn metals remain. (B) Scrap, *e.g.*, old radiators, is melted in a reverberatory furnace, the Fe is slagged off, and the molten metal is transferred to a converter, covered with a layer of coke, and blown; the fume contains Zn. The coke is then removed (and returned to the reverberatory) and the charge is again blown, when a fume containing Sn with a little Pb is produced, and a SnO_2 dross remains over the bottom of metallic Cu, which is purified electrolytically. L. C. M.

Refining of lead and lead alloys. Soc. Minière & Métallurgique de Pennaroya (B.P. 465,345—6, 31.10.35. Fr., 2.11.34).—Cu, Sn, and As are removed from Pb or Sb–Pb alloys (A) free from, (B) containing, Zn by adding Na to the molten alloy and cooling to produce a crust containing the impurities. [Stat. ref.] A. R. P.

Lead alloy. R. H. Canfield and H. F. Kaiser (U.S.P. 2,040,078, 12.5.36. Appl., 8.11.33).—An alloy suitable for accumulator grids contains Sr 0·04—0·6 with or without Te 0·1—0·5%. L. C. M.

Production of composite metal articles. Hardy Metallurg. Co., Assees. of C. Hardy (B.P. 463,775, 14.2.36. U.S., 24.9.35).—Pb–Cu bearings are produced from Cu-coated Pb powder (obtained by treating 100-mesh Pb powder with aq. Cu acetate) containing, *e.g.*, 59—80 (63)% of Cu, by compressing it in a mould at 5—50 tons/sq. in., and sintering in an atm. of H_2 or N_2 at $>327°$. The density of the sintered alloys may be increased by cold-rolling, and they may be welded to steel, bronze, or Cu backing plates by prolonged heating in a reducing atm. under pressure. L. C. M.

Compound metal bodies. A. Monzer (B.P. 463,892, 13.2.36. Ger., 15.2. and 30.3.35).—Bearings of Pb-bronze supported by Al or Al alloy are manufactured by supporting the Pb-bronze element in a mould filled with inert gas, and surrounding it with the molten Al alloy; in order to avoid melting the Pb, a steel cylinder (coated with graphite) of appropriate heat content is inserted in the bronze element. L. C. M.

Electrical resistance alloys. Brit. Driver-Harris Co., Ltd. (B.P. 464,033, 9.10.35. U.S., 12.10.34. Addn. to B.P. 438,140; B., 1936, 504).—Ni–Cr (Ni $>$ 50) or Ni–Cr–Fe (Ni 60, Cr 10—15) alloys containing Mo 1—20 (4·83), Zr 0·1—1 (0·15), Ca 0·01—0·2 (0·01), and Mn 0·02—2 (1·04) and/or Si 0·2—2 (0·51)% are claimed. L. C. M.

High-strength alloys. G. P. Halliwell, Assr. to Westinghouse Electric & Manufg. Co. (U.S.P. 2,044,165, 16.6.36. Appl., 1.12.34).—Alloys possessing high tensile strength, suitable for turbine parts, consisting of Ni 20—70 (40—60, 40—50), Co 10—60 (20—35, 24—30), Fe 5—50 (5—20, 5—10), Ti 0·5—10 (2—5), and Cr 0—20 (10—20)%, are heat-treated by quenching from 900° and ageing at 500—800°. L. C. M.

Electrolytic deposition of chromium. F. A. Rojas, Assr. to Rojas Chem. Works, Inc. (U.S.P. 2,040,881, 19.5.36. Appl., 15.5.31).—An electrolyte containing CrO_3 16—54 oz. per (U.S.) gal. and $Al(OH)_3$ 5—15 wt.-% is employed. L. C. M.

Tin-plating. R. M. Gordon (U.S.P. 2,044,210, 16.6.36. Appl., 24.4.33).—The bath of molten Sn is covered by a layer of refined fish oil (of I val., in the raw state, 120—200), which is claimed to seal pinholes and to improve the lustre of the plate. L. C. M.

Tin alloys. (Sir) J. Campbell, D. Hanson, and W. T. Pell-Walpole (B.P. 463,216, 23.12.35).—The alloys, containing Sb 2—14 and Cd 1·5—10%, are heat-treated at 140—175°, cooled, and re-annealed at $>$180° but $<$ m.p.; the alloys containing high Cd and Sb may be further annealed at $>$120°. L. C. M.

(A) **Melting and handling of cadmium and its alloys.** (B) **Coating of ferrous metals with cadmium.** (C) **Flux for cadmium and its alloys and regeneration thereof.** (A) A. J. Phillips and (A—C) C. E. Swartz, Assrs. to Amer. Smelting & Refining Co. (U.S.P. 2,040,269 and 2,040,282—3, 12.5.36. Appl., [A] 12.6.34, [B] 30.1.33, [C] 14.4.34).—(A) The addition of 0·05—0·1% of Zn is claimed to inhibit the formation of a flocculent CdO dross. (B) A bath containing Ni 0·1—10 (1—6) wt.-% is used at 375—500°, preferably beneath a layer of flux. (C) A mixture of Cd and alkali halides (*e.g.*, $CdCl_2$ 58, KCl 22, and NaCl 20%, m.p. 354°) is employed; when it becomes loaded with CdO it is regenerated by treatment with NH_4 halide. L. C. M.

Coating metal articles [window frames] with zinc. A. H. Williams (B.P. 464,020, 9.8.35).—A bath of Pb at $\nless$490° (550—570°) covered by a thin layer of Zn is used; the frames are coated by immersion in the Zn, lowered into the Pb so that the Zn alloys with the surface metal, and withdrawn through the Zn, receiving a further coating. L. C. M.

Corrosion-resistant coating [for zinc]. C. E. Heussner, Assr. to Chrysler Corp. (U.S.P. 2,041,545, 19.5.36. Appl., 29.5.33).—Articles of Zn or Zn alloys are treated in a bath containing $Ba(NO_3)_2$ 15 or $Sr(NO_3)_2$ 12, $MnCO_3$ or $Mn(OH)_2$ 8 or $Al(OH)_3$ 10, $Na_2Cr_2O_7$ 0·5, and H_3PO_4 14—20 or AcOH 25 g./litre for 5—15 (10) min. at 66—100° (90°). L. C. M.

Treatment of zinc-bearing ore material. T. A. Mitchell, Assr. to Hughes-Mitchell Processes, Inc. (U.S.P. 2,039,331, 5.5.36. Appl., 5.11.34).—ZnS ore is roasted at a low temp. and the ground calcine treated with aq. $CaCl_2$ (*d* 1·38) and CO_2 under pressure; the aq. $ZnCl_2$ (*d* 1·53) thus produced is clarified and treated with CaS, yielding ZnS, from which Zn is recovered by distillation with CaO and C, and regenerating aq. $CaCl_2$. L. C. M.

Separation and recovery of gold, platinum, palladium, selenium, tellurium, and arsenic by means of mercurous salts. G. G. Pierson (U.S.P. 2,044,366, 16.6.36. Appl., 24.11.34).—An aq. 2% HCl solution of the halides is treated with HgCl; the ppt. (I) containing Au, Pt, Pd, and excess of HgCl is heated to drive off the HgCl, dissolved in aqua regia, evaporated to dryness, and Au pptd. in dil. HCl solution by $H_2C_2O_4$. Pd is separated from the filtrate by treatment with HgCl in cold 5% aq. $CuSO_4$, and Pt is pptd. by boiling the filtrate with HgCl. The filtrate from (I) is acidified with HCl and boiled with $NaHSO_3$, when Se separates; As is pptd. from the solution by treatment with conc. HCl and HgCl, and the final liquor contains Os, Ir, Ru, and Rh. L. C. M.

Recovery of gold and other metals by amalgamation. C. C. Farr and J. M. Cadigan (B.P. 462,626, 13.12.36. New Zealand, 8.2.35).—The Au-bearing wash is cascaded into a trough containing a pool of Hg, which is connected to the negative pole of a battery, the positive of which is joined to an electrode in the form of a baffle plate supported above the Hg. L. C. M.

Pen point. J. S. Streicher, Assr. to Amer. Platinum Works (U.S.P. 2,041,381, 19.5.36. Appl., 19.3.34).—The use of a Ag alloy containing Cu 15 and Zn 10% is claimed. L. C. M.

Preparation of pen points. Amer. Platinum Works (B.P. 463,937, 16.12.36. U.S., 21.12.35).—A low-voltage electric welding apparatus for attaching Ir tips is described. L. C. M.

(A) **Pen.** (B) **Pen point.** (C) **Gold plating.** H. S. Lukens, Assr. to C. Howard Hunt Pen Co. (U.S.P. 2,039,326—8, 5.5.36. Appl., [A] 20.1.34, [B, C] 13.5.35).—Steel pen nibs (containing Cr 18, Ni 8, and Mo 2·5%) are pickled in aq. HCl, washed, and (A) electroplated with Au from an alkaline cyanide bath, (B) treated with 5—10% aq. HNO_3 so as to form a surface film of oxide, and electroplated with Au from an acid cyanide bath, or (C) electroplated with Au, first from an acid and then from an alkaline cyanide bath. L. C. M.

Production of magnesium sulphide and magnesium. D. Gardner (B.P. 465,366 and 465,421, 23.12.35).—(A) MgS is produced by heating $MgCl_2$ with Fe_2S_3 (from FeS_2 and Fe) and subsequently reduced to Mg by heating with CaC_2, $CaSi_2$, Al, or Na in an inert atm. (B) The MgS is produced by

heating dolomite or $MgCO_3$ with C in CS_2 at 800—1000° and the reduction with CaC_2 is effected in the presence of a fluoride flux at 1200—1300°.
A. R. P.

Production of metallic magnesium. F. Hansgirg, Assr. to Amer. Magnesium Metals Corp. (U.S.P. 2,039,483, 5.5.36. Appl., 27.11.34).—A mixture of MgO with Al and/or Si is passed continuously at $>$ the b.p. through a reaction chamber containing an inert gas at reduced pressure; the Mg vapour passes off through a condenser, and the liquid is collected under hydrocarbon oil. L. C. M.

Refining of magnesium or its alloys. Oesterr. Amerikanische Magnesit A.-G. (B.P. 465,277, 4.11.35. Austr., 2.8.35).—Mg granules contaminated by C and MgO from electrothermal distillation are mixed with 1% of $MgSiF_6$ and melted in an Fe crucible Mg ingots are refined by melting them with 1% of a 9 : 1 mixture of $MgSiF_6$ and $(NH_4)_2SiF_6$.
A. R. P.

Treatment of magnesium articles. J. A. Gann and W. H. Gross, Assrs. to Dow Chem. Co. (U.S.P. 2,041,331, 19.5.36. Appl., 18.2.35).—In order to improve the adhesion of paint, lacquer, etc., articles are immersed for ½—1 min. in a bath containing HCl 2—20 (6—17), a sol. chromate 5—40 (20—30), and a sol. Mg salt 5—40 (5—30) wt.-%.
L. C. M.

Magnesium alloy. F. Christen (B.P. 463,224, 15.5.36. Switz., 15.5.35).—The alloy, suitable for the pistons of internal-combustion engines etc., contains Al 14—18, Si 0·1—1, Sb 3—8, Ni 2—5, Cr 0·1—0·5, Mn 0·1—1, Mo 0·1—0·5, Cu 6—8, and Ti 0·1—2%. L. C. M.

Magnesium alloys. J. L. Houghton and W. E. Prytherch (B.P. 464,030, 7.10.35).—Alloys suitable for use at 20—200°, containing Al 6—8, Ag 1·5, Mn 0—4, and Zn and/or Ca 0—6%, are claimed.
L. C. M.

Welding of magnesium and its alloys. I. G. Farbenind. A.-G. (B.P. 463,434, 27.9.35. Ger., 14.12.34).—Claim is made for the use of fluxes consisting of mixtures of alkali or alkaline-earth halides with HPO_3, H_3BO_3, or $H_2C_2O_4$ or salts thereof, and MnO_2 0—1%; *e.g.*, a mixture of LiBr 12, KF 5, and KH_2PO_4 2 pts. may be used. L. C. M.

Electrolytic production of protective layers on magnesium and magnesium-base alloys. I. G. Farbenind. A.-G. (B.P. 463,024, 27.7.36. Ger., 27.7.35).—The articles are anodised for 5—10 min. at 0·5—1 amp./sq. dm. in a molten polyfluoride electrolyte, *e.g.*, KF,2—4HF (m.p. 60—70°), NH_4F,2—5HF (m.p. 20—30°), or NH_4F,2HF 80, NH_4F,HF 20% (m.p. 20°). L. C. M.

Production of bright surfaces on aluminium. R. B. Mason and M. Tosterud, Assrs. to Aluminum Co. of America (U.S.P. 2,040,617—8, 12.5.36. Appl., 10.2.34).—A bright, transparent film is produced by anodising in a bath containing HF 0·2—1·5 and (A) CrO_3 1—25 or (B) H_2SO_4 1—60% for 10 min. at 30—70° (50°), and afterwards impermeabilising in H_2O at 80—100°. L. C. M.

Coating and protection of aluminium. S. R. Sheppard (B.P. 463,790, 30.7.35).—Anodised Al surfaces are coated with a fired-on ceramic glaze, which may be applied either as a frit paste, or by successive immersion in solutions of a metal salt [*e.g.*, $Pb(OAc)_2$, $ZnCl_2$, $MgCl_2$, or $Co(OAc)_2$] and a sol. silicate, followed by washing and drying.
L. C. M.

Treatment of [aluminium] pistons. G. L. Moore, Assr. to Aluminum Co. of America (U.S.P. 2,040,324, 12.5.36. Appl., 21.3.35).—Cast Al alloy pistons, containing Si 7—15 (14), Mg 0·2—3 (1), Ni 0·5—7 (2·5), and Cu 0·3—4 (0·8)%, are withdrawn from the moulds at $>$480°, heated at 480—550° for ¼—6 hr., cooled rapidly, machined, and installed without further heat-treatment. L. C. M.

Solder for aluminium. R. B. Derr and C. C. Callis, Assrs. to Aluminum Co. of America (U.S.P. 2,044,671, 16.6.36. Appl., 24.10.34).—Sn alloys containing Pb 25—55 (25—32, 31·5), Zn 8—25 (10—20, 20, 10), and Cd 1—15 (5—10, 10, 5)% are claimed.
L. C. M.

Aluminium alloy. J. B. Bates, Assr. to Titanite Alloys Corp. (U.S.P. 2,041,042, 19.5.36. Appl., 5.11.34).—The casting alloy contains Mn 0·5—5 (2) and Ti 0·05—0·5%. L. C. M.

Aluminium-base alloys. Aluminium, Ltd., Assees. of F. Keller and C. M. Craighead (B.P. 463,324, 24.9.35. U.S., 25.10.34).—Alloys containing Mg_2Si 1·5—3 (1·5—2, 1·6), Cu 0·1—4 (1—3), and one or more of Cr, Mo, W, or U 0·1—1 (Cr; 0·25)% are annealed at $>$500° but $<$ m.p. until $\nless$0·5% of Mg_2Si remains undissolved; they are then cooled and aged at 140—200° for 3—36 hr. L. C. M.

Recovery of beryllium. J. E. Bucher, Assr. to Antioch Industrial Res. Inst., Inc. (U.S.P. 2,040,804, 12.5.36. Appl., 28.4.33).—Powdered Be, obtained, *e.g.*, by reduction of $BeCl_2$ with Na, is freed from $Be(OH)_2$ (which renders it impossible to obtain a coherent briquette by heating the metal in H_2) by treatment with aq. Na, K, or NH_4 carbonates or bicarbonates, followed by washing with H_2O or EtOH in an inert atm. L. C. M.

Preparation of beryllium by electrolysis. G. Jaeger (U.S.P. 2,041,131, 19.5.36. Appl., 9.7.34. Ger., 10.7.33).—A mixture of NaCl with $BeCl_2$ $\nless$30 (40—60) wt.-% is electrolysed at 350—450° (370—380°). L. C. M.

Sintered hard metal alloys. F. Krupp A.-G. (B.P. 465,323, 13.7.36. Ger., 7.8.35).—The alloys consist of WC with TiC 3—30, V_4C_3 0·3—10, and Fe, Co, or Ni 0·5—20%. A. R. P.

Hard composition [sintered alloy]. P. M. McKenna, Assr. to Vanadium-Alloys Steel Corp. (U.S.P. 2,039,822, 5.5.36. Appl., 2.5.33).—The alloy contains TaC with W (in particles 1—100 mμ) 10—28, or W 4 and Pd 16%. L. C. M.

Flotation of minerals. E. I. Du Pont de Nemours & Co., and S. Lenher (B.P. 463,261, 25.9.35).—Non-sulphide, acidic minerals are conc. by flotation in the presence of a quaternary NH_4 or PH_4 or ternary sulphonium salt (excluding NR_4SO_4) in which at least one radical is $\not< C_8$ ($C_{12}H_{25}$—$C_{18}H_{37}$), *e.g.*, cetyl. L. C. M.

Roasting and heat-treatment of ores and minerals. C. Q. Payne (U.S.P. 2,039,833, 5.5.36. Appl., 22.8.35).—The apparatus consists of a horizontal drum of fireclay, faced with zircon and rotating on H_2O-cooled bearings, which is heated by oil burners at one side, while the powdered ore falls on it from a hopper shielded from the flame; the calcine is removed continuously by scrapers. L. C. M.

Sintering of concentrates, ores, etc. A. Holmberg (B.P. 463,746, 25.11.35. Sweden, 25.1.35).—The finely ground material is forced by a stream of hot air through the flame of an oil burner and is thrown against a vertical wall with sufficient force to form a sintered cake, which is swept down into a hopper by a second air blast. L. C. M.

Metallurgical converters. G. A. Mullin (B.P. 462,837, 7.10.35).—The converting chamber is a fixed metal cylinder, slightly inclined to the horizontal, lined with firebrick, and fitted with tuyères at bottom and sides; the metal passes through the converter continuously, slag being retained by a transverse partition. L. C. M.

Treatment of molten metal for casting. Meehanite Metal Corp. (B.P. 463,145, 23.1.36. U.S., 8.6.35).—A melt of Fe containing scrap steel ($\not>$25%) is treated with Cu (as Cu–Fe alloy) $\not<$0·6 (1—3)% and a graphitising agent (Ca or Zr). L. C. M.

Pickling inhibitor. W. P. ter Horst, Assr. to Wingfoot Corp. (U.S.P. 2,050,204, 4.8.36. Appl., 29.12.33).—Pentamethylene disulphide (from NH_4SH and CH_2O), or products obtained by treating CH_2O with $(NH_4)_2S$ or NH_4CNS, are claimed as pickling inhibitors; the prep. and use of the substances is described. P. G. C.

Manufacture and control of a lubricating compound [for wire drawing]. R. P. Lutz, Assr. to Western Electric Co., Inc. (U.S.P. 2,040,321, 12.5.36. Appl., 14.7.32).—An emulsion containing tallow 3, rape oil 1·5, soap 0·5, and H_2O 95% is employed, and in use the p_H is maintained colorimetrically between 8 and 9. L. C. M.

Plant for preparation of metal powder for bronze colours. L. Baier (B.P. 463,826, 31.1.36).—A battery of stamping machines is arranged radially and delivers into a common central feed pipe, which leads to sifting and polishing machines; separate pneumatic connexions are provided, each with its own fan, between the various sections of the plant so that they may be controlled independently. L. C. M.

Manufacture of powdered metals. J. H. L. De Bats (U.S.P. 2,040,168, 12.5.36. Appl., 25.3.32).—The molten metal is allowed to fall on a rotating horizontal disc, faced with refractory ($MgCO_3$) and just covered with cold running H_2O or other suitable liquid; the apparatus is enclosed in a cylindrical vessel fitted with inert gas. L. C. M.

Changing the grain structure of metals [electric welding]. C. J. Holslag, Assr. to Manhattan Co. (U.S.P. 2,041,343, 19.5.36. Appl., 23.3.33).—Welds are normalised by striking an arc between them and a C electrode. L. C. M.

Coating of pure and alloyed light metals with a firmly adhering protection against corrosion. W. Klapproth (B.P. 463,511, 6.3.36. Ger., 6.3.35).—The metal is coated with vegetable or animal fat or oil, and heated for >10 min. at >200° (270—380°); or the oil may be sprayed on the preheated metal. L. C. M.

Welding material. J. Strauss, Assr. to Vanadium Corp. of America (U.S.P. 2,040,189, 12.5.36. Appl., 4.1.30).—The use of rods of steel containing C 0·05—0·4 (0·1—0·25), Mn 0·2—3 (0·4—0·8), Si 0·02—0·5 (0·1—0·3), V 0·02—0·2 (0·12—0·2), and Ti 0·04—0·2, with or without Cr 0·5—4·5 (1—1·5) and/or a V-protecting agent (Be, Ca, Mg, B, Al, Si, Ti, Zr, or Ce) 0·04—0·2%, is claimed. L. C. M.

Welding. A. G. Bloxam. From Combustion Eng. Co., Inc. (B.P. 463,787, 18.12.36).—In the construction of vessels of mild steel fitted with linings of corrosion-resisting Cr or Ni–Cr steel, the liner is joined to the shell by plugs constructed of two alloys, the inner ends of which may be readily welded to the alloy steel and the outer to the mild steel. L. C. M.

Testing the hardness of metals. J. H. Barber and J. F. Bridge (B.P. 464,005, 25.3.36).—A hardness-measuring machine is equipped with a stop device to prevent loading beyond a predetermined max., and mechanism for swinging aside the indentor and measuring the depth of the indentation *in situ* by means of a microscope. L. C. M.

Apparatus for testing the hardness of materials. J. Rule, and Holman Bros., Ltd. (B.P. 467,276, 27.12.35).—A portable apparatus for testing drill shanks and the like, operated on the Brinell system, is described. B. M. V.

Apparatus for detecting presence of metallic particles in non-metallic substances. Brit. Thomson-Houston Co., Ltd., and C. G. Mayo (B.P. 465,338, 5.11.35).—Two similar, closely balanced, opposed secondary coils are arranged in a magnetic field produced by a primary coil with their axes normal to the direction of the field; when the substance to be tested is passed axially through the field the magnitude and direction thereof are changed if a metallic particle is present and this change is caused to operate a signal or relay. A. R. P.

Electroplating of metal. C. A. Harrison, Assr. to Anaconda Copper Mining Co. (U.S.P. 2,044,431, 16.6.36. Appl., 5.3.32).—An arrangement of electrodes designed to avoid excessive thickness of deposit at the edges of the articles is claimed. L. C. M.

Hardening the teeth of toothed wheels by a flame. I. G. Farbenind. A.-G. (B.P. 463,054, 19.9.35. Ger., 26.9.34).

Manufacture of metal products [seamless pipe elbows and tees]. F. B. Wendel, H. Albert, and A. Stauber (B.P. 463,651, 3.10.35. U.S., 3.10.34).

Automatic electric welding [machine]. Union Carbide & Carbon Res. Labs., Inc., Assees. of H. E. Kennedy, M. A. Rotermund, and L. T. Jones (B.P. 463,954, 4.10.35. U.S., 9.11.34).

Light metals. Ferrophosphorus. Zn ores. Roasting pyrites. Alloy resisting Cl_2 etc.—See VII. **Glass–metal joints. Soldering ceramic material.**—See VIII. **Beating slag.**—See IX. **Metal coated with resin.**—See XIII.

XI.—ELECTROTECHNICS.

Developments in electric heat-treatment furnaces. A. G. Robiette (Metallurgia, 1936, **15**, 57—60).—Continuous, salt-bath, and bright-annealing types of electric furnaces are described. W. P. R.

Electric furnaces for aluminium alloys. G. B. Lamb (Metallurgia, 1937, **16**, 39—41).—For heat-treatments batch furnaces with forced air circulation are preferable to salt baths. The factors controlling the air circulation in horizontal and vertical furnaces are discussed. Conveyer and continuous-roller hearth furnaces for billet heating are described. S. J. K.

Calculation of work of electric heating installations. D. K. Koller (J. Chem. Ind. Russ., 1937, **14**, 211—212).—Mathematical. R. T.

Erosion of sparking-plug electrode materials and variation of sparking-plug voltage. W. R. Debenham and F. G. Haydon (Aero. Res. Comm. Rept. and Memo. No. 1744, 1937, 22 pp.).—With a view of determining the most suitable material for the electrodes of sparking plugs used in aero engines running on standard and $PbEt_4$ fuels an investigation was made of the relative performances of W, Ni, Ni–Cr, Ni–Mn, Co–Cr, stellite, etc. when subjected to magneto spark discharge. None of the materials showed signs of chemical attack after testing. Erosion increased in the order: W, Ni, Ni alloys. Pure Ni is recommended as the most suitable material. W is unsuitable on account of its high end-of-test voltage. R. B. C.

Electrical conductivity of aluminium for large-scale conduction. A. Schulze (Physikal. Z., 1937, **38**, 445—446).—Tests on 71 specimens of Al from 7 German firms gave for the average val. of breaking strain 19·0 kg. per sq. mm., and sp. resistance at 20° 0·02810 ohm/mm.^{2}/m. A. J. M.

Thermal and electrical conductivities of a sample of Acheson graphite from 0° to 800°. R. W. Powell (Proc. Physical Soc., 1937, **49**, 419—426).—The thermal conductivity, k, decreases with rise of temp. throughout the range. Over the same range the electrical conductivity, κ, increases and then decreases with rise of temp., attaining a max. val. at 450°. The val. of the Lorenz function, $k/\kappa T$, at 0° is approx. 200 times the val. for most metals and that indicated by the electronic theory. The val. of the function decreases with rise of temp. according to $k/\kappa T = 0{\cdot}0294/T^{1\cdot8}$, extrapolation indicating a val. 1×10^{-8} at 3800° abs. This val. is slightly $>$ the theoretical val. for metallic conductors. C. R. H.

Molecular physics of insulating material. F. H. Müller (Oel u. Kohle, 1937, **13**, 591—602).—Modern knowledge of mol. structure is reviewed in its connexion with the behaviour of electrical insulating and cable oils, solid insulators (*e.g.*, artificial resins), ceramic materials, glass, and cryst. substances such as mica. The ε vals. and loss factors of these materials can be quantitatively accounted for by Debye's dipole theory, which has been of service in correcting undesirable properties. The properties of rubber and the effect of vulcanisation are also explained by consideration of the behaviour of "thread" mols., and Wagner's theory of double-surface condensers is applied to emulsions. A short description is given of the application of the theory of ion-lattice structure to consideration of crystals, stones, ceramic materials, and glass. H. C. R.

Non-inflammable dielectric organic liquids. F. M. Clark (Ind. Eng. Chem., 1937, **29**, 698—702).—Pentachlorinated Ph_2, Ph_2O, and $COPh_2$, and hexachlorinated CH_2Ph_2, being non-inflammable high-dielectric liquids, decomposed by the arc to non-explosive gases, make good insulating liquids for condensers and, blended with $C_6H_3Cl_3$ (to reduce η), for transformers. A. Li.

Distribution of relaxation times in typical dielectrics. W. A. Yager (Physics, 1936, **7**, 434—450).—The consts. of Wagner's equation have been evaluated for a no. of dielectrics; the equation is applicable to polydisperse systems of all degrees of complexity. H. J. E.

Sheathing of cables with plastics. E. Pallas (Korros. u. Metallschutz, 1937, **13**, 95—96).—The properties of Plexigum (polymerised acrylates 30, fillers 70%) and its applications in place of Pb are discussed. R. B. C.

Progress in technical electrolysis. Hellmut Fischer (Chem. Fabr., 1937, **10**, 284—292).—Developments in the electrolytic production of a wide range of metals, non-metals, and their compounds, and metal and oxide coatings in other countries are reviewed and compared with German technique. I. C. R.

Ingredients of the Leclanché cell. I. Z. Herrmann and C. Slonim (Monatsh., 1937, **70**, 84—103).—An attempt is made to correlate the activity of samples of natural MnO_2 from various sources as depolarising materials in Leclanché cells with the purity of their crystal structures. The isothermal dissociation of certain ores has also been investigated. J. W. S.

Ash and dust from gases.—See I. **Carbonising coal. Mineral oils. Lubricating oils. Insulating oil.**—See II. **Ethylcellulose.**—See V. **H_2SO_4 from smoke abatement. $NaClO_3$. Electrolysis of KCl. Cr plating.**—See VII. **Magnetite. Smith alloy 10. Magnets. Zn die-castings. Tinning steel strip. Sn-plate. Ni-plate. Cr-plating liquors. Cathodic protection against corrosion. Electrochemical study of corrosion. Potential measurements in corrosion research. Corrosion and p_H indicators. Prep. of metal for painting. Metals in vac. tubes.**

Magnetic testing. Electrodeposits.—See X. **Determining p_H of sulphonated oils.**—See XII. **Polystyrene. Electro-osmosis of ochre.**—See XIII. **Insulation rubber.**—See XIV. **Grading white sugars. Determining η of cane molasses.**—See XVII.

Patents.

Arrangement of electrode wires or threads in electrical gas purifiers and similar apparatus. W. W. Triggs. From Bolidens Gruvaktieb. (B.P. 462,637, 10.6.36).—In the construction of, *e.g.*, a Cottrell apparatus, the negative wires, instead of being rigidly attached to the frame, pass over pulleys at the top, and are kept taut by weights at both ends. Should a wire break, the broken pieces at once fall out of the cage and possible short-circuits are avoided. L. C. M.

Cathodes for electron-discharge devices. Radio Corp. of America (B.P. 462,706, 17.2.36. U.S., 23.2.35).—The filaments are made of a sintered alloy containing W, Mo, or Ta, together with Cr and ThO_2, CeO_2, Y_2O_3, or La_2O_3 (*e.g.*, Mo or W with ThO_2 3 and Cr 1 wt.-%), and are plated with Cr. L. C. M.

Electrical contacts. Ideal Werke A.-G. f. Drahtlose Telephonie (B.P. 462,442, 1.9.36. Ger., 15.2.36).—Switch contacts of ceramic material coated with Ag, *e.g.*, by spraying, with superimposed layers of Pt on the contact faces and Cu on the connecting tag are claimed. L. C. M.

Resistance units of silver sulphide and circuits utilising them. Standard Telephones & Cables, Ltd. From Western Electric Co., Inc. (B.P. 465,923, 27.3.36).—Resistances having a high negative temp. coeff. are composed of Ag_2S powder (1) compressed at $\not<10{,}000$ lb./sq. in., or (2) deposited by chemical action on a supporting member, or (3) by suspending Ag in S vapour at 300°. In all cases the resistance is heated in dry N_2 at 200—300° for 1 hr. In (1) the compressed powder may be heated in S vapour before the N_2. Reaction (2) is effected between NaOH and a solution of $AgNO_3$ or AgOAc and $CS(NH_2)_2$. B. M. V.

Electrical batteries. Chloride Electrical Storage Co., Ltd. From Accumulatoren-Fabr. A.-G. (B.P. 462,450, 18.12.36).—A construction of air-O_2 electrode for galvanic cells with air depolarisation is claimed. L. C. M.

Electrolytic condensers. Brit. Thomson-Houston Co., Ltd. (B.P. 466,193, 27.11.35. U.S., 30.11.34).—The electrolyte comprises a conc. ($\not>15\%$ of H_2O) aliphatic acid, alone or absorbed in a porous spacer, but in any case introduced in the liquid form. No addition is made other than a cellulose ester or ether as thickener and NH_4 borate or other resistance modifier, the resistance of the mixture being adjusted to <1 megohm per cm. cube. B. M. V.

Electrolytic condensers. Dubilier Condenser Co. (1925), Ltd. (B.P. 465,727, 8.11.35. U.S., 8.11.34).—To the electrolyte of a condenser (before soaking into the spacer) is added enough material of the same nature as the dielectric film [*e.g.*, $Al(OH)_3$] to saturate the electrolyte and thus prevent destruction of the film when the condenser is not in use. B. M. V.

Powdered iron cores for high-frequency electrical coils. Steatit-Magnesia A.-G. (B.P. 463,084, 23.10.35. Ger., 25.10.34).

[Machine for] manufacture of electrodes for galvanic [dry] cells. O. Schidlo, and Pile Lumina Belge, Soc. Anon. (B.P. 463,044, 16.9.35).

Electric batteries or accumulators. A. D. Froggatt (B.P. 465,956, 18.11.35).

Dewaxing oils.—See II. **Accelerating reactions.** See III. **Na. Tetrathionates.**—See VII. **Resistance alloys. Pb alloy. Deposition of Cr. Amalgamation. Pen etc. Au plating. Bright surfaces on Al. Protective layers on Mg etc. Be. Electroplating.**—See X. **Wax-like composition.**—See XII. **Sterilising liquids.**—See XXIII.

XII.—FATS; OILS; WAXES.

Fat of grape marc. J. Maille de Girvès (Bull. Assoc. Chim. Sucr., 1937, **54**, 140—146).—100 kg. of moist, or 58 kg. of dried, grape marc contain about 3·5 kg. of fat, of which about half is in the pips and half in the skins and pulp. The fat has a greenish colour, m.p. (Ubbelohde) 51°, *d* 0·917, sap. val. 182, acid val. 26·8, I val. 118, and unsaponifiable 5%. Fat has been recovered industrially from the pips, but this is not economical at present. The whole marc, freed from stalks, is a more promising raw material, as the separation of the pips from the marc is difficult and costly. The total marc produced in France and Algeria annually would yield 30,000 tons of fat. J. H. L.

Action of micro-organisms on fats. L. B. Jensen and D. P. Grettie (Food Res., 1937, **2**, 97—120; cf. B., 1933, 513).—Methods of culturing hydrolysing bacteria on emulsified and continuous fatty substrates are described. Certain types of bacteria containing lipase and oxidase cause rapid development of both free acid and oxidative rancidity analogous to "chemical" or O_2–light rancidity. The rate of development of rancidity in bacon fat at −17·8° was found to vary with the no. of bacteria on the original fat. Bacteria will not develop on H_2O-free fat, but slow growth occurs when only 0·3% of H_2O is present. Pink and purple discolorations are due to fat-sol. pigments of micro-organisms. E. C. S.

Hydrogen value of unsaturated compounds, in particular of fats. V. P. Golendeev (J. Appl. Chem. Russ., 1937, **10**, 696—701).—The degree of unsaturation of fats is better expressed by means of the H val. than of the I val. (Hübl). Apparatus and methods (using Ni catalyst) are described. R. T.

Antioxidants and the autoxidation of fats. IX. Antioxidant properties of the tocopherols. H. S. Olcott and O. H. Emerson (J. Amer. Chem. Soc., 1937, **59**, 1008—1009; cf. B., 1937, 364).—Tocopherols have antioxidant properties for lard and oleo oil in the order $\alpha<\beta<\gamma$, but none for hydrogenated cottonseed oil; their protective properties are not ∝ their vitamin-*E* activity. The allophanates also have similar properties for lard, as has the allophanate of α-$C_{10}H_7$·OH, but not that of cholesterol. R. S. C.

Fractionation equipment for qualitative and quantitative examination of natural fats. H. E. Longenecker (J.C.S.I., 1937, **56**, 199—202T).—The applicability of an electrically heated, packed fractionating column provided with total reflux and adjustable rate of distillation (*i.e.*, collection of distillate) for the max. separation of ester mixtures is indicated by several examples, including beef tallow "solid" and butter fat "liquid" esters. The separation of adjacent members of the saturated ester series was more efficient than in the case of the unsaturated esters. Intermediate fractions in all cases represented a small % of the total distillate. Pure fatty acids were obtained on hydrolysis of appropriate ester fractions. The use of this column for the qual. and quant. determination of minor component acids in natural fats is suggested. Occurrence of small amounts of hexadecenoic (palmitoleic) and myristic acids in groundnut oil has been demonstrated. Closely agreeing composite analyses of groundnut oil obtained with both this column and one of a simpler type (Willstätter bulb) are interpreted as an indication of the general accuracy of ester fractionation procedure in the detailed analysis of natural fats.

Collaborate work of the D[eutsche] G[esellschaft für] F[ettforschung]. IV. Hydroxyl number. H. P. Kaufmann (Fette u. Seifen, 1937, **44**, 150—153).—Full details of the German (proposed standard) version of the C_5H_5N method (cf. Verley and Bolsing, A., 1902, ii, 54) for the determination of OH val. (Ac val.), and of the Lewkowitsch distillation and filtration (B.S.S. 650) methods, as circulated by the International Commission for the Study of Fats, are described for the purposes of collaborate tests. E. L.

Crops producing drying oils [in Dutch East Indies]. C. van de Koppel (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 395—409).—The consts. of tung oil (*Aleurites* spp.) from Java compare favourably with good commercial samples (I val. 164, heat test at 282° 12—24 min.). *A. trisperma*, suitable for the tropics, gives seed of 28% oil content, with oil of *d* 0·937, I val. 137, but relatively high acid val. (25—42). The oil from *A. moluccana*, a substitute for linseed oil, has good drying properties but is low in yield. Oiticica, perilla, and safflower oils are also described. The compositions of press cakes are supplied. W. L. D.

A.O.C.S. Seed Analysis Committee report. Anon. (Oil & Soap, 1937, **14**, 155—156).—The procedure for fuming is modified as follows: the dried seed in the pot is covered and placed in the fuming oven, which has been previously opened and ventilated for 5—10 min., and fumed for 1 hr. at an oven temp. which is gradually raised to ≯115°. An alternative (preferred) method of mixing such fumed seed is to stir it lightly in a 4-in. deep, straight-sided Fe mortar with the pestle in the inverted position. E. L.

Refractometric determination of fat in oil seeds (light petroleum method). W. Leithe and H. Lamel (Fette u. Seifen, 1937, **44**, 140—142).—The determination of fat content by extracting the ground seed, cake, etc. (1—4 g.) with a known vol. (5 c.c.) of solvent and measuring the difference in n_D due to dissolved oil is a rapid and convenient method for use in control of factory operations, or where only a few seeds are available, *e.g.*, in plant-breeding experiments. The method is described and illustrated by typical tables. E. L.

Refractometric determination of oil in linseeds by the Leithe method. L. Lompe (Angew. Chem., 1937, **50**, 296—298; cf. B., 1935, 317).—*n* for linseed oil depends on the locality where the seeds are grown. Hence *n* for each oil must be found before the method can be employed. T. G. G.

Modern oil deacidification. K. Schneider (Allgem. Oel- u. Fett-Ztg., 1937, **34**, 252—255).—The advantages of modern processes developed by the plant manufacturers, such as the Bamag-Meguin soda deacidification and distillation processes for highly acid oils, are briefly indicated. E. L.

Bleaching of [fatty] oils with bleaching earths. J. Davidsohn and A. Davidsohn (Ind. Chem., 1937, **13**, 281—283).—Simple laboratory methods for evaluating bleaching earths and modern technical methods of bleaching fatty oils with absorbents and regenerating the spent earths are outlined. E. L.

Refining fatty oils with ethanolamine. A. Rooseboom (Trans. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 384—391).—Free fatty acids, odour, and colouring matters are removed from fats by adding small amounts of NH_2·C_2H_4·OH (I), which dissolves out the acids etc. and is conveniently separated in a const.-flow centrifuge. There is little loss of neutral fat and the (I) is recoverable by distillation. W. L. D.

Improvement of vegetable oils by conjugated hydrogenation. V. A. Rusch and I. L. Dvinianinova (J. Appl. Chem. Russ., 1937, **10**, 702—708).—Sunflower-seed oil and PrOH are heated with Ni catalyst (250°/30 atm.; 20 min.), whereby linolenic acid is converted into oleic and *iso*oleic acids, and PrOH into propylene and CO. The composition of the oil obtained approximates to that of olive oil. R. T.

Chemistry of linseed stand oils. II. H. Kurz (Fette u. Seifen, 1937, **44**, 192—194; cf. B., 1936, 749).—Ebullioscopic determinations of the mol. wt. of the acids obtained from various components separated from stand oil by fractionation with solvents (the oil, the acids, soaps, and esters therefrom being treated) indicate the presence in stand oil of various (mostly viscous) acids of high mol. wt. as well as unimol. acids in sufficient amount to account for the formation of stearic acid on hydrogenation without assuming the presence of cyclised acids (Eibner-Rossmann). E. L.

Drying of linseed oil. Electron-diffraction study. D. H. Clewell (Ind. Eng. Chem., 1937, **29**, 650—653).—Linseed oil films at different drying stages were photographed with an electron-diffraction

camera designed primarily for investigation of surfaces by the reflexion method. The surface structure of the wet film is amorphous, but gradual orientation of the C-chain mols. normal to the surface occurs during drying. Pigmentation [Venetian-red, $Al(OH)_3$] enhances the tendency towards coagulation of the C chain into crystals. General conclusions on the drying process are drawn. Diffraction patterns of high definition were not obtained, owing probably to the complexity of linseed oil, but examination of pure triesters of glycerol should be informative.
S. S. W.

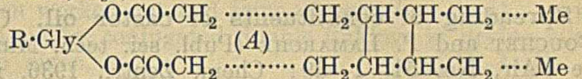
Drying oils and resins. Mechanism of the "drying" phenomenon. T. F. BRADLEY (Ind. Eng. Chem., 1937, **29**, 440—445).—Whilst it is believed to be primarily physical, drying of oils and some resins can be related to chemical reactions involving oxidation. The sp. nature of the reactions is, however, of less importance than the functionality equivs. of the reactants. Drying involves the transformation of linear monomerides or polymerides into 3-dimensional polymeric forms. Active is distinguished from potential functionality, and the influence of ring-closure, whether by uni- or bi-mol. reactions, is considered.
F. C. B. M.

Rate of linseed oil oxidation with driers. A. J. CURRIER and I. H. KAGARISE (Ind. Eng. Chem., 1937, **29**, 467—469).—Measurements of the rate of O_2 absorption at 98·5° by linseed oil containing Co, Mn, and Pb oleates and linoleates show that, in general, with 0·1% of drier (on total oil) Co and Mn linoleates have the same induction periods as the corresponding oleates, and a shorter period than has Pb linoleate. Pb salts not appreciably sol. in oil, such as salicylate, acetate, and phenylpropiolate, have much longer induction periods than sol. salts.
F. C. B. M.

Polymerisation of fatty oils. H. I. WATERMAN, C. VAN VLODROP, and G. GAIKHORST (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 392—399).—The *n* and I val. of Et linoleate polymerised in N_2 at 290° in contact with Ni-kieselguhr or Pt–C are linearly related. At 200° the *n* rapidly rises to a max., when a highly reactive ester is formed, which on further heating polymerises with a rapid decrease in *n* and I val. until the degree of unsaturation reaches that of Et oleate.
W. L. D.

Oxidised and polymerised oils. II. Relations between characteristic viscosities and cooking degrees of linseed oil. M. TATIMORI (J. Soc. Chem. Ind. Japan, 1937, **40**, 19—21B; cf. B., 1937, 806).—The η of linseed oils, raw, oxidised by O_2 at 100°, or polymerised at 280° in CO_2 to I vals. of 158, 140, and 124, are measured in C_6H_6 at varying concns. It is found that $\log (K_0 - c) = b \log I + \log a$, where K_0 is the characteristic const. of η in dil. solution, I is the I val., and a, b, and c are consts. There is a linear relation between K_0 and the mol. wt. of both oxidised and polymerised oils.
J. D. R.

Mechanical molecular interlocking as explanation of stand oil formation of fatty oils. E. ROSSMANN (Fette u. Seifen, 1937, **44**, 189—192).—It is suggested that the thickening and gelation (polymerisation) of drying oils such as tung oil and β-elæostearin (II) is chiefly due to an increase of "mol." size (or the formation of micelle-like units) by mechanical interlocking and not by extensive extra-mol. polymerisation. Thus the two Y-like fatty acid radicals in the αα-position of, *e.g.*, elæostearin etc. may intrapolymerise at a pair of corresponding unsaturated linkings, and the large ring (*A*) so formed, *e.g.*,



$$R\cdot Gly\begin{cases} O\cdot CO\cdot CH_2 \cdots\cdots CH_2\cdot CH\cdot CH\cdot CH_2 \cdots Me \\ \qquad\qquad (A) \qquad\qquad\quad | \qquad | \\ O\cdot CO\cdot CH_2 \cdots\cdots CH_2\cdot CH\cdot CH\cdot CH_2 \cdots Me \end{cases}$$

(where Gly is the glyceryl residue and R a fatty acid chain) may be locked, like the links of a chain, with one or more similar rings formed from other mols., to form large units. This theory is supported by experiment since fatty acids from polymerised tung oil or (I) always show a mean mol. wt. (cryoscopic method) of 400—422 (*i.e.*, corresponding with a mixture of mono- and di-meric acids) whatever the degree of polymerisation (from thickened oil of mol. wt. 872—1870 to solid gel) of the oil from which the acids have been recovered. Miller's observations (1928), that both viscous and fluid fractions of stand oil have the same I val., and the separation of 66% of dimeric and 33% of monomeric cyclised acids by vac.-distillation of the acids from gelled tung oil (Rossmann, A., 1933, 807), are explained by the new theory.
E. L.

Analytical methods and studies in technical practice of the linoleum and cork industry. III. Linoxyn, and the influence of the glyceryl radical on oxidation of linseed oil to linoxyn. B. GLASSMANN and S. BARSUTZKAJA (Z. anal. Chem., 1937, **109**, 251—262; cf. B., 1937, 154).—Technical linoxyn (I) before purification with Et_2O and H_2O, and also that obtained from linseed oil by the action of a Co drier, contain a mixture of di- and triglycerides of partly oxidised linoleic acids, present as unsaturated OH-acids. The Et_2O-sol. portion contains a higher proportion of diglycerides; purified technical (I) is essentially the triglyceride. Oxidation of linseed oil to (I) proceeds by the condensation of primarily formed OH-acids, and not by polymerisation. The glyceryl radical is not attacked, but degradation to a diglyceride takes place. The formation of volatile and low-mol. products arises from degradation of the unsaturated acids.
J. S. A.

Effect on refining results of mixing expeller and hydraulic cottonseed oil. G. W. OWEN (Oil & Soap, 1937, **14**, 149—151).—Expeller oils, which have a high content of gossypol (I) (0·4—1·2%), yield hard, compact foots entraining but little oil in the refining process, whilst hydraulic-press oils, which contain no (I) (0·0—0·6%), furnish bulky soft foots with high refining loss. The refining loss of certain hydraulic-press oils (especially those giving soft, oily soap-stocks) could be much reduced by mixing them with 30% of expeller oils prior to refining, the improvement being due, apparently, to the presence of (I) (cf. Royce and Lindsey, B., 1933, 974).
E. L.

Press-room operation as it affects the quality of cottonseed oil. M. K. THORNTON, jun. (Oil &

Soap, 1937, **14**, 151—152).—The lowest refining loss and best colour are obtained by heating the meats as rapidly as possible (*e.g.*, in 15—20 min.) to 88—93° and adding hot H_2O when the meats have reached this temp. Cooking should be for as short a time and at as low a temp. as possible, and the oil should be settled at about 32—43°. Oils kept at such high temp. that they become quite dry settle out very slowly. E. L.

Spreading of constituents of castor oil. C. Bouchet and P. Lamarche (Publ. sci. tech. Min. de l'Air, No. 51, 1—39; Chem. Zentr., 1936, i, 3472).—Ricinoleic acid and mixtures of castor oil with oleic acid show no discontinuities in the surface-pressure curve, chemical combination occurring in the latter case. J. S. A.

Spreading of castor oil and various glycerides on the surface of water. C. Bouchet and R. Lafont (Publ. sci. tech. Min. de l'Air, No. 33, 1—46; Chem. Zentr., 1936, i, 3472).—Mol. lengths and cross-sections are: for oleic acid, 16·8 A., 31 A.², castor oil, 7·6 A., 205 A.², aged castor oil, 7·8 A., 188 A.², respectively. Surface-pressure data are recorded. J. S. A.

Solvent extraction of soya beans. W. E. Meyerweissflog (Oil & Soap, 1937, **14**, 10—14).—The economic advantages of extraction methods over pressing are stressed; light petroleum can be completely eliminated from the extracted oil and meal, leaving both suitable for human or animal nutrition. E. L.

Improving soya-bean oil colour. R. T. Anderson (Oil & Soap, 1937, **14**, 149).—The most modern types of high-capacity expellers work at higher temp. (*e.g.*, 160—175°) than the early types (93—111°) and yield a much darker oil. The colour of the oil can be materially improved by reducing the temp. of the barrel of the expeller by spraying cold oil over it during working, which also washes it free from foots. E. L.

Tung seed and oil from Empire sources. III. Anon. (Bull. Imp. Inst., 1937, **35**, 147—157; cf. B., 1933, 75).—The analyses of fruits and oil from *Aleurites Fordii* and *A. montana* from various Empire countries are detailed. The yield and quality of the oils from *A. Fordii* were mostly satisfactory, except where the seeds were obtained from immature fruits, or as the first crop of the trees. The oils from *A. montana* were all satisfactory (except for one instance, probably attributable to immature fruit), and in some cases (*e.g.*, seeds from Ceylon and British Honduras) of exceptionally high quality. E. L.

Japanese tung oil. R. S. McKinney and G. S. Jamieson (Oil & Soap, 1937, **14**, 2—3).—The kernels formed 63·9% of the seeds of *Aleurites cordata* and contained 67·5% of oil. The expressed oil, which did not gel in the Browne heat test, but solidified on treatment with $SbCl_3$ in $CHCl_3$, had d_{25}^{25} 0·9313, n^{25} 1·5059, acid val. 0·6, sap. val. 190·2, I val. (Rosenmund–Kuhnhenn, ½ hr.) 145·2, SCN val. 80·9, unsaponifiable matter (I val. 105·5) 0·57%. The oil contains about 70·5% of elæostearic acid, 18·5% of oleic acid, and 6·2% of saturated acids (Bertram). No evidence of linoleic or linolenic acid could be found. Allowing ½ hr. for reaction, the Rosenmund–Kuhnhenn method gives I vals. for the oil or for pure β-elæostearic acid (I) (viz., 182·4 ≡ 2 double linkings) which are independent of the amount of oil used for the test. The SCN val., 91·2, of pure (I) corresponds with one double linking. E. L.

Standardisation of whale oil. H. P. Kaufmann (Fette u. Seifen, 1937, **44**, 196—201).—Proposed standards for quality and standard methods of analysis (representing modifications of the Norwegian standards NS 001—003) are detailed. E. L.

Chia [seed] oil. H. A. Gardner (Sci. Sect. Nat. Paint, Var. Assoc., Circ. 535, 1937, 194—207).—An account is given of the cultivation of chia seed (*Salvia hispanica*, L., and certain allied species) in Mexico, of the history of its local use as a paint oil, and of recent experimental cultivation. A sample of seed (1937) contained 34·7% of oil. The expressed oil had I val. 207, acid val. 1, and dried in about the same time as perilla oil; like the latter, it exhibits a tendency to "crawl" during drying, which may be prevented, *e.g.*, by addition of 0·01% of $Ph{\cdot}N_2{\cdot}C_6H_4{\cdot}N_2{\cdot}C_{10}H_7{\cdot}OH\text{-}\beta$. E. L.

Unsaponifiable fraction of mohwa [mowrah] oil from the United Province, India. I. N. N. Godbole and P. D. Srivastava (Fette u. Seifen, 1937, **44**, 142—143).—Freshly prepared oil from seeds of *Bassia latifolia* from Cawnpore, having acid val. 22·5, sap. val. 186·5—188·5, I val. (Hanus) 61·8, contained 2·3% of unsaponifiable matter (Spitz–Hönig method) which had $[\alpha]_D$ +26·8° (1% in $CHCl_3$), I val. (Hanus) 180·9 and contained 1·75% of sterol (acetate, m.p. 172—174°). Only 2% of the unsaponifiable matter was sol. in 95% EtOH; by fractionating it from MeOH and $COMe_2$, products (probably impure) having m.p. 64—67°, 122—125°, and 50—52° were recovered. E. L.

Acorn oil. W. D. Hutchins [with R. M. Simpson] (Oil & Soap, 1937, **14**, 148).—Acorns (? kernels) from the pin (swamp Spanish) oak, *Quercus palustris*, Muench, contained H_2O 24·08, oil 13·4, and NH_3 0·78%. The expressed oil had (figures relating to a refined oil in parentheses) d_{25}^{25} (0·9158), n^{40} (1·4647), free fatty acids, 3·5% (0·3%), sap. val. 192·9 (193·2), I val. (Wijs) 99·4 (97·2), SCN val. (73·75), Ac val. 7·0 (3·6), unsaponifiable matter 1·11% (0·45%) [with I val. 120·9 (119·1)], titre (25·9°), Et_2O-insol. bromides (0), smoke test (A.O.C.S.) (180°). The fatty acids consisted essentially of saturated acids 15%, oleic acid 57—58%, linoleic acid 27—28%. The oil can be refined and bleached and readily deodorised and hydrogenated (cf. A., 1937, III, 332). E. L.

Philippine physic-nut oil. A. O. Cruz and A. P. West (Philippine J. Sci., 1937, **61**, 437—445).—The kernels from the seeds (65·7% of kernels) of *Jatropha curcas*, Linn., contain 46·5% of oil having d_4^{30} 0·9082, n^{30} 1·4665, I val. (Hanus) 94·8, sap. val. 192·4, unsaponifiable matter 0·45%, saturated acids 16·82%, unsaturated acids 78·00% (I val. 111·00). It consists of the glycerides of oleic (62·86), linoleic (18·65), myristic (0·45), palmitic (11·84), stearic (5·07), and arachidic (0·26%) acids. E. H. S.

Philippine tobacco-seed oil. A. O. Cruz and A. P. West (Philippine J. Sci., 1937, **61**, 161—168).—The dry seeds contain 39·92% of oil having d_4^{30} 0·9130, n^{30} 1·4714, I val. 135·8, sap. val. 190·5, unsaponifiable matter 1·41%, acid val. 16·8, saturated acids (myristic 0·49, palmitic 67·08, stearic 29·10, arachidic 3·33%) 9·99%, unsaturated acids (linoleic 69·55, oleic 30·45%) 82·87% (I val. 152·6). It is similar to kapok, cottonseed, and peanut oils. E. H. S.

Pine-needle oil. Y. Mayor (Oil Col. Tr. J., 1937, **91**, 1877—1888).—Composition, properties, and uses of the oil are reviewed. L. A. O'N.

Seeds of certain varieties of *Meconopsis* as a source of oil and manure. N. C. Nag and H. N. Banerjee (Trans. Bose Res. Inst. Calcutta, 1934—5, **10**, 125—143).—Tables summarise the amounts and physical characteristics of the oil obtained from a considerable no. of different species of Himalayan *Meconopsis* seeds growing at high altitudes. The N, H_3PO_4, and alkali contents of the extracted residues are also determined. The oil yields from seeds of *M. wallichii* grown at Darjeeling is about 44% of the seed wt., the oil also having a high sol. volatile fatty acid content and having possible economic importance as an edible and drying oil. The oil of *M. paniculata* has the lowest I val., due probably to absence of linolenic acid since it gives no hexabromide on bromination. P. W. C.

Rust- and acid-resisting steel in the oil and soap industry. H. Hougardy (Allgem. Oel- u. Fett-Ztg., 1937, **34**, 260—265).—The use of acid-resisting steels for autoclaves enables hydrolysis of fats to be conducted at high temp. (225—230°), with consequent saving in time and catalyst; possible uses of various types of steels, and of steel-lined vessels, in the fatty acid and soap industries are indicated. E. L.

Hydrogenation of fish oils at low pressure. I. R. Koyama (J. Soc. Chem. Ind. Japan, 1937, **40**, 29—30B).—Sardine oil is hydrogenated at 110—180°/1—6·5 atm. for ½—6¾ hr. in presence of Ni. The m.p. of the hydrogenated oil increases and the I val. decreases with rising temp. and increasing pressure and reaction time. The effect of hydrogenation conditions on the properties (m.p., I val., *iso*oleic acid content) of the mixed, solid, and liquid acids from saponification of the hydrogenated oils is tabulated. J. D. R.

Catalytic ester exchange of fatty oils by alcoholic potash. H. Kurz (Fette u. Seifen, 1937, **44**, 144—146).—No appreciable difference could be found between the rates of alcoholysis of saturated, unsaturated, and polymerised oils. Practically complete elimination of glycerol can be procured when only small amounts (*e.g.*, 1—8% of the theoretical equiv.) of KOH is present, but the rate of alcoholysis is greater with EtOH than with MeOH, and increases with increasing dilution with H_2O, and with increasing concn. of alkali (even for the same total amount of KOH). E. L.

Vegetable oils (University of Delft). J. Böeseken (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 348—366).—Methods of determining *d*, *n*, m.p., and transformation points, distillation of small quantities of oils, and improvements in the determination of unsaturation by I vals., oxidation with AcO_2H, and hydrogenation vals. are described. The constitution of the elæostearic acids and their derivatives by controlled oxidation has been worked out and some observations on the part played by conjugated double linkings in drying oils are given. W. L. D.

Effect of various adsorptive media on rancidity and the Kreis test. J. P. Harris and W. A. Welch (Oil & Soap, 1937, **14**, 3—5).—Treatment of non-rancid cottonseed and maize oils with certain brands of activated C caused the oils, which had previously given negative Kreis tests, to react positively; in the case of rancid oils, the treatment increased the intensity of the positive Kreis reaction. Other brands of C, however, had no harmful effect on fresh oil and, in the case of rancid oils, removed the substance responsible for the colour reaction, so that the oils react less intensely or negatively after the treatment. E. L.

Applicability of the Stamm reaction for rancidity [of oils etc.]. H. L. Roschen and W. J. Lehmann (Oil & Soap, 1937, **14**, 17—19).—The Korpaczy modification (B., 1934, 368) of the Stamm reaction gives erratic and unreliable results with seed oils and marine-animal oils (oxidised by exposure or by air-blowing), but is applicable to lard and beef fat; on the whole, the Kreis reaction shows a better correlation with peroxide val. and organoleptic rancidity. E. L.

Report of A.O.C.S. Committee on the determination of soap in refined oil. L. A. Spielman, N. T. Joyner, J. J. Lappen, and R. C. Stillman (Oil & Soap, 1937, **14**, 153—154; cf. B., 1936, 1054).—The following EtOH-extraction process is recommended as a tentative method: 100 g. of oil are extracted with five 50-c.c. portions of hot EtOH, the united extracts are evaporated and finally ignited (in Pt), and the residue is dissolved in about 50 c.c. of hot neutral H_2O and titrated with 0·02*N*-HCl (1 c.c. ≡ 0·00607% Na oleate), using Me-orange as indicator. Great care is required in order to obtain concordant results, but the average of collaborate analyses was fairly accurate. E. L.

Determination of water in vegetable oils. P. Z. Zaitschenko, V. P. Rshechin, and N. I. Pogonkina (J. Appl. Chem. Russ., 1937, **10**, 908—916).—10—15 g. of oil and 1—2 g. of 88—90% glycerol (I) are shaken for 5 min. and centrifuged, the operation is repeated, and the H_2O content of the (I) determined refractometrically. The H_2O content of the oil is given by $0{\cdot}03 + 769p(n_0 - n)/m$, where n_0 and n are the refractive indices before and after shaking, and p and m are the no. of g. of (I) and of oil taken. Should the oil be completely anhyd., it will extract H_2O from the (I) until it contains 0·03% of H_2O. R. T.

Determination of the p_H of sulphonated oils. G. Parsy (J. Soc. Leather Trades Chem., 1937, **21**, 261—274).—The p_H of an emulsion of a sulphonated oil, determined electrometrically, is affected by the mode of prep. of the emulsion, but not by the temp. or time of keeping. The degree of dispersion and the p_H are influenced by addition of small amounts of KCl to conc. emulsions of the oil. The p_H vals. determined by the quinhydrone electrode are in agreement with those given by the glass electrode, and by the colorimeter are 0·5 $<$ the latter; this difference is attributed to " salt error." The p_H vals. obtained electrometrically on different conc. emulsions prepared in the same way indicate their comparative " relative activities." D. W.

Glycerin recovery in the soap industry on the basis of the lime-saponification process. History of the Krebitz process. G. Buchner (Fette u. Seifen, 1937, **44**, 147—149).—The essential improvements introduced by Krebitz (cf. B., 1922, 770) are described and the significance of the process is stressed. E. L.

Rapid dichromate method for the determination of glycerol in soaps and spent lyes. E. Randa (Oil & Soap, 1937, **14**, 7—10).—Concordant results, agreeing well with those given by the official A.C.S. method, are obtained by a modification of the dichromate method (fully detailed) in which $NHPh_2$ is employed as internal indicator (cf. Knop, B., 1924, 404). Addition of H_2SO_4–H_3PO_4 to the $Fe(NH_4)_2(SO_4)_2$ solution prior to titration with $K_2Cr_2O_7$ improves the sharpness of the end-point. E. L.

Soap from oxidised fats. V. C. Stebnitz and H. H. Sommer (Oil & Soap, 1937, **14**, 16—17).—Oxidised (air-blown) cottonseed oil, lard, or tallow is saponified more readily and rapidly than the fresh fats, but the loss of soap in the spent lye is high; the soaps obtained darken on exposure to air, and differ very little, if at all, from the soaps from the fresh fats as regards surface tension or interfacial tension or H_2O-softening power of their solutions. E. L.

Anion and cation activity of soap-like colloidal electrolytes. II. A. Chwala and A. Martina (Österr. Chem.-Ztg., 1937, **40**, 270—277; cf. B., 1937, 231).—Recent work on soap-like colloids is discussed, and the conditions controlling the distribution between the various states in which the ions and micelles can exist in these solutions are deduced. The relative wetting powers of Na oleate, Gardinal WA, and Igepon T for cotton and wool are in accord with theory, and are discussed from the viewpoint of detergency. J. W. S.

Report of the [A.O.C.S.] Soap Analysis Committee, 1936. M. L. Sheely (Oil & Soap, 1937, **14**, 19—20).—The Oct., 1933, methods for soap analysis are adopted officially with certain minor modifications in the methods for determination of rosin (correction of original text) and free alkali (the alcoholic filtrate should be heated to incipient boiling before titration). H_2O should be determined by the distillation method in cold-process and semi-boiled soaps (including paste soaps) containing appreciable amounts of glycerin. Discrepancies in the determination of H_2O-insol. matter in highly silicated soaps are pointed out. E. L.

Soap industry and its modern development. G. B. Dellepiane (Chim. e. l'Ind., 1937, **19**, 319—325).—A lecture.

Aluminium stearate grease quality depends on exact manufacturing control. J. McKee (Nat. Petroleum News, 1935, **27**, No. 42, 24D—24F).—Properties of this grease can be controlled by means of η and type of oil, rate of cooling, time of compounding, H_2O content, and by the use of fluxes. Ch. Abs. (*e*)

Lubricants.—See II. **Annatto dye**—See IV. **Applications of dyes.**—See VI. **Soya-bean oil.**—See XIII. **Oilseed cultivation.**—See XVI. **Chocolate fat bloom. Vitamins. Determining vitamin-*A*.**—See XIX.

Patents.

Wax-like composition. S. D. Gehman, Assr. to Wingfoot Corp. (U.S.P. 2,050,209, 4.8.36. Appl., 17.7.34).—Compositions comprising $>20\%$ of wax (*e.g.*, paraffin wax, beeswax, or synthetic waxes such as chlorinated $C_{10}H_8$) and a condensation derivative of rubber made by decomp. with H_2O the product prepared by treating rubber solution with H_2SnCl_6 or a halide of an amphoteric metal are claimed. Solutions in a common solvent, *e.g.*, C_6H_6, are also claimed. The products can be used for moisture-proofing, polishing, and electrical insulation. J. W. Cr.

Manufacture of spray-dried soap. C. Ellis, Assr. to Procter & Gamble Co. (U.S.P. 2,046,449, 7.7.36. Appl., 15.10.34).—Middle soap is treated with (2—3% of) a degumming agent, *e.g.*, NaCl, Na_2CO_3, Na_3PO_4, etc., which renders it sufficiently fluid to permit spray-drying. The dried soap is obtained as comparatively large hollow particles of glassy appearance with surface vesiculations, but not puffed or powdery, which retain about 10% of H_2O and are easily sol. E. L.

Cleaning composition. F. R. Johnson (U.S.P. 2,044,246, 16.6.36. Appl., 23.11.32).—The mixture, suitable for cleaning clothing, carpets, paintwork, silk, or wool, contains soap 5, H_2O 10—15, Turkey-red oil (75%) 15—25, C_2HCl_3 20—35, petrol 25—30, and Na_3PO_4 2 pts., with 0·5—1·5 wt.-% of fatty (oleic) acid. L. C. M.

Antioxidants. Quaternary N compounds.—See III. **Lubricating compound.**—See X. **Edible fatty esters.**—See XIX. **Cosmetic products.**—See XX.

XIII.—PLASTICS; RESINS; PAINTS; COATING COMPOSITIONS.

Bitumen plastics. C. G. F. Pritchett (Chem. and Ind., 1937, 543—544).—The properties of bitumen plastics are described and the raw-material sources, the present output (mainly for battery cases), and the trend of development (large mouldings where low cost and acid-resistance are important factors) indicated. In the event of national emergency the natural bitumens from abroad can be replaced with coal-tar pitch; Empire asbestos filler would probably be available, but could be replaced with disintegrated cotton rags, and home sources of non-fibrous fillers can be found. J. W. Cr.

Casein plastics. T. L. Birrell (Chem. and Ind., 1937, 544—545).—The manufacture and properties of casein plastics are outlined. The essential raw materials are rennet casein and CH_2O. The availability of home casein in case of national emergency is discussed. J. W. Cr.

Aminoplastics.—P. K. Chance (Chem. and Ind., 1937, 639—641).—A review.

Testing and evaluation of synthetic resin moulding compositions. R. Nitsche (Plast. Massen, 1937, **7**, 167—168, 225—226).—The German Standard, DIN 7701, dealing with the classification, prep., properties, uses, and testing of synthetic resin moulding compositions, is examined. F. McK.

Comparison of the properties of silicate glasses and glass-clear synthetic materials. W. Eitel (Glastech. Ber., 1937, **15**, 137—141).—The characteristics of synthetic resins are reviewed in relationship to the substitution of the glass-clear resins for silicate glass. The limitations and advantageous uses of the former are discussed. C. L. M.

Moulded plastics for general engineering purposes. A. R. Dunton (Metropolitan Vickers Gazette, 1937, **16**, 381—388, 406—411).—The composition, properties, testing, and applications of the plastics are reviewed. R. B. C.

Plastics fortify against corrosion. A. J. Weith (Ind. Eng. Chem., 1937, **29**, 380—384).—A brief, illustrated description is given of the applications of synthetic plastic materials in the form of mouldings, machined parts, and painted coatings. Phenol-CH_2O, Haveg, and chlorinated rubber are the plastics most generally used in the fabrication of chemical plant. The importance of uniform thickness of section and the avoidance of unduly thin walls in mouldings is stressed. Details which should be observed when designing mouldings are indicated. F. J. B.

Pyrometers and thermometers for [use in moulding] modern materials. N. Dejarme (Rev. Gén. Mat. Plast., 1937, **13**, 161s—163s).—A review with illustrations. F. McK.

"Plastic iron" as jointing material. H. Vogt (Chem.-Ztg., 1937, **41**, 429—430).—Fe compounds, *e.g.*, magnetite, are heated at $<$ the m.p. of Fe to give a porous spongy mass. This is then impregnated with bitumen, bonded with Fe wire, and shaped into strips which can be readily formed into rings for gaskets. It is claimed that the material is a complete substitute for Pb as jointing medium. When compressed the material loses plasticity and porosity; a graph shows that its resistance to deformation under hammer blows is only slightly $>$ that of Pb and considerably $<$ that of soft wrought Fe. H. W. T.

Collection of resin from *Pinus nigra* and *P. sylvestris*. P. Buffault (Bull. Inst. Pin, 1937, 73—75).—A *résumé* is given of an investigation by A. Ougrenovitch and B. Cholaya into the effects of method of incision, temp., presence of undergrowth, etc. on the rates of flow, max. yields, and compositions of the resins from trees grown on the Carso plateau. S. M.

Slash pine oleoresin. J. A. Hall (Ind. Eng. Chem., 1937, **29**, 637—639).—Samples of the oleoresin were collected in a manner designed to eliminate extraneous H_2O-sol. material, and analytical details of the "clean wound secretion" are tabulated. A fuller examination of the aq. extract from the commercial oleoresin was also made. The complex, H_2O-sol. substances (present in small quantities) could not be positively identified; their removal improves the colour and cleanness of the rosin product, and commercial adoption of this process is probable. S. S. W.

Shellac. X. Lesser-known properties. W. Nagel and E. Baumann (Wiss. Veröff. Siemens-Werken, 1937, **16**, 120—129; cf. A., 1936, 1361).—The hydrolysis of shellac by bases and acids is discussed. A method is described which yields reproducible results for the determination of the softening point of shellac; the changes of softening point with thermohardening and esterification are described. The permeability to H_2O vapour of shellac films, hardened, unhardened, and esterified, is measured. The permeability is a very characteristic property of the resin. J. D. R.

Plastic properties of shellac. W. H. Gardner (Physics, 1936, **7**, 306—310).—A summary of published work on the polymerisation, aggregation, and condensation in presence of chemicals of shellac, and its absorption of H_2O. O. D. S.

Extraction of hard lac resin by means of aqueous solutions. R. Bhattacharya (Chem. and Ind., 1937, 666).—The soft component can be removed by agitation at 80—100° with aq. Na_2CO_3, borax, or alkali phosphates and decanting after 1 hr. The hard residue has acid val. 55. S. M.

Precipitation of resin acids with ammonia from a dry ethereal solution of the resin. K. H. Bauer and H. Moll (Fette u. Seifen, 1937, **44**, 187—188).—On passing dry NH_3 through a dry Et_2O solution of dammar resin or olibanum, the NH_4 salt of dammarolic acid (I) or boswellic acid, respectively, is pptd. (cf. Bauer and Gerloff, A., 1937, II, 28). Elemi resin yields no corresponding ppt., but the NH_4 salt is readily pptd. from an Et_2O solution of free α-elemolic acid (II) [obtained by extracting an Et_2O solution of the resin with 1% aq. KOH; K_2CO_3 does not extract (I) or (II) from their respective resins]. The NH_4 salts lose some NH_3 on exposure to air; on treating them with Et_2O or other org. solvent, NH_3 is liberated as the salt slowly dissolves, and the pure acids can be recovered by evaporating the solution. Dry solid (II) and dammar resin absorb 0 and 1·2% of NH_3, respectively. E. L.

Sweating and foaming properties of sodium and potassium resinates. II. Foam number of sodium and potassium resinates. N. N. Godbole and P. D. Srivastava (Kolloid-Z., 1937, **80**, 76—77; cf. A., 1937, I, 234).—Foam nos. have been determined for several resinates of different origin: (a) neutral, (b) with free alkali, (c) with free resin. The nos. for the K resinates are > those for the corresponding Na resinates. E. S. H.

Use of resinous and terpenic products for the maintenance of floors and furniture. Feytaud and P. de Lapparent (Bull. Inst. Pin, 1937, 76—78).—A composition which renders the articles free from insects and bacteria is prepared by heating turpentine (65 pts.), rectified terpineol (5), powdered derris or cubé roots (3), and pyrethrum (3) on a water-bath for ½ hr.; bornyl acetate (5), bornyl chloride (15), and Zn resinate (I) (10) are added and the product is filtered after 2—3 days. To impart a lustre, beeswax, spermaceti, or other wax and more (I) are also incorporated. S. M.

Polymerisation of mixed vinyl resins. P. Trevy (Rev. gén. mat. plast., 1937, **13**, 147—149).—Resins of improved properties suitable for the prep. of lacquers and dentures are obtained by polymerisation, in the usual manner, of a mixture of vinyl chloride and vinyl acetate in presence of 1—2% of a modifying agent (ethylene glycol crotonate, allyl crotonate). Patent literature and the theory of the process are reviewed. F. McK.

Utilisation of coumarone resins. W. Obst (Teer u. Bitumen, 1937, **35**, 137—139).—German and American patent literature on the production of paints from these resins is summarised. R. B. C.

Physical and chemical properties of polystyrene. I. Mechanical properties. N. P. Korshavin (J. Appl. Chem. Russ., 1937, **10**, 676—682).—Homogeneous blocks of polystyrene, weighing 3—5 kg., are obtained from styrene by allowing the temp. to rise from 50° to 110° during 10—20 days, with free access of air. The material is suitable as condenser dielectric, or in place of amber in electrical instruments. R. T.

Styrene and acrylic resins. A. Renfrew and A. Caress (Chem. and Ind., 1937, 682—684).—A review.

Dry pigments. Method of carrying out specification tests. V883—[Lead] chromate-yellow. V884—Prussian-blue. V885—Bremen-green. Hoofcommissie voor de Normalisatie in Nederland (Verfkroniek, 1937, **10**, 125—128).—New standard procedures for determining composition and pigment properties are given. D. R. D.

Preparation of Prussian, Milori, and Paris blues. E. Kunze (Farben-Chem., 1937, **8**, 221—225).—The views of various authors on the composition of Prussian-blue are summarised. Direct pptn. may give a blue of the formula $Fe^{III}_4[Fe^{II}(CN)_6]_3$, but contact with KCl results in a series of compounds containing K in increasing proportions and hydrolysis also occurs. The product of direct pptn. is cloudy. A clear blue with a deep colour having the composition $K_8Fe^{III}_{12}[Fe^{II}(CN)_6]_{11}$ is obtained by subsequent oxidation with $KClO_3 + H_2SO_4$; over-oxidation must be prevented. Special bronze effects are obtained by addition of other metallic salts. C. I.

Electro-osmosis of ochre. A. Tamisier (Bull. Soc. chim., 1937, [v], **4**, 1290—1291).—The Fe_3O_2 content of ochre is slightly increased by electro-deposition, on the anode, from a suspension in very dil. aq. Na_2SiO_3. J. G. A. G.

Composition of zinc-yellow. A. A. Brizzolara, R. R. Denslow, and S. W. Rumbel (Ind. Eng. Chem., 1937, **29**, 656—657).—Eight typical samples of commercial "Zn-yellow" were analysed (methods detailed) and the compostion $K_2O,4ZnO,4CrO_3,3H_2O$, differing somewhat from earlier formulæ in the literature, is assigned to this pigment. S. S. W.

Oxidation of drying oils. Lehrer (Farbe u. Lack, 1937, 293).—A brief summary is given of current views on the oil-oxidation process, with special reference to Morrell's work (cf. A., 1936, 1361). S. S. W.

Measurements of drying time [of paints, varnishes, and lacquers]. H. C. Bryson (Paint Manuf., 1937, **7**, 185—187).—Various published methods are described. D. R. D.

Uses of soya-bean oil in paints and varnishes. A. J. Heberer (Oil & Soap, 1937, **14**, 15—16).—The advantages of soya-bean oil in grinding pigment pastes, and in admixture with linseed oil in paint, in oil-modified synthetic resins, etc. are briefly reviewed. E. L.

Emulsion binding media [water paints]. Anon. (Farbe u. Lack, 1937, 201, 211—212).—The wax–resin–oil complex must be homogeneous; internal stresses lead to uneven films and absorption and early peeling, particularly from old plaster. The surface to be covered must be prepared so that the coating has uniform thickness; pre-application of the diluted emulsion, without pigment, is recommended. The effect of the pigment on the film properties is discussed; barytes and gypsum tend to produce spots and streaks and settle out from the paint. S. M.

Paint spraying and precautions against dangers therein. J. A. Verhoeff (Verfkroniek, 1937, **10**, 119—124).—The composition of cellulose spraying acquers and the dangers of fire, explosion, and poisoning involved in their use are discussed. Special spray-booths are described and illustrated. D. R. D.

[Paint] extenders. A. B. Searle (Paint Manuf., 1937, **7**, 188—189).—The properties and uses of the common extenders for paints ($BaSO_4$, $BaCO_3$, SiO_2, etc.) are discussed. D. R. D.

Influence of films on the incipient corrosion of iron. A. H. Stuart (Paint Manuf., 1937, **7**, 179—182).—The electrolytic theory is discussed with particular reference to the protective action of metallic coatings and paints. Experiments demonstrating the protective action of graphite are described. D. R. D.

Rusting under [paint films]. K. Würth (Farbe u. Lack, 1937, 295—296, 307—308).—Among the factors influencing the formation of rust under apparently protective paint films are the development of hair-line cracks by physical changes in the paint film on ageing, permeability to H_2O and gases, swelling tendencies of linseed oil films, and sp. nature of the Fe surface itself. The use of sealing coats and H_2O-impermeable films based on the newer paint vehicles to combat this type of rusting is explored. S. S. W.

New [mechanical] methods for testing paint [and varnish etc.] films. E. Rossmann (Fette u. Seifen, 1937, **44**, 136—139).—A lecture. Protection against rusting of the base is a hyperbolic function of the thickness of the film; the p_H of the absorbed H_2O of the film is related to the pigment employed and must be considered in connexion with the corrosion problem. E. L.

Study of printing inks and their relationship to printing processes. G. L. Riddell (J. Oil & Col. Chem. Assoc., 1937, **20**, 220—235).—A review is given of the problems existing in this field, including a discussion of the physical properties of printing inks used for the different processes now in use, variations in flow, drying time, covering power, etc. of inks according to quality of paper used, machine conditions, etc. S. S. W.

Behaviour of resins in nitrocellulose lacquers. III. A. Kraus (Farben-Ztg., 1937, **42**, 615—616, 639—640; cf. B., 1936, 206).—Contrary to previous views, nitrocellulose lacquers based on coumarone resin and giving clear films can be obtained without admixture of ester gum or natural resins. This is achieved by incorporating synthetic resins of various types and/or suitable plasticisers and solvents, *cyclo*hexanol derivatives being particularly suitable in any of these groups. This type of lacquer can be emulsified with H_2O, such emulsions also yielding clear films. S. S. W.

Durability of cellulose mixed-ester lacquers. W. E. Gloor (Ind. Eng. Chem., 1937, **29**, 690—696).—Lacquers based on cellulose aceto-butyrates and -propionates show advantages in durability (particularly with a non-drying oil-modified alkyd resin replacing dammar), colour- and gloss-retention, etc. over corresponding nitrocellulose lacquers. Physical properties, solubility data, compatibility with resins, and durability of lacquers are tabulated for such esters, and they are considered particularly suitable for use in aero dopes, cloth finishes, etc. An aceto-propionate of 29·5% O·COEt and 15·7% OAc content is of great promise for all-round work. S. S. W.

Applications of metallic phthalates. H. A. Gardner (Ind. Eng. Chem., 1937, **29**, 640—641).—Paints and nitrocellulose lacquers are rendered more durable by pptd. Ti phthalate, and clear varnishes by Pb phthalate. A. Li.

Examination of solvents for nitrocellulose. F. Deschaux (Rev. gén. mat. plast., 1937, **13**, 159—160).—Methods for chemical and physical examination of suitable solvents and diluents are outlined. F. McK.

Effect of film thickness, temperature, and humidity variation on the drying of alkyd resin [varnishes and paints]. V. N. Sheets (Off. Digest, 1937, No. 166, 176—183).—Film thickness (which is largely dependent on η) has the greatest influence on drying time, but high humidity also delays drying appreciably, particularly at low temp. This effect is less marked with phenolic varnishes. The progress of drying was followed by means of the Sward hardness rocker (B., 1936, 1055). D. R. D.

Urea–formaldehyde resin finishes. H. C. Cheetham (Paint, Oil, Chem. Rev., 1937, **99**, No. 12, 42—44).—A review. D. R. D.

Chemical policemen.—See I. **Light-fastness of pigments. Annatto dye.**—See IV. **Coloured varnishes. Ethylcellulose. Resin in coniferous woods.**—See V. **Applications of dyes.**—See VI. **By-products from making Al_2O_3.**—See VII. **Decorating tinplate. Prep. of metal for painting.**—See X. **Mol. physics of insulators. Plastic sheathing for cables.**—See XI. **Drying oils and resins. Linseed oil oxidation. Stand oils.**—See XII.

Patents.

Production of plastic material from proteins. O. Sturken and J. C. Woodruff, Assrs. to Resinox Corp. (U.S.P. 2,040,033, 5.5.36. Appl., 1.9.33).—Plastics capable of being cured in the mould are prepared by mixing a protein (casein, zein, gluten, etc.) with a plasticising agent (H_2O), α-ethyl-β-propylacraldehyde, and a plasticiser. Fillers and pigments may also be added. The mixture is plasticised at 50—100° and cured under pressure at 110—150°. R. J. W. R.

Plastic. M. A. Burgess (U.S.P. 2,047,058, 7.7.36. Appl., 15.5.34).—A plastic for decorating vases etc. consists of a dry ingredient (cement 35 lb., dry bank sand 55, whiting 10 lb.) mixed with H_2O (15 quarts) and vinegar (5 quarts). T. W. P.

Treatment of plastic substances. J. Kremer (U.S.P. 2,054,937, 22.9.36. Appl., 30.7.32).—Plastic material, *e.g.*, dough, is shaped by passing through a conduit and then moulded by subjecting to electrical energy. Apparatus is described. J. W. Cr.

Refining of natural oleo-resin. R. W. Frey and W. C. Smith, Assrs. to H. A. Wallace (U.S.P. 2,039,481, 5.5.36. Appl., 28.9.35).—Oleoresinous exudate of coniferous trees, heated and thinned with turpentine etc. if desired, is brought in contact with (filtered through a bed of) a fibrous, insol., non-hydrolysable, tanned protein (chrome-, aldehyde-, or Syntan-tanned leather) which removes the natural tannins etc. from the oleoresin. S. S. W.

Prepared resin. C. A. Thomas, Assr. to Monsanto Petroleum Chemicals, Inc. (U.S.P. 2,039,367, 5.5.36. Appl., 15.7.35).—A preformed, EtOH-insol., substantially neutral "unsaturated hydrocarbon synthetic resin" [polymerisation product (metal halide catalyst) of a cracked petroleum distillate or of a diolefine with an olefine or alkylbenzene] is heated with castor oil and, if desired, a polyhydric alcohol (glycerol). The product is EtOH-sol. and capable of drying from solution to flexible films resistant to H_2O, without the use of metallic driers. S. S. W.

Prepared [synthetic] resin. C. A. Thomas, Assr. to Monsanto Petroleum Chemicals, Inc. (U.S.P. 2,039,363, 5.5.36. Appl., 17.6.30).—Light amber to brown, neutral resins are prepared by polymerising mixtures of olefines and dienes, *e.g.*,

$CH_2{:}CHPr^a$ and hexadiene, in the presence of a catalyst, *e.g.*, $AlCl_3$, preferably at $\ngtr 40°$. The resins are sol. in benzol and insol. in $COMe_2$, and do not retard the drying of linseed oil. R. J. W. R.

Manufacture of interpolymerisation products. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 466,898, 18.12.35 and 2.11.36).—Interpolymerisation products suitable for preparing plastics etc. are obtained by polymerising together in aq. emulsion $CH_2{:}CHCl$ and esters (Me, Et, Bu^a, Bu^β, *iso-* or *cyclo*-hexyl, C_6H_4Me, etc.) of maleic acid, followed by coagulation of the product by, *e.g.*, adding electrolytes, and preferably either before, during, or after this operation treating the product with dil. aq. alkalis at about room temp. N. H. H.

Manufacture of interpolymerisation products. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 467,084, 8.11.35).—Uniform interpolymerisation products are produced by polymerising in any proportions and in aq. emulsion any desired pair of compounds of the vinyl and acrylic series or homologues thereof having different speeds of polymerisation, by adding that of higher speed either in small fractions or continuously, as fast as used, to that of lower speed. Examples are the interpolymerisation of $CH_2{:}CHCl$ and $CH_2{:}CH{\cdot}CO_2Me$, $CH_2{:}CH{\cdot}CN$ and $CH_2{:}CHPh$, $CH_2{:}CHCl$ and $CH_2{:}CH{\cdot}CO{\cdot}NH_2$ in aq. dispersion by adding the latter to the former in each case. N. H. H.

Production of polymerisation products. G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 467,167, 11.11.35).—Polymerised products especially stable to light and heat are produced by polymerising $CH_2{:}CHCl$ with, if desired, another H_2O-insol. unsaturated compound capable of polymerising under the same conditions, *e.g.*, vinyl or acrylic esters, $CH_2{:}CH{\cdot}CN$, $CHPh{:}CH_2$, in presence of (0·5—3% of) an unsaturated acid or acid amide of the acrylic series or of an $\alpha\beta$-unsaturated $\alpha\beta$-dicarboxylic acid, *e.g.*, $CH_2{:}CMe{\cdot}CO_2H$, $CH_2{:}CCl{\cdot}CO_2H$, maleic acid, and afterwards treating the product with dil. aq. alkalis to convert the acid or amide into the corresponding salt. Examples illustrate the polymerisation of emulsified $CH_2{:}CHCl$ with *iso*octyl acrylate and $CH_2{:}CH{\cdot}CO_2H$ (I), $CH_2{:}CMe{\cdot}CO_2H$, (I), or maleic acid, followed by after-treatment with dil. NaOH at 70—90°. N. H. H.

Manufacture of [resinous] interpolymers of methylacrylamide. F. B. Dehn. From Röhm & Haas A.-G. (B.P. 467,402, 11.11.35).—Transparent resins are obtained by polymerising mixtures of $CH_2{:}CMe{\cdot}CO{\cdot}NH_2$ (I) with other polymerisable substances, particularly vinyl compounds. *E.g.*, (I) (15—20), $CH_2{:}CH{\cdot}CO_2Bu$ (85—80), and Bz_2O_2 (0·1—1) are heated in EtOH (50 pts.) at 100° for 3 days, or (I) (10) and $CH_2{:}CH{\cdot}CO_2Me$ (90) are polymerised by Bz_2O_2 (0·01 pt.) at 60—80°. The products are incorporated with glycerin, acetin, phthalic or adipic esters, oils or fats, cellulose compounds, various artificial resins, gelatin, etc. R. S. C.

Condensation products of methylacrylamide and formaldehyde. F. B. Dehn. From Röhm & Haas A.-G. (B.P. 467,492, 11.11.35).—$CH_2{:}CMe{\cdot}CO{\cdot}NH_2$ (I) or polymerised or partly polymerised (I), alone or mixed with other polymerisable (acrylic or vinyl) substances, is treated with CH_2O gas or with CH_2O or $(CH_2O)_x$ in H_2O or other solvent. Metal salts may be added. The products are plastics etc. and may be mixed with addenda as in B.P. 467,402 (preceding abstract). R. S. C.

Preparation of condensation products. H. Hönel, Assr. to Beck, Koller & Co., Inc. (U.S.P. 2,049,447, 4.8.36. Appl., 4.5.32. Austr., 6.8.27).—Solid, heat-hardening, oil-sol. resins are prepared by heating *p-tert.*-butylphenol with mol. excess of aq. CH_2O in presence of a strong alkaline catalyst (a preliminary heating with an acid may be given), the catalyst is neutralised, and the product further condensed by heating (*e.g.*, for 2 hr. at 100° and ½ hr. at 135°). J. W. Cr.

Preparation of (A) resinous condensation products, (B) plastic masses [from terpene phenols and aldehydes]. (C) [Oil-soluble phenolic] artificial resins. Beck, Koller & Co. (England), Ltd. (A, B). From Beckacite Kunstharzfabr. G.m.b.H. (B.P. 467,816—7 and 467,899, [A, B] 6.11.35, [C] 20.11.35. U.S., [C] 20.12.34).—(A) Phenols are caused to react with terpenes; the aromatic substituents in the alicyclic compounds thus formed have $\nless 2$ OH and > 2 reactive positions. Condensation with excess of CH_2O at low temp. for a prolonged period in presence of a strong alkali and an inert solvent yields hardenable resins. Terpene-like substances of high mol. wt., *e.g.*, natural resins, and "terpenogenes," *e.g.*, geraniol, may also be used, and bis(hydroxyphenyl)menthane, or similar multivalent phenol, may be condensed with CH_2O. Addition of a phenol of low mol. wt., *e.g.*, *o*-cresol, facilitates the reaction. With conjoint condensation of a resin according to the process of B.P. 417,122 (B., 1934, 1071) the product becomes compatible with drying oils. Up to 50% of castor oil may be added as plasticiser. (B) Suitable fillers are incorporated. (C) CH_2O is heated in presence of strong alkalis for a prolonged period with a phenol containing only 2 reactive positions and an alkyl or aryl substituent in which the no. of saturated C atoms is $\nless$ twice the no. of phenolic OH groups, *e.g.*, *p*-$C_6H_4Et{\cdot}OH$. For compatibility with linseed oil the amount of CH_2O condensed is < the max. S. M.

Synthetic resins. E. K. Bolton, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,048,774, 28.7.36. Appl., 17.4.34).—Fusible sol. resins are obtained by heating *sec.* alicyclic alcohols with polycarboxylic acids, alone or with other substances. Resins from *cyclo*hexane-1 : 4-diol and di-(4-hydroxy*cyclo*hexyl)-*iso*propane or -*cyclo*hexane are specially claimed. R. S. C.

Manufacture of [alkyd] resinous products. Beck, Koller & Co., (England), Ltd. (B.P. 467,945, 17.6.36. U.S., 5.3.36).—Masticated copal resins (I) obtainable as in B.P. 444,853 (B., 1936, 1218), monobasic carboxylic acids which may be resinous (*e.g.*, abietic acid) or fatty (*e.g.*, from linseed oil), polybasic carboxylic acids, and polyhydric alcohols are heated together at temp. (*e.g.*, 230°) < the decomp. temp. of

OH-acids of (I). Resinous products are obtained which resemble alkyds in properties but have greater H_2O-resistance. J. W. Cr.

Manufacture and application of a plasticising agent for cellulose derivatives. Howards & Sons, Ltd., and R. H. Lock (B.P. 467,510, 17.12.35).—*Glycerol monolactate triacetate*, decomp. > 200°, prepared by heating in presence of a catalyst, *e.g.*, H_2SO_4, glycerol monolactate with sufficient AcOH (and an org. solvent the vapours of which entrain H_2O) or Ac_2O to acylate $\nless 3$ OH at the b.p. of the mixture, is a valuable plasticising agent for cellulose derivatives (nitrate, acetate) when incorporated in up to 150 wt.-% of the latter. N. H. H.

Cellulose derivative compositions. H. S. Holt, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,565, 4.8.36. Appl., 23.4.35).—Cellulose derivatives are plasticised with neutral esters of polycyclic dicarboxylic acids (*e.g.*, Me_2 tetrahydronaphthalenedicarboxylate). The products are permanently flexible, and of good durability and H_2O-resistance. J. W. Cr.

Cellulose derivative composition. W. E. Lawson, Assr. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,047,972, 21.7.36. Appl., 26.3.32).—An alkyl (Et) or aryl (CH_2Ph) ester of sorbitol is used as plasticiser. 14 examples are given. S. M.

Manufacture of resilient articles. J. C. Patrick (U.S.P. 2,049,974, 4.8.36. Appl., 29.10.31).—A rubber compound (I) and the reaction product (II) of an alkaline polysulphide with an olefine containing the group C_nH_{2n} combined with the equiv. of 2 univalent negative radicals are separately formed and then secured together by heating (*e.g.*, at about 140°) to vulcanise (I) and cure (II). Both (I) and (II) may contain pigments but must be substantially free from paraffin and stearic acid (or adhesion is impaired). The products, which retain the flexibility of (I) but because of (II) have greater oil-resistance, are suitable for gaskets etc. J. W. Cr.

Preparation of pigment composition. C. R. Park, Assr. to Wingfoot Corp. (U.S.P. 2,050,193, 4.8.36. Appl., 7.3.32).—Dry pigments (C black) are exposed to the vapours of oily materials (pine-tar oil of specified distillation range), giving coated (adsorption) pigments of improved dispersibility in rubber etc. S. S. W.

Manufacture of lead pigments. Dupont Viscoloid Co., and P. D. Brossman (B.P. 462,549, 10.9.35).—Basic Pb carbonate is produced by carbonating at atm. pressure aq. 0·5—6 (1·6—2·8)% basic Pb acetate (I) containing 1—6 mol.-% of a salt (*e.g.*, acetate) of Ca, Sr, Ba, Ni, Mg, Th, Zn, or Cd compatible with (I); coloured pigments are obtained by addition to (I) of a sol. dyestuff, *e.g.*, eosin or tartrazine O. L. C. M.

Manufacture of composite titanium pigments. United Color & Pigment Co., Inc., Assees. of L. W. Ryan and W. J. Cauwenberg (B.P. 467,925, 27.1.36. U.S., 10.4.35).—A slurry of natural gypsum, wet-milled in presence of a substance making it less H_2O-sol. and retarding its crystal growth [$Ca(OH)_2$, alkali sulphate], and, if desired, a reducing agent (Na_2SO_3) eliminating discoloring Fe compounds from the final pigment, is added to a H_2SO_4 solution of Ti of controlled acidity, and heated rapidly, a composite hydrated TiO_2–$CaSO_4$ pigment being hydrolytically pptd. S. S. W.

Calcium-base lithopone. H. F. Saunders, Assr. to Sherwin-Williams Co. (U.S.P. 2,041,618, 19.5.36. Appl., 23.11.33).—A mixture of $CaSO_4$ (obtained by calcining gypsum at 650—850°) 47 and calcined ZnS (96%) 53 pts. is tumbled in a tube mill, treated with H_2O in a high-speed mixer, dried, and ground. L. C. M.

Manufacture of colour concentrates. F. B. Dehn. From H. T. Neumann Research, Inc. (B.P. 458,447, 21.6.35).—Powdered bentonite is treated with boiling alcohol, and an alcoholic solution of the dye (fuchsin) is added, with or without addition of H_2O. [Stat. ref.] C. H.

[Thixotropic] paints and pigments. Imperial Smelting Corp., Ltd., Assees. of D. L. Gamble and L. D. Grady, jun. (B.P. 467,875, 18.7.36. U.S., 24.8.35).—Pigments coated with substances insol. in oil-paint vehicles and more readily wetted by H_2O than by the vehicle (gum arabic, Irish moss, dextrin) form thixotropic paints when incorporated with H_2O in the vehicle. S. S. W.

Inks. D. McBurney and E. H. Nollau, Assrs. to E. I. Du Pont de Nemours & Co. (U.S.P. 2,049,507, 4.8.36. Appl., 7.5.32).—Dispersed and solvent-free inks suitable for printing on fabrics coated with a cellulose ester composition comprise pigment (20—80%), drier (0·015—2·0%), and the remainder a 45—60% drying oil-modified polyhydric alcohol–polybasic acid resin; such inks dry tack-free in 12—16 hr. and remain plastic on the platen of a press for up to 4 hr. S. S. W.

Protective coating. C. A. Thomas and C. A. Hochwalt, Assrs. to Monsanto Petroleum Chemicals, Inc. (U.S.P. 2,039,364, 5.5.36. Appl., 24.7.30).—Resins prepared by polymerisation of mixtures of unsaturated hydrocarbons (cf. B., 1932, 902), *e.g.*, olefine–diene mixtures or the products of cracked petroleum distillates, are cooked into drying oils to give materials suitable for varnishes, lacquers, etc. The products have good air-drying properties and give flexible films. Products prepared by cooking the resins into castor oil–drying oil mixtures are particularly suitable as undercoats and for drying by baking. R. J. W. R.

Coating composition. C. A. Thomas, Assr. to Dayton Synthetic Chemicals, Inc. (U.S.P. 2,039,366, 5.5.36. Appl., 24.11.34. Can., 11.9.31).—Resinous materials obtained by polymerising mixtures of aliphatic and cyclic olefines and dienes, either alone or with alkylbenzenes, with, *e.g.*, $AlCl_3$, are cooked into drying oils and castor oil. The products are sol. in petroleum solvents. *E.g.*, the clear resin obtained by the action of $AlCl_3$ on a mixture of isoprene, *cyclo*hexene, and PhMe may be heated with a drying oil at >250°. R. J. W. R.

Light-filtering overcoating containing diphenylene oxide. T. F. Murray, jun., Assr. to Eastman Kodak Co. (U.S.P. 2,043,805, 9.6.36.

Appl., 16.1.32).—Nitrocellulose layers are protected from decomp. by ultra-violet light by a superimposed coating or layer of a vehicle containing (3% of) diphenylene oxide, which absorbs ultra-violet light, with cellulose acetate and $\ngtr 50\%$ of a plasticiser. J. L.

[Metallic] coated article [with vinyl resins]. J. Fletcher, Assr. to Plastergon Wall Board Co. (U.S.P. 2,047,957, 21.7.36. Appl., 14.4.34).—The metal is first coated with a composition containing a phenol-aldehyde resin (produced in presence of an alkaline catalyst) dissolved in a phenol (b.p. >140°) and blended with, *e.g.*, an alkyd resin; after baking, a solution in a ketone of a resin made by the joint polymerisation of vinyl chloride and acetate is applied. S. M.

Carbon paper and like transfer materials [with portions non-transferring]. W. H. Smith & Son, Ltd. From Standard Register Co. (B.P. 468,964, 15.1.36).

Roller mills.—See I. **Methacrylic esters. Carbinol esters. Antioxidants. Si esters. Naphthenyl esters.**—See III. **Colouring lacquers etc. Phthalocyanine dyes and lakes. Pigment dyes. Dyes for resins.**—See IV. **Shaped articles.**—See V. **Moistureproofing compositions.**—See VI. **Limestone and chalk for whiting. $PbCrO_4$. TiO_2.**—See VII. **Safety glass. Abrasive articles.**—See VIII. **Bronze colours. Mg articles.**—See X. **Casein solution.**—See XV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Chronological development of utilisation of [rubber] latex. C. Philipp (Gummi-Ztg., 1937, **51**, 611—614).—The development of latex processes is reviewed historically. D. F. T.

Centrifugal concentration of [rubber] latex. J. H. Piddlesden (J. Rubber Res. Inst. Malaya, 1937, 7, 169—178).—Experiments with two types of centrifuge indicate that addition of 0·2% NH_3 to the latex is sufficient prior to centrifuging, the proportion of NH_3 being increased to 0·5% immediately after the process. Storage of the latex for $\nless 24$ hr. before centrifuging leads to smoother operation of the machine. On account of trouble from corrosion the machines should be of stainless steel. No economic method could be found for conversion of the rubber from the " skim " into smoked sheet. D. F. T.

Coagulation of latices by polar–non-polar liquids. F. K. Daniel, H. Freundlich, and K. Söllner (Trans. Faraday Soc., 1937, **33**, 890—894).—Polar–non-polar liquids (*e.g.*, alcohols, esters) coagulate diluted latices whilst polar liquids have no effect. The latex particles, normally hydrophilic, adsorb the dissolved mols. of the polar–non-polar liquid and become less hydrophilic; this is borne out by the smaller coagulating effect of polar–non-polar liquids which are only slightly sol. in H_2O. The small amount of $Pr^{\alpha}OH$ and $Pr^{\beta}OH$ necessary for coagulation appears to be connected with the instability of the foams produced. $Bu^{\alpha}OH$ and $Bu^{\beta}OH$, which at low concns. form stable foams, do not coagulate at such concns. The advantage of coagulating by means of org. liquids rather than by electrolytes is instanced in the case of jelutong latex. On coagulation with an org. liquid, *e.g.*, $Bu^{\beta}OH$, the resin content of the latex, which is very high, remains dissolved in the org. liquid, the coagulated rubber being resin-free. C. R. H.

Preservation of [rubber] latex by acids. E. Rhodes and K. C. Sekar (J. Rubber Res. Inst. Malaya, 1937, 7, 179—181).—Addition of 9 wt.-% of HCO_2H to field latex gives a mixture which retains its fluidity, but being apparently micro-flocculated and unstable is technically unattractive. D. F. T.

Drying of rubber. J. H. Piddlesden (J. Rubber Res. Inst. Malaya, 1937, 7, 117—146).—The drying of a wet solid such as rubber coagulum involves three stages, viz., a const.-rate period while the surface remains uniformly wet, a falling-rate period during which the area of wet surface gradually diminishes, and a final period when the progress of drying is dependent only on the rate of diffusion. By far the greater proportion of the time falls in the last period and, in accordance with theoretical expectation, the drying time for sheet rubber is $\propto$ the square of the thickness. Although raising the air velocity may increase the rate of drying in the first period, the advantage is small and the main methods for expediting drying are by sheeting more thinly and using higher temp. A period of 4 days at 38—60° is recommended, but with sheet 0·1 in. thick, 3 days may suffice. Rubber absorbs little smoke when it is nearly dry, so that for production of smoked sheet a 4-day period, with comparatively low temp. for the first 2 days, is advantageous. D. F. T.

" Subur " type smoke-houses [for rubber]. A. Moore and J. H. Piddlesden (J. Rubber Res. Inst. Malaya, 1937, 7, 147—164; cf. preceding abstract).—Details and dimensions are given of an inexpensive smoke-house which obviates the need for carrying the sheet and permits almost continuous smoking. The recommended fuel is a mixture of jungle wood and rubber wood. D. F. T.

Purified rubber for electrical insulation. A. R. Kemp (Ind. Eng. Chem., 1937, **29**, 643—649).—The nature of the non-caoutchouc constituents of rubber and latex is reviewed, particularly the effect of these constituents on H_2O-absorption and dielectric properties. Sol. substances rather than proteins are mainly responsible for the H_2O-absorption, this relation being in accordance with an osmotic mechanism for this phenomenon. NH_3-preserved latex after 9 treatments by centrifugal creaming and re-dilution gave an ash-free rubber containing 0·056% N and 1·48% of substances sol. in $COMe_2$; this result confirms the existence of an adsorbed layer of protein and of adsorbed or dissolved " resin " in association with the rubber globule. Purified rubber obtained by heating crêpe rubber with aq. NH_3 under pressure is of excellent quality and compares favourably with the best product of other methods. The poorness of unmilled plantation rubber as an electrical insulating material when immersed in H_2O, relative to the same rubber after vulcanisation, is explained by the fact that milling disperses the protein, which is further hardened and increased in H_2O-resistance by the action of heat and of S. D. F. T.

Significance of sulphur and accelerators for vulcanisation. Anon. (Gummi-Ztg., 1937, **51**, 614—617).—A crit. review is given of modern views on the chemical aspect of vulcanisation. D. F. T.

Crystallisation and thermal effects in stretched rubber. E. Guth and H. Mark (Österr. Chem.-Ztg., 1937, **40**, 304).—The Clausius–Clapeyron equation, applied to the calculation of the heat evolved on stretching rubber, leads to a val. of the order of 1 g.-cal. per g. of rubber for an elongation of 200% at –183°. C. R. H.

Viscosity and strength of stretched rubber. E. Guth (Österr. Chem.-Ztg., 1937, **40**, 305).—The val. of data on these properties for elucidating the internal structure of rubber and other plasto-elastic solids is discussed. C. R. H.

Rubber, cellulose acetate, nitrocellulose, synthetic resins, and similar materials as solvents. I. Maximal solvent capacity of rubber of different degrees of vulcanisation for isomeric nitrophenols. H. Brintzinger and H. Beier (Kolloid-Z., 1937, **79**, 318—323).—A method is described for determining the solubility of solid substances in rubber and other colloidal materials by shaking the latter with excess of the solute in presence of an auxiliary solvent. The results are independent of the nature of the auxiliary solvent provided this has no action on the colloid. Using $OH\cdot C_6H_4\cdot NO_2$ and H_2O, a saturated solution in 1 g. of raw rubber is found to contain: *o*-, 112; *m*-, 40; *p*-, 60 mg. The solvent power decreases rapidly with progressive vulcanisation. Raw rubber does not appreciably dissolve NaCl, KCl, KNO_3, glycerol, glucose, or mannitol. F. L. U.

Rubber-lined equipment. Fundamental principles of design. J. R. Hoover and H. C. Klein (Ind. Eng. Chem., 1937, **29**, 394—397).—Vulcanised rubber linings can be attached to almost any materials, but alloys of high Cu, Pb, Mn, or SiO_2 content are to be avoided, and the most usual supporting material is mild steel, since it is the cheapest. The article to be lined should be of welded construction and the welds non-porous, free from depressions, and ground flush. All corners should be radiused to at least $\frac{1}{8}$-in. and any sharp projections removed. The surfaces, if large, should be accessible both for the application of the bonding solution and the rolling-on of the rubber sheet by hand, except in cases of pipes and small units which can be put under sufficient pressure to ensure intimate contact of the lining with the inner wall. Where possible the plant should be designed in units which can be subjected to steam pressures of 30—75 lb./sq. in., or are small enough to be placed in autoclaves designed for such pressures in order to ensure vulcanisation under pressure. The finished lining should be $\frac{3}{16}$—$\frac{3}{8}$ in. thick, and protected against mechanical abuse and high temp. by the provision of auxiliary linings of wood or acid-proof brick. F. J. B.

Analysis of rubber. II. Qualitative determination of the serum constituents in raw and vulcanised rubber. P. Dekker (Kautschuk, 1937, **13**, 110—118; cf. B., 1937, 473).—Scherer's test for *l*-methylinositol (I) is not suitable for detection of serum constituents in rubber. The following procedure, based on a recommendation by Schoorl, gives a positive result for (I) in evaporated latex ("whole latex rubber") and a negative one with crêpe or sheet rubber, so that the two types can be differentiated. 2 g. of the $COMe_2$-extracted rubber are heated with xylene (80 c.c.) and AcOH (5 c.c.) under reflux until dissolved; heating in an oil-bath at 110° is then continued for 2 hr. after the further addition of AcOH (5 c.c.) and H_2O (10 c.c.). After removal of xylene by steam-distillation, the aq. solution is filtered and evaporated and the residue is dissolved in 20% H_2SO_4 (5 c.c.). $\frac{1}{2}$ hr. after careful gradual addition of a slight excess of 5% aq. $KMnO_4$ ($\not>$2 c.c. in all), the solution is decolorised with 10% $H_2C_2O_4$ (1 c.c.); Schiff's reagent (2 c.c.) added to this solution (2 c.c.) gives a blue-violet colour within $\frac{1}{2}$ hr. if serum constituents are present. CH_2O also can be detected in the remainder of the solution by Leach's test. The presence of glue does not interfere with the method, but if fabric is present it is necessary, after the steam-distillation, to add H_2O (50 c.c.) and 10% basic Pb acetate (3 c.c.); the liquid is then filtered after $\frac{1}{2}$ hr., when, after removal of Pb by H_2S, the above procedure is again followed. D. F. T.

Determination of free carbon in rubber goods. E. W. Oldham and J. G. Harrison, jun. (Ind. Eng. Chem. [Anal.], 1937, **9**, 278—279).—Modified procedure for the Smith–Epstein HNO_3-decomp. method (B., 1919, 151a) is described. E. S. H.

Synthetic rubbers. Anon. (Gummi-Ztg., 1937, **51**, 609—610).—The subject, including rubber-like products such as the C_2H_4 polysulphides and polyvinyl chloride, is reviewed historically. D. F. T.

New production of factice [rubber substitute]. R. Salchow (Kautschuk, 1937, **13**, 119—122).—"Thiolelaidic acid," $C_{18}H_{34}O_2S$ (Me ester, m.p. 31°), and "thiolbrassidic acid," $C_{24}H_{42}O_2S$, obtained by way of the corresponding thiocyanate compounds, do not contain the SH group. Although apparently saturated, they react readily with Br or HCl, the latter disrupting a C·S linking with formation of a ·SH group. The alkali salts of the "thiol" acids in the presence of K_2CO_3 under oxidation by I give a "latex" which on acidification deposits "acid factice," a pale yellow, crumb-like elastic mass which is insol. in ordinary org. solvents and is rather more resistant towards alkali than is common rubber substitute. Technical possibilities are indicated for these new products. "Thiololeic acid" does not give an "acid factice." D. F. T.

Mol. physics of insulators.—See XI.

Patents.

Manufacture of natural rubber and artificial rubber-like masses. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 463,194, 23.9.35).—Vulcanised and unvulcanised compositions of natural or artificial

rubber are made containing substances (or substitution products or salts thereof) obtainable from styrene and aromatic OH-compounds (PhOH, resorcinol) in the presence of agents which accelerate the polymerisation of pure styrene (B.P. 456,359; B., 1937, 119). The products show good ageing and are fast to light.
D. F. T.

Method of vulcanising rubber. R. R. Lewis and A. J. Weiss, Assrs. to Vulcan Proofing Co. (U.S.P. 2,040,698, 12.5.36. Appl., 24.11.33).—A mixture containing rubber (2 pts.), Thiokol ($\ngtr$1 pt.), and a small proportion of thiuram sulphide accelerator is heated to ordinary vulcanising temp.; the Thiokol provides all the S necessary for vulcanisation. Over-vulcanisation is claimed to be impossible; the product does not bloom and shows good ageing. D. F. T.

Age retarder [for rubber]. W. M. Lauter, Assr. to Wingfoot Corp. (U.S.P. 2,040,490, 12.5.36. Appl., 18.9.31).—Rubber is vulcanised in the presence of a primary mono- or di-aminofluorenone (especially 2 : 7-diaminofluorenone). D. F. T.

Rubber composition and method of preserving rubber. W. M. Lauter, Assr. to Wingfoot Corp. (U.S.P. 2,040,491, 12.5.36. Appl., 13.7.33).—Rubber is preserved by vulcanisation in the presence of a tertiary *N*-arylalkylnaphthylamine (an alkyldinaphthylamine or β-$C_{10}H_7$·NPhMe). D. F. T.

Production of air-permeable sheet materials of or containing rubber. Internat. Latex Processes, Ltd. (B.P. 463,160, 10.7.36. Hung., 19.7.35).—A layer of frothed aq. dispersion of rubber (applied to a fabric base) is subjected to a sudden rise in temp., *e.g.*, $>$100° (120°), so as substantially to burst all the bubbles; the setting of the layer is then completed, if necessary, and vulcanisation may be effected.
D. F. T.

Manufacture of elastic fabrics. Internat. Latex Processes, Ltd. (B.P. 463,176, 15.9.36. U.S., 24.1.36).—Fabric wetted with a liquid (H_2O) readily removable by drying is caused to adhere to a surface which has been stretched. On allowing this surface to contract the fabric is reduced in length without planar distortion; in this condition it is treated with rubber (by spraying with latex). Apparatus is claimed. D. F. T.

Rubber composition and [antioxidants for] preservation of rubber. W. L. Semon, Assr. to B. F. Goodrich Co. (U.S.P. 2,037,932, 21.4.36. Appl., 11.5.34. Fr., 29.5.33).—The addition to rubber of $\nless$2% of a dihydroacridine or its hydro-derivatives, *e.g.*, 5 : 5-dimethyldihydroacridine, as an antioxidant is claimed. H. A. P.

Securing together of surfaces by means of adhesive. Boston Blacking Co., Ltd., Assees. of A. D. Macdonald (B.P. 466,751, 29.11.35. U.S., 30.11.34).—An adhesive for sticking rubber–leather–fabric–rubber comprises a dispersion in H_2O of rubber and an org. solvent thereof which is spread on both faces to be joined, allowed to dry, and activated by a softener comprising mostly a solvent of rubber, *e.g.*, latex, PhMe, and C_2HCl_3. An antioxidant (β-$C_{10}H_7$·NHPh) and a dispersing agent (Nekal) may be present. B. M. V.

Production of rubber structures, *e.g.*, sponge-like or cellular rubber upholstery. Internat. Latex Processes, Ltd., E. A. Murphy, G. W. Trobridge, and A. N. Ward (B.P. 468,875, 2.6.36).

Antioxidants. Benzthiazyl disulphides.—See III. **Surfacing materials.**—See IX. **Wax-like composition.**—See XII. **Resilient articles. Pigment composition.**—See XIII.

XV.—LEATHER; GLUE.

Structure of the hair roots of short and long hairs. A. Küntzel, G. Vago, and A. Seitz (Collegium, 1937, 85—96).—Two kinds of horny tissue formation have been identified, viz., with and without the destruction of the protoplasmic fibrous system in the cells. Hair-keratin is formed in the hair root by such destruction. Long hairs can be removed without reductive keratolysis, but the short hairs are removable only by chemical decomp. of the hair-root keratin. Numerous photomicrographs are given.
D. W.

Lipins of steer hide. IV. Effect of liming. R. M. Koppenhoefer (J. Amer. Leather Chem. Assoc., 1937, 32, 210—230; cf. B., 1937, 817).—The total lipin content in the corium was unchanged by liming, and such treatment did not effect either the saponification or the removal of the corium triglycerides. Phospholipins remaining after curing were saponified to form Ca soaps, and all free fatty acids were converted into Ca soaps. The epidermal wax was reduced to $\frac{1}{3}$ of its quantity. 67% of the epidermal lipins were removed by scudding.
D. P.

Saphrophytic digestion of sterilised animal hair and keratose. L. S. Stuart (J. Amer. Leather Chem. Assoc., 1937, 32, 276—284).—An extensive growth of fungi, principally *Chaetomium globosum* and *Aspergillus glaucus*, is obtained on animal hair by incubating NaCl-cured hide at 30°. *C. globosum* is shown to grow on pure keratin (I), to reduce disulphide linkings, and to hydrolyse polypeptide linkings in keratose (II). *A. glaucus* does not grow on pure (I), but will grow on (I) modified by the action of *Escherichia coli* or in presence of glucose. S groups in (II) are reduced by *A. glaucus* in presence of glucose, and more slowly of mannitol. D. P.

Curing processes. VI. Effect of mode of curing on the manufacture and properties of the leather. F. Stather and H. Herfeld (Collegium, 1937, 129—136; cf. B., 1936, 804).—No difference was found in the analytical figures obtained on leathers manufactured from hides which had been cured in different ways. Some variations were noted in the soaking and liming processes, but these disappeared in later processes. Leathers tanned from hides cured by brining in a 10% aq. NaCl and with 10% of (dry) NaCl, respectively, were more permeable to air and H_2O and wet back much more readily than leathers made from hides cured in other ways. D. W.

Chrome tanning. II. Effect of neutralisation on combined sulphate and basicity of the leather. E. R. Theis (J. Amer. Leather Chem. Assoc., 1937,

32, 285—292; cf. B., 1937, 267).—Analyses of chrome leather neutralised with different weak alkalis are recorded. Borax, NH_4HCO_3, and NaOAc are considered to be the best neutralising agents (cf. Innes, B., 1935, 601). D. P.

Leather preparations by the Wiley mill. T. F. Oberlander (J. Amer. Leather Chem. Assoc., 1937, **32**, 292—294).—A higher amount of sol. solids and free tannins and therefore a lower degree of tannage is shown by leather ground in a Wiley mill as compared with leather prepared for analysis by slicing. D. P.

Tanning effect of sulphite-cellulose waste extracts. W. Grassmann, A. Miekeley, H. Schelz, and V. Windbichler (Collegium, 1937, 136—152).—Adsorption curves of sulphite-cellulose waste extracts, quebracho, and pine-bark extracts, respectively, indicate that the first-named is not a true tanning material. None of the sulphite-cellulose extracts tried can be used alone for tanning purposes, but they offer definite advantages in conjunction with other good tanning agents. $\not>$25% of them can be used in such a mixture without appreciably affecting the properties of the leather. The ligninsulphonic acid in the sulphite-cellulose extracts appears to react with the tannin to form a simpler, more highly dispersed tannin of mellower properties. The % of combined tannin is increased by the use of some of this liquor. D. W.

Native (Czechoslovakian) tanning materials. V. Němec (Collegium, 1937, 152—158).—The tans, sol. non-tans, insol. matter, and H_2O in the following tanning materials were, respectively (%): *Rumex crispus*, L. (root), 3·1, 10·3, 27·6, 59·0; Badan leaves (*Bergenia crassifolia*, Fritsch), 15·2, 27·7, 42·6, 14·5, degrees (yellow) 3·4 and (red) 0·6; sumac leaves [*Rhus hirta* (*typhina*)], fresh picked, 23·1, 12·6, 49·8, 14·5, sugars 3·7, degrees (yellow) 2·9 and (red) 0·9; fallen leaves, 25·4, 4·2, 55·9, 14·5. D. W.

Tannin content of Philippine oak barks. F. M. Yenko and L. Baens (Philippine J. Sci., 1936, **61**, 415—416; cf. B., 1935, 469).—Six species of the bark were found to contain >10% of tannin. *Quercus pruinosa* grown at Cebu Forest Station gave 17·76% of tannin, and grown near Baguio gave 3·52%. D. P.

Incrustations in the evaporators in tanning extract manufacture. J. A. Sagoschen (Collegium, 1937, 158—178).—>55% of the incrustation is CaC_2O_4 derived from $H_2C_2O_4$ present in the tan liquors. The amount of the deposit is affected by the type of H_2O, raw tanning material, temp. and mode of leaching, decolorisation, clarification, filtration, type of evaporator, temp. therein, degree of concn., and frequency with which the evaporator is cleaned out. D. W.

Effect of concentration and method of drying of [vegetable] tanning extracts on their viscosity. J. A. Sagoschen and A. Luft (Collegium, 1937, 75—85).—η has been determined for mimosa, oakwood, and chestnut liquors of different d (1·070—1·210) and at different temp. (20—50°), respectively, prepared from powdered extracts manufactured in different ways, *e.g.*, Duplex and Multiplex evaporators, old and new. The η was smaller for liquors prepared from extracts dried by the latest methods than by the vac. drum, and for extracts conc. in the modern Multiplex evaporator. η is not characteristic for each material (cf. Pollak, B., 1925, 516). Sole leather can be filled better with modern extracts because of their lower η. D. W.

Western hemlock bark as potential tanning material. C. C. Smoot and R. W. Frey (U.S. Dept. Agric., 1937, Tech. Bull. 566, 47 pp.).—Very large quantities of the bark of the Western hemlock, *Tsuga heterophylla*, containing 15% of pyrocatechol tannin, are available as a by-product of pulp production. The major portion of the bark is removed from the logs mechanically, thus removing a high proportion of wood containing very little tannin. The large-scale production of tanning extract from the bark has been studied. Deck-peeled bark must be dried artificially, preferably for 2—3 hr. at 121—138° and R.H. <40%. Wood-peeled bark may be dried either naturally or artificially. Open leaching is recommended, the optimum conditions being an initial temp. of extraction of 65° rising to 100°, ratio of liquor to bark of 12 : 1, and an extraction time of 72—96 hr. An extraction efficiency of 80% may be expected. Evaporation by spraying yields a better extract than drying in a vac. drum or vac. pan. The leather produced by this extract is plump, firm, and of good fibre strength, but of a reddish colour. The approx. cost of production has been estimated. It is concluded that the bark could be successfully utilised if production is conducted on economic lines supported by rigid chemical control. D. P.

Action of micro-organisms on vegetable tanning materials. V. W. P. Doelger (J. Amer. Leather Chem. Assoc., 1937, **32**, 265—275; cf. B., 1937, 266).—The amount of total acid, lactic acid (I), and AcOH in vegetable sole-leather "rocker" liquors has been determined. In an experimental "rocker" set the (I) was found to increase if the amount of fermentable tanning material was >55%, and to diminish if <45%. D. P.

Effect of moulds on Philippine tanning liquors. II. L. Baens and F. M. Yenko (Philippine J. Sci., 1936, **61**, 417—427; cf. B., 1937, 374).—Tannin is destroyed in aq. infusions of some Philippine tanbarks by infection with atm. mould spores or by inoculation with *Aspergillus niger* or *Penicillium glaucum*. The rate of destruction is greater when less acid is present. The tannin from betel-nut (*Areca catechu*) kernel and black wattle (*Acacia decurrens*, Willd.) bark is more resistant to *P. glaucum* than to *A. niger*, but the reverse is the case with kalumpit bark (*Terminalia edulis*, Blco.). Both moulds deleteriously affect tannin from kamachile [*Pithecolobium dulce* (Roxb.), Benth.] bark. D. P.

Determination of total solids of [vegetable] tan liquors. A. Cheshire (J. Soc. Leather Trades Chem., 1937, **21**, 255—261).—The aq. tannin solutions are evaporated to dryness in a porcelain or SiO_2 basin, which is then transferred to a metal box

(" stabiliser ; " 150 c.c. capacity) provided with a lid and filter-paper soaked in aq. $CoCl_2$ (5%). The box and contents with the lid detached are heated for 1 hr. at 100° in a vac., and the lid is fixed on the box, which is allowed to cool and then weighed. Const. wt. is attained with porcelain basins in 45 min. and with SiO_2 basins in 30 min. D. W.

Acid content of vegetable tan liquors. A. Ponte and G. Cavallone (Collegium, 1937, 68—75).—The total acid content of different tan liquors and extracts (sulphited and non-sulphited) has been determined by the Steven–Anacker (B., 1927, 611) and Kubelka–Wagner (Gerber, 1929, **55**, 108) methods, the volatile acids by the modified official method of distilling in steam and by the Rota method of distilling a mixture with EtOH; the p_H vals. were determined colorimetrically and ionometrically. The total volatile acid content was > that of total acids in some tan liquors, which is attributed to the formation of salt-like compounds between the volatile acids and the nitrogenous matter in the particular liquors. These compounds were decomposed only on distillation, *e.g.*, in the determination of volatile acids. The total acid content depends partly on the extracts used and partly on fermentation. Org. acids are derived by the fermentation of sugary matter in the extracts used, and the p_H is not a sufficient criterion of the acid condition of the tan liquors. The determination of total acid and volatile acids is necessary to ensure the most suitable composition of the tan liquors and to follow the progress of the fermentation processes. D. W.

Use of animalised fibre (" Tessan ") for testing the colour of tanning materials by a modified method. A. Gansser and W. Vogel (J. Soc. Leather Trades Chem., 1937, **21**, 274—277).—" Tessan " is animal or vegetable fibre treated with gelatin. The " Tessan " is suspended in tan liquors of analytical concn. for 36—48 hr., after which it is drained, dried, and its colour determined by means of the Zeiss photometer or Lovibond tintometer. Results on different tanning materials are compared. D. W.

Determination of water absorption of leather. V. Kubelka and V. Němec (Collegium, 1937, 179—180; cf. B., 1937, 267).—A modified apparatus is described. D. W.

Tanning and corrosion.—See X.

Patents.

Working up untanned animal hide material. C. Freudenberg Ges.m.b.H. (B.P. 464,406, 15.10.35. Ger., 15.10.34).—Untanned hide material is highly swollen chemically and treated mechanically to produce a fibrous hide paste, which is extruded through shaping nozzles, the whole of the processes being conducted in cooled machines to maintain a temp. of <22° (10°). D. W.

Manufacture of artificial or reconstructed leather. Internat. Latex Processes, Ltd., Assees. of Soc. Anon. Prodotti Salpa & Affini, S.A.P.S.A. (B.P. 464,905, 31.10.36, Ital., 3.12.35).—5% of an aq. paste of a H_2O-sol. zincate and $Mg(HCO_3)_2$ is mixed with the disintegrated leather and/or hides and aq. dispersions of rubber (cf. B., 1935, 242). D. W.

Treatment of chrome-tanned leather. J. Burchill, H. A. Piggott, G. S. J. White, and Imperial Chem. Industries, Ltd. (B.P. 465,048, 26.10.35).—Prior to being dried, Cr-tanned leather is treated with a 3—30% aq. neutral polyhydroxy-compound containing at least one ether group or a polyether compound, which may or may not contain OH groups. Examples describe the use of a $(CH_2)_2O$–sucrose condensation product, polyethylene glycol, polyglycerol or its esters, etc. D. W.

Dyeing of leather. A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 466,215, 28.11.35).—Leather is dyed by a process which employs monoazo dyes of good solubility made by diazotising sulphonated α- or β-$C_{10}H_7{\cdot}NH_2$ and coupling with *m*-$C_6H_4(NH_2)_2$ which may contain both nuclear and *N*-substituents. Among examples (22) is described the use of the dyes 1 : 3 : 6 : 8-$NH_2{\cdot}C_{10}H_4(SO_3H)_3$ (alkaline) → 1 : 2 : 4-$C_6H_3Me(NH{\cdot}C_2H_4{\cdot}OH)_2$ (reddish-brown), 1 : 3 : 6-$NH_2{\cdot}C_{10}H_5(SO_3H)_2$ (acid) → 1 : 3 : 4-$(NH_2)_2C_6H_3{\cdot}NO_2$ (brownish-yellow), 2 : 6 : 8-$NH_2{\cdot}C_{10}H_5(SO_3H)_2$ (acid) → 1 : 2 : 4 : 5-$C_6H_2Me(NH_2)_2{\cdot}SO_3H$ (orange-brown), and 2 : 5 : 7-$NH_2{\cdot}C_{10}H_5(SO_3H)_2$ (alkaline) → 4 : 1 : 3-$C_6H_3Cl(NH_2)_2$ (orange-brown). The dyeings can be sharpened without spots becoming visible by the showing of undyed parts. K. H. S.

Manufacture of hardened gelatin films. B. B. Burbank, Assr. to Technicolor Motion Pict. Corp. (U.S.P. 2,046,320, 7.7.36. Appl., 25.10.34).—Cr hardening baths can be rendered alkaline to any desired degree, without pptn. of the Cr, if the solution is first treated by adding tartaric acid (about 1 mol. per atom of Cr) and heating to b.p.; on cooling, aq. NH_3 is added until the required p_H is attained. Max. hardness is attained at about p_H 4·9 for 10% Cr alum solution. Residual Cr in the film, after hardening, decreases rapidly, above p_H 4, with increasing p_H. J. L.

Casein solutions. C. Iddings, Assr. to Muralo Co., Inc. (U.S.P. 2,047,143, 7.7.36. Appl., 8.12.33).—A stable casein solution of high η for adhesive or H_2O-paint medium is prepared by adding a H_2O-sol. soap of a glycerol–phthalate resin (<50% of wt. of casein). The η can be modified by the choice of alkali in the soap and by addition of thinners or other substances (urea, alkali fluorides). E. B. H.

Leather dyes.—See IV. **Drying tubular products.**—See V. **Treating protein materials.**—See VI. **Securing surfaces together.**—See XIV. **Proteolytic enzymes.**—See XVIII.

XVI.—AGRICULTURE.

Soil problems of the Anglo-Egyptian Sudan. H. Greene (Empire J. Exp. Agric., 1937, **5**, 1—10).—A general discussion. A. G. P.

Nature of the alkalinity of solonetz soils. V. A. Kovda and S. V. Bistrov (Trans. Irrig.

Comm. Acad. Sci., U.S.S.R., 1936, **6**, 227—249).—The alkalinity of the solonetz is due to the hydrolysis of Na humates, aluminates, and silicates. The formation of Na_2CO_3 is facilitated by the presence of CO_2. A. M.

Solonetzous chestnut soils of the Ukraine and their reclamation. A. M. Mosheiko (Trans. Irrig. Comm. Acad. Sci., U.S.S.R., 1936, **6**, 175—225).—Treatment with $CaSO_4$ resulted in improved physical properties, drainage, and crop yield. Results under dry farming were poor, irrigation being required. The use of $CaSO_4$ on solonetz was dangerous without adequate drainage and leaching, owing to a high H_2O-table. A. M.

Changes in solonetzosity of Lower Volga soils by chemical reclamation and irrigation. I. N. Antipov-Karataiev and V. N. Filipova (Trans. Irrig. Comm. Acad. Sci., U.S.S.R., 1936, **6**, 67—136).—Changes occurring in adsorbed bases, micro-aggregate analysis (Vageler), filtration analysis, and determination of curve of H_2O suction proved most suitable for determining the effect of amelioration. The action of CaO is slow, but that of H_2SO_4 is rapid but may be harmful in absence of carbonate. CaO + S proved efficient in laboratory experiments. A. M.

Chemical nature of soils in North Manchuria. M. Ikeda (J. Agric. Chem. Soc. Japan, 1937, **13**, 348—362).—Tamm's method of test indicates that the soils of North Mongolia belong to the brown soil class. No free Al_2O_3 could be detected. The humus is almost saturated by bases and the C : N ratio is within the limits 8—10. 70% of the C and 50% of the N remain in the residue after hydrolysis. J. W. S.

Padang soil, a typical example of podsol in the tropical lowlands. H. J. Hardon (Proc. K. Akad. Wetensch. Amsterdam, 1937, **40**, 530—537).—The structure and composition of padang soil profiles in Padang Loewai, S.E. Borneo, and in Bangka are described, and are shown to be typical of podsolisation. O. D. S.

Mountain-forest and meadow soils in North Caucasus. I. N. Antipov-Karataiev, T. F. Antipova-Karataieva, and L. T. Simakova (Trans. Dokuchaiev Soil Inst., 1936, **13**, 366—398).—High base unsaturation prevails, but no podsolisation is observed, the soils having a uniformly brown colour. Raw humus is characteristic and aërobic N fixation is excluded by low Ca and P_2O_5 contents. The optimum temp. for nitrifying and denitrifying bacteria in alpine mountain-forest soils is 2—4°. A. M.

Origin and improvement of Koog soils. W. Ohle (Chem.-Ztg., 1937, **61**, 509).—The Koog, reclaimed land on the west coast of Schleswig-Holstein, consists at first of blue-green clays, which, on drying, turn grey-brown, FeS being oxidised to $Fe(OH)_3$ and H_2SO_4. The S originates mainly from S-containing proteins in sea-plants (algæ) and dissolved sulphates in the sea. The soils thus become extremely acid and require copious CaO treatment to prevent harm to crops. The formation of insol. Fe phosphates is also thus preventable. J. L.

Ion exchange with special reference to agricultural chemistry. J. Møller (Kolloid-Beih., 1937, **46**, 1—112).—A crit. review of previous work is given. Experiments on cation exchange with a commercial H_2O softener ("Natrolith-AG") and K, NH_4, Ca, and Ag salts have been carried out at concns. for which the activities can be calc. When activities are used the law of mass action is shown to be applicable to the results. Retention of nutrient ions in soil by pptn. and by exchange is discussed. Significant soil characteristics are surface area, surface NH_4, surface K, mobile P, and p_H. The customary analytical methods for determining NH_4, K, and available P are criticised, and alternative procedures are described. The preliminary transfer of the ions to be determined from the soil sample to an added excess of Na-permutit, from which they are subsequently removed, is recommended. A simplified method for determining the CaO requirement of soils is described. F. L. U.

Mobile potash, phosphates, and nitrogen in Lower Volga soils. I. N. Antipov-Karataiev and I. P. Serdobolski (Trans. Irrig. Comm. Acad. Sci., U.S.S.R., 1936, **6**, 137—173).—K is carried into lower horizons as a result of chemical treatment. P_2O_5 behaves similarly, but chemical reclamation increases its mobility. Dil. HCl and NH_4Cl extracts showed good correlation with Neubauer's method for K. A. M.

Factors influencing studies of nitrogen fluctuations in soil plots. A. Sreenivasan and V. Subramanyan (Proc. Nat. Inst. Sci. India, 1937, **3**, 233—239).—Erroneous observations due to lack of uniformity of soil samples and to inadequate analytical methods are discussed. Elimination of errors by use of modern technique is considered. A. G. P.

Transformations of nitrogen in a swamp soil. A. Sreenivasan and V. Subrahmanyan (Proc. Nat. Inst. Sci. India, 1937, **3**, 219—225).—Decomp. of urea, farmyard manure, green manure, oilseed cake, etc. in swamp soils yields NH_3 in amounts which depend on the C : N ratio of the material, high NH_3 formation being, in general, associated with a narrow ratio. In such soils the rate of ammonification is $>$ that of nitrification. Increased additions of org. N material results in correspondingly increased production of NH_3 and increased loss of N from the soil. This loss, which is largely attributable to volatilisation of NH_3, is accentuated when the C : N ratio is narrow. Addition of carbonaceous matter to widen the ratio lowers the loss of N. A. G. P.

Mechanism of nitrification in soil. K. M. Pandalai (Proc. Nat. Inst. Sci. India, 1937, **3**, 175—184).—Small amounts of glucose, humic acid, or peptone inhibit nitrification by *Nitrosomonas* in pure culture. In mixed culture with other soil organisms, *e.g.*, *B. mycoides*, *B. megatherium*, *Azotobacter*, much larger amounts of these substances are tolerated and nitrification may even be increased. A. G. P.

Nitrogen fixation in soil with cellulosic substances, cow dung, and fats. I. N. R. Dhar and S. K. Mukerji (Proc. Nat. Acad. Sci. India, 1936, 6, 289—295).—Marked increase in total N occurs when filter-paper, dry leaves, cow dung, etc. are mixed with soil and exposed to sunlight or diffused light, the effect being increased by addition also of small amounts of molasses. N fixation also occurs when the Na salts of org. acids are allowed to oxidise in air on the soil surface. Stearic, palmitic, and oleic acids lead to greater fixation than does citric acid (cf. B., 1936, 246, 707; 1937, 166). P. W. C.

Volatilisation of ammonia from Indian soils. V. Subrahmanyan (Current Sci., 1937, 5, 587—589).—Loss of N from soil occurs by volatilisation of NH_3, which is increased by rise of temp. and by dressings of CaO, and varies with the different NH_4 salts used. It is due to purely chemical agencies and is checked by addition of cellulosic materials. The effect on tropical agriculture is discussed. F. R. S.

Evaluation of the lime requirements of soils. R. Chaminade (Bull. Assoc. Chim. Sucr., 1937, 54, 49—55).—When a soil suspension is treated with lime-H_2O insufficient for saturation the fixation of Ca is immediate, but the soil-p_H first produced falls by 0·5—2·3 units in the course of 1—2 days. The quantity of CaO necessary to produce a given p_H is less when the p_H is produced directly than when it is first exceeded and then reduced by acidification. Such temporary over-adjustment occurs to part of the soil in treatment with solid $Ca(OH)_2$ or $CaCO_3$, and it accounts for the relatively large amounts of these substances required as compared with lime-H_2O to produce the same p_H. These relations are represented by graphs and made the basis of a method of assessing CaO requirements in different forms. Equal quantities of $CaCO_3$ and solid $Ca(OH)_2$ are found to produce about the same final p_H. J. H. L.

Cobalt status of New Zealand soils. E. B. Kidson (New Zealand J. Sci. Tech., 1937, 18, 694—707).—In the soils examined the Co content varied from 0·3 to 380 p.p.m. Bush sickness and allied ailments are associated, in many cases, with soil areas of low Co status. In anomalous instances the question of the availability of soil-Co is considered. *N*- and 0·1*N*-HCl, H_2O, and aq. CO_2 did not appear to indicate the availability of Co by comparison with the incidence of bush sickness. A. G. P.

Soil fungi and *Actinomyces* in relation to manurial treatment, season, and crop. J. Singh (Ann. Appl. Biol., 1937, 24, 154—168).—The no. of fungi and *Actinomyces* in the soils examined was directly related to fertility as measured by crop growth. No seasonal periodicity in nos. nor marked influence of the nature of the crop was apparent. High fertility and greater variety of fungal species are associated. No sp. types of soil flora are determined by particular manurial treatments. A. G. P.

Method for determining ice–water relationships by measurements of dielectric constant changes. L. T. Alexander and T. M. Shaw (Nature, 1937, 139, 1109—1110).—A method for determining the f.p. of soil and plant materials is described and illustrated by curves obtained with peas and sweet potatoes. L. S. T.

Improved method of determining nitrogen in soils and plant materials. C. R. H. Iyer, R. Rajagopalan, and V. Subrahmanyan (Proc. Nat. Inst. Sci. India, 1937, 3, 251—257; cf. B., 1936, 340, 1170).—In the H_2CrO_4–H_2SO_4 digestion method losses of N occur through formation and decomp. of $(NH_4)_2Cr_2O_7$ if the $K_2Cr_2O_7$ or CrO_3 is added to a cold or only moderately hot mixture of soil and H_2SO_4. When these are added to the boiling mixture and heating is continued immediately no loss of N occurs. A. G. P.

Determination of nitrous- and nitric-nitrogen in soils. K. M. Pandalai (Proc. Nat. Inst. Sci. India, 1937, 3, 241—250).—The soil sample, suspended in H_2O, is treated with CaO (to stabilise NO_2') and with $CuSO_4 + Pb(OAc)_2$ (to prevent dissolution of org. matter). NO_2' in the filtered extract is determined by addition of excess of H_2O_2 or $KMnO_4$ and titrating the excess. Total $NO_2' + NO_3'$ is determined after oxidation with $KMnO_4$ by means of Devarda's alloy. The deposit of Pb on the alloy ensures a smooth reduction without loss of efficiency. A. G. P.

[Determination of] less common elements [iodine] in soil. J. S. McHargue (J. Assoc. Off. Agric. Chem., 1937, 20, 222—225).—It is unneccessary to add Na_2SO_3 (I) to the soil during fusion or combustion (cf. *ibid.*, 1936, 19, 66) since iodates are not formed, and results are slightly higher when (I) is omitted. When $<5 \times 10^{-5}$ g. of I is present, CS_2 is preferable to CCl_4 as an extractant. The latter is to be preferred only when $>5 \times 10^{-5}$ g. of I is present and in warm weather. E. C. S.

Colorimetric determination of manganese in soils. V. T. Illiminskaja (Probl. Soviet Soil Sci. Symp., 1936, 1, 149—165).—Oxidation to MnO_4' by $(NH_4)_2S_2O_8$ after removal of Cl' is recommended. A. M.

Irrigation of Lower Volga Soils. I. N. Antipov-Karataiev, V. N. Filipova, and A. P. Sapelov (Trans. Irrig. Comm. Acad. Sci., U.S.S.R., 1936, 6, 5—66).—Irrigation of isolated field monoliths (1 × 1 × 2 m.) of chernozem, chestnut, and solonetzous soils showed that up to 15,000 cu. m. of H_2O are required to free the surface 1 m. from sol. salts. Mg and Na are removed by gypsum, but large amounts of H_2O are required for complete interaction. Other Ca salts should be tried. A. M.

Influence of sodium-containing irrigating water on soil properties. K. V. Madar (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 249—253).—Waters containing 0·4% of $NaHCO_3$ and 43—85% of cation as Na render soils of reasonable adsorbing capacity alkaline and impaired their necessary physical properties for crop growth. W. L. D.

Use of pure ammonia in irrigated agriculture. A. Rooseboom (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 246—248).—Dissolution of NH_3 in irrigation waters ensures even distribution without the cumulative deteriorating effect of anions (*e.g.*, SO_4''). W. L. D.

Improvement of alkaline soils by formation of ponds used for fish breeding. A. von Endrédy (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 254—260).—From experience extending over 35 years, the cutting of artificial ponds for fish rearing in Biharugra (Hungary) has lowered the salt table in the originally alkaline soil, and the drainage properties of the top soils has improved. W. L. D.

Treatment of glasshouse soils with chloropicrin for control of *Heterodera marioni* (Cornu), Goodey, and other soil pathogens. W. Newton, J. E. Basher, and R. J. Hastings (Canad. J. Res., 1937, **15**, **C**, 182—186).—Chloropicrin (I) applied by injection controlled bulb nematodes and certain fungal diseases of other crops. Treatment of soil with a $Cu(NO_3)_2$–KCN prep. (II) produced a smaller increase in tomato yields than did (I), but, unlike roots of plants treated with (I), those grown in (II)-treated soil were free from root knot at the end of the season. $CaCN_2$ applied at the rate of 1000 lb. per acre did not eliminate nematodes. A. G. P.

Blast-furnace processes for the production of phosphatic and potassic fertiliser materials. P. H. Royster, K. G. Clark, T. P. Hignett, L. E. Bowe, H. I. Lansdon, J. C. Southard, and J. W. Turrentine (U.S. Dept. Agric., Tech. Bull. 543, 1937, 75 pp.).—Experiments carried out by the Bureau of Soils on a semi-technical blast furnace, in 1932—1933, are described. Reduction of phosphate rock (Tennessee and Florida) can occur at temp. $\nless 1235°$, and for a commercial process high blast temp. are necessary. Detailed analysis of the heat balance indicates that, for a full-scale plant, coke requirements (the main item of cost) are $<2{\cdot}5$ tons per ton of P_2O_5 (blast temp. $\nless 1100°$). 90% reduction of P_2O_5, and 95% recovery of the P in the top gases, should be possible. 5—8% of the reduced P may be found as ferrophosphorus. Potash volatilisation from wyomingite (8—12% K_2O) requires cheap $CaCO_3$ (the ratio CaO + MgO to $Al_2O_3 + SiO_2$ should be $\nless 0{\cdot}9$) and coke. The combined smelting of phosphate and potash is more attractive than either of the individual processes; it requires less fuel and flux, and yields a more easily transportable product. I. C. R.

Chlorination of phosphorites for production of Ammophos. F. S. Stefkin, M. M. Sokolov, and M. S. Slesareva (J. Chem. Ind. Russ., 1937, **14**, 581—584).—Phosphorite–C mixtures are chlorinated at 700—800°, the products are treated with aq. NH_3, and the filtrate is used for production of Ammophos fertiliser. Quant. recovery of P is claimed. R. T.

Preparation of complex fertilisers of the type of Nitrophos and Ammophos. A. M. Dubovitzki and Z. N. Lunskaja (J. Chem. Ind. Russ., 1937, **14**, 496—503).—The factory-scale prep. of fertilisers of the above type is described. R. T.

Calcium metaphosphate fertilisers. W. H. MacIntire, L. H. Hardin, and F. D. Oldham (Ind. Eng. Chem., 1937, **29**, 224—234).—The composition, solubility, stability, and hygroscopicity of several types of $Ca(PO_3)_2$ (I) (P_2O_5 equiv. 65%; theory 71·7%), prepared by the action of vapours of burning P on beds of rock phosphate, are discussed. (I) is determined by hydrolysis to orthophosphate by prolonged boiling with conc. HNO_3 and pptn. by $(NH_4)_2MoO_4$. All types of (I) are readily sol. in dil. acids, *e.g.*, HNO_3, and NH_4 citrate; acid types (10% SiO_2) dissolve in H_2O (48 hr.), presumably because HPO_3 is formed by hydrolysis of SiO_2,P_2O_5, but low-acid types are much less sol.; carbonates, *e.g.*, $CaCO_3$, considerably reduce the solubility. Hydrolysis of (I) is very slow in H_2O and dil. acids at room temp., but increases with temp., and slightly with addition of salts. H_2O-quenching of the melt results in greater solubility (through hydration) than air-cooling, and in accelerated hydrolysis of the extracts. Sorption by soil, subsoil, and Fe and Al oxide gels is decidedly greater for PO_3' than PO_4'''. Hygroscopic tendencies of finely-ground, air-cooled (I) are inhibited by admixture with 3 pts. of ground limestone. I. C. R.

Chemical reactions in fertiliser mixtures. K. C. Beeson (Ind. Eng. Chem., 1937, **29**, 705—708).—The attempt to neutralise the acidity and give a mixture suitable for application as a fertiliser gives rise to reactions which are shown to follow the equation $2(NH_4)_2HPO_4 + 3CaCO_3 = Ca_3(PO_4)_2 + 4NH_3 + 3CO_2 + 3H_2O$ fairly closely, whereas $5(NH_4)_2HPO_4 + 3CaCO_3,MgCO_3 = 3MgNH_4PO_4 + Ca_3(PO_4)_2 + 7NH_3 + 6CO_2 + 6H_2O$ is only approx. followed, and does not envisage all the compounds formed as products of the reaction. In either case there is loss of NH_3 and the production of citrate-insol. phosphates. F. J. B.

Chemical changes during fermentation of dung. A. von Kúthy and B. Baskay-Tóth (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 261—266).—Dung allowed to ferment cold, warm (solid mass), and warm (air openings) did not show much difference in composition after six weeks. The org. matter decreased, and the N and ash content increased. The main change was that of sol. to insol. N. W. L. D.

Determination of hygroscopic and crystal hydrate water in superphosphate. L. Berlin, O. Voznesenskaja, I. Nikonova, and R. Fiskina (J. Chem. Ind. Russ., 1937, **14**, 41—49).—Wichern's method (B., 1933, 384) is laborious and inaccurate. Variable results are obtained using a method based on extraction with EtOH; extraction with $COMe_2$ gives const. results, which are, however, < theoretical owing to dissolution of H_2SiF_6. Hygroscopic H_2O is best determined by drying at 60° (4—6 hr.), applying a correction (−1%) for H_2SiF_6 volatilised. Crystal hydrate + hygroscopic H_2O is determined by drying at 90°. At 100° decomp. of $CaH_4P_2O_8$ commences, with liberation of constitutional H_2O. R. T.

[Determination of] acid- and base-forming quality of fertilisers. L. E. Horat (J. Assoc. Off. Agric. Chem., 1937, **20**, 264—275).—Pierre's method (cf. B., 1933, 761) of determination of acidity or basicity is modified by titrating to bromothymol-blue in place of Me-red. Collaborative results by the original and modified method and by electrometric titration are recorded. E. C. S.

[Determination of] nitrogen [in fertilisers]. A. L. Prince (J. Assoc. Off. Agric. Chem., 1937, **20**, 249—252).—For the determination of H_2O-insol. N by the A.O.A.C. official method (Methods of Analysis, 1935, 27) more sp. directions are given. E. C. S.

Determination of available potash in fertilisers. S. F. Thornton and H. R. Kraybill (J. Assoc. Off. Agric. Chem., 1937, **20**, 287—292; cf. B., 1935, 515).—The present A.O.A.C. official method gives results which may be several times $>$ those obtained by the former method, but they represent the K actually available to plants. Treatment of the K_4PtCl_6 ppt. with acidified EtOH is shown to be necessary in order to avoid H_2O-insol. residues. E. C. S.

Effect of removing water-soluble compounds prior to determination of citrate-insoluble phosphorus in fertilisers. K. D. Jacob and T. H. Tremearne (J. Assoc. Off. Agric. Chem., 1937, **20**, 277—287; cf. B., 1936, 1036).—The preliminary washing with H_2O prescribed in the A.O.A.C. official method resulted in lower vals. for citrate-insol. P in all but 3 of 43 samples of ordinary and double superphosphate, ammoniated ordinary and double superphosphate, wet-mixed base goods, and complete fertiliser mixtures. In all but the two first-mentioned, thorough washing is important. Solubilities of the principal superphosphate constituents in H_2O and neutral NH_4 citrate are tabulated. E. C. S.

[Determination of] magnesium in fertilisers. J. B. Smith (J. Assoc. Off. Agric. Chem., 1937, **20**, 252—263).—Collaborative analyses of total MgO by Hoffmann's method (cf. B., 1933, 17) show rather large errors. The shorter Bartlett–Tobey method, which is briefly described, gives encouraging results. The results of attempts to determine active (available) Mg are reported, and a procedure for the determination of MgO in H_2O-sol. constituents of fertilisers is outlined. E. C. S.

Availability of calcined phosphate and other new phosphatic materials as determined by chemical and vegetative tests. W. H. Ross and K. D. Jacob (J. Assoc. Off. Agric. Chem., 1937, **20**, 231—249).—Finely-ground calcined phosphate (I), $Ca(PO_3)_2$, and fused phosphate rock are as effective as is $Ca(H_2PO_4)_2$ in promoting plant growth when applied to neutral or acid soils, but are apparently less effective in highly calcareous soils. (I) in the form of particles $>$ 40-mesh is less readily available than more finely-divided (I). The availability of P_2O_5 in these products, as determined by the citric acid and NH_4 citrate (A.O.A.C. official) methods, does not differ appreciably, but is $<$ that determined by direct tests on plant growth. Filter-paper interferes with the citrate digestion. The Shimer filter, when provided with a suitable mat, is adapted for use in this determination. E. C. S.

Use of phosphatic fertilisers in the cultivation of sugar cane and bananas. L. A. C. Blaisemont (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 290).—$CaHPO_4$ and $Ca(H_2PO_4)_2$ in soils are equally assimilable by plants although the former only is H_2O-sol. Under certain climatic and edaphic conditions $Ca_3(PO_4)_2$ is equally assimilable and often superior to more available PO_4'''. The texture of and H_2O movement in the soil are the main factors governing the advantages derived from the type of PO_4''' added. W. L. D.

Magnesium-containing fertilisers. O. Eckstein (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 233—241).—The part played by Mg in chlorophyll-building in green plants is discussed. Mg deficiency in leaves of plants follows on a deficiency in the soil and this may be corr. by applying Mg as $MgSO_4,K_2SO_4$, usually at the rate of 10—50 kg./hectare. In cases of Mg deficiency generous applications of N–P–K manures increase the defect. This is a possible reason of the non-response of some crops to liberal manuring. W. L. D.

Sewage as a source of nitrogen supply to the soil. V. Subrahmanyan (Proc. Nat. Inst. Sci. India, 1937, **3**, 197—211).—Sewage effluents diluted with 3—5 vols. of H_2O (preferably after removal of sludge) increased the yields of a no. of crops, grass and leafy crops giving best results. Market-garden crops following irrigation with dil. sewage are not entirely free from pollution and constitute a danger to health. Forage crops may be used with safety. A. G. P.

Manuring of tea. T. Eden (Tea Res. Inst. Ceylon, Bull. 16; Malay. Agric. J., 1937, **25**, 208—209).—N is the chief yield promoter; for up to 40 lb. per acre, 1 lb. of N will produce 4—5 lb. of tea. PO_4''' up to 30 lb. per acre is also beneficial. K produces no increase, but after several years' application appears to effect an improvement in quality. L. D. G.

Magnesium requirements of sugar beet. G. Roland (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 457—467).—When deprived of Mg in sand culture beet leaves become partly chlorotic in the inter-veined areas, outside leaves showing the deficiency $>$ heart leaves. Such leaves are richer in sugar than normal leaves but the yellow patches contain no starch. The leaves are easily subject to " black-spot " disease. In the absence of P, the leaves are dark green but are subject to " brown-spot " disease, which spreads over the surface of the outside leaves. Results of analyses of soils and plants verify the above causes of these deficiency diseases. W. L. D.

Selenium absorption by crop plants as related to their sulphur requirement. A. M. Hurd-Karrer (J. Agric. Res., 1937, **54**, 601—608).—In various crop plants grown in soils treated with Na_2SeO_4 the intake of Se was directly related to that of S. The S requirement of the plant probably determines its tendency to absorb Se. A. G. P.

Requirements of agricultural plants for minor and secondary elements. J. Baeyens (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 477—488).—The parts played by Mg, Fe, Cr, Co, Al, Mn, Cu, Ti, Zn, Si, As, S, the halogens, and B in plant physiology are discussed. Certain elements (Mg, Fe, Al, Mn, Cu, Si, S) enter into the composition of the plant whilst others affect oxidation–reduction and other physical reactions. The bearing of the presence of traces of elements on the onset of diseases is discussed. W. L. D.

Minor elements in plant nutrition. P. Bertram (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 267—289).—The val. of traces of Mn, Cu, I, B, and impurities in Chili saltpetre on the growth of agricultural plants is discussed. The B contents of artificial and ore fertilisers are given. W. L. D.

Significance of copper for biological processes. E. G. Mulder (Chem. Weekblad, 1937, **34**, 433).—Very small amounts of Cu in soil can be determined by means of the colour and appearance of *Aspergillus niger* cultures grown on the sample. Land suffering from reclamation sickness has a Cu content $<2{\cdot}5 \times 10^{-6}$ g./g. and can be cured by a dressing of $CuSO_4$ (5 g./sq. m.), whilst the normal Cu content of healthy soil is $2{\cdot}5$—10×10^{-6} g./g. Wheat and oats grown on normal and sick lands showed corresponding differences in Cu contents. The low Cu content on sick land results from the removal of sol. Cu (as CuS) by H_2S-forming bacteria. Small amounts of Cu are necessary for the normal functioning of *A. niger*, *Azotobacter chroöcoccum*, and *Acetobacter aceti*. S. C.

Influence of cobalt top-dressing on the cobalt status of pasture plants. H. O. Askew and J. K. Dixon (New Zealand J. Sci. Tech., 1937, **18**, 688—693).—Application of $CoCl_2$ to soil increased the Co content of herbage. Large dressings were toxic, clover being especially sensitive. Superphosphate facilitated and CaO depressed the intake of Co by plants. Results are discussed in relation to the prevention of stock ailments. A. G. P.

Cobalt status of animal organs from South Island (N.Z.) drench experiments. H. O. Askew and J. K. Dixon (New Zealand J. Sci. Tech., 1937, **18**, 707—716).—Co administered to lambs suffering from "Morton Mains" disease is stored chiefly in the liver and to a smaller extent in the pancreas. Repeatedly drenched animals attain a level of storage similar to that of healthy animals. Co is probably transmitted from ewes to offspring. Liver-Co is examined at birth and at later stages. A. G. P.

Humidity- and temperature-control cabinet for growing plants. C. O. Grandfield and F. J. Zink (J. Agric. Res., 1937, **54**, 503—508).—Construction and use of the cabinet are described. A. G. P.

Cultivation and manuring of coconuts in Malaya. W. N. C. Belgrave and J. Lambourne (Malay. Agric. J., 1937, **25**, 179—186).—Records of six estates, taken in 1936, showed no significant response to manurial, CaO, and surface treatments given from 1931—4. A seventh estate, on poor light soil, gave a definite increase of yield with certain treatments, but not sufficient to pay for their cost. L. D. G.

Effect of phosphatic fertilisers and superphosphate–lime mixtures on turnip-seed germination. A. W. Hudson, J. W. Woodcock, and B. W. Doak (New Zealand J. Sci. Tech., 1937, **18**, 739—749).—Under low soil-moisture conditions the germination is susceptible to acidity from superphosphate or alkalinity due to excess of $Ca(OH)_2$ added either as such or in excess of that required to revert the sol. to insol. PO_4'''. The reduction of germination injury by ground limestone $\propto$ fineness of grinding. Basic superphosphate which causes a satisfactory improvement in germination is best made from hot "green" superphosphate and CaO in the proportion of 1 : 8. A method for determining H_2O-sol. PO_4''' in superphosphate–CaO mixtures is given. W. L. D.

"After-ripening" of seed. B. K. Dutt and A. G. Thakurta (Trans. Bose Res. Inst. Calcutta, 1934—5, **10**, 73—91).—The "after-ripening" dormancy (period in which seeds after reaching full maturity are incapable of germination) of seeds of a variety of *Cajanus* is reached when the moisture content is 10%. Pre-resting seeds with a moisture content of 36—40% germinate within 16—18 hr., the time for germination increasing as the H_2O content increases above or decreases below this optimum. The resting seed is capable of immediate germination by absorption of H_2O when the seed coat is removed or pricked with a pin. The seed is permeable to H_2O in the pre- and post-stage, but not in the resting stage. When the % of H_2O of the resting seed is low the length of the after-ripening period is considerably increased. P. W. C.

Relation between internal structure and photosynthetic behaviour of apple leaves. W. F. Pickett (Kansas Agric. Exp. Sta. Tech. Bull., 1937, No. 42, 58 pp.).—The structure of leaves is examined in relation to carbohydrate production in several varieties of apples. A. G. P.

Plant-breeding research and oil-seed cultivation. W. Rudorf (Fette u. Seifen, 1937, **44**, 129—136).—The effects of climate, soil, fertilisers, and selective breeding on the quality and yield of oil of various plants are discussed in relation to the problem of increasing German cultivation of suitable oil-yielding plants; experiments with certain varieties of *Lupinus albus* have given promising results. E. L.

Aspects of malting-barley breeding in Great Britain. H. Hunter (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 291—309).—A review. W. L. D.

Growing of potatoes [in Denmark]. T. Frederiksen (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 335—348).—The use of dung and liquid manure supplemented by artificial fertilisers of moderate N, low P, and high K content is described. The profitable potato varieties contain 26—28% of dry matter when manured with dung but only 23% with heavy N–P–K artificial dressings. The starch content varies with rainfall, incidence of disease, period of growth, manuring, and length of storage time before processing. W. L. D.

Potato growing in Holland. J. D. Koeslag (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 363—366).—Potatoes for starch manufacture are grown mostly on the Groningen peat soils and questions of variety and manuring are of greatest importance. W. L. D.

Artificial light in the growing of greenhouse plants. J. W. M. Roodenburg (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 331—334).—Prolonging exposure to light in winter by the use of Ne tubes working at low voltage (220—380 volts) is favourable to photosynthesis, growth, and development of plants. W. L. D.

Growing and selection of Hungarian paprika. E. Obermayer (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 426—435).—The average yield of the dry plant is 60% of pericarp or 30% of seed. The seed contains sugar 35—41, carotene 0·04, capsanthin 0·27, and fat 4—6%. The choice of soils, cultivation, and selection on a quality basis are discussed. W. L. D.

Influence of heavy nitrogenous manuring on sugar beet. K. de Haan (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 242—245).—Increasing the N dressing increases the yield of beet, sugar, and tops per acre, but lowers the sugar content slightly. The N content of the wet and dry matter of the root increases, but the polarimetric reading, *d*, and purity of the juice decrease, with increasing N manuring. The ash of the juice increases. W. L. D.

Deficiency diseases of plants. J. Dufrenoy (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 468—476).—In addition to P, N, K, Mg, and S, plants need cations capable of existing in forms of variable valency such as Mn, Fe, Cu, and Zn in traces, and B. Lack of traces of certain elements causes an accumulation of N compounds and sugars in the vacuoles of cells which predispose the plants to various infections. Other elements play a chemotherapeutic rôle in preventing infection. $M/15,000$-$Co(NO_3)_2$ prevents the growth of tumours in *Ricinus*. W. L. D.

Diseases of sugar beet, sugar cane, and cotton. J. Dufrenoy (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 438—450).—Yellowing of beet leaves is due to badly balanced nutrition and shortage of Fe. Poor growth may be due partly to shortage of Mn and Cu and "heart rot" to B deficiency. The ratios % of element in root to % in soil for the elements are: K 815, Ca 6·6, Mg 272, Mn 3·8, Na 992. For the last 25 years, the % of sugar in the root and in molasses, the yield of molasses from roots, and the N content of the sugar have regularly increased. The change in the distribution of N in the juice has consisted of a decrease of true protein but rises in amide and other harmful N compounds. Diseases of sugar cane lower the sugar yield, but increase the non-protein, protein, and K_2O contents. W. L. D.

Soil conditions in relation to little leaf or rosette of fruit trees in California. A. Kozlowski (Phytopath., 1936, 26, 1041—1049).—Incidence of little leaf is associated with denitrification or unfavourable growth conditions in the soil strata in which roots are largely distributed. Invasion of trees by the fungus follows impoverished nutrition. No toxins were detected in the soil. The curative effect of Zn is not sp., but results from its action in improving soil conditions, in modifying plant metabolism, or from its fungicidal action. A. G. P.

Brown-heart of swedes and turnips in Nelson [N.Z.] district. A boron-deficiency ailment. T. Rigg, H. O. Askew, and E. Chittenden (New Zealand J. Sci. Tech., 1937, 18, 750—755).—Analyses of healthy and affected roots showed that low B content was associated with a high % of disease. A top dressing of 56 lb. of borax per acre gave a large measure of control. W. L. D.

Disease of cultivated heaths caused by *Phytophthora cinnamomi*, Rands. E. Oyler and W. F. Bewley (Ann. Appl. Biol., 1937, 24, 1—16).—Recommended preventive measures include treatment of H_2O-tanks etc. with CH_2O, and heat-sterilisation of composts before re-use. A. G. P.

Evaluation of some [forms of] cuprous oxide recommended as seed-treatment products for control of damping-off. H. W. Anderson, K. J. Kadow, and S. L. Hopperstead (Phytopath., 1937, 27, 575—587).—Cu treatments injured seed of Cruciferæ. Preps. should normally contain $\ngtr 5\%$ of Cu_2O and should not be used in soil having $p_H < 5\cdot0$. Results with a no. of different crops are recorded.

Use of mineral oil products for control of plant diseases. J. P. Pfeiffer and P. A. Blijdorp (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 489—500).—The toxic effect of oils varies directly with their volatility, but with oils of low b.p. penetration into vegetable tissue is detrimental. Lubricating oil in emulsified form is generally used, mostly with an emulsifier. Mixed oil sprays which break rapidly on the vegetation are useful. Spreaders such as Na salts of olefine sulphuric esters are prepared from cracked heavy oils. Precautions in spraying are discussed. W. L. D.

Use of copper carbonate sprays in the cultivation of sugar beet. F. Lambermont (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 501—507).—To counteract *Cercospora* and mildews, Bordeaux and Burgundy mixtures and aq. $Cu(OH)Cl$ (16% Cu) were used as sprays in two centres (Spain). Increased sugar content of root, sugar yield per hectare, and total yield were obtained. The treatment is economical. W. L. D.

Bacterial leaf spot of begonia. L. McCulloch (J. Agric. Res., 1937, 54, 583—590).—The disease, which is favoured by warm, moist, badly ventilated conditions and rapid forcing, is caused by *Bact. flavozonatum* (n. sp.). Cultural characteristics of the organism are described and preventive measures discussed. A. G. P.

Spring treatment of autumn-harvested gladiolus cormels. F. E. Denny (Contr. Boyce Thompson Inst., 1937, 8, 351—353).—Treatment of cormels with vapour of $CH_2Cl\cdot CH_2\cdot OH$ improved germination and increased the yield of cormels at harvesting. Varieties responded differently according to the storage temp. prior to treatment. A. G. P.

Control of gooseberry rust. W. R. Saunderson and H. Cairns (Ann. Appl. Biol., 1937, **24**, 17—25).—Effective control was obtained by spraying with Bordeaux (I) or Burgundy mixture or with proprietary preps. of colloidal Cu (II) or S. (I) and (II) were the more generally satisfactory. A. G. P.

Nematode disease of bulbous iris caused by *Ditylenchus dipsaci* (Kühn, 1858), Filipjev, 1936; its control by bulb treatment. W. Newton, R. J. Hastings, and J. E. Bosher (Canad. J. Res., 1937, **15**, **C**, 175—181).—Hot-H_2O treatments (44° for 1 hr.) failed to control the nematode. Org. Hg preps. increased the yield of bulbs largely through destruction of *Penicillium* and other parasites rather than of nematodes. Fumigation with $C_2H_4Cl_2$, EtOAc, and CH_2O injured bulbs without controlling the nematode. A. G. P.

***Penicillium* rot of lily bulbs and its control by calcium hypochlorite.** K. O'Leary and C. E. F. Guterman (Contr. Boyce Thompson Inst., 1937, **8**, 361—374).—Application of $CaOCl_2$ at the rate of 160 g. per 50 lb. of soil controlled the rot (probably caused by *P. cyclopium*) and also the bulb mite *Rhizoglyphus echinopus*, F. and R. Org. and inorg. Hg dusts controlled the rot but were toxic to the lilies. $C_{10}H_8$ also gave good control but discoloured the bulbs. S, Cu, and CH_2O in liquid or dust form were not very effective. A. G. P.

Control of blight (*Phytophthora infestans*) in seed potatoes by tuber disinfection. T. N. Greeves (Ann. Appl. Biol., 1937, **24**, 26—32).—Storage losses of tubers, lifted while the sporulating organism is present on the haulm, are prevented by steeping in 0·1% aq. $HgCl_2$ for 90 min., or by dipping in org. Hg preps. Treatment, which must be carried out within 24 hr. of lifting, does not affect the subsequent sprouting of the tubers. A. G. P.

Ultra-violet absorption spectra, determined by reflexion, of some basic copper salts and other fungicides and insecticides. F. Willaume and O. Binder (Compt. rend., 1937, **204**, 1363—1365).—The position of max. absorption in the ultra-violet is determined for many basic Cu salts. J. L. D.

Zeolitic copper compounds as fungicides. A. A. Nikitin (Diss., Columbia Univ., 1937, 72 pp.).—Field trials indicate that Cu-zeolite is a promising fungicide. A Cu content of 14% is attained by making a synthetic zeolite with a $SiO_2 : Al_2O_3$ ratio of 3 : 1, and treating (at p_H 8·0) with a Cu salt before drying. For commercial production certain modifications are suggested. No sticker or spreader is necessary, but a small addition of Cu soap increases the wetting power. L. D. G.

Calcium arsenate standard. P. V. Popov (J. Chem. Ind. Russ., 1937, **14**, 600—603).—Determination of H_2O-sol. $As_2O_3 + As_2O_5$ in Cu arsenate insecticide should be preceded by fixation of free CaO in the powder by means of CO_2. Powders containing $>0·75\%$ of H_2O-sol. As oxides are toxic to vegetation. R. T.

Scientific progress in the region of chemical insecticides. L. Sprengel (Angew. Chem., 1937, **50**, 560—569).—The properties required in effective insecticides and modern methods of testing them are described. J. W. S.

Variations in toxicity of some races of *Derris elliptica*. C. D. V. Georgi, J. Lambourne, and G. L. Teik (Malay. Agric. J., 1937, **25**, 187—200).—Et_2O extracts of the roots, on a 10% moisture basis, are: Changi Nos. 1 and 2, 19·55%; Changi No. 3, 24·05%; Singapore No. 1, 14·60%. Whilst individual variations exist in rotenone content and Et_2O extract, Changi No. 3 is clearly superior to the other races. L. D. G.

Application of [fruit] sprays to expanding plant surfaces. D. E. H. Frear and H. N. Worthley (Science, 1937, **85**, 610).—The expansion of the surfaces of apples during growth, especially during early development of the fruit, is the most important single factor operating against the maintenance of an adequate deposit of Pb and As sprays for the control of chewing insects, particularly *Carpocapsa pomonella*, L. More frequent applications of spray at graded time intervals are recommended in preference to spraying at regular periods. L. S. T.

Protection of crops against acridians. M. Volkonsky (Compt. rend. Soc. Biol., 1937, **125**, 417—418).—The use of an extract of the leaves of *Melia azedarach*, L., is recommended. H. G. R.

Use of mercurated fatty compounds as weed-killers. A. W. Ralston, C. W. Christensen, and G. Josh (Oil & Soap, 1937, **14**, 5—7).—Kerosene solutions (*e.g.*, 0·1%) of compounds obtained by the action of Hg^{II} salts (acetate, nitrate, or halides) on esters of unsaturated acids, *e.g.*, Me θ-acetoxymercuri-ι-methoxystearate (from Me oleate), kill weeds rapidly (24 hr.) by destroying their root systems without causing serious damage to monocotyledonous plants (grasses etc.) provided the concn. is not excessive; the destructive action appears to be due to sp. absorption of these Hg compounds by the roots of plants containing latex, *e.g.*, of Compositæ, Asclepiadaceæ. E. L.

Applications of dyes.—See VI. **Mg silicophosphate. Fertilisers from alunite.**—See VII. **Manure from *Meconopsis* seeds.**—See XII. ***Derris* and *Lonchocarpus*. Rotenone.**—See XX.

Patents.

Insecticide. L. E. Smith, Ded. to U.S.A. (U.S.P. 2,049,725, 4.8.36. Appl., 20.3.35).—Phenoxthionine or, in general, a product obtained by heating a diaryl ether with Si in presence of a catalyst is claimed as an insecticide; it may be used in sprays or dusts. P. G. C.

Accelerating reactions.—See III. **Morpholines.**—See XX.

XVII.—SUGARS; STARCHES; GUMS.

Physico-chemical phenomena in sugar extraction. O. Spengler (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 508—520).—Conditions affecting diffusion are divided into two groups, mechanical and physico-chemical. The rate

of sugar diffusion $\propto$ temp. and inversely $\propto$ sugar content of the juice. The movement of the juice in the extractor and the efficiency of extraction with slow and rapid movement are discussed. The relationship between capacity of working, thoroughness of extraction, and purity of juice is treated.
W. L. D.

Physico-chemical conditions in the extraction of sugar juices. J. Vondrák (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 521—525).—Only one third of dissolved matter in the extracting H_2O passes into the juice. 10% of beet cells are ruptured in pulping and 40% yield their sugar to a rinsing with cold H_2O. One treatment with hot H_2O (75—80°) yields 60% of the sugar. Patches of unextracted pulp can be found in commercial extractors. Extracted pulp may contain up to 0·7% of sugar, which can further be extracted, without increasing the yield of molasses, to a 0·25% sugar level.
W. L. D.

Physico-chemical phenomena in the extraction of sugar juices. P. M. Siline (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 534—563).—The extraction of sugar from beet pulp by the countercurrent principle and the expected loss of sugar are treated mathematically. A factor, *A*, which is fairly const. for laboratory and factory work (6·45—6·55) has been deduced to express the efficiency of extraction. Beets from different sources behave differently in extraction. Frozen beet give a rate of diffusion > the theoretical rate owing to cell rupture. Geographical source and root composition give slight variations of *A*. Sources of loss of sugar in commercial practice are enumerated.
W. L. D.

Equilibria in the diffusion process of sugar beet. I. Sorgato (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 526—533).—The root cell as a diffusion apparatus and the sucrose and salt equilibria are discussed. Cold extraction does not reach an equilibrium, but, above 60°, the sugar concn. in the juice rapidly reaches that in the H_2O of the cell and the relationship is linear for the continuous extraction process. Equilibrium with the salts and colloidal materials is reached most rapidly at 90° and the diffusion is not so free as that of the sugar.
W. L. D.

Regulation of draw-off in [sugar-beet] diffusion batteries. E. Szego (Bull. Assoc. Chim. Sucr., 1937, 54, 19—27).—In the Wintzell-Weibull-Cederborg process of battery control, described, the draw-off is controlled by measuring, not the vol. of juice drawn off, but the vol. of H_2O entering the battery, and ensuring that always the same total vol. of H_2O enters between the beginning of "meichage" of one cell and that of the next. The draw-off thus depends, in a complementary way, on the vol. of H_2O entering for meichage, and may vary from cell to cell, but greater uniformity in the *d* of the juice drawn off is thus attained. The regulation of the H_2O entering is automatic.
J. H. L.

Suitability of indigenous [German] filter cloths for filtration of first-carbonatation [beet-sugar] juices. O. Spengler and E. Horn (Z. Wirts. Zuckerind., 1937, 87, 8—22).—Technical tests with cloths containing 50 and 100% of "artificial fibre," not further specified, indicated that with suitable choice of material it might be possible to use cloths made from indigenous materials in place of cotton or jute cloths.
J. H. L.

Automatic preliming [of beet-sugar juices]. D. Vračun (Z. Wirts. Zuckerind., 1937, 87, 1—7).—In apparatus described and illustrated, inflow of raw juice into the measuring tank raises a partly submerged metal cylinder suspended from one end of a centrally pivoted lever, and causes a second cylinder, suspended from the other end of the lever, to displace a proportional vol. of milk-of-CaO (I) from a const.-level vessel. The displaced (I) mixes with the juice entering the measuring tank.
J. H. L.

Brukner's barium chloride method [for determining the end-point of second saturation of sugar-beet juices]. R. Ruzicka (Deut. Zuckerind., 1937, 62, 502; cf. B., 1937, 716).—The conflicting views on this method could be best judged by means of experiments with electrometric titration. The so-called buffering alkalinity, expressed as CaO, must vary with the degree of ionisation of the acid used for titration. The suggested effect of atm. CO_2 is considered to be insignificant. The determination of buffer action by the $BaCl_2$ method, if possible at all, can be so only with optimally carbonated juices, *i.e.*, those in which the NaOH liberated by CaO has been just completely converted into Na_2CO_3.
J. H. L.

Purification of press-water from sugar-beet pulp. E. Szego (Bull. Assoc. Chim. Sucr., 1937, 54, 28—31).—After referring to the Stenzel and Hildesheim processes of purification by fermentation, the author describes the Nolte process, in which the press-H_2O first undergoes acid fermentation, then is limed to p_H 7·2—7·4, and afterwards undergoes putrefactive fermentation followed by chlorination.
J. H. L.

Chemical control [in cane-sugar factories]. E. Haddon (Bull. Assoc. Chim. Sucr., 1937, 54, 17—18).—A method of calculating the % of H_2O used in milling (imbibition) is recommended, based on a relation established by Deerr between the % and Brix of "abs. juice" (cane — dry fibre) and those of first-mill juice and mixed juice.
J. H. L.

Deposits on the steam side of the heating bodies of [sugar-factory] evaporators. K. Šandera (Z. Zuckerind. Czechoslov., 1936, 61, 110—112; Int. Sugar J., 1937, 39, 236).—Deposits were found at this point in each of two factories (*A*, *B*). That in *A* gave: loss on ignition 22·0, CuO 41·3, ZnO 31·1, Fe_2O_3 0·5, NH_3-N 0·1, and sucrose 2·0%; and in *B*: loss on ignition 13·0, CuO 40·0, ZnO 32·0, Fe_2O_3 0·5, insol. in HCl 0·1, and SO_3 4·0%. Their formation was probably to be traced to an abnormal composition of the roots, as the result of which an unusual amount of NH_3 had been present in the vapours. This had induced the formation of basic Cu and Zn compounds on the brass tubes.
J. P. O.

[Massecuite] crystallisers and their control. R. Elliott (Repts. Assoc. Hawaiian Sugar Tech., 1936, 261—262; Int. Sugar J., 1937, **39**, 240—241).—H_2O-coils do not necessarily increase the total recovery in a crystalliser. Their function is chiefly to increase the rate of crystallisation and thus the capacity of the individual units and economise in housing space. By rapidly lowering the temp. of a crystalliser, the supersaturation coeff. tends to increase and crystallisation is accelerated. A more rapid reduction of the mother-liquor purity is thus obtained, but the purity to which the mother-liquor in a given massecuite may be reduced is dependent, apart from its glucose/ash ratio, on its d or η, its circulation, and its temp. Heating to reduce η does not increase the purity of the mother-liquor if the heating equipment is of sufficient capacity to operate it at a small H_2O : massecuite temp. differential, and if the massecuite-saturation temp. is not exceeded. J. P. O.

Theoretical and technical aspects of sugar crystallisation. P. Honig (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 564—577).—Formation of grain, size and growth of crystals, graining, use of seed, rate of and practical control of crystallisation, and the shape of crystals are discussed. The formation of grain depends on the degree of supersaturation and purity of the syrup, and the lower is the purity the higher is the concn. for grain formation. The rate of crystallisation is expressed mathematically and varies directly with temp. and degree of supersaturation and inversely with η. The relationship between η and rate of crystallisation is illustrated graphically. W. L. D.

Graining of sugar crystals by seeding. K. Šandera (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 578—584).—Fine powder (10^7 grains/g.) is as advantageous as fine sugar crystals (300 grains/g.) for seeding. The latter give larger crystals and the former small crystals not homogeneous in size, but the yield is favoured by crystal seeding. The degree of supersaturation for seeding is 1·05—1·10 but this must be exceeded for syrups of low purity. Temp. and concns. likely to cause redissolution of seeding powder must be avoided. W. L. D.

New materials for construction of machinery in sugar factories and distilleries. W. H. Hatfield (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 687—693).—The steels used are divided into three groups, those with high mechanical strength, those resistant to wear and tear, and those resistant to corrosion. Analyses and mechanical properties of the steel are given and their different applications in industry indicated. W. L. D.

"The two molasses." R. Dutilloy (Bull. Assoc. Chim. Sucr., 1937, **54**, 118—121; cf. B., 1937, 75).—Present conditions restricting the output of sugar encourage the production of molasses in excess of the necessary min., containing recoverable sugar. The efficiency of the general purification processes should nevertheless be rigorously maintained, so that, when the max. output of sugar is again required it will be easy to obtain the recoverable sugar now allowed to pass into the molasses. J. H. L.

Theory of molasses formation. N. Deerr (Int. Sugar J., 1937, **39**, 178—181, 228—230).—Results obtained algebraically are presented to explain simply some of the problems connected with the separation of crystal sugar from massecuites or to interpret mathematically the operation of sugar-boiling. As the result of this analysis, molasses is defined as a mixture of a saturated solution of sugar and a solution of non-sugar, in which the constituents retain their sp. solubilities independently of each other. When the dry substance reaches a certain figure the molasses becomes unworkable, and is operatively exhausted. This condition is reached when the dry substance becomes of the order 0·8. In the case of typical cane molasses, this point corresponds with a ratio of sugar/non-sugar of ±0·6, and with a ratio of sugar/dry substance of ±0·375. In beet molasses the corresponding ratios are of the order ±1·0 and ±0·5. J. P. O.

Composition and exhaustibility of Lafeuille and U-crystalliser molasses. G. A. Guanzon and H. B. Fernandez (Sugar News, 1936, **17**, 469—475; Int. Sugar J., 1937, **39**, 240).—Molasses treated in the Lafeuille crystalliser appeared to be slightly better exhausted than that in the U-apparatus. It had a higher content of reducing sugars, but it is believed that the lower content of these in the U-crystalliser was due to their destruction in that apparatus. Probably the loss was 0·55—0·93%, but rather less in the case of the Lafeuille product. It is concluded that although the Lafeuille does not seem to yield a final molasses of much greater exhaustibility than the ordinary U-type of crystalliser, it is more economic of time and labour. J. P. O.

Technical applications of molasses in the United States. C. Pietrusky (Chem.-Ztg., 1937, **61**, 557—559).—A review.

Testing of molasses. Subject 6, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal., 1936 (Int. Sugar J., Suppl., Jan., 1937, 18—22s).—The Referee, E. Saillard, presented a crit. survey of double-polarisation methods for determining sucrose (I); he pointed out that in most methods the influence of the salts in the molasses is ignored. For the analysis of beet and cane molasses it was decided to adopt as tentative the official methods of the U.S. National Bureau of Standards, which are now official in the U.S. Customs Service and the New York Sugar Trade Laboratory. These are set out in full. For (I) determinations clarification is effected with dry Pb subacetate, and for invert-sugar determinations with neutral $Pb(OAc)_2$ followed by $K_2C_2O_4$. (I) in cane molasses is determined by method IV of Jackson and Gillis (B., 1920, 634), and (I) and raffinose in beet molasses by a plain form of the Clerget method; in both cases inversion is effected by 10-min. heating at 60°. Reducing sugars are determined by the Munson–Walker method. The official methods include one for finding the wt. per gal. of molasses. J. H. L.

Determination of the viscosity of [cane] molasses. A. Fabius (Repts. Assoc. Hawaiian Sugar Tech., 1936, 263—274; Int. Sugar J., 1937, **39**, 232).—A falling-sphere viscosimeter was devised having a pair of electrodes, the conductive path of the molasses between these forming an integral part of a Wheatstone bridge. On passing the electrodes, the ball caused a decrease of resistance, throwing the bridge out of balance. Then the p.d. was amplified, and detected by a suitable indicator. This apparatus gave results within 5% of the truth, which was considered sufficient for factory work. J. P. O.

Refining [of sugar liquors] with the use of chlorine. D. G. Aurioles (Proc. 9th Ann. Cong. Cuban Sugar Tech. Assoc., 226—228; Int. Sugar J., 1937, 39, 242).—A mixture of $Ca(OCl)_2$ and $CaHPO_4$ is caused to interact with the sugar liquor for its decolorisation, the excess of Cl being removed by means of H_2O_2. Only one filtration is required, and therefore, compared with the use of activated C, which requires two filtrations, it is more economical of filtering surface. Moreover as the reaction is effected at room temp., heating equipment is saved and steam is economised. It is claimed that the sugar made is of the highest quality without secondary products. The approx. cost of the process is 35 c. per 100 lb., all included, over the normal cost of raw 96° sugars. J. P. O.

Use of Collactivit in the sugar industry. C Veldkamp (Deut. Zuckerind., 1937, 62, 499—502).—Collactivit (I), produced by the action of H_2SO_4 on sawdust and subsequent washing-out of the acid, is a colloidal C product of hydrophilic character having decolorising and purifying action on sugar juices and exceptional filtering qualities. It is used wet and loses its activity on drying. The production of 100 kg. of (I) (dry substance) requires 170 kg. of air-dry fine sawdust and 130 kg. of H_2SO_4. In the Roosendaal beet-sugar factory 0·17% (on sugar) is added to the final thin juice, passes with this through the evaporators, and is removed from the thick juice in filter-presses, filtration being very rapid and efficient. The filter cakes from the thick juice are mixed with juice from first-carbonatation and go to waste with the second-carbonatation cake. Used thus, (I) greatly improves the quality of the sugar obtained, reduces the η of juices, facilitates filtration, and lessens frothing. It removes from the thick juice $>$ its own dry wt. of non-sugars, including a large proportion of inorg. matter. J. H. L.

Use of "Collactivit" in the sugar industry. K. Šandera (Z. Zuckerind. Czechoslov., 1937, 61, 185—191; Int. Sugar J., 1937, 39, 235—236).—See preceding abstract. Collactivit possesses a distinct power of adsorbing Ca, in addition to its decolorising properties. A criticism made of the process is the cost of the necessary H_2SO_4, the economic recovery of which does not appear to be possible. J. P. O.

Determination of the decolorising power and filtering quality of chars [for the sugar industry]. Subject 5, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal., 1936 (Int. Sugar J., Suppl., Jan., 1937, 16—17s).—The Referee, K. Smolenski, presented in outline a scheme of tests for decolorising carbons, comprising determinations of decolorising power, rate or capacity of decolorisation, rate of filtration, effect on p_H of solutions, capacity for revivification, moisture and ash contents, d, and rate of sedimentation. It was recommended that determinations of decolorising power, in comparison with a standard C, should be carried out for 1 hr. at 80° with raw sugar solution of 50° Brix, 50° Stammer, and p_H 8—8·5. Suggestions for the determination of moisture, ash, constituents sol. in H_2O, decolorising power, and filterability were made by P. Honig. H. I. Knowles, referring to bone chars in refineries, considered that tests of relative decolorising and filtering vals. are best made by individual users with the particular class of sugar product to be treated. J. H. L.

Weighing, taring, sampling, and classification of sugars. Subject 2, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal., 1936 (Int. Sugar J., Suppl., Jan., 1937, 7s).—The Referee, J. Vondrák, reported that sampling is carried out according to prescribed rules in many countries, and recommended that international methods should be drawn up on the basis of experience with these rules. The methods must be adapted to the purpose for which the samples are required and to the condition and mode of storage of the sugar. Well-closed tin containers are preferred to glass bottles for sugar samples. The Report was adopted. K. Smolenski outlined Polish practice in the sampling and classification of sugars. R. Boyd described the method of sampling and assessing the sugar content of beets in Canada. J. H. L.

Photoelectric grading of white sugars and their solutions by reflectance and transmittancy measurements. J. C. Keane and B. A. Brice (Ind. Eng. Chem. [Anal.], 1937, 9, 258—263).—The variation of reflectance of granulated white sugars with grain size and amount of colouring matter has been measured with a photoelectric apparatus using directional illumination, providing a practical method of evaluating the appearance of white sugars. A practical method of determining apparent colour and turbidity of sugar solutions by abridged spectrophotometry is described. E. S. H.

Evaluation of the refining qualities of raw cane and beet sugars. Subject 10, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, 39, 30—31s).—Recommendations proposed and reported by the Referee, O. Spengler, were as follows. In regard to raw beet sugars, the methods of the Sugar Institute of Berlin should be used to obtain a more complete evaluation of the refining val. To complete the measurement of the sugar type (colour of the sugar centrifuged under uniform conditions) employed for many years with great success in the German sugar industry, the conductometric determination of ash of the affined sugar be used as a means of judging the conditions of affination, such as the quantity of wash-H_2O and the duration of centrifuging. In regard to raw cane sugars, the methods of Harman and Honig (outlined) could be used. J. P. O.

Application of refractometer methods to sugar analysis. Subject 7, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal., 1936 (Int. Sugar J., Suppl., Jan., 1937, 22—25s).—International Tables of Refractive Indices of Sugar (sucrose) Solutions, for

20° and 28°, with temp.-correction tables covering the ranges 20° ± 10° and 28° ± 8°, submitted by the Referee, E. LANDT, were adopted. The table for 20° consists of the Schönrock–Landt 5-figure vals. (B., 1933, 1030) from 0 to 24% of sucrose, the Schönrock 4-figure vals. (1911) from 24 to 66%, extrapolated Schönrock vals. from 66 to 70%, and H. Main's vals. from 71 to 85%. The table for 28° is calc. from that at 20° by means of Schönrock's data; it does not differ from Geerligs' table for 28° by $>$0·0004 at any point, and up to 60% of sucrose the max. difference is 0·0002. The temp.-correction tables are based on Schönrock's data. J. H. L.

Analysis and evaluation of refined sugars. Subject 17, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal., 1936. (Int. Sugar J., 1937, **39**, 38—40s).—The Referee, K. ŠANDERA, reported that although refined sugars are sold in most countries on sample, refineries used the following test for controlling the quality of their wares: moisture, ash (gravimetric or conductometric), invert sugar (Kraisy or Main method), colour, and turbidity. Less frequently other tests are made, as: candy (caramelisation), determination of buffer substances by p_H titration of a 50° Brix solution, $COMe_2$-sol. substances (*e.g.*, wax), added starch in icing sugars, chlorides, colloids using the dye test, and the enumeration of thermophilic bacteria, using the methods of the National Canners' Association. Physical tests which may be made include: grain size, p_H, rate of solubility, filterability, vol.-wt., hardness, and foaming test. J. P. O.

Value of Clerget divisors for [sugar-]inversion methods. Subject 14, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, **39**, 35—36s).—Summarising new work, German investigators have redetermined the divisor for acid hydrolysis by the Herzfeld procedure at 67—70°, and have found 133·02 at 20°, which is in satisfactory agreement with Schrefeld and American workers. At 60° it would be found to be 133·00, also checking Zerban's results; for inversion with invertase the figure 132·06 was found, which confirms that of 132·1 adopted by the A.O.A.C. The Referee, F. W. ZERBAN, recommended that Jackson and Gillis' methods be adopted tentatively for the determination of sucrose in molasses, it being understood that these are to be replaced as soon as possible by the invertase method. He also recommended that further studies be made on Clerget divisors, the effect of salts on their determination, and on the temp. coeff of the divisor. J. P. O.

Elimination of errors due to lead clarification in polarising raw sugars. Subject 11, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, **39**, 32s).—After discussion, the following recommendation was considered and reported by the Referee, K. ŠANDERA: if no change in the sugar scale is or has been made, clarification shall be effected with standard Pb subacetate (I) solution (3rd Int. Comm., 1900), but if a change from the Herzfeld–Schönrock scale to the International Sugar Scale is made, then clarification shall be effected with dry (I) (Horne's "dry Pb"). J. P. O.

Determination of reducing sugars and the influence of overheating on the determination of invert sugar. Subject 4, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., Suppl., Jan., 1937, 9—16s).—In a report by the Referee, J. H. LANE, methods are considered in three classes, suitable respectively for very small, medium, and large proportions of invert sugar. In the first class, applicable to beet sugars, white sugars, etc., Herzfeld's method has already been largely superseded; it gives somewhat irregular results owing to variable superheating. It should be replaced by an international method combining the best features of the Ofner, Luff–Schoorl, and Berlin Institute methods, all of which use Cu reagents having little action on sucrose. For medium % of invert sugar, as in raw cane sugars, the Luff–Schoorl (Java) and Lane–Eynon methods appear most suitable for general use; the Herzfeld and Munson–Walker methods are less widely used for this purpose. For the determination of invert sugar in cane molasses, comparative studies should be made of the Munson–Walker, Lane–Eynon, Schoorl (Java), and Brown–Morris–Millar methods. Defecation of all classes of sugar products for invert sugar determinations should also be studied. The report was adopted. K. SMOLENSKI compared the principles of 29 recent methods for determining reducing sugars. Working descriptions are given of the Ofner (B., 1933, 166, 1076; 1934, 1115), Luff–Schoorl, and Berlin Institute (B., 1936, 1225) methods for sugars, and the Schoorl (Java) and Brown–Morris–Millar methods for molasses. J. H. L.

The 100° *S* point of the saccharimeter. Subject 8, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., Suppl., Jan., 1937, 25—28s).—The Referee, F. BATES, presented a report on the French saccharimeter scale (B., 1937, 75), tracing its history, pointing out that the present official normal wt., 16·29 g., is inaccurate, and recommending that the French authorities should adopt the val. 16·269 g., which would bring the French scale into line with the International Sugar Scale. The recommendation was approved. The following proposal by E. EINSPORN (Phys.-Techn. Reichsanstalt) was adopted. For saccharimeters used in tropical countries at t° the fundamental vals. 26·000 g., 100 metric c.c., and 2·000 dm. shall be valid at t°. The polarisation of the solution of pure sugar shall then be 100° S. The sugar val. at t°, S_t, of a quartz control plate reading S_{20} at 20° shall be found by the equation $S_t = S_{20} + aS_{20}(t - 20)$, a being a const. to be determined by the four national physical laboratories; a provisional val. determined at the Reichsanstalt is 0·000305. J. H. L.

Saccharimetric scales and their characteristics. D. SIDERSKY (Bull. Assoc. Chim. Sucr., 1937, **54**, 3—11).—Bates' recent account of the French scale (cf. preceding abstract) is quoted and the history of the Ventzke scale briefly traced. J. H. L.

Normal weights for different saccharimetric scales. D. SIDERSKY (Bull. Assoc. Chim. Sucr., 1937, **54**, 97—99).—Normal wts. of sucrose, glucose, lactose, maltose, and sol. starch (or dextrin) for the

French, "Ventzke–Herzfeld," and International scales, and also a few relevant data, are given.

J. H. L.

Standardisation of quartz control plates [of saccharimeters]. Subject 9, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, **39**, 28—30s).—The Referee, E. Einsporn, reported that, in regard to optical purity of the quartz used for control plates, it was recommended that the national physical laboratories of Washington, Teddington, Berlin, and Paris should investigate tests for fixing a quant. limit to permissible defects in homogeneity. On the plates shall be engraved "I. P." (International Plate), the no., the year, and the sign of the Testing Laboratory. The mounting shall be free from compression, and the clearance a min. The 4 laboratories shall determine the rotation of the 100° *S* plate in circular degrees for the λ produced by the Osram Na-vapour arc lamp for vals. of 25°, 50°, 75°, and 100° *S*, and sets of these be interchanged between them for comparative tests to be made.

J. P. O.

Relation between extinction coefficient and Stammer degrees. E. Landt and H. Hirschmüller (Deut. Zuckerind., 1937, **87**, 531—532; cf. B., 1933, 887).—Formulæ and data are given for calculating Stammer degrees from extinction coeffs. found with the Zeiss–Pulfrich step-photometer or the new Schmidt & Haensch trichromatic spectral colorimeter. They are considered accurate within the rather wide limits of variation in the optical consts. of reputedly similar Stammer glasses.

J. H. L.

Conductometric determination of the ash content [of sugars]. Subject 3, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal., 1936 (Int. Sugar J., Suppl., Jan., 1937, 8—9s).—The Referee, O. Spengler, reported that, with raw beet sugars, results in close agreement with the gravimetric ash are obtained with the conductometric method. Only in a small % of cases are the differences $>$ those commonly found between duplicate results by the gravimetric method. These differences between the results by the two methods are only of importance so long as the gravimetric method remains standard in the evaluation of raw sugars, for the gravimetric results do not indicate melassigenic effect better than the conductometric. The Eighth Session approved the conductometric method as a preferred alternative to the gravimetric, and in Czechoslovakia the former is now official in the evaluation of raw sugars. With raw cane sugars the two methods give much larger and more variable differences, probably owing to greater variations in the nature of the mineral matter present. [P. Honig.] With Javan raw sugars it has been found useful to determine both the gravimetric ash and the conductivity (at 20° Brix and 30°); the two vals. are not proportional, but the relation between them, illustrated by a graph, gives information of refining quality.

J. H. L.

Determination of water in sugars and sugar products by drying. Subject 15, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, **39**, 36—38).—The Referee, H. C. S. de Whalley, reported the following recommendations. For refined and normal raw sugars a method based on the following conditions be adopted as standard: vac. oven at 60°; pressure $\not>$5 cm.; oven bled with current of dry air, drying to const. wt.; dishes (2 in. diameter × 1 in. high, preferably of Al) to be metal with close-fitting lids; quantity, 10 g.; time before first weighing, 5 hr.; and subsequent weighings hourly until $<$1 mg. differences are found. For beet molasses, low-ash cane syrups, and golden syrups conditions recommended are: vac. ovens bled with dry air at 70, or preferably 60°; pressure $\not>$5 cm.; 25—30 g. of 50—60-mesh white quartz sand per 1 g. of solids; drying until 2-hourly weighings differ by $\not>$0·5 mg. This method as applied to cane molasses should be studied further. Refractometer solids, corr. for invert sugar, should be taken as equiv. to the desiccation method, and the possibility of introducing a correction based on ash or conductivity should be examined.

J. P. O.

Determination of raffinose. Subject 12, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, **39**, 33s).—The Referee, J. Vondrák, reports that in the present state of knowledge of this determination, the only methods that can be recommended for the determination of raffinose (I) depend on the use of enzymes, either a single one splitting up the trisaccharide exclusively, or two, one decomp. only sucrose (II) and the other both (I) and (II). The Osborn–Zisch method (B., 1934, 645), or any other, must be judged by its capacity always to give results in close agreement with those obtained by enzymes.

J. P. O.

Colorimetry in the sugar industry. Subject 13, 9th Sess., Int. Comm. Unif. Meth. Sugar Anal. (Int. Sugar J., 1937, **39**, 33—35s).—The Referee, V. Sazavsky, recommended that abs. measurement be introduced as far as possible into factory and commercial control, using the monochromatic light of the Hg arc at λλ 4358, 5461, and 5789 A., and also that an abs. val. of the Stammer degree suitable for the international definition be published. The old Stammer colorimeter is entirely unsuitable for colour determination when used with white light. In future it should be used only with monochromatic light obtainable with dispersion prisms or suitable filters. It will be necessary to standardise the prep. of solutions to be examined, especially their p_H.

J. P. O.

Lactose, or sugar of milk. W. L. Davies (Dairy Ind., 1937, **2**, 249—250, 264).—The chemical and physical properties and the manufacture, quality, and uses are described.

W. L. D.

Alcohol manufacture from Jerusalem artichokes. I. Saccharification of Jerusalem artichoke. Acid hydrolysis. I, II. T. Asai (J. Agric. Chem. Soc. Japan, 1937, **13**, 247—261, 331—340).—I. Inulin is easily converted into fructose by heating with dil. H_2SO_4, and at ordinary pressure 10 pts. of 0·8% H_2SO_4 at 100° for 30 min. gave 95·1% saccharification. With dried artichoke saccharification was complete at 100° in 1 hr., using 1·5% H_2SO_4; increasing the pressure to 40 lb.

shortened the time of heating. Steaming previous to the acid treatment lowered the pressure necessary and also the duration of heating. Dried artichoke is far more easily saccharified than dried potato or dried sweet potato. Lower pressures and smaller amounts of H_2SO_4 can be used for the wet artichoke.

II. Saccharification of dry artichokes is complete in ½ hr. at 100° using 0·7% HCl and in 1 hr. using 0·6% HCl. Hydrolysis occurs more easily if fresh wet artichokes are used. Preliminary cooking and heating under pressure decrease the time of heating and lower the [HCl] needed. J. N. A.

Sugars of "heavenly manna" from the Baghdad Desert. H. Colin and H. Belval (Bull. Assoc. Chim. Sucr., 1937, **54**, 12—16).—The material, consisting of brittle lumps becoming soft in a moist atm., contained about 15% of vegetable débris indicating an origin from oaks, 48—49% of sucrose, 9—10% of reducing sugars, and 10—12% of melezitose. Its composition resembled that of the Alhagi manna described by Berthelot in 1861 as an exudation from the leguminous plant *Alhagi maurorum*.

J. H. L.

Hydrolysis of potato starch paste by malt amylase at different temperatures. J. L. Baker and H. F. E. Hulton (J. Inst. Brew., 1937, **43**, 301—307).—Potato starch paste was incubated with pptd. malt amylase at varying temp. (15·5—74°) for 1 hr. and 12 hr. and the nature of the reaction products investigated. At $\ngtr$50° maltose (I) and (probably) one dextrin (II), $[\alpha]_D$ about 185—190°, are the sole ultimate products of digestion; the whole of the "apparent (I)" is fermentable by *S. cerevisiæ*. At temp. >50° maltodextrin (III) is also formed, as indicated by the fermentation of only part of the "apparent (I)" by *S. cerevisiæ*, and by vals. for reducing power and $[\alpha]_D$ of EtOH-insol. fractions intermediate between those of (I) and (II). The higher temp. restricts diastatic activity, so that (III) accumulates through failure to be hydrolysed to (I). E. A. H. R.

Determination of the p_H value of potato starch and its relation to the titratable acidity. C. von Schéele, I. Afzelius, and K. Leander (Z. Spiritusind., 1937, **60**, 163, 171).—The p_H of starch in aq. suspension is very unstable, and determinations are accordingly carried out (quinhydrone) in suspensions in 0·5*M*-KCl (25 g. of starch : 25 c.c. of solution), 15—30 min. after the suspensions are prepared. Reproducible vals. are thus obtained, but the results are higher with lower concn. of starch, or lower—approaching a limit val.—with variably increased [KCl]. The p_H vals. and titratable acidities of 70 samples of potato starch are compared. For testing starch quality, p_H determination is preferred.

I. A. P.

Bagasse.—See II. **Magnesite from dolomite.**—See VII. **Road composition from molasses.**—See IX. **Sugar beet. Potatoes.**—See XVI. **Yeast crops on sugar solutions. Determining honey diastase. Beet-sugar distillation. Gluconic acid.**—See XVIII. **Sugar beet. Sugar-beet ensilage.**—See XIX. **Sugar-factory effluents.**—See XXIII.

XVIII.—FERMENTATION INDUSTRIES.

Processes in the synthesis of yeast cell-substance, and maximal theoretical and practical yeast crops on sugar solutions. (A) H. Claassen. (B) H. Fink. (C) R. Lechner (Z. Spiritusind., 1937, **60**, [A] 156, 158, [B, C] 158).—(A) The accuracy and practical utility of earlier published equations (cf. B., 1935, 40) for calculation of the possible max. yields of yeast on media containing sugar and NH_4 salts are supported against the views of Fink and Lechner (cf. B., 1936, 1227).

(B, C) The critics maintain their position.

I. A. P.

Assimilation of nitrogen from amino-acids by yeast. R. S. W. Thorne (J. Inst. Brew., 1937, **43**, 288—293).—The fermentation of tyrosine, tryptophan, glutamic acid, phenylalanine, valine, and arginine by yeast has been studied under conditions closely resembling those of the brewery. Autolysis of the yeast was precluded. In each case the yeast splits off NH_3 from the NH_2-acid, leaving CO_2 and an alcohol (or corresponding acid). The NH_3 is assimilated but the other products are rejected and can be recovered from the fermented media in good yield.

E. A. H. R.

Effect of growth conditions on yield and vitamin-B_1 of yeast. P. L. Pavcek, W. H. Peterson, and C. A. Elvehjem (Ind. Eng. Chem., 1937, **29**, 536—541).—The yield of yeast, calc. as dry wt. % of reducing sugar, was 30% when grown on a glucose–salts medium, 35% on molasses–salts, and 40% on grain wort, the -B_1 contents of the dry substance being 3, 5, and 10 international units per g., respectively. Exclusion of air from the grain medium reduced the yield by 90%, but increased the -B_1 content threefold. Commercial yeasts contained from 5 (baker's) to 40 international units per g. dry wt. (brewer's). E. C. S.

Effect of pressure, air flow, and agitation on gluconic acid production by submerged mould growths. P. A. Wells, A. J. Moyer, J. J. Stubbs, H. T. Herrick, and O. E. May (Ind. Eng. Chem., 1937, **29**, 653—656; cf. B., 1935, 1065).—The rate of fermentation depends on the proper adjustment of these factors. The highest yields were ≡ 97% of the glucose consumed, and were obtained with *A. niger* 18 hr. after inoculation with germinated spores. With rapid fermentation the adverse effect of contaminating organisms disappears, rendering sterilisation unnecessary. E. C. S.

Determination of honey diastase. G. Gorbach and K. Barle (Z. Unters. Lebensm., 1937, **73**, 530—536).—The Willstätter–Schudel method for determination of aldoses (B., 1918, 556A) is used to determine the rate of breakdown of starch, p_H and [NaCl] being adjusted to specified vals. It is unnecessary to separate the diastase from the honey. The diastase val. is defined as the no. of mg. of maltose formed in 1 hr. at p_H 5·2 and 40° in presence of 3 c.c. of 0·1*N*-NaCl per 20 c.c. of reaction liquid by 1 g. of honey from 0·2 g. of starch. E. C. S.

Composition of the total nitrogen of various varieties of brewing barley, its changes during

ripening and germination, and its significance for protein modification. I. Influence of conditions of cultivation, variety, and nitrogen content on the division of barley protein into individual fractions. H. Fink and G. Kunisch (Woch. Brau., 1937, **54**, 193—196, 201—208, 209—212).—Using a modification of Bishop's method, total, salt-sol., hordein-, and glutelin-N have been determined in a no. of German barleys. In agreement with Bishop's findings, salt-sol. and hordein-N, expressed as a % of total N, tend to decrease and increase respectively with increasing total N. Glutelin-N shows but little variation in a given variety, and glutelin vals. for different varieties are frequently too similar to allow their use as varietal characters. The actual N partition is influenced directly by the variety, but only indirectly by cultural conditions through the effect of these on total N. Weathering and climatic conditions affect the partition within relatively narrow limits, however, conditions favouring vegetative development of the cells causing an increase in glutelin. I. A. P.

Growth, selection, and malting qualities of barleys in the northern countries of Europe. H. Thunaeus (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 311—327).—The results of the experiments of Svalöf and Abed from 1926 onwards are discussed. The best results were given by a cross of the Swedish "Gold" with the Danish "Bind" variety. In the selection, the ratio N of wort/N of malt, and the yield of malt extract, have been taken as the principal chemical characteristics. The amylase content, on which the diastatic power of malt depends, is const. for any one variety. Minor factors influencing the behaviour of the malt in the brewing processes have to be taken into account. W. L. D.

Dutch malting barleys. A. M. Söhngen (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 328—330).—The drawbacks of some varieties are discussed from the viewpoint of protein solubility and cold-temp. pptn. W. L. D.

Proteolytic activity of barley malt. S. Laufer (J. Assoc. Off. Agric. Chem., 1937, **20**, 307—330).—Proteolytic activity was determined by the rate of change of η of gelatin solutions, and by the extent of proteolysis of gelatin and edestin as determined by Willstätter titration in EtOH. The results by these three methods on any one infusion of malt did not agree, nor was there any regularity in the results with different infusions. No correlation was found to exist between proteolytic activity and the Lintner val. E. C. S.

Colorimetric method for soft resins of hops. D. E. Bullis (Ind. Eng. Chem. [Anal.], 1937, **9**, 267—270).—The results of colorimetric methods (*e.g.*, the Guthrie–Philip method; B., 1930, 1086) do not correspond closely with those obtained by gravimetric analyses, but in conjunction with physical tests they are of val. in assessing the quality of hops. The effect of concn. and presence of hops on the stability of the colour produced by UO_2 salts in MeOH solutions of the α-resin is investigated. A modified procedure is described, differing essentially in the greater $[UO_2(NO_3)_2]$ employed. E. C. S.

Yeast troubles in brewing. J. de Clerck (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 21—30).—It is suggested that weakening of yeast strain is given undue attention. The question as to whether aëration should be carried out in the fermentation processes is discussed and the importance of anti-yeast growth factors in some worts is emphasised. Difficulties of yeast propagation are minimised in absence of aëration. W. L. D.

Precautions taken with aluminium equipment [in brewing]. R. Chevillotte (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 78—85).—The purity of the Al is of prime importance and solders containing heavy metals are inadmissible. Metal surfaces must be polished for hygienic reasons. Galvanic and stray currents must be avoided. Too high a NaCl content of H_2O softened by base-exchange is harmful. $CaCl_2$ brine (30%) dissolves Al slightly, but 1—2% of Na_2CrO_4 in the brine decreases corrosive action to 4—8% of its extent in straight brine. W. L. D.

Improving the stability of beers. J. Raux (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 5—20).—Improvement consists mainly of control and standardisation of raw materials, intensive research into the exceptional qualities of some beers from grain grown under outstanding soil and climatic conditions, and barley quality. Methods of mashing, racking, and filtering need attention, and improved methods of cleaning and sterilising equipment are needed. W. L. D.

Use of fuller's earth for softening brewing liquor. W. Schaefer and M. Thomas (Woch. Brau., 1937, **54**, 196—197).—With the sample of natural H_2O investigated, fuller's earth alone was unable to effect sufficient softening; when used after prior $Ca(OH)_2$ treatment it caused a small though definite improvement, but whilst MgO was in part removed, the SiO_2 content of the liquor was increased. I. A. P.

Presence of free oxygen in beer. R. Laneau and S. Rosier (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 72—77).—Bottled beer contains 0·15—9·3 ml. of O_2 per litre. Ordinary bottled beer contains 10 ml./litre. The CO_2 content varies from 1400 to 2500 and non-CO_2 from 17 to 60 ml./litre. The influence of the method of carbonation and stoppering of bottles on the O_2 content is discussed. The free O_2 content does not depend on CO_2 content. W. L. D.

Stability of the colloids of beer. G. Chabot (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 86).—The effect of pasteurisation, aëration, modifications of methods of malting and brewing, carbonation, and physico-chemical conditions are discussed. W. L. D.

Protein problems in beer. H. Lüers (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 44—57).—Three classes of difficulties with proteins appear: from pure protein, from protein–tannin compounds, and from metal proteinates.

Ppts. of pure protein do not redissolve on warming and are due to insufficient digestion during malting, and incomplete coagulation and filtration in the racking process. Protein-tannin compounds are pptd. on cooling, but redissolve on warming. Their appearance depends on the protein and tannin level in the product, and minimising the protein content of the mash overcomes the trouble. Metal proteinates are due to Sn and Fe and are favoured by high acidity and a low content of protective colloids in the beer. Using non-corrosive metallic surfaces will overcome this difficulty. W. L. D.

Bacterial problems in beer. M. H. van Laer (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 58—71).—The various types of bacteria which can grow and cause faults in beer and the effect of physico-chemical conditions, *e.g.*, p_H, source of food, and antiseptics (EtOH and humulone), on their growth are described. W. L. D.

Problems in beers after pasteurisation. E. Helm (Trans. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 31—43).—Two faults occur after pasteurisation, viz., protein settling out in the cold and oxidation. The sensitivity of beer to cold-storage is increased by pasteurisation, but there is little effect on oxidation, which is due to dissolved O_2. The stability of beer is not influenced by the methods of malting and racking, and no relation between the N compounds and stability has been established. The effects of tannins, various adsorbents, SO_2, and proteases are discussed. W. L. D.

Comparison of production of choice alcoholic spirits from fruit mashes and expressed fruit juices. W. Zimmermann and K. Wöger (Z. Spiritusind., 1937, **60**, 161).—Parallel fermentations were carried out with or without added lactic acid (I) and without added yeast or with one of two added yeast races, using either fruit mash or expressed fruit juice. Less volatile acid is formed in presence of (I) and less with the fruit-juice fermentation than with the mash. 40 vol.-% distilled spirit was prepared from each fermentation; the flavour of spirit from (apple) juice was superior to that from the mash, whilst the former possessed a fine aroma. I. A. P.

Stabilisation of grape juice. E. J. Hugel (Bull. Assoc. Chim. Sucr., 1937, **54**, 44—47).—Known methods of preserving unfermented grape juice impair its flavour or its physiological action. Flocculation of certain constituents essential to fermentation offers a better means of preservation, and a new process on these lines is foreshadowed. J. H. L.

Proportions of glucose and fructose in grapes, must, and wines. J. Szabo and L. Rakcsányi (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 936—949).—At the commencement of ripening more glucose (I) than fructose (II) occurs, but this is reversed during ripening, and (II) is $>$ (I) in over-ripeness. (I) increases again after cutting and during drying. In must of 17—20% sugar content (I) ferments more rapidly than (II) until (II) $= 2 - 3 \times$ (I); with 20—25% of sugar, fermentation of (II) = that of (I); with 25—30% of sugar (II) ferments more rapidly than (I) and in solutions of 40—50% sugar (I) can be 2·0—2·5 × (II). EtOH does not influence the (I) : (II) ratio. In wines this ratio is similar to that in must. In low-fermented Tokay, (I) is $>$ (II). In standardised wines and in those from conc. musts, the ratio is similar to that of the corresponding light wines. W. L. D.

Nutrition of natural wine yeasts. S. Soós (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 929—935).—The addition of 0·4 g. of $(NH_4)_2CO_3$ per litre to (Hungarian) grape juice had an accelerating effect on the rates of primary and advanced fermentation, but it was found that there was sufficient N present in the juice to support yeast growth for fermenting 4 times whilst fresh juice diluted to 16 vols. also fermented satisfactorily. Addition of N cause rapid yeast growth and is recommended for sluggish fermentation. W. L. D.

Tartaric acid content and alkalinity of ash of Hungarian and American wines. G. Requinyi (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 926—928).—American wines contain higher tartaric acid content (0·5% against 0·1—0·3%) and greater alkalinity of ash. The range for Hungarian varieties is $<$ the differences between them and the American varieties. W. L. D.

Electrometric titration of acidity [of wines etc.]. R. U. Bonnar (J. Assoc. Off. Agric. Chem., 1937, **20**, 203—205; cf. A., 1932, 241).—Owing to the difficulty of ascertaining the inflexion point in the titration of wines and fruit products, it is recommended that titration should be carried out to a previously fixed end-point. E. C. S.

Effect of feed temperature on the manufacture of spirits from low-grade mash. J. Schimunek, A. Schwab, and W. Tapp (Chem. Fabr., 1937, **10**, 279—280).—In the recovery of alcohol from dil. liquors, *e.g.*, sulphite liquor, molasses, the feed liquor may be preheated in the reflux condenser, and by the exit liquor in a preheater. Condensate (and steam) from the heating coil may also be added to the exit liquor. It is shown that in such plant there is an optimum feed temp. Preheating to this, rather than to b.p., may result in a steam saving of 20%. The plate no. of the still has a max. val. at this feed temp., but extra cost involved is small compared with the saving in steam. The optimum diameter of the still also is a min. at this temp. I. C. R.

Silver in artificial ageing of brandies. E. A. Beavens, H. E. Goresline, and E. K. Nelson (Ind. Eng. Chem., 1937, **29**, 623—625).—Raw, quick-aged, and naturally aged brandies were treated for 5 days in a small ionic Ag steriliser. Considerable change in flavour and aroma took place, that at 15° and 25° being desirable, and at 45° undesirable. The treated samples were satisfactorily stored at 0—37°, but not at 45°. No significant change in the content of acids, esters, aldehydes, or fusel oil was observed, but more sediment was formed in the treated samples. E. C. S.

Problems arising in calculating vat-room plant [in beet-sugar distilleries]. J. Pérard

(Bull. Assoc. Chim. Sucr., 1937, **54**, 100—117).—A mathematical study is made of the system of beet-juice fermentation in which const. *d* is maintained in a no. of vats by continuous addition (coulage) of fresh juice, and from time to time one of the vats is set aside for the completion of fermentation and a previously empty vat is added to the series after receiving a fraction of the charge from each of the others (coupage). Theoretically the more vats there are in a series the better it is, but there is little benefit in exceeding six, the no. usually adopted. After coupage all the vats should contain the same quantity of juice. The optimum const. *d* to be maintained during coulage is about 1° [Beaumé] or below. Effects of other factors are calc. J. H. L.

Effect of vinasse on certain metals. J. Pérard and Grimaud (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 707).—Suitable metals for work on vinasse are the stainless steels, forged bronze, and monel metal. W. L. D.

Biochemistry of *Sonti* fermentation. K. R. Reddi and V. Subrahmanyan (Trans. Nat. Inst. Sci. India, 1937, **11**, 293—331).—Various methods of rice fermentation adopted in Eastern countries, the prep. of the *Sonti* seed, the possible rôle of roots and herbs incorporated with it, and the prep. and alleged medicinal val. of *Sonti Annam* (fermented rice) are discussed. The latter contains glucose (14·04%), EtOH (9·76), dextrin (1·37), lactic acid (1·83), AcOH (0·1), MeCHO (0·01), fusel oil (0·06), $C_5H_{11}\cdot OAc$ (0·12), starch (10·35), and fungus mycelium. The procedure for isolation of micro-organisms from *Sonti* seed is described, the most important organisms being *Rhizopus Sontii* (new sp. related to *R. cambodia*), a *Dematium* sp., *Saccharomyces* sp., a *Torula*, and *Micrococcus perflavus*. The influence of various factors on EtOH production, including ratio of rice to H_2O, time of fermentation, amount of seed, type of rice and method of cooking, temp. of fermentation, initial p_H of the medium, and effect of adding various sugars, sources of N, etc., is investigated. P. W. C.

Determination of methyl alcohol in alcoholic liquors. T. von Fellenberg (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 184—196).—The Denigès method, in which MeOH is oxidised to CH_2O and the colour developed with Schiff's reagent determined, is advocated. Acid concn., the amount of aq. $KMnO_4$, the quantity of EtOH present, the composition of the $NaHSO_3$–fuschin solution, and the time of heating affect the depth of colour and are standardised. W. L. D.

Manufacture of sweet cider. S. Warcollier (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 436—444).—Two methods are described. Fresh apple juice prevented from fermenting by pasteurisation, centrifuging (Sharples, 36,000 r.p.m.), SO_2, or concn. is mixed with completely fermented juice to the desired blend; or fresh juice is allowed to ferment slightly and then marketed in the flat or sweetened form. Juice defecated and fermented at 0° under a low pressure of CO_2 gives a choice product. W. L. D.

Detection and determination of heavy metals in cider. H. E. Durham (Bull. Assoc. Chim. Sucr., 1937, **54**, 129—131).—250 or 500 c.c. of the cider are treated with 5—10 c.c. of 1% $K_4Fe(CN)_6$ solution and, after mixing, with 1—2 c.c. of 0·5% gelatin solution, which, with the tannin present (or added if not present in sufficient quantity), brings about flocculation. After 12—24 hr. the liquid is filtered through ordinary filter-paper, and the ppt. allowed to drain without being washed. If Zn is not to be tested for, a more rapid method of producing flocculation of the pptd. ferrocyanides is to add 0·2 c.c. of a 20% $ZnSO_4$ solution; the liquid may then be filtered after ½ hr. The dried ppt. is incinerated if the metals sought are not volatile, or digested with HNO_3 and H_2SO_4 if they are, to decompose ferrocyanides, and the tests are carried out by known methods. Some details and precautions are given. The absence of citric and tartaric acid and $H_2C_2O_4$ in cider facilitates the complete pptn. of the metals as ferrocyanides. J. H. L.

[Alcohols from] wood distillation.—See II. **Brewing and corrosion.**—See X. **Materials for construction in distilleries. Alcohol from artichokes. Hydrolysis of potato starch.**—See XVII.

Patent.

Treatment of materials containing or secerning proteolytic enzymes. A./S. Dansk Gærings-Ind. (B.P. 464,857, 22.7.35. Denm., 26.10.34).—Proteolytic action in animal or vegetable materials may be inhibited by addition of a halogen oxy-acid, or a per-acid, or their salts; other enzymes present escape the inhibiting effect. Thus, proteolysis may be prevented in gelatin manufacture by the use of $KBrO_3$ or $(NH_4)_2S_2O_8$, whilst when using malt extract to augment the diastatic content of flour in baking the unwanted proteolysis may be almost completely eliminated by suitable addition of KIO_3 to the extract. I. A. P.

XIX.—FOODS.

Influence of lipins on quality and keeping properties of flour. A. T. Sinclair and A. G. McCalla (Canad. J. Res., 1937, **15**, **C**, 187—203; cf. B., 1935, 1160).—During ageing of flour the % absorption increases irrespective of deterioration of baking quality. Acidity also increases, but is not a good criterion of deterioration. The latter is marked by diminution of Et_2O-extractives, but is shown best by changes in quality of gluten (I), which becomes harsh, spongy, and short and is incompletely dispersed by Na salicylate. Addition of unsaturated acids to flour produces similar effects on (I), but not on baking quality. Addition of ground wheat germ to deteriorated flour improved (I) and restored its solubility. Similar effects were produced in flour deteriorated as a result of extraction with EtOH. Lipins are probably adsorbed on (I), and denaturation is possibly related to the breakdown of lipin–(I) complexes. A. G. P.

Control of insect pests in stored grain. E. A. Back and R. T. Cotton (U.S. Dept. Agric. Farmers'

Bull. [Revised], 1936, No. 1483, 35 pp.).—A *résumé*. Use of CS_2, $C_2H_4Cl_2$, CCl_4, $(CH_2)_2O$, HCN, and chloropicrin is discussed. A. G. P.

Correlation between gluten content and gluten consistency in single grains of wheat and in varieties of wheat. E. Berliner (Mühlenlab., 1937, **7**, 81—86).—The apparent weakness of the gluten in the outer layer of the grain is due to admixture with enzyme-containing fragments of embryo and aleurone cells during milling. Varieties vary both in quantity and quality of gluten, and it should be possible to evolve a wheat rich in gluten of high quality. E. C. S.

Corn [maize] proteins. J. F. Walsh (Ind. Eng. Chem., 1937, **29**, 673—674).—The composition, properties, and industrial uses of the carbohydrate-free, carbohydrate, protein, and zein fractions of the proteins are reviewed. E. C. S.

Relationship between viscosity, elasticity, and plastic strength of a soft material as illustrated by some mechanical properties of flour dough. IV. Separate contributions of gluten and starch. R. K. Schofield and G. W. S. Blair (Proc. Roy. Soc., 1937, **A**, **160**, 87—94; cf. B., 1933, 843).—Experiments indicate that gluten forms an elastic network which controls the deformation of flour dough. The " work-hardening " is explained. The network is weakened by drastic mixing of the dough, but recovers its strength on keeping. Its strength is also destroyed by addition of dil. HCl. G. D. P.

Control of rope in bread. C. Hoffman, T. R. Schweitzer, and G. Dalby (Ind. Eng. Chem., 1937, **29**, 464—467).—The determination of rope spores by the dilution method is described. Spores were found in American flours before, but not since, 1928. Yeast and malt are important sources of infection, and all ingredients of unknown origin and characteristics should be tested. Milk solids do not introduce rope, but they favour its growth. E. A. F.

Nutritive value of bread. (Miss) A. Z. Baker, (Miss) M. D. Wright, and J. C. Drummond (J.S.C.I., 1937, **56**, 191—194T).—Various samples of wheat, and of wheat products when the grain is (*a*) stone-ground, (*b*) milled, have been assayed for vitamin-B_1 by the bradycardia method. This has also been used for the assay of a no. of different breads. White bread is found to have an average val. (international units per g.) of 0·15, malt or " brown " bread 0·3—0·6, wholemeal and germ breads 1·1—1·7. These figures, taken in conjunction with estimates of bread consumption, indicate that bread to-day supplies about 60 units of -B_1 per head per day as against 550 or more units in 1840. Previous to 1870 recorded diets supplied 600—1000 units of -B_1 per day, whereas present-day diets supply 220—550 units. It is suggested that this decrease in the intake of -B_1 may be associated with nutritional disorders, and reference is made to the pathological findings in a large colony of rats kept for three years on (*a*) a diet partly deficient in -B (particularly -B_1) and (*b*) an adequate control diet; the most striking difference was in the incidence of lesions of the digestive tract in group (*a*). The question is raised whether such conditions as gastric ulcer have increased in the human population since 1870 when the decrease in -B_1 intake was initiated.

Vitamin-B_1 content of various kinds of bread and flour. L. J. Harris and P. C. Leong (J.S.C.I., 1937, **56**, 195—196T).—A summarised account of work published elsewhere (A., 1937, III, 280). Soil treatment has little significant effect on the vitamin-B_1 content of wheat or barley.

Contents of vitamin-B_1 and -B_2 complex in rye and wheat breads. L. S. Fridericia and M. Schousboe (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 48—56).—Choice rye bread contained 116 and 36, medium-quality rye bread 50—108 and 16—32, whole-wheat flour 590 and 49, whole-rye flour 252 and 60 international units of vitamin-B_1 and -B_2, respectively, in 100 g. of dry matter. Wholemeal wheat bread contained 3 times as much -B_1 as white wheat bread. W. L. D.

Methods of flour analysis. P. Nottin (Proc. 5th Internat. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 172—180).—Purity is gauged from fibre and ash content since ash rises from 0·4 to 0·6% as the milling yield increases from 57 to 83%. The figures should be interpreted on a dry-matter basis as the H_2O content ranges from 10 to 17%. For laboratory work, baking tests are lengthy. Details of methods of determination of gluten are described and the results interpreted. W. L. D.

[Determination of] bromine in flour and wheat. R. Pérez Ibáñez (Separate, Rosario, 1936, 14 pp.).—As the calcination method gives low results, Br in flour and wheat is determined by extracting 10 g. with 50 c.c. of 90% EtOH, adding 2 c.c. of 10% KOH, evaporating, and calcining at a dull red heat. The residue, which contains all the Br, is determined by the Denigès–Chelle method. F. R. G.

Determination from modified absorption spectra measurements of carotenoids in yellow maize of different varieties and qualities. G. L. Clark and J. L. Gring (Ind. Eng. Chem. [Anal.], 1937, **9**, 271—274).—The carotenoids are extracted from the ground sample with MeOH, the xanthophyll (I) esters saponified, and (I) is separated from carotene (II) and cryptoxanthin (III) by extraction with light petroleum. Each fraction is examined spectrographically by a procedure described. In nine samples analysed, (II) and (III) together formed only 1·4—6·6% of the total carotenoid content, the % being less in damaged samples. E. C. S.

New reaction for lecithin and its application to the determination of lecithin in dough products. P. Stadler (Z. anal. Chem., 1937, **109**, 168—170).—EtOH solutions of lecithin (I) give an immediate blue coloration with Mo-blue solution, that part of the coloration due to (I) being sol. in CCl_4. For the determination of (I), the dried dough is extracted with abs. EtOH, and an aliquot portion of the extract is diluted with H_2O and treated at 55° with Mo-blue solution. The solution is extracted with CCl_4, and the blue coloration of the CCl_4 layer is colorimetered. J. S. A.

Air conditioning in the milk plant. G. O. Weddell (Milk Dealer, 1937, **26**, No. 9, 40—42, 86).—Temp. and R.H. conditions of air in various sections of a milk-processing plant are suggested. W. L. D.

Effect of the atmosphere [bacterial content] on dairying. M. Fouassier (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 339—345).—The distribution and movement of air-borne bacteria as a source of milk contamination are discussed. Temp., R.H., and wind direction all play a part. W. L. D.

Use of pure bacterial cultures in dairying. T. Baumgärtel (Milch. Zentr., 1937, **66**, 177—189).—A historical survey of the methods of obtaining pure cultures is given. The variability and ecology of micro-organisms and aroma-producing bacteria are discussed. W. L. D.

Lactogenic preparations from the anterior pituitary and the increase of milk yield in cows. G. J. Asimov and N. K. Krouze (J. Dairy Sci., 1937, **20**, 289—306).—The injection of a total prep. from the anterior pituitary gave a temporary but real increase in yield. Injection in the case of 510 cows gave an increase of 7675 litres of milk of normal quality and slightly higher % of fat in 2 days. The injections are harmless and cause no undesirable after-effects. The response is greatest with well-managed cattle during the first half of lactation. W. L. D.

Efficiency of pasteurisation of milk in the high-temperature–short-time method. A. Lembke and M. Claussen (Z. Fleisch- Milchhyg., 1937, **47**, 237—239).—Total destruction of coliform organisms occurred with heating to 70° in 24 and 13 sec., followed by holding for 40 sec. Without holding, *coli* were present in $\frac{1}{10}$ ml. The time–temp. combination for *coli* to appear only in 1 ml. was 23·4 sec. to 65°, holding for 40 sec. W. L. D.

Effect of fat content on oxidised flavour in milk and cream. C. T. Roland and H. A. Trebler (J. Dairy Sci., 1937, **20**, 345—350).—The sensitivity to oxidised flavour is measured by pasteurisation of milk and cream in presence of metallic Cu; it is $\propto$ the fat content. Skim milk gives no flavour and increases of 1% in fat content give progressively greater taint. W. L. D.

Relation of acidity of milk to oxidised flavour. E. O. Anderson, L. R. Dowd, and C. A. Stuewer (Food Res., 1937, **2**, 143—150).—Neutralisation to $\ngtr$0·145% acidity prevented oxidised flavour in pasteurised milk, but neutralisation to 0·15% acidity did not prevent its development in all cases. Milk of high acidity invariably developed an oxidised flavour when pasteurised. E. C. S.

Creaming power of heated milk as influenced by denaturation of albumin and globulin. S. J. Rowland (J. Dairy Res., 1937, **8**, 194—202).—The reduction in cream vol. and the degree of protein denaturation in milk heated for 30 min. at temp. between 57° and 80° have been determined. Creaming power is equal to that of raw milk with heating at 62°, greater for temp. $<$62°, and less for temp. $>$62°, the reduction being $\propto$ % of albumin plus globulin denatured, or creaming $\propto$ residual undenatured proteins. Denaturation of globulin is the major factor reducing creaming power. W. L. D.

Variation in composition of milk of individual cows. K. Jeschki (Z. Unters. Lebensm., 1937, **73**, 505—522).—The weekly average vals. for the vol., *d*, *n*, f.p., acidity and % of fat, dry matter, and Cl of the milk from 6 cows over a period of several months towards the end of lactation are tabulated. The variations in these vals. are also recorded in terms of magnitude and frequency. E. C. S.

Composition of milk and whey. E. R. Ling (J. Dairy Res., 1937, **8**, 173—193).—Analytical data of 54 milk samples and their wheys spread over 14 months are tabulated. The a.m. samples did not differ in composition from p.m. but rennetting times were greater for the latter, due in part to longer time in cold storage. The partitions of Ca and P into sol. and insol., org. and inorg., have been determined. Disturbances occur in most constituents seasonally, especially in Jan.—Feb. and Apr.—May, the latter due to start of grazing and no. of cows in early lactation. Time of rennetting decreases with increasing serum acidity and sol. org. P_2O_5/sol. CaO, but increases with increasing sol. CaO, di- and tri-citrates, and diphosphates. Casein is associated with $Ca_3(PO_4)_2$ in a physical rather than a chemical manner and the amount so held by casein $\propto$ acidity per g. of casein. W. L. D.

Composition of mare's milk. R. G. Linton (J. Dairy Res., 1937, **8**, 143—172).—With advancing lactation, total solids, lactose, and fat increased and solids-not-fat, protein, CaO, and P_2O_5 decreased linearly. The regression of Cl, Cl–lactose no., and total solids was parabolic. The decreases of CaO and P_2O_5 were parallel and the ratio CaO/P_2O_5 remained $\sim$1 throughout the lactation period. The stage of lactation is the principal factor governing composition. Intra-mammary pressure lowers solids-not-fat, fat, lactose, and P_2O_5 but increases ash, protein, Cl, and Cl–lactose no. W. L. D.

Colour tests to distinguish ewe and cow milk. S. Kaloyéréas (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 346—347).—The whey of ewe milk is clearer and greener than that of cow milk. The ultra-violet fluorescence of ewe-milk serum, prepared by addition of a mixture of aq. NaCl and Et_2O, is strongly yellow whilst that of the cow is bluish. With aq. NH_3, ewe milk gives a mauve-violet and cow milk a grey-blue, and with EtOH or $COMe_2$ a greenish-yellow and a light yellow fluorescence, respectively. W. L. D.

Standardisation of methods of milk analysis. B. van der Burg (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 181—183).—Accurate methods of fat analysis are satisfactory, but such is not the case for moisture or total solids, and international standardisation of such methods is of val. W. L. D.

(A) Burette for formol titration. (B) Specifications of a burette for direct determination of casein in milk by the Walker method. F. H. McDowall (New Zealand J. Sci. Tech., 1937, **18**, 720—721).—The burette is graduated (A) to permit the automatic deduction of "formalin acidity," and (B) to give a direct reading of the casein content.
A. G. P.

Rapid determination of bacterial count [of milk]. W. Lorenz (Milch. Forsch., 1937, **18**, 265—279).—A method embracing modifications of the Frost "little plate" method is described. Apparatus for carrying out the test, and the technique employed, are described. Results are tabulated and statistically examined.
W. L. D.

Dairy bacteriology. VI. Pasteurisation of milk. General bacteriology. J. G. Davis (Dairy Ind., 1937, **2**, 142—144; cf. B., 1937, 611).—The effect of heating milk at different temp. on the distribution of flora is described. Raw milks of various qualities possess a different distribution of flora which has an effect on the behaviour of milk after pasteurisation. The need for quick and efficient cooling after pasteurisation is stressed.
W. L. D.

Dairy bacteriology. VII. Thermophilic and thermoduric organisms. J. G. Davis (Dairy Ind., 1937, **2**, 261—262; cf. B., 1937, 179, 281, 388, 611).—Heat-resistant and heat-loving organisms growing in milk heated to 55—63° are described.
W. L. D.

Optical equipment for bacteriological examination in the dairy laboratory. F. Leitz Ges.m.b.H. (Milch. Zentr., 1937, **66**, 161—172).—Binocular and plate-culture microscopes, projectors, and various forms of vertical cameras for photomicrographic work are described. Examples of photographed tissue sections and bacterial growths are given.
W. L. D.

Assay of vitamin-*D* in milk; duration of the assay period. W. C. Russell (J. Assoc. Off. Agric. Chem., 1937, **20**, 213—216; cf. B., 1937, 489).—The assay period may be shortened from 10 to 7 days provided the amount of milk normally fed in the first 8 days of the 10-day assay is fed as 3 separate daily feedings for the first 3 days of the 7-day period.
E. C. S.

Nutritive value of chocolate-flavoured milk. W. S. Mueller and W. S. Ritchie (J. Dairy Sci., 1937, **20**, 359—369).—The rate of consumption of fluid milk decreased as the cocoa increased above 1%. When cocoa was added to dried milk, a 1% cocoa diet was = whole milk, but higher cocoa contents retarded growth even when accompanied by greater accumulation of food residues in the caeca. 1% cocoa diets had no effect on intestinal flora or fæcal $p_{\rm H}$.
W. L. D.

Evaporation and spray systems of cooling cream. W. H. Martin, W. J. Caulfield, and A. C. Fay (Kansas Agric. Exp. Sta. Circ., 1936, No. 180, 16 pp.).—Conditions affecting the efficiency of the two methods are examined.
A. G. P.

Sour cream. Anon. (Milk Dealer, 1937, **26**, No. 9, 60—61).—Uses of sour cream in confectionery are described.
W. L. D.

Rheology of cheese, butter, and other milk products. Measurement of body and texture. J. G. Davis (J. Dairy Res., 1937, **8**, 245—264).—Rheological characteristics are defined and simple apparatus for determining deformation, elastic recovery, and flow of test cylinders of butter and cheese under different loads is described. The logs of the shear modulus (pM) and η (pV) conveniently express the respective characteristics as a compact figure and an index of springiness (pS) = $pV - pM$. These vals. have been determined for choice and ordinary cheese and butter. The application of these vals. to grading properties is discussed. Body is qualified by η and modulus, and a measure of texture or openness is afforded by measurements of work-hardening. Deformation curves of four types of cheese show the following descending order of η: Cheddar, Cheshire, Leicester, Lancashire. Guernsey is much firmer than Shorthorn butter and the working of butter increases η. The part played by the state of the H_2O in cheese is realised.
W. L. D.

Manufacture of rennet. R. H. Leitch (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 307—320).—Sources and methods of manufacture, clarification, filtration, activation, colouring, and storage of commercial preps. are described.
W. L. D.

Preparation of clear rennet. B. van der Burg and A. F. van der Scheer (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 321—324).—Crude rennet extracts are clarified by addition in succession of 10% K alum and 10% Na_2HPO_4. The Al floc is allowed to settle. The $p_{\rm H}$ is adjusted for various extracts by regulating the amount of aq. Na_2HPO_4. A $p_{\rm H}$ range of 5·3—6·3 is suggested for the final extract.
W. L. D.

Commercial dried whey. W. L. Davies (Dairy Ind., 1937, **2**, 213—215).—The compositions of liquid and of dried whey are given. The latter contains protein 12·5, lactose 71·8, ash 7·5, fat 1·2, Ca 0·59, P 0·56, and H_2O (average) 7·0%. The properties of roller- and spray-dried whey are discussed and the nutritive val. and various uses of dried whey are treated.
W. L. D.

Neutralisation of cream for buttermaking. I. Determination of $p_{\rm H}$ of cream, butter, and buttermilk. II. Estimation of titratable acidity of cream. F. H. McDowall and A. K. R. McDowell (New Zealand J. Sci. Tech., 1937, **18**, 725—732, 733—738).—I. The $p_{\rm H}$ of cream, butter, and buttermilk is determined colorimetrically by comparison with buffer solutions or in the Lovibond comparator. The serum from cream is diluted sixfold (correction factor −0·3) but that from butter is undiluted (correction factor −0·2) for buffer solutions and phenol-red; sera are diluted twenty-fold for the Lovibond comparator. The methods are suitable for the $p_{\rm H}$ range 6·5—8·0. Bromocresol-purple is used for $p_{\rm H}$ 6·0—6·4.

II. The acidity of cream is determined by titration with alkali to an end-point with phenolphthalein comparable in colour with 2 ml. of 0·0004% rosaniline acetate (in EtOH) per 9 ml. of cream. 0·5 ml. of a

1% EtOH solution of phenolphthalein should be added per 9 ml. of cream for the titration.
W. L. D.

Vitaminisation of butter. H. Herz (Dairy Ind., 1937, 2, 263).—The addition of vitamins to winter butter and of colouring matter to pale butter is discussed. W. L. D.

Influence of moulds and yeasts on the keeping quality of butter. T. R. Vernon (Dairy Ind., 1937, 2, 255—256).—Special methods for determining mould and yeast counts are described. The quality of imported butter $\propto$ yeast count but the count is not a satisfactory index of the activity of the organisms. Pasteurisation of cream largely eliminates both organisms. W. L. D.

Chemical analyses of butter for moisture, salt, curd, and fat. Amer. Dairy Sci. Assoc., Butter Analysis Commee. (J. Dairy Sci., 1937, 20, 351—357).—Methods of sampling and analysis are given.
W. L. D.

Colouring matters in dairy products. W. L. Davies (Food Manuf., 1937, 12, 199—201).—Carotene and its relation to vitamin-*A*, lactoflavin, and the uses and properties of annatto and cheese-rind colours are described. W. L. D.

Laboratory work in dairy plants. M. A. Collins (Canad. Dairy & Ice Cream J., 1937, 16, No. 4, 30—31, 71).—The duties of laboratory work as control for the quality of products are discussed.
W. L. D.

Gas requirements of moulds. I. *Penicillium Roquefortii*. N. S. Golding (J. Dairy Sci., 1937, 20, 319—343).—CO_2 inhibits the growth of several strains in different media according to $[CO_2]$ and temp. With 75% CO_2 there is total inhibition at 9° and almost total at 30°, but at 21° it is only partial. Replacement of O_2 by N_2 affects growth in different media. In air/N_2 = 1/3 growth is accelerated to a greater degree than in air at 9°. When grown in media where NaOH is allowed to absorb CO_2, all but a trace of O_2 is removed. W. L. D.

Relationship between temperature and overrun in the whipping of ice-cream mixes. A. Leighton and A. Leviton (J. Dairy Sci., 1937, 20, 371—378).—This can be expressed by: % overrun = $At + B$, where t = temp., A = rate of overrun increase with rise of temp., and B = the location of the line with relation to the co-ordinates. In practice, vals. of A of 24—48 and of B of 178—252 were obtained equiv. to 105—143% overrun (max.). If mixes are frozen at too low a temp. the relation does not hold. W. L. D.

Freezing process [for ice cream]. Anon. (Dairy Ind., 1937, 2, 279—280).—Ice and salt, surface, iceless cabinet, brine, and direct-expansion freezers are described. The advantages of continuous freezers are discussed. W. L. D.

Ice cream manufacture. II. Chemical analysis. E. L. E. Humphriss (Dairy Ind., 1937, 2, 195—197).—Methods of sampling and for the determination of fat, total solids, ash, protein, sugars, milk solids, gelatin, egg yolk, lecithin, and acidity are given. W. L. D.

Manufacture of fruit ice creams. M. J. Mack (Dairy Ind., 1937, 2, 235—236).—Clean fruit is mixed with 2—3 pts. of sugar for 12—24 hr. and added to the ice cream when coming out of the freezing chamber. The product does not withstand long storage. Pasteurisation of the fruit injures the flavour.
W. L. D.

Minnesota test for fat in ice cream. H. Nichol (Dairy Ind., 1937, 2, 284).—The protein-dissolving agent consists of Na salicylate 645, K_2CO_3 355, and NaOH 160 g. dissolved in 2840 ml. of H_2O and 945 ml. of $Pr^{\beta}OH$. 9 g. of ice cream and 15 ml. of reagent are mixed and heated to 90° in a Babcock cream test bottle and the test is completed as for milk. The results are 0·5% $>$ the gravimetric.
W. L. D.

Emulsifying reagents in the preparation of processed cheese. O. Gratz (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 335—338).—Present knowledge on the effect of alkali salts (Ca and Na_2 and Na_3 citrate, Na_3PO_4, NaH_2PO_4, Na_2HPO_4, and $NaHPO_3$) in emulsifying cheese is discussed. The best results are given by the citrates and by a mixture of Na ortho-, meta-, and pyrophosphates. Na_2HPO_4 is inferior and Ca lactate and tartrate have no effect. W. L. D.

Neufchatel and cream cheese. E. L. Reichart (Dairy Ind., 1937, 2, 136—137).—The manufacture, processing, salting, and packaging of Neufchatel (from whole milk) and cream (made from 10—20%-fat cream) cheese are described. The amounts of pimento, olive nut, and sweet pickle to flavour such cheese are given. W. L. D.

Salting of brick cheese. E. L. Byers and W. V. Price (J. Dairy Sci., 1937, 20, 307—318).—NaCl penetrates cheese from brine rapidly into the outer coating, but not uniformly until 8 weeks. The best results are obtained when 2% NaCl is present. A high NaCl content gives a hard body and slow ripening, whilst a low content of NaCl gives weak body and abnormal fermentations. Brine is superior to dry-salting. W. L. D.

Cheddar cheese. VI. Degradation of milk proteins by lactic acid bacteria isolated from cheese, alone, with sterile rennet, and with whole rennet. J. G. Davis, W. L. Davies, and A. T. R. Mattick (J. Dairy Res., 1937, 8, 238—244; cf. B., 1937, 491).—Experiments in milk show that the enzymes of commercial rennet in conjunction with lactic acid bacteria isolated from Cheddar cheese can break down protein to the same extent as in ripe cheese as far as non-protein-N is concerned. The NH_2-N is $<$ in cheese, due to the higher p_H of cheese than that of milk cultures, where acidity decreases peptidase action. W. L. D.

Lactic bacteria in relation to cheese flavour. I. I. R. Isherwood (J. Dairy Res., 1937, 8, 224—237).—Different strains of lactobacilli isolated from Cheddar cheese, when added to cheese milk, caused flavours of the desirable and objectionable type to develop. Such flavours as aromatic, Ac_2-like, metallic, bitter, unclean, or fermented were formed. Natural mixtures of lactobacilli gave unclean fer-

mented flavours. Undesirable strains are few in ordinary mature Cheddar cheese. Lactobacilli are the most important flavour-producing agents.
W. L. D.

Cheese with added meat. W. Lorenz (Z. Unters. Lebensm., 1937, **73**, 522—529).—The bacteriological examination is described. So long as perfectly fresh meat or salami is employed there is no objection on microbiological grounds to the practice.
E. C. S.

Relation between yolk index, percentage of firm white, and albumin index [in hens' eggs]. V. Heiman and L. A. Wilhelm (J. Agric. Res., 1937, **54**, 551—557).—Changes in these characteristics of eggs during storage are examined. The observed grade of eggs was closely related to the albumin index, but not to the other factors.
A. G. P.

Physical qualities of the hen's egg. V. Age and seasonal changes as factors in the rate of deterioration of the interior quality of Los Banos Cantonese eggs. F. M. Fronda and D. D. Clemente (Philippine Agric., 1937, **25**, 660—679).—Effects of seasonal conditions on quality of stored eggs are examined.
A. G. P.

Decomposition in eggs. J. Callaway, jun. (J. Assoc. Off. Agric. Chem., 1937, **20**, 155—158).—A rapid method for determining the acidity of the fat is described. The sample is diluted with aq. NaCl + EtOH and extracted twice with Et_2O + light petroleum (1 : 1). The extracted fat is taken up in $CHCl_3$, filtered, evaporated, weighed, dissolved in C_6H_6, and titrated with NaOEt in EtOH. The results compare favourably.
E. C. S.

Effect of kelp-meal feed on the iodine contents of hens' eggs. E. Sumita, A. Kawabata, and Y. Fujioka (Wiss. Ber. 6. Weltgeflügelkongr., Berlin and Leipzig, 1936, **1**, 343—346).—The I content of white and yolk of eggs is considerably increased by feeding 5—10 g. of kelp meal per bird per day. There is a very rapid increase in the I content of the white, but a much greater if somewhat delayed increase in the yolk. When kelp feeding is discontinued the I contents of white and yolk return to nearly normal within 12 days.
Nutr. Abs. (*m*)

[Determination of] ammonia-nitrogen in eggs. M. Tubis (J. Assoc. Off. Agric. Chem., 1937, **20**, 159—161).—Bandemer and Schaible's method (B., 1936, 810), with unimportant modifications, gave higher vals. than the A.O.A.C. official method, the recovery of NH_3 from $(NH_4)_2SO_4$ being $>97\%$ of the calc. val. The new method is also shorter.
E. C. S.

Technical developments in meat packing. J. J. Vollertsen and A. D. Rich (Ind. Eng. Chem., 1937, **29**, 485—488).—Recent advances in the treatment of cured meats, lard, pharmaceutical preps., and canned and refrigerated products are reviewed.
E. C. S.

Effect of addition of skim-milk powder and of alimentary casein on quality and keeping properties of sausages. Lerche (Z. Fleisch- Milchhyg., 1937, **47**, 315—320).—Addition of 2% of skim-milk powder or 4% of casein does not injure the quality, but larger amounts must not be added owing to change of taste and consistency. The H_2O-binding capacity of milk-proteins gives a drier meat. The keeping quality is not interfered with.
W. L. D.

Nitrite in cured meats. Anon. (Food Manuf., 1937, **12**, 230—231).—$NaNO_2$ is formed naturally in $NaNO_3$ pickle by bacterial reduction in amounts up to 800 p.p.m. Addition of $NaNO_2$ to pickle, at present prohibited by law, would simplify curing methods, prolong the life of cured meat, and provide the curer with an accurate means of controlling his operations.
W. L. D.

Rapid determination of nitrite in presence of large amounts of sodium chloride and organic substances in meat extracts. J. S. Lutzenko (J. Appl. Chem. Russ., 1937, **10**, 948—954).—20 ml. of extract are filtered, a saturated solution of 0·3 g. of $NH_2{\cdot}SO_3H$ is added to the filtrate + washings, and the NO_2' content is calc. from the vol. of N_2 evolved.
R. T.

Spinach and kale in frozen pack. I. Scalding tests. II. Microbiological studies. H. F. Smart and B. C. Brunstetter (Food Res., 1937, **2**, 151—157, 157—163).—I. The optimum duration of scalding pretreatment for spinach and kale was 3 and 5 min. respectively. 0·24% aq. $CaCl_2$ added to blanched spinach before freezing improved texture, colour, and flavour in some instances. 2% aq. NaCl was not satisfactory. A temp. of −9·4° was usually low enough to prevent undesirable changes, but −17·8° is safer for long periods.

II. Wide variation in microbial contents was observed in different samples of both fresh and frozen spinach and kale. Scalding, freezing, and storage at −9·4° reduced the microbial content by $>99\%$. The types were those ordinarily present on fresh vegetables.
E. C. S.

Nutritive value of marine products. VIII. Proximate analysis of canned British Columbia sockeye and pink salmon. N. M. Carter. **IX. Proximate analysis of British Columbia canned pilchard. X. Proximate analysis of ling cod.** F. D. White. **XI. Proximate analysis of canned British Columbia coho (blueback) salmon. XII. Mineral constituents of food fishes of British Columbia. XIII. Mineral constituents of the flesh, skin, bone, and free liquor in canned British Columbia coho salmon.** W. A. Riddell. **XIV. Proximate analyses of fresh British Columbia oysters.** J. P. Tully (J. Biol. Bd. Canada, 1936, **2**, 439—455, 457—460, 461—462, 463—468, 469—472, 473—475, 477—484).—VIII. Data are given for the composition of the entire contents and separate parts of a large no. of samples of canned sockeye (*Oncorhynchus nerka*) and pink (*O. gorbuscha*) salmon from different parts of the British Columbian coast. The entire contents have the following % composition: H_2O 68·6—71·5, Et_2O extract 6·8—8·8, protein 19·3—20·2, total solids 21·4—22·5, ash (free from NaCl) 1·57.

IX. The nutritive val. of canned pilchard caught in Sept. is 1090 kg.-cal./lb., whilst that of those caught in July is 768 kg.-cal./lb. The % composition of the entire contents (July and Sept., respectively) is: H_2O 68·22, 60·70; Et_2O extract 10·95, 18·88; protein 16·46, 15·85; ash (free from NaCl) 1·88, 1·64.

X. The % composition of the flesh and skin of fresh ling cod (*Ophiodon elongatus*) is: H_2O 79·2, 69·0; Et_2O extract 0·7, 0·7; protein 18·1, 26·9; ash 1·2, 2·5.

XI. The fat, protein, and NaCl-free ash contents of the entire contents of canned coho salmon (*Oncorhynchus kisutch*) caught in mid-July are $>$ those of others caught in May, June, Aug., and Sept. The % composition of the entire contents is: H_2O 72·8, Et_2O extract 4·5, protein 19·9, ash (free from NaCl) 1·4.

XII. The % composition of the ash of composite samples of canned salmon (various) and pilchard, respectively, is: CaO 10·71—15·85, 13·07; MgO 2·05—2·30, 2·11; Na_2O 12·54—20·05, 22·70; K_2O 16·91—21·62, 13·59; P_2O_5 23·91—30·00, 20·00; Cl 9·80—18·42, 25·74; SO_3 0·13—1·18, 0·34; Cu 0·0034—0·0120, 0·0032; Mn nil—0·0102, 0·0034.

XIII. The % compositions of the ash from the skin, bone, flesh, and free liquids are, respectively: CaO 13·51, 47·13, 5·30, 0·65; MgO 2·40, 3·37, 2·03, 1·86; Na_2O 9·18, 0·14, 18·09, 13·76; K_2O 17·15, 1·27, 15·75, 25·39; P_2O_5 33·31, 38·48, 23·41, 18·65; Cl 21·22, 1·68, 33·85, 48·18. The average % of skin, bone, flesh, and free liquids in the entire contents of the cans are, respectively, 6·1, 1·9, 71·3, and 20·7.

XIV. The following are the ranges and average % compositions, respectively, of the dry matter of 3 species: protein 41·71—57·90, 49·18; glycogen 11·85—29·45, 19·90; fat 6·75—15·75, 11·40; ash 5·78—12·66, 7·95. The fresh material contains 76·20—83·80% (average 80·44%) of H_2O and has an energy val. of 63·5—91·7 (average 76·37) kg.-cal. per 100 g. NUTR. ABS. (*m*)

Nutritive values of fish and beef. O. C. COMES (Quad. Nutriz., 1936, 3, 342—350).—Young rats fed exclusively on beef for 54 days cease to grow, whereas similar rats fed exclusively on sardines grow normally. The % N absorbed is 97·6 for beef and 96·9 for sardines. Growth is satisfactory when the beef is supplemented with cod-liver oil; hence the principal cause of the inferiority of beef is its deficiency in vitamin-*A*. The possibility of mineral deficiency, in particular of Ca, is not excluded. NUTR. ABS. (*m*)

Protein decomposition in salt fish during storage. B. S. ALEEV, N. E. POPOVA, and N. D. BERESHNOI (Problems of Nutrition, Moscow, 1936, 5, No. 6, 17—26).—During storage the protein content of salt fish decreases, and the content of non-protein substances and bacteria increases. The extent of bacterial growth depends on the [NaCl] and the temp. of storage. Proteolytic enzymes are only partly inhibited by salting. NUTR. ABS. (*m*)

Bacteriology of fresh marine-fishery products. F. P. GRIFFITHS (Food Res., 1937, 2, 121—134).—The subject is reviewed. E. C. S.

Tomato canning [in California]. V. CAHALIN (Food, 1937, 6, 395—396).—A continous vac. concentrator and pulp cooker are described. Pastes, pulps, and purées of 23—33% content of total solids are manufactured. W. L. D.

Canning of tomato purée [in Hungary]. C. TAXNER (Food, 1937, 6, 392—394).—The sorting, washing, grinding, screening, concentrating in vac., sterilising (100°), and packing are described. W. L. D.

Colorimetric determination of lactic acid in tomato products. F. HILLIG (J. Assoc. Off. Agric. Chem., 1937, 20, 303—307).—The method for determining lactic acid in milk (B., 1937, 489) is applied to tomato products. E. C. S.

Determination of chlorides in tomato juice. F. L. HART (J. Assoc. Off. Agric. Chem., 1937, 20, 217—219).—The method described previously (B., 1937, 493) has proved trustworthy in the hands of collaborative workers. E. C. S.

Canned vegetables. ANON. (Food, 1937, 6, 380—382).—The washing, blanching, and processing of green vegetables and mushrooms are described. W. L. D.

Preservation of fruits and legumes during transport. S. KALOYÉRÉAS (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 409—414).—The main factor governing storage is the respiratory activity, which, measured as mg. of CO_2 developed per kg. per 24 hr., varies with different fruits from 3 to 35. Respiration can be lowered by storage in air of different CO_2 content, *e.g.*, 20—40%. Optimum gas compositions for various fruits are discussed. W. L. D.

Preservation of fruits and legumes for transport. F. SCURTI (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 415—425).—The use of artificial gases for fruit storage is discussed. With bananas, N_2, O_2, and CO_2 alone did not delay spoilage. Addition of 2·5—10% of O_2 to N_2 decreased the rate of ripening, but the best results were obtained with 2·5—10% of $O_2 + 2·5—10\%$ of CO_2 in N_2 at temp. $< 18°$. W. L. D.

Composition of citrus fruit juices. J. A. ROBERTS (Ind. Eng. Chem., 1937, 29, 574—575).—The *d*, p_H, % of H_2O, citric acid, N, sugars, pectic acid, and ash, and the principal constituents of the ash of the juice of four varieties of orange, two of grapefruit, and two of tangerines are tabulated. Spectrographic analyses of the "CaO" ppt. showed the presence of traces of many metals, generally in proportion to the amounts present in the original sample. E. C. S.

Conditions of contamination by copper from apparatus and vessels in the preparation of fruit and berry products. A. M. KOGAN and K. M. NASIROVA (Problems of Nutrition, Moscow, 1936, 5, No. 5, 61—72).—Considerable contamination of fruit and berry products from grating machines, presses, and cooking vessels containing Cu occurs. NUTR. ABS. (*m*)

Standardisation of pectin analysis. A. C. SLOEP and R. RIPA (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 141—171).—The constitution of pectin is discussed. Methods of determination such as pptn. by means of Ca and

EtOH, and pectic acid and MeOH determinations, are reviewed. The method of carrying out determinations of gel strength, using various forms of viscosimeters, is described. Gelling val. is considered more important than purity, and a " limit " method is discussed. Theories of gelling are advanced.
W. L. D.

Uses and manufacture of [unfermented] grape juice. H. Gachot (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 445—451).—The juice, used for non-alcoholic drinks, infant food, and medicine, has *d* 1·072, and contains dry matter 19, sugar 15·6, and ash 0·29%. The nutritive val. saved by not fermenting into wine is stressed.
W. L. D.

Chemical composition and nutritive value of "grape honey." E. Caserio (Indust. ital. Cons. aliment., 1936, **11**, 51).—" Grape honey " (conc. grape juice) from muscat grapes contains H_2O 24, Et_2O extract 0·70, ash 0·90, total sugar (as invert sugar) 72, reducing sugar (as fructose) 66·80, total protein 0·787, sol. protein 0·787, total acidity (as malic acid) 1·50, alkalinity of ash (as g. of HCl) 0·430, P_2O_5 0·608, K_2O 0·190, CaO 0·160, Fe_2O_3 0·003, CuO 0·0005%, and a trace of Mn. Nutr. Abs. (*m*)

Commercial production of fruit syrups. V. L. S. Charley (Food Manuf., 1937, **12**, 192—195).—The manufacture of fruit juice syrup, sparkling fruit juices, and fruit squashes is described. The vitamin-*C* contents of fresh fruit juices from various soft fruits are tabulated. W. L. D.

Flavouring essences. H. S. Redgrove (Food Manuf., 1937, **12**, 190—191).—Soft drink and artificial nut flavours and essence grading are described.
W. L. D.

Staling of coffee. II. S. C. Prescott, R. L. Emerson, R. B. Woodward, and R. Heggie (Food Res., 1937, **2**, 165—173; cf. B., 1937, 837).—The isolation from roasted coffee of kahweol (cf. A., 1932, 975), Ac_2, $COEt_2$, vanillone, *p*-vinylguaiacol, guaiacol, *n*-heptacosane, 4-vinylpyrocatechol, sylvestrene, eugenol, and a hydrocarbon, m.p. 116—117°, is described. Staling is attributed in part to the oxidation and polymerisation of certain of these constituents and of furfuryl alcohol. E. C. S.

Chromatographic adsorption analysis in pharmacy. V. Examination of coffee extracts. H. Valentin (Pharm. Ztg., 1937, **82**, 527—530; cf. B., 1936, 1068).—Seven different samples of coffee have been examined. Caffeine (I) can be satisfactorily detected and determined by the method. Chlorogenic acid is present in two forms in true extracts, viz., one in combination with K and (I), which is easily sol., and another, not very sol. form, which is hydrolysed by NaOH. Quinic acid was absent from all extracts. E. H. S.

Physico-chemical investigation incidental to the study of chocolate fat bloom. I. W. Clayton, S. Back, R. I. Johnson, and J. F. Morse (J.S.C.I., 1937, **56**, 196—199t).—Fat bloom developing on stored chocolate is due to separation of higher-melting glycerides from solution in lower-melting glycerides of cacao butter. The influence of air-blown cacao butter to retard the onset of fat bloom was investigated. Cacao butter was oxidised by blowing with air at 250° until the I val. had fallen to about 20 and the mol. wt. had increased to about 1350. The blown fat has a mol. structure which leads to very highly sp. adsorption-orientation phenomena. Quant. correlation was observed of the capacity of blown cacao butter to inhibit the deposition of stearin from chilled olive oil and to retard fat bloom. Various experiments, including mobility determinations, confirm the importance of polar groups in the polymerised oxidised cacao butter and their influence on the wetting of suspended (sugar and cacao) particles in non-aq. media.

Nutmegs, mace, cloves, and pimento. P. H. Jones (Food, 1937, **6**, 383—386).—The origin, flavouring constituents, and prep. of four spices are described. Photomicrographic characteristics of powders illustrating cases of adulteration, such as with wild mace, or contamination, such as castor seed in pimento, are supplied. W. L. D.

Passage of lead into foods due to tinning. A. M. Kogan and S. L. Rochlina (Problems of Nutrition, Moscow, 1936, **5**, No. 5, 53—60).—Food cooked by ordinary methods or allowed to remain for 3 hr. or less in vessels lined with Sn containing 0·45% of Pb is not contaminated by the Pb, but after 24 hr. traces of Pb can be detected. When the Pb content of the Sn is 0·76% contamination occurs in some foods and not in others. In general, the higher is the Pb content of the lining, the greater is the risk of contamination. Nutr. Abs. (*m*)

Microscopical examination of mixed feeding-stuffs after screening and treatment with chloroform. F. Bartschat (Angew. Chem., 1937, **50**, 298—299).—The application of the method described previously (B., 1935, 876) to the determination of the constituents of mixed feeding-stuffs is outlined. The treatments necessary before the method can be used for certain varieties of feeds, viz., expressed, dried, and those containing molasses, are described.
T. G. G.

[Determination of] fluorine in foods. D. Dahle (J. Assoc. Off. Agric. Chem., 1937, **20**, 188—191).—Collaborative analyses of F in a sample of $CaHPO_4$ gave results varying from 10 to 65 p.p.m., the wide variation being due to varying conditions of distillation and to the use of $HClO_4$, which may yield volatile acid on distillation. E. C. S.

[Determination of] copper [in foods]. E. J. Coulson (J. Assoc. Off. Agric. Chem., 1937, **20**, 178—188).—Cu added, with Zn, Pb, Sn, Hg, As, Sb, and Cd, to spinach was recovered and determined by a modification of the Haddock–Evers diethyldithiocarbamate method (cf. A., 1932, 1011), which is described, with a max. error of 14·6%, but 79% of the vals. were within 5·6%. The max. error of determination of Cu added to milk was larger, owing to occlusion of Cu by the pptd. $Ca_3(PO_4)_2$. E. C. S.

Determination of small amounts of cyanide in foodstuffs after fumigation. M. M. Raines and A. I. Krupkin (J. Appl. Chem. Russ., 1937, **10**, 960—962).—0·05—0·5 mg. of HCN in 1 kg. of grain is determined by steam-distilling a suspension of the grain in aq. tartaric or citric acid, and HCN is determined colorimetrically in the distillate, using a Cu_2O photo-element. R. T.

[Determination of] colouring matters in foods. C. F. Jablonski (J. Assoc. Off. Agric. Chem., 1937, **20**, 161—165).—The results of collaborative analyses of Ponceau 3R and SX in mixtures of the two are recorded. Certain errors were due to presence of H_2O_2. E. C. S.

Determination of vitamin-*A* with the Hilger vitameter. J. B. Wilkie (J. Assoc. Off. Agric. Chem., 1937, **20**, 208—212).—A longer period of saponification with more conc. KOH is recommended. Operations are described which obviate emulsification during the extraction after saponification. A procedure is described for the extraction of fat from, and determination of -*A* in, evaporated milk. E. C. S.

Nutritive value of marine products. VII. Vitamin-*A* and -*D* potency of oils from British Columbia canned salmon. B. E. Bailey (J. Biol. Bd. Canada, 1936, **2**, 431—437).—Oils from 3 samples of canned sockeye and 3 samples of canned pink salmon were examined. One sample of each variety of oil contained 50 international units of vitamin-*D* per g. and 2 samples of each variety contained 67 units. The -*A* content of both varieties was negligible. Nutr. Abs. (*m*)

Carotene content of some Indian vegetable foodstuffs; variation due to storage. I, II. N. K. De (Indian J. Med. Res., 1936, **23**, 937—948).—The carotene (I) contents of a no. of foodstuffs are given. Storage of roots, pulses, and fruits results in increase of (I), synthesis of which continues for some time after harvesting or plucking, deterioration ultimately occurring. (I) is not appreciably affected by storage in some non-leafy vegetables that are generally consumed fresh. Leafy vegetables show rapid loss of (I) on storage, particularly at higher temp. R. N. C.

Vitamin-*C* content of some Indian foodstuffs. S. Ranganathan (Indian J. Med. Res., 1935, **23**, 239—252).—The vitamin-*C* contents of a large no. of vegetable foodstuffs are given. The -*C* content depends on the locality, season, rainfall, manuring, and the stage of growth of the vegetable. -*C* is conc. on the outside of some vegetables and fruits, but in the centre of others. -*C* is destroyed by storage more rapidly in vegetables than in fruits. Acidity in spinach falls with -*C*. R. N. C.

Vitamin-*C* content of some Indian food materials. R. K. Chakraborty (Indian J. Med. Res., 1935, **23**, 347—351).—The vitamin-*C* contents of a no. of foodstuffs which are eaten raw, and of cow, goat, buffalo, and human milk, are given. R. N. C.

Effect of storage on the vitamin-*C* potency of foodstuffs. S. Ranganathan (Indian J. Med. Res., 1936, **23**, 755—762).—Coriander, tender amaranth, and fenugreek leaves lose vitamin-*C* rapidly on storage, the rate of loss at 38° being > at room temp. Mangoes, chillies, and bitter gourds lose very little -*C* if stored while green, but after ripening an appreciable loss occurs. R. N. C.

Comparison of cod-liver oil and ultra-violet irradiation as sources of vitamin-*D* for confined laying hens. R. B. Nestler (J. Agric. Res., 1937, **54**, 571—582).—For hens kept in confinement for 2 years without direct access to daylight cod-liver oil (2% of diet) was superior to ultra-violet irradiation (15 min. daily with C arc) as a source of vitamin-*D* in respect of egg production, live wt. of hens, total wt. of eggs per hen, wt. of eggshells, and hatchability of fertile eggs. Differences in the effect of the two sources of -*D* on wt. of shells and hatchability were not significant in the second year. With cod-liver oil food consumption per bird was >, and food per egg <, with irradiation. A. G. P.

Vitamin-*K*; methods of determining its presence and quantity in agricultural products. H. Dam (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 7—12).—A method involving the measurement of the increase in the rate of coagulability of blood is used. The following units per g. of dry matter were found: cabbage, spinach, and lucerne 200—300; cereal grains 10—15; potatoes and carrots 20; pig liver 50—100; pig-liver fat 400; light petroleum extract of lucerne 25,000—50,000. W. L. D.

Difficulties in the vitamin control of proprietary food preparations. M. Bauwen (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 71—78).—With rats as test animals for -*D*, flavouring materials and considerable dilution with coconut cake cause difficulties in controlling the amount of intake and lead to false results, *e.g.*, too large an intake leading to large increases in body wt. and a rachitic condition, or *vice versa*. The examination of the Et_2O extract is preferable, but this does not overcome the effect of essential oils on the ration or their destructive action on -*D*. Owing to added Ca and P, chemical analyses are necessary in order to prepare an identical control ration. W. L. D.

Phosphatides. B. Rewald (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 400—408).—The occurrence, properties, and commercial uses of phosphatides are described. Methods of determination by the use of solvents and lecithin-kephalin separations are given. W. L. D.

Biological value of wheat gluten and of the globulin of cottonseed. M. Laporta and E. La Fratta (Quad. Nutriz., 1936, **3**, 305—312).—The biological val. of the gluten for rats is 64·4% and of the globulin 67·2%. The coeffs. of apparent and of true digestibility are 83·7% and 95·2%, respectively, for the gluten, and 76·9 and 88·0% for the globulin. Nutr. Abs. (*m*)

Relative efficiency for growing lambs of the protein in rations supplemented by soya-bean oil meal, linseed meal, or maize-gluten meal. J. I. Miller, F. B. Morrison, and L. A. Maynard (J. Agric. Res., 1937, **54**, 437—448).—No appreciable difference in digestibility, total N storage, % of digestible N stored, or biological val. of the proteins was apparent in N-balance trials with lambs. A. G. P.

Phosphorus requirements in the ration of growing pigs. C. E. Aubel, J. S. Hughes, and H. F. Leinhardt (Kansas Agric. Exp. Sta. Tech. Bull., 1936, No. 41, 86 pp.; cf. A., 1936, 756).—The min. P requirement of young pigs (50 lb.) is met by an intake of 6·5 g., and for older animals (200 lb.) 4·0 g., per 100 lb. live wt. A. G. P.

Composition and nutritive value of certain cereal hays as affected by plant maturity. J. Sotola (J. Agric. Res., 1937, **54**, 399—415).—Analyses, stem : leaf ratios, and digestibility data of wheat, barley, and oat hays are recorded. Among varieties examined the most suitable time for cutting was the medium dough stage. Young cereals afford a high-protein pasture almost identical in composition (excepting Ca and P) with legume pasture. A. G. P.

Effect of leaf hopper yellowing on the carotene content of lucerne. H. W. Johnson (Phytopath., 1936, **26**, 1061—1063).—Affected lucerne contains approx. 50% of the normal amount of carotene. A. G. P.

Science and the conservation of food. T. Macara (Proc. Roy. Inst., 1937, **29**, 657—682).—A lecture.

Storage of food for emergency of war. J. J. Piqué (Food Manuf., 1937, **12**, 183—189).—The storage temp., R.H., atm., and length of storage life of fresh, frozen, smoked, and pickled meats, poultry, game, fish, eggs, milk products, fruit, and vegetables are tabulated. W. L. D.

Storage and preservation [of foods]. F. Gerrard (Food Manuf., 1937, **12**, 241—242).—The use of preservatives in, and the storage of, sausages are discussed. Mould and bacterial growth and sweating are the chief faults in storage. The cold-storage temp. in relation to humidity and bacterial growth is discussed. W. L. D.

Preservatives in foods. T. W. Corran (Food Manuf., 1937, **12**, 232—234).—The amount and form of preservatives permissible in sausages, sausage meat, fruit juices, cordials, syrups, etc. in various countries are tabulated. The preservatives are SO_2, HBO_3, NaOBz, HCO_2H, and $K_2S_2O_5$. W. L. D.

Preservatives for foods. T. Sabalitschka (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, II, 454—455)—The esters of p-$OH{\cdot}C_6H_4{\cdot}CO_2H$ are preferable to those of BzOH and salicylic acid; their use is permitted by Norway, Hungary, Jugoslavia, Rumania, and Germany. W. L. D.

Fodder ensilage. J. van Beynum (Chem. Weekblad, 1937, **34**, 432—433).—Silage is stable when the lactic acid fermentation of sugars produces $p_H < 4{\cdot}2$. Should it not reach this val. $EtCO_2H$ fermentation is liable to occur at a progressively increasing rate due to a further decrease in p_H. Treatment with inorg. acids is not always successful on account of the difficulty of ensuring adequate distribution throughout the mass. S. C.

Ensilage of forage plants. F. Smeyers (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 198—203).—The min. loss of nutritive material during ensilage of common crops is 12—15%. The loss, which occurs mostly in the drainage, is greater in young growth than when the flowering stage has been reached. In feeding practice it is more economic to grow plants, especially those which are frost-resistant, for green winter-feeding. W. L. D.

Drying and ensilage of sugar beet and pulp. D. Sidersky (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 204—223).—The efficiency of drying beet cossettes by the De Vecchis process depends on the thickness of the layer of wet material, and the control of the temp. and vol. of the drying air. The material is dried in three stages, the temp. of the air for treatment in each compartment being regenerated in turn. Juice of 30° Brix can be easily prepared from dry pulp and the liming and carbonatation of this liquid presents no difficulty. For the drying of pulp, three methods are used, viz., by steam, combustion gases, and flue gases. No loss of nutritive val. occurs. Pit silos for pulped beet and spent pulp and other means of preserving in the wet state are described. W. L. D.

Examination of silage. E. Szonntag (Proc. 5th Intern. Cong. Tech. Chem. Agric. Ind., Holland, 1937, I, 224—232).—The Wiegner method is not satisfactory for determining the quality of silage or the fermentation process involved in making it. The determination of free volatile fatty acids can be discarded as of no val. The determination of HCO_2H and esterified acids is important and true lactic acid determined by the oxidation (MeCHO) method is valuable. Formulæ for calculation are given. W. L. D.

Chemical policemen.—See I. **Action of micro-organisms on fats.**—See XII. **Casein plastics.**—See XIII. **Tea. Potatoes. Paprika. Fruit sprays.**—See XVI. **Lactose. EtOH from artichokes.**—See XVII. **Vitamin-B_1 of yeast. Malting barley. Titrating acidity [of fruit products etc.]. Grape juice.**—See XVIII.

Patents.

Plant for drying, conditioning, and otherwise treating cereals and other substances. E. E. Curtis and J. E. Newman (B.P. 467,623, 21.5.36).—Grass or the like is transferred from one foraminous tray to another during the complete process but at any stage both trays are at substantially the same temp., the hot air or other medium being passed in parallel through the masses. B. M. V.

Regeneration of bakery products. J. Lyons & Co., Ltd., and V. L. Cohen (B.P. 462,897, 12.8.35).—Bakery products, *e.g.*, bread rolls, in which the H_2O content of the outside layers has increased by exposure to the atm. are heated in freely circulating air at 120—150° for 8—10 min. E. B. H.

Manufacture of bakery products. J. Sagi (B.P. 462,986, 18.9.35).—In bakery products prepared for diabetics, containing aërated egg-white or whole egg, $\ngtr 60\%$ of the egg may be replaced by a suspension of H_2O-sol. gum, *e.g.*, gum arabic, gum Kordofan, or gum Senegal. E. B. H.

Preparation of food products from barley, soya beans, maize, and ground nuts. C. H. Christensen (B.P. 465,884, 15.11.35).—The cereal is pulped, heated, broken down by enzymes, homogenised with a suitable oil, and then spray-dried. Glucose and/or maltose may be added before pulping.
E. B. H.

Preparation of a food product. A. F. Burgess. From Libby, McNeill, & Libby (B.P. 462,653, 7.6.35).—Starch-containing food is rendered more easily digestible by homogenising the cooked pulp at 3500 lb./sq. in., the starch grains and cellulose being thereby disrupted. The product is canned.
E. B. H.

Pasteurising apparatus for liquids [milk]. Creamery Package Manufg. Co., Ltd., H. Yates, and A. E. Page (B.P. 466,105—7, 15.11.35).—(a) The milk while flowing in bulk is passed through an initial heater, a filter, and a second heater in which the pasteurising temp. (θ) is attained, the milk is filled into separate vessels and held therein at θ for the required period, and the vessels are finally emptied through a cooler. The heating medium is at const. temp., *e.g.*, in H_2O under a definite v.p., and the control is pneumatic; a master valve is described in (b). (c) Timing is effected by a cam rotated by a const.-speed motor.
B. M. V.

Food-protecting material. H. A. Levey (U.S.P. 2,043,897, 9.6.36. Appl., 26.10.31).—Milk bottles made from cellulose material, which can be discarded after use, are proofed internally by first coating with an aq. wax emulsion at a temp. $<$ the m.p. of the wax, and then heating the whole to the m.p. of the wax.
E. B. H.

Production of edible fatty esters of synthetic origin. H. D. Royce, Assr. to Southern Cotton Oil Co. (U.S.P. 2,048,818, 28.7.36. Appl., 21.7.34).—Mixed mono- and di-glycerides, useful for improving the emulsifying and H_2O-absorptive properties of margarine and other edible fatty compositions, are made by heating a fatty oil (cottonseed oil) with 20% of glycerol at about 250° in a stream of H_2 in presence of a basic catalyst, cooling in H_2, agitating with H_3PO_4 (0·1—2·0%), and separating the clear supernatant liquid from the acid foots which settle. Further purification may be effected by vac. steam-distillation.
R. G.

Treatment of cheese. A. F. Burgess. From Kraft–Phenix Cheese Corp. (B.P. 466,517, 2.12.35).—An apparatus is described in which cheese is heated for a short time (preferably with anhyd. Na phosphate as emulsifying agent), until capable of flowing, then flash-pasteurised, and finally subjected to reduced pressure. The total processing time is $\ngtr$15 min., and it is claimed that the treatment enhances the smoothness and flavour of the cheese, and causes swelling in the casein.
E. B. H.

Manufacture of cheese from milk. B. Nowak (B.P. 467,678, 13.1.36. Ger., 12.1.35).—A small quantity of gum (*e.g.*, 0·25% of gum tragacanth) is added to the milk before treatment with rennet. It is claimed that a more complete separation of milk-proteins from the whey is thus obtained, with a consequently increased yield of cheese. E. B. H.

Egg material. B. R. Harris and M. C. Reynolds (U.S.P. 2,039,409, 5.12.36. Appl., 26.9.34).—The addition to egg contents of compounds of balanced lyophilic–lipophilic structure such as are used as anti-spattering agents for margarine, *e.g.*, sulphonated fatty acid monoglycerides or polyglyceryl esters free from choline, is claimed to improve their batter- and cake-making qualities and to prevent breakdown of colloidal structure on thawing-out after freezing.
H. A. P.

Production of a lecithin nutrient material. B. A. Rewald, Assr. to Amer. Lecithin Co. (U.S.P. 2,039,739, 5.5.36. Appl., 25.10.33. Ger., 26.11.32).—Commercial lecithin is obtained in a form that can be cut or moulded by mixing in a foam beater with 10% of sugar and 10% of a suitable nutrient, *e.g.*, cocoa powder, or by adding these substances to an aq. phosphatide emulsion from which the H_2O is evaporated and the product deodorised. Improved flavour and keeping qualities are claimed.
E. B. H.

Preservation of substances of animal origin. G. Beisser (U.S.P. 2,052,206, 25.8.36. Appl., 18.4.35. Luxembourg, 24.4.34).—Preserving pickle is introduced into the blood vessels after a lapse of $\nless$7—8 hr. from slaughter. E. B. H.

Preparation of fresh meat. W. J. Dubil, Assr. to E. J. Hubik (U.S.P. 2,052,221, 25.8.36. Appl., 13.9.35).—Meat, in the form of single pieces or smaller pieces compressed into a loaf, is frozen solid at −8° to −4°, then allowed to thaw at −1° to 0°, and cut mechanically into thin slices, which are compressed into any desired shape and re-frozen.
E. B. H.

Meat-curing composition. H. E. Allen and A. G. McCaleb (B.P. 468,799, 15.2.36).—$NaNO_2$ 1—5%, $NaNO_3$ 1—10%, Na_1 glutamate (I) 1—10%, and NaCl to complete are mixed together and towards the end of the mixing an edible adhesive, *e.g.*, maple flavour concentrate 1—3%, is added slowly to "cement" (I) to the other salts. E. B. H.

Preparation of meat sauce. O. Ungnade, Assr. to S. M. A. Corp. (U.S.P. 2,049,576, 4.8.36. Appl., 9.6.33).—A suitable protein, such as casein, is hydrolysed by HCl of const.-boiling concn. in presence of phosphate or filter cake from the prep. of lactose, both of which accelerate the rate of hydrolysis while the latter gives a desirable dark colour to the end-product. The hydrolysate is conc. under vac., neutralised, and filtered. E. B. H.

Preventing moisture from depositing on cold-stored goods. Deuts. Kühl- & Kraftmaschinen-Ges.m.b.H. (B.P. 467,438, 16.12.35. Ger., 15.12.34).—Prior to removal from cold storage the goods are placed in sealed waterproof sacks or other containers, preferably of low heat-conductivity, and are left in them until they have attained room temp. [Stat. ref.]
B. M. V.

Treatment of fruit. R. B. Harvey, Assr. to Food Machinery Corp. (U.S.P. 2,049,563, 4.8.36. Appl., 20.10.32).—The colour of pale oranges is deepened by application of an oil emulsion containing an authorised orange food colour. Growth of mould is retarded by incorporating Cu oleate, palmitate, or stearate, or thymol. To detect abrasion, 0·25 pt. of H_2O-sol. Brilliant-blue in 437·5 pts. of soap solution may be further mixed with the emulsion. E. B. H.

Method of conditioning fruit. A. E. Nelson, Assr. to California Fruit Growers Exchange (U.S.P. 2,042,857, 2.6.36. Appl., 1.5.33).—Citrus fruit is washed in a detergent solution and treated while still wet with an aq. emulsion containing 1—5% of waxy components (carnauba or paraffin wax), this concn. being maintained by further additions of more conc. emulsion. Machinery is described. E. B. H.

Removal of insecticidal residues from fruits and vegetables. (a, b) R. H. Carter and (b) J. E. Fahey, (a, b) ded. to U.S.A. (U.S.P. 2,046,546 and 2,046,548, 7.7.36. Appl., [a, b] 23.5.34).—Insecticidal residues containing F are removed from deciduous fruits and from vegetables by washing in aq. 0·1—2·5% HCl or H_2SO_4 containing (a) Al chloride or sulphate (1—5%), (b) H_3BO_3 (from 1% to > that required for a saturated solution), and finally rinsing in H_2O. Heat accelerates the action. E. B. H.

Production of pectin. P. Hirsch (B.P. 466,356, 26.11.35).—H_2O-sol. pectin (I) is produced by treating vegetable matter with an org. solvent (MeOH, EtOH, AcOH) to dissolve the substances accompanying (I) but in which (I) is insol., in the presence of an acid. The (I) may then be extracted by H_2O. E. B. H.

Flavouring material. A. A. Lund, Assr. to Royal Baking Powder Co. (U.S.P. 2,046,567, 7.7.36. Appl., 16.8.32).—The quality of the flavour used for crystal jellies etc. is preserved by incorporating it in a glucose fondant boiled to contain 9—30% of H_2O, cooled to 15—36°, and crystallised in a fondant machine after addition of the flavour. E. B. H.

Preservation of food substances. Autoxygen, Inc., Assees. of V. R. Kokatnur (B.P. 466,158, 24.7.35. U.S., 1.8.34).—In the foodstuff is incorporated 0·1—2·0% of an org. peroxide, preferably of one of the constituents of the foodstuff, *e.g.*, butyryl or a fatty acid peroxide in milk, a fruit acid peroxide in fruit and vegetables. The mixture should be kept in chilled, sealed containers. Slight bleaching will occur but freshness will not be impaired. E. B. H.

Treating plastics.—See XIII. **Proteolytic enzymes.**—See XVIII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Cholesterol and oxycholesterol as [cosmetic] emulsifying agents. H. S. Redgrove (Ind. Chem., 1937, **13**, 264—265).—A review. E. L.

Properties of *Strychnos* extracts prepared from curare. F. W. Freise (Pharm. Ztg., 1937, **82**, 577—578; cf. A., 1936, 1278).—The significance of the constituents of foreign plants mixed with curare for the prep. of *Strychnos* extracts is discussed. Extracts of the following are described: *Trymatococcus amazonicus*, Poepp (contains an *alkaloid*, $C_{23}H_{29}O_2$, m.p. 204°, α_D −55° 40′), *Elissarrhena grandifolia* (Eichl.) (3·65% of *alkaloid*, $C_{22}H_{28}N_2O_4,H_2O$, subl. 185°), *Elæophora abutifolia*, Ducke (plant contains 1·7—1·9% of alkaloid similar to or identical with cytisine), "Angolabaum, páo d'Angola" sp. (contains an *alkaloid*, $C_{18}H_{23}N_2O_3$, α_D 0·0), stems of species of *Eucerœa nitida*, Mart. (contain a cyanogenetic glucoside). E. H. S.

Determination of rotenone. W. M. Seaber (J.S.C.I., 1937, **56**, 168—173T).—Comparisons have been made by the use of various solvents for extraction of the roots. $CHCl_3$ is recommended as the best solvent and the process of Beach (B., 1936, 858) is preferred. The use of $CHCl_3$ gives higher % of rotenone (I) than those obtained when CCl_4 is used, and in some cases the differences are very large. Methods for obtaining the purity of the (I) complex are considered and the use of polarisation is recommended for commercial purposes. The ultra-violet absorption curve of (I) is given. There is a max. at about 293 mμ.

Differentiation of *Derris* and *Lonchocarpus* powders. A. Diakonoff (Pharm. Weekblad, 1937, **74**, 901—909).—The powders are differentiated by the size of the starch grains, *Derris* being the smaller. S. C.

Nicotine content of Chinese tobaccos. H. Y. Fang, C. L. Liu, and P. P. T. Sah (Sci. Rep. Nat. Tsing Hua Univ., 1937, **4**, A, 53—54).—Ten varieties of Chinese tobacco contained 0·66—2·7% of nicotine, the smaller amounts being in the cheaper kinds. R. S. C.

Occurrence of a number of varieties of *Eucalyptus radiata* (*E. numerosa*) as determined by chemical analyses of the essential oils. II. A. R. Penfold and F. R. Morrison (J. Proc. Roy. Soc. New South Wales, 1937, **70**, 375—377; cf. B., 1933, 124).—The essential oil from the leaves of *E. radiata* (type) was fairly const. in composition (d_{15}^{15} 0·8815, $[\alpha]_D^{20}$ −43·7°, n_D^{20} 1·4778, piperitone content 3%) but that from leaves from two separate stems of variety *A* had respectively d_{15}^{15} 0·8983, 0·9051, $[\alpha]_D^{20}$ −34·5°, −56·2°, n_D^{20} 1·4792, 1·4799, piperitone content 18%, 50%, whilst only one contained the usual high content of phellandrene. Blakely's variety *stenophylla* cannot be an independent variety since it has been found growing on *E. radiata*. S. C.

Various [essential oils]. Schimmel & Co. (Ann. Rept., 1936, 7—8, 26, 76, 87—88).—Characteristics of oils from *Ocimum basilicum*, L., and var. *selasih hidjan* (Java), *O. pilosum*, *O. canum*, Sims, and Java basilicum oil are given. A sample of dill-herb oil (d^{15} 0·8957, α_D +88° 37′, n_D^{20} 1·48364) was sol. in 9·5 vols. of 80% EtOH and contained 37% of carvone; it was adulterated with caraway oil. Two samples of commercial sassafras oil consisted of camphor oil fractions containing safrole. A sample of wormwood oil, probably adulterated, had d^{15} 0·9232, α_D −12° 10′, n_D^{20} 1·46191, acid val. 2·8, ester val. 9·3 (after acetylation 37·3), solubility in 80% EtOH, 1 in 0·9 vol., and contained 60·9% of thujone. E. H. S.

Essential oil from fruit of *Pittosporum monticolum*, Miq. A. J. Ultée (Pharm. Weekblad, 1937, **74**, 666—669).—The fruits afforded 0·6% of an oil (d 0·8611—0·9131, n_D 1·4811—1·4735, $[\alpha]_D$ +1·5° to −38·02°, according to place of origin) consisting mainly of α-pinene with small amounts of β-pinene. S. C.

Rotatory dispersion of essential oils. N. A. Valjaschko and J. G. Borisiuk (Ukrain. Chem. J., 1937, **12**, 245—247).—The dispersion coeffs. of a no. of essential oils are recorded; they vary from 1·93 to 2·28. R. T.

Determination of the volatile oil content of vegetable materials. H. J. van Giffen (Pharm. Weekblad, 1937, **74**, 812—829).—The various factors affecting the accuracy with which the volatile oil content of vegetable materials can be determined have been studied and the following method has been evolved. A quantity of powdered material containing 100—200 mg. of oil is boiled under reflux for 1 hr. with 50 c.c. of light petroleum, cooled, and filtered through a small filter placed inside a larger one. The filter is washed with 15 c.c. of solvent and again extracted, together with its contents, three times with 25 c.c. of boiling light petroleum. The combined filtrates and washings are evaporated to 10 c.c. at 50° and the residue is transferred with 15 c.c. of petrol and 425 c.c. of H_2O to a 1-litre flask containing 60 g. of NaCl. The mixture is distilled until NaCl starts to crystallise and the condensate is collected at $\not>$20°. The condenser is washed down with 3 × 5 c.c. of light petroleum, the distillate treated with 120 g. of NaCl, and the solvent layer separated. The aq. layer is extracted with 15 c.c. of petrol, and finally shaken with 1 g. of norit and filtered. The petrol extract is dried with 5 g. of Na_2SO_4 and filtered into a tared, 100-c.c. wide-mouthed Erlenmeyer flask containing 1 g. of liquid paraffin, and is followed by 3 × 5-c.c. washings from the separating funnel and the filter containing the norit. The solvent is distilled at $\not>$50° and the residue (10 c.c.) dried to const. wt. at room temp. in a stream of dry air (300 c.c./min.), weighings being made after each 500 c.c. of air after the residue has reached about 2 c.c. The residue is free from solvent when the difference between successive weighings is $\not>$5 mg. A table is given showing the results obtained on representative samples by the above method and the two official Dutch methods. The latter usually give lower results. S. C.

Diacolation.—See I. **Sensitive reaction for dulcin.**—See III. **Applications of dyes.**—See VI. **Lactogenic preps. Meat packing. Chromatographic analysis. Carotene in Indian foods. Vitamins.**—See XIX.

Patents.

Production of alkaline-earth metal aurothioglycollates. R. Delange, Assr. to Fabr. de Prod. de Chimie Organique de Laire (U.S.P. 2,049,198, 28.7.36. Appl., 16.6.33).—Dithioglycollic acid is reduced to thioglycollic acid, b.p. 110—115°/18 mm. (*Et* ester, b.p. 53°/17 mm.; *amide*, m.p. 52°), which with $NaAuCl_3$ gives the S-*Au*^{I} salt, converted by $CaCl_2$ into *Ca aurothioglycollate*, of which a 10% solution in oil is of therapeutic val. The prep. of the corresponding *Sr* and *Mg* salts and of the *Et* and *ethylene glycol* esters from the alkylthioglycollates is also described. R. S. C.

Anæsthetics. W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 467,026, 9.12.35).—Anæsthetic solutions based on aminobenzoic alkamine esters, which are isotonic and isoionic with and have the same osmotic pressure and η as blood-serum, are obtained by adding the correct amounts of all salts occurring in blood. Methylhydroxyethylcellulose (physiologically indifferent) may be used to increase the η. *E.g.*, p-$NH_2 \cdot C_6H_4 \cdot CO_2C_2H_4 \cdot NEt_2$,HCl (2 g.), K_2SO_4 (7), KCl (32), NaCl (400), glucose (100), $NaHCO_3$ (234), $CaCl_2$ (30), $MgCl_2$ (11), and Na_2HPO_4 (7·5 mg.) are made up to 100 g. by H_2O. R. F. P.

Manufacture of derivatives of 3 : 17-diols of the *cyclo*pentanopolyhydrophenanthrene series. W. P. Williams. From Schering–Kahlbaum A.-G. (B.P. 467,161, 9.9.35).—17-Alkyl or -acyl derivatives of *cyclo*pentanopolyhydrophenanthrene-3 : 17-diols are obtained by mild hydrolysis of 3 : 17-disubstituted derivatives, the substituent attached to $C_{(3)}$ being chosen as more easily removed than that attached to $C_{(17)}$. Acetylation of the 3-*CPh_3 ether* of androstene-3 : 17-diol (I), obtained by reduction of the CPh_3 ether of dehydroandrosterone (II), gives the 3-*CPh_3 ether* 17-*acetate* of (I), m.p. 161°, which on hydrolysis with $COMe_2$–N-H_2SO_4 yields the 17-*acetate* of (I), m.p. 146°. CPh_3Cl and the 3-acetate of (I), obtained by the reduction of the acetate of (II), afford the 17-*CPh_3 ether* 3-*acetate* of (I), hydrolysis of which with 2% EtOH–KOH yields the 17-*CPh_3 ether* of (I). 17-Chloroandrosten-3-ol acetate with dil. MeOH–KOH at room temp. affords 17-*chloroandrosten*-3-*ol*, m.p. 156°. R. F. P.

Manufacture of unsaturated neutral oxidation products of stigmasterol compounds. Schering–Kahlbaum A.-G. (B.P. 467,376, 13.7.36. Ger., 13.7.35).—Stigmasteryl acetate and CrO_3–AcOH at room temp. give a *keto-alcohol acetate* (I), $C_{31}H_{48}O_3$, m.p. 180—182°, and a non-ketonic *substance* (II), $C_{31}H_{50}O_5$, m.p. 192—193°. Hydrolysis of (I) gives the *keto-alcohol*, m.p. 98—103° (*semicarbazone*, m.p. 226—228°), and of (II) gives a *substance*, $C_{29}H_{48}O_4$, m.p. 252—253° (*acetate*, m.p. 243—245°). R. S. C.

Manufacture of unsaturated diketones related to the corpus luteum hormone. Schering–Kahlbaum A.-G. (B.P. 467,482, 12.9.35. Ger., 12.9. and 31.10.34).—Pregnanol-3-ones, having on $C_{(20)}$ a free or potential *sec.*-OH, are converted into αβ-unsaturated ketones by halogenation and subsequent removal of HHal. Pregnanedione (I) and Br–$CHCl_3$ give a compound, converted by hot C_5H_5N into *pregnenedione* (II), *forms*, m.p. 121° and 128·5° [*dioxime*, m.p. 244° (decomp.)] (1 rabbit unit = 0·4—0·7 mg.); Br in AcOH containing a little HBr gives a *substance*, $C_{21}H_{31}O_2Br$, m.p. 186—187° (decomp.), converted by C_5H_5N into (II). Pregnan-20-ol-3-one acetate (III) and Cl–$CHCl_3$ give a substance, converted by quinoline at 150—180° and subsequent hydrolysis into pregnenolone. Pregnan-20-ol-3-one and Br–AcOH give the 4-*Br*-derivative, m.p. 185° (decomp.), converted by hot C_5H_5N into Δ^4-*pregnen*-20-*ol*-3-*one* (IV), m.p. 159°, $[\alpha]_D^{20}$ +89·7° in EtOH. *allo*Pregnane-

3 : 20-dione and Br–HBr–AcOH give a *Br*-derivative, m.p. 199° (decomp.), converted by 21% KOAc–AcOH into Δ^1-allo*pregnene*-3 : 20-*dione*, m.p. 140°, $[\alpha]_D^{23}$ +68·6° in EtOH (absorption band at 235 mμ). Cl_2–CCl_4, followed by quinoline, converts (I) into (II). Br–HBr–AcOH converts (III) into a *Br*-derivative, m.p. 167°, which with C_5H_5N gives (IV). R. S. C.

Manufacture of dihydrofollicle hormone. Schering–Kahlbaum A.-G. (B.P. 467,107, 10.12.35. Ger., 11.12.34. Addn. to B.P. 428,132; B., 1935, 655).—Dihydrofollicle hormone is obtained by treating aq. alkaline solutions of the hormone itself with finely-divided metals, especially Raney Ni and Al powder, which evolve H_2 with aq. alkali. R. F. P.

Iodised bile acids. P. Goedrich (B.P. 466,896, 12.12.35. U.S., 15.12.34).—Ox-gall bile acids, *e.g.*, glyco- and tauro-cholic acids, absorb an excess of I. The I-compounds, which are powerful, non-irritant germicides, are prepared either by addition of an excess of I to solutions of the acids in CS_2 or to an EtOH-extract of ox-gall in H_2O, EtOH, or CS_2, or by grinding the gall with I. "Iodoglycocholic" acid is insol. in H_2O but by conjunction with the sol. "iodotaurocholic" acid aq. solutions are obtained. The "I-acids" show no free I by titration. The bile acids may be chemically saturated with Cl_2 or Br before treatment with I. R. F. P.

[Preparation of] (A) phenolic morpholines, (B) morpholino-metho- [-methyl derivatives of] polyhydric phenols. H. A. Bruson, Assr. to Röhm & Haas Co. (U.S.P. 2,040,039—40, 5.12.36. Appl., [A] 26.2.35, [B] 27.6.35).—The prep. by interaction of the appropriate phenol with CH_2O and morpholine of (A) o-*hydroxybenzyl*-, m.p. 95—96°, 2-*hydroxy*-5-*phenylbenzyl*-, m.p. 88—89°, 2-*hydroxy*-3-o-, m.p. 155—156°, and -3-p-*chlorophenylbenzyl*-, m.p. 125—126°, 2 : 4-*dihydroxy*-5-ααγγ-*tetramethylbutylbenzyl*-, m.p. 145—146°, and 2-*hydroxy*-(?)1-*naphthylmethyl-morpholine*, m.p. 115—116°, and (B) the *bismorpholinomethyl* derivatives of resorcinol, m.p. 207°, pyrocatechol, m.p. 176°, quinol, m.p. 205°, pyrogallol, m.p. 174—175°, 4-ααγγ-tetramethylbutylpyrocatechol, m.p. 112—113°, 4-ααγγ-tetramethylbutylresorcinol, m.p. 145—146°, 1 : 5-dihydroxynaphthalene, m.p. >330°, and 4 : 4′-dihydroxy-ββ-diphenylpropane, m.p. 154—155°, is described. The products are said to be of val. as fungicides, bactericides, antioxidants, and insecticides. H. A. P.

Therapeutic [arsenical] preparations. W. A. Lott and A. E. Jurist, Assrs. to E. R. Squibb & Sons (U.S.P. 2,047,275, 14.7.36. Appl., 14.7.34).—Stable solutions of $[3:4\text{-}NH_2\cdot C_6H_3(OH)\cdot As{:}]_2$ are prepared by dissolution (preferably anaërobic) in $(CH_2\cdot OH)_2$ or mixtures of glycerol with $OEt\cdot C_2H_4\cdot OH$, $O(C_2H_4\cdot OH)_2$, $CH_2(CH_2\cdot OH)_2$, etc., preferably in presence of a non-protein protective colloid. R. F. P.

Production of a medium for disinfection, wound treatment, etc. H. G. Hammer (B.P. 467,631, 23.10.36. Austria, 18.8.36).—Disinfecting media are obtained by treating a solution of tannin and Ag–albumin compound with cresol-containing soaps, H_2O-sol. glyceroborates, CH_2O, or double salts of antipyrine (*e.g.*, with caffeine citrate). Vitamin-*A* and/or -*D* may be added. The product may be a liquid or a grease. R. S. C.

Manufacture of cosmetic products. Chem. Fabr. Grünau, Landshoff & Meyer A.-G. (B.P. 462,977, 12.9.35. Ger., 20.9.34, 10.10.34, and 11.10.34).—Cosmetic soaps and products containing soaps are improved by addition of protein-degradation products, *e.g.*, lys- and/or prot-albinic acid, or their *N*-substituted derivatives. Sulphonated oils may also be added. E. H. S.

Manufacture of therapeutic preparations containing carbonic acid. J. G. Waldenmeyer (B.P. 463,035, 15.7.35. Fr., 18.12.34).—To prevent premature liberation of CO_2 from mixtures of solids which interact to liberate the gas, the substances are coated separately with a fatty material containing lecithin. E. H. S.

Na formaldehydesulphoxylate. Dinitrophenol ethers.—See III. **Bakery products.**—See XIX.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photography and chemical engineering research. W. Clark (Trans. Amer. Inst. Chem. Eng., 1935, **31**, 60—82).—A survey of recent advances and new applications. H. W. T.

Progress in photography since 1930. W. Meidinger (Angew. Chem., 1937, **50**, 553—560).—Recent developments in methods of measuring photographic characteristics (emulsion speeds, grain size, halation), infra-red and colour photography, direct positive films, and in the investigation of the processes involved in photography are summarised. J. W. S.

Infra-red photography beyond 10,000 A. III. W. Dieterle and O. Riester (Z. wiss. Phot., 1937, **36**, 141—144; cf. B., 1937, 622).—*N*-Tetrahydroquinolylacraldehyde is condensed with glutaconic acid in presence of Ac_2O–AcOH to give the nonamethine *dye*, $C_7H_{10}N\cdot[CH{:}CH]_4\cdot CH{:}NXC_7H_{10}$ (absorption max. 6850 A.), and this is converted by means of 1-methylbenzthiazole ethiodide into *benzthioundecacarbocyanine ethiodide*, $C_7H_4N(EtI)S\cdot[CH{:}CH]_5\cdot CH{:}C_7H_4NSEt$, which has a coppery lustre and is an intensive sensitiser with a max. at 10,200 A. Plates sensitised with it have a good sensitivity over the range 9000—11,000 A., and keep well. A. J. M.

Syneresis phenomena with silver iodide. Lüppo-Cramer (Kolloid-Z., 1937, **80**, 72—76).—The changes taking place in the drying of AgI films are described, with special reference to their significance in photography. E. S. H.

Extension of gradation of light-sensitive [photographic] emulsions by Sterry's method. E. O. Langer (Phot. Ind., 1937, **35**, 667—668).—Sterry's method (1904) is to bathe exposed bromide or gaslight papers for a short time in $K_2Cr_2O_7$ solution before development, whereby fog is removed without affecting the image and increased range of contrast is obtained. The effect has now for the first time been quantitatively examined, and figures are given for soft and hard bromide and gaslight papers showing increased ranges of 42·5 and 100% (bromide) and 80 and 125% (gaslight), respectively. 0·5% dichromate solution is used, papers being bathed for ½—2 min. according to sensitivity, and washed for ½ min. before development. 4—6 times the normal exposure is required. The method is also applicable to negatives. J. L.

Silver bromide layers free from binding agent. Lüppo-Cramer (Z. wiss. Phot., 1937, **36**, 156—161).—Experiments with colloid-free AgBr layers, prepared according to Ollendorf and Rhodius (B., 1936, 620), show that some dyes will desensitise them, but that many others, desensitisers to normal plates, act as sensitisers. Latent images on colloid-free layers, treated with phenosafranine, are scarcely affected, and treatment with p-$C_6H_4(NH_2)_2$,2HCl or CrO_3 does not destroy the latent image to the same extent as in normal plates. H_2O_2 does not fog colloid-free layers. These and other results show that the usual effects obtained on plates are due to reactions with primary Ag, which is absent in layers free from colloid. The greatest light-sensitivity is obtained in the finer AgBr deposits on the surface. The results obtained by other workers are discussed in relation to these facts. J. L.

Admixtures improving the quality of photographic emulsions and developers. A. Steigmann (Chem.-Ztg., 1937, **61**, 505—507).—A review of the uses of various types of substances, *e.g.*, " Fesakaptol " [1 : 8-$C_{10}H_6(NH_2)_2$], " Fesazin," and several other compounds synthesised by the author, cystine derivatives, triazole, etc. J. L.

New fine-grain developer. P. W. Vittum and J. I. Crabtree (Brit. J. Phot., 1937, **84**, 385—388).—Kodak " Ultra Fine Grain " developer (I) is compared with " D 72 " (II) (ordinary elon–quinol formula), with p-$C_6H_4(NH_2)$ developer (III), and with (III) + glycin developer (IV). The fineness of grain obtained with (I) is = that with (III) or (IV). Relative effective emulsion speeds are also the same, about twice normal exposure being required. Development time with (I) is, however, nearly the same as with (II). (I) has good keeping properties and is free from toxicity and tendency to stain. The image obtained is distinctly brown, and the warm tone aids contrast. Practical recommendations for the use of (I) are given. J. L.

Addition of silver ion reactants to organic [photographic] developing solutions. H. D. Murray and D. A. Spencer (Phot. J., 1937, **77**, 458—460).—Two predictions, based on previous work (B., 1937, 844), have been verified experimentally: (1) that $Na_2S_2O_3$, KI, or KCN, when added to a quinol or metol developer, produces an increase in density rising to a max. with increasing concn. and then diminishing progressively; (2) that when the developer contains a concn. of $Ag^{\cdot}$ reactant > that producing the max. effect, relatively more active development proceeds in the depths of the emulsion than in the surface. The increase of development which can be produced is due to an increase in the energy, rather than in the rate, of development. J. L.

Theory of deviations from the reciprocity law [in photography]. J. E. de Langhe (Z. wiss. Phot., 1937, **36**, 162—167).—Mathematical. On the basis of the author's theory of development (A., 1937, I, 39) and statistical evaluation of reciprocity failure it is shown that with an increasing min. no. of atoms per development centre, the reversal point of the effect is shifted towards greater exposing intensities, the strength of the direct Schwarzschild effect also increasing. The known fact that unripened emulsions show greater deviations is also derived from the theory. J. L.

Graininess, variation in density, and capacity for enlargement of photographic negatives. H. Siedentopf (Physikal. Z., 1937, **38**, 454—459).—Variations of density due to grain in negatives for photometric work, the production of sound-films, and the enlargement of a negative are considered theoretically. Variation in density ∝ the square of the mean density and the ratio of the mean dimensions of the grains to the diameter of the field measured. This is confirmed experimentally. The conditions for accurate photographic photometry are considered. The power of the eye to detect contrast is an important factor in the problem of enlargement. Apart from individual differences in the sensitivity of the eye to contrast, the capacity of enlargement is inversely ∝ to the mean diameter of the grain. The above connexions between grain size, variation in density, and capacity for enlargement make it possible to measure grain size from variation in density. A. J. M.

Experimental determination of photographic density. A. M. Koerner and C. Tuttle (Phot. J., 1937, **77**, 444—457).—The integrating sphere, used with an incident light of angle of incidence $\not>10°$ from the normal, is proposed as a standard instrument, as it conforms most logically to Hurter and Driffield's definition. Opal densitometers are not exact, but give results bearing a definite relation to the true densities measured by the sphere, and are therefore satisfactory as secondary instruments, when calibrated. Various problems connected with densitometry are discussed. J. L.

Objective tests of colour reproduction on infra-red-sensitive films. M. Plotnikov (Phot. Ind., 1937, **35**, 686—687).—Tests on Agfa Infra-red-R film and " 800 Rapid " plates, with and without filters, in daylight or artificial light show that colour charts are unsuitable for cases where infra-red light is concerned, owing to reflexions of these rays; spectrographic tests are necessary. The above film is very sensitive to blue-violet, but has a gap in the green. J. L.

Removal of scratches from photographic film. H. R. Crane (Rev. Sci. Instr., 1937, [ii], **8**, 220).—Complete elimination, even of bad scratches, from enlargements is effected by placing a large drop of Canada balsam on each side of the film, which, with careful avoidance of air bubbles, is squeezed and bound between two glass microscope slides. N. M. B.

Xanthine dyes.—See IV. **Photomicrography of corrosion.**—See X.

Patents.

Photographic process. F. Goldmann (B.P. 464,112, 12.10.35. Austr., 13.10.34).—A light-sensitive semi-conductor layer (containing Cu_2O or grey Se) is placed in contact with an electrolyte layer (*e.g.*, a gelatin emulsion of a salt which is practically insensitive to light), and metal electrode layers (at least one of which is transparent to light) are placed in contact with the two sides of the former pair. Glass or celluloid sheets are placed outside these layers to form a compact whole. The metal layers are connected to opposite poles of a battery, one *via* a rheostat and one *via* a switch. A required image is focussed on the plate, which becomes sensitive when the switch is closed, the semi-conductor layer yielding electrons which produce an image by electrolysis in the electrolyte layer. The image may be strengthened by chemical treatment, physical development, or by passing an electric current between the metal layers. J. L.

Photographic materials. W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 466,879, 7.9.35).—Protective layers, applied to films (emulsion or rear side) to prevent scratches or other damage, are formed by drawing the developed, but undried, moist film through an aq. dispersion of a natural or artificial org. colloid, *e.g.*, Me polyacrylate, PhOH–CH_2O resin, albumin, or casein. The film is then dried, the protective layer drying simultaneously. Other methods of coating the film may be used. Softening, hardening, smoothing, or wetting agents may be incorporated. J. L.

Photographic sensitive material of the monopack type adapted for colour photography. F. B. Dehn. From Omnichrome Corp. (B.P. 467,110, 10.12.35).—Two or more colour-sensitising dyes of different particle size and rate of diffusion are applied to the surface of an emulsion (already coated on a carrier) or on to a gelatin-coated carrier, the warm emulsion being coated on this afterwards. By the differential diffusion, layers are produced within the emulsion having predominant amounts of one dye only. Thus a mixture of large particles of pinacyanol (in EtOH) for the red, with small particles of erythrosin and pinachrome (in H_2O) for green, and fine particles of orthochrome-T (in EtOH) for the blue, may be sprayed on the emulsion. Suitable filter dyes, *e.g.*, medium-size particles of Rose-Bengal and fine particles of Rapid Filter Yellow, both in aq. solution, may be added to the sensitising dyes. The emulsion is preferably pre-wetted and swollen with, *e.g.*, borax solution, before application of the dyes. J. L.

Photographic material for colour photography or kinematography. Truecolour Film, Ltd., and E. Sanders-Dolgoruki (B.P. 467,380, 29.7.36).—A transparent support is provided with two superimposed emulsion layers on one side and one layer, or, if desired, two layers, on the other. The layers are suitably sensitised to different colours and suitable decolorisable filter-layers are interposed between the emulsions or between an emulsion and the support, so that the different layers are screened from light of undesired colour. One arrangement might thus be: "blue" layer, yellow filter, "green" layer, red filter, support, "red" layer, as seen in sequence in a transverse section. Other arrangements are described. [Stat. ref.] J. L.

Obtaining colour separation [in photography]. J. S. Friedman, Assr. to Omnichrome Corp. (U.S.P. 2,047,022, 7.7.36. Appl., 9.5.35).—A normal blue-sensitive emulsion on a celluloid or glass base is sensitised with a solution containing a yellow filter dye and a colloidal red sensitiser (*e.g.*, pinacyanol), after application of a pre-wetting agent if desired, for such a time that the yellow dye penetrates the whole film, and the red sensitiser only the top half. The film is then used as a two-layer pack, exposed through the base, and a third layer, on a separate base, may be placed behind it in contact. After exposure and development, the unfixed images are treated with a stop-bath (10% AcOH and 1% Cr alum), and prints are made by reflexion printing from the appropriate image surface. The two-layer film is then fixed, and printed by transmitted light to give a black and white key plate. The prints obtained are used in the normal manner to obtain two- or three-colour pictures with a key print. J. L.

Colour reproduction process. A. G. Hapke (U.S.P. 2,046,326, 7.7.36. Appl., 8.3.35).—Prints are made, from an ordinary negative, on to blue-print emulsions coated on smooth white surfaces on waterproof metal plates, as many prints as colours required being made. The portions desired in a particular colour are covered with blacking or shading, remaining portions being then washed away. Photographs are taken of these prepared prints, and prints made from the negatives on to the usual Zn etching blocks, from which the final picture is printed. J. L.

Colour photography or kinematography. Truecolour Film, Ltd., and E. Sanders-Dolgoruki (B.P. 467,005, 29.10. and 26.11.36).—To obviate the difficulties of varying rates of development in a colour developer, multilayer photographic material, containing different colour-forming compounds in the different layers, is first developed in a developer incapable of reacting with the colour formers, *e.g.*, metol. The layers are then fixed, and the Ag images bleached and redeveloped with a p-$C_6H_4(NH_2)_2$ developer, which forms the colours. For reversal images, the Ag image is removed after development with metol, and the remaining Ag halide is exposed and developed, fixed, bleached, and redeveloped as above. J. L.

Light-sensitive diazotype layers. Kalle & Co. A.-G. (B.P. 467,145, 28.10.36. Ger., 14.11.35).—Light-sensitive layers are made from compounds having the diazo group attached to a C_6H_6 nucleus which may contain other substituents and is fused to a hydrogenated ring containing N which carries an aryl, aralkyl, alkyl, or *cyclo*hexyl or acyl group.

The diazo compounds may be used alone in the layers or mixed with a coupling component and the usual adjuvants, *e.g.*, thiourea, metal salts, and acids. Among examples are the $ZnCl_2$ salt of 2 : 6-dichloro-6-diazo-1-benzyl- and the $SnCl_4$ salts of 3-hydroxy-6-diazo-1-benzyl- and 6-diazo-1-benzyl-1 : 2 : 3 : 4-tetrahydroquinoline, of 5-diazo-1-benzyl-2-methyl-2 : 3-dihydroindole, and of 6-diazo-9-ethylhexahydrocarbazole. K. H. S.

Diazotype photographic printing paper. Kalle & Co. A.-G. (B.P. 467,313, 12.10.36. Ger., 12.10.35).—A developing powder, either alone or mixed with an azo component, is rubbed into a layer of light-sensitive diazo compound and the excess removed with a current of non-injurious gas, *e.g.*, air. In the example, paper is sensitised with a solution of the $ZnCl_2$ salt of the diazo compound of p-$NH_2{\cdot}C_6H_4{\cdot}NH{\cdot}CH_2{\cdot}C_6H_3Cl_2$-2′ : 6′ (36) and citric acid (30 g.) dissolved in H_2O (3000 c.c.); into the dry layer is rubbed a powder of phloroglucinol (125 g.) and $Ca(OAc)_2$ (250 g.), the excess of dust is blown off with air under pressure, and the paper calendered. The paper is free from dust, while speed and quality of the print remain unimpaired. K. H. S.

Processing of film material coated with emulsion on both sides. M. H. Carpmael. From G. Wolf (B.P. 466,299, 11.2.36).—With double-coated film carrying different partial-colour records on the two sides, one side is partly developed in a given developer, and then both sides are completely developed in another developer; by this means, differences in contrast etc. may be compensated, allowing for subsequent dyeing etc. If a normal picture is printed on to both sides, one side with $>$ and one $<$ correct exposure, and the first is developed to low γ and the second to high γ, a combination of gradation is obtained which gives increased range of contrast. J. L.

Photographic colour development and developers. W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 467,087, 5.12.35).—Halogenated p-$OH{\cdot}C_6H_4{\cdot}NH_2$ (I) is used to develop coloured pictures consisting of Ag and dye either in single or multiple layers, in presence of a coupling component, which may be in the emulsion or the developer. Substituents of (I) mentioned are 2-Br-, 2-I-, 3-Cl-, 2 : 5-Cl_2-, -Br_2-, and -I_2-, 3 : 5-Cl_2-. Among examples, a developing solution of 1 : 2 : 5 : 4-$OH{\cdot}C_6H_2Br_2{\cdot}NH_2$ (2), Na_2SO_3 (2), KBr (0·5 g.), N-NaOH (13·9 c.c.), and H_2O (200 c.c.) affords a red picture if used with 1-phenyl-3-methylpyrazolone (0·5 g.), blue with α-$C_{10}H_7{\cdot}OH$, and yellow with $CH_2Bz{\cdot}CO{\cdot}NHPh$. K. H. S.

Mordanting photographic silver images. Cinecolor Inc. (B.P. 466,290, 2.1.36. U.S., 12.1.35).—Ag images to be bleached with I, for production of a AgI image which will mordant dyes, are pretreated with a bath of KI solution; this first bath is relatively conc., and the usual bleaching bath relatively dil., in KI, a ratio of about 4 : 1 being suitable, with about 120 g./litre in the first bath. The AgI first pptd. then forms a sol. complex (K_2AgI_3) which breaks down again to KI and AgI, the latter being deposited in a finer grain than usual, and overall stain is obviated. After bleaching, the image is cleared as usual with $KHSO_3$, and suitably dyed. J. L.

Treatment of photographic pictures with developer and other liquids. H. Casler (B.P. 466,913, 3.3.36. U.S., 23.3.35).

Dye intermediates.—See III. **Dyes and sensitising of emulsions.**—See IV. **Light-filtering overcoating.**—See XIII. **Hardened gelatin films.**—See XV.

XXII.—EXPLOSIVES; MATCHES.

Objective methods for identification of war gases. D. H. Wester (Pharm. Weekblad, 1937, **74**, 742—759).—A scheme of analysis for detecting war gases is described. It is based on orientating, non-sp. reactions with "benzaldehydeamine" (0·5 g. of p-$NMe_2{\cdot}C_6H_4{\cdot}CHO + 0{\cdot}5$ g. $NHPh_2$ in 10 c.c. of EtOH), Sudan-red, and Na_2S, followed by tests for halogens, S, As, Fe, N, CN, and b.p. and sp. reactions for mustard gas ($AuCl_3$ and $NaI + CuSO_4$ in gum arabic solution), lewisite, $COCl_2$ (NH_2Ph and nitrosodimethylaminophenol + $NMe_2{\cdot}C_6H_4{\cdot}OH$ in xylene; sensitivity 1 : 10^6), diphosgene, $CCl_3{\cdot}NO_2$ (Na_2O_2 gives NaCl–$NaNO_3$), adamsite (red colour with H_2SO_4), $AsPh_2{\cdot}CN$ (CN + As), $COPh{\cdot}CH_2Cl$ [formation of 1 : 3-diphenyl-(1 : 2-diazo-Δ^2-*cyclo*butene), m.p. 137°, with $NHPh{\cdot}NH_2$, ppt. with Na_2S and indigo with $(NH_4)_2S$ in EtOH]. S. C.

Nitrating cellulose.—See V. **Explosiveness of chlorates, and of NH_4 salts.**—See VII. **Nitrocellulose.**—See XIII.

XXIII.—SANITATION; WATER PURIFICATION.

Germicidal properties of nitrogen bases from transformer-oil extract. W. N. Axe, D. D. Henson, and V. T. Schuhardt (Ind. Eng. Chem., 1937, **29**, 503—505).—Aromatic and non-aromatic nitrogenous fractions, b.p. approx. 340°, markedly inhibited the growth of *Eberthella typhi* and *Staph. aureus* when dissolved in 0·1N-HCl and pptd. by the peptone broth medium as a fine emulsion, but were without action when emulsified in soap solution. E. C. S.

Disinfection [with hydrogen cyanide]. M. Bornand (Mitt. Lebensm. Hyg., 1937, **28**, 50—60).—A review of practice in Switzerland. E. C. S.

Examination of the air of the Sušak railway tunnel. H. Iveković (Arh. Hemiju, 1937, **11**, 7—14).—The H_2O, CO, CO_2, and SO_2 contents of the air indicate inadequate ventilation. R. T.

Report of Sub-Committee on physical procedures in air analysis. Instruments and methods for recording thermal factors affecting human comfort. (Amer. Publ. Health Assoc. Year Book, 1936/37, 84—88).—A report of suggested working standards for atm. and space environments. The Dufton eupatheoscope, Vernon globe thermometer, Winslow and Greenburg thermo-integrator, and Yaglou heated globe are described and their merits discussed. O. M.

Report of Sub-Committee on chemical methods in air analysis. (Amer. Publ. Health Assoc. Year Book, 1936/37, 88—96).—An outline of the programme of work, and a tabulation of methods available for the determination of poisonous org. contaminates in the atm. O. M.

Report of Sub-Committee on bacteriological procedures in air analysis. Bacteriological method of sanitary air analysis. (Amer. Publ. Health Assoc. Year Book, 1936/37, 97—101).—The method involves centrifugal pptn. of the bacteria on nutrient media by spinning a special glass cylinder containing the media about its vertical axis while admitting a measured vol. of air through the central axial tube to the bottom of the cylinder. The bacteria are deposited on the media as the air whirls upwards through the cylinder. The pumping, measuring of air, and collecting and planting the bacteria are performed in a single operation. O. M.

Smoke of cities. J. S. Owens (Proc. Inst. Mech. Eng., 1936, **134**, 211—275).—Pollution of air by smoke, and the methods of measuring such pollution, together with certain sp. problems are discussed. A new instrument is described for measuring the optical density of smoke emitted from chimneys, by means of revolving vanes adjustable to produce various shades of grey. During observation the vanes are adjusted to match the smoke, and the % obstruction of light is measured direct. A method of fixing limits of smoke emission is described. O. M.

Chemical coagulation of sewage. W. Rudolfs and H. W. Gehm (Sewage Works J., 1937, **9**, 22—33).—Experiments to determine the effects on clarification of different chemical sludges under various conditions show that: (1) returned alum, $FeCl_3$, and $FeCl_3$–$Ca(OH)_2$ sludges have a definite clarifying val.; (2) max. clarification is obtained with less returned $FeCl_3$ and alum sludge than with $Ca(OH)_2$ sludge; (3) either sludge or coagulant can be added first; (4) partly treated sludges are less effective than those fully treated, which latter are as effective as over-treated sludges; (5) acid sludges have no clarifying val., but slightly lower the $[H^{\cdot}]$; (6) increasing the Fe^{III} coagulant dosage decreases the clarifying power of the returned sludge; (7) returned $FeCl_3$ or alum sludges afford additional clarification regardless of coagulant dosage. O. M.

Effect of town sewage on tidal waters. E. Waser and G. Blöchliger (Mitt. Lebensm. Hyg., 1937, **28**, 120—138).—Samples of tidal waters from 22 places on a tidal estuary have been examined chemically, bacteriologically, and biologically for a period of two years and the H_2O quality is discussed. W. L. D.

Industrial water supplies. S. T. Powell and H. E. Bacon (Ind. Eng. Chem., 1937, **29**, 615—622).—An illustrated account of the methods which are applied singly or in combination to produce supplies of H_2O which are satisfactory for a wide range of industrial requirements. It is stressed that it is desirable to make a systematic survey of the available H_2O supplies before deciding on the system to be employed, and that consideration should be given to the corresponding liquid effluent at the same time. F. J. B.

Soft water and its importance in water supply. L. W. Haase (Chem. Fabr., 1937, **10**, 249—253).—Only about 15% of Germany's H_2O supply is naturally soft, but of the total H_2O consumption only about 3% is used for domestic washing in such a way that the hardness represents soap usage. Actual soap usage is $\ll$ the equiv. of the hardness of the H_2O even in this case. Methods of economising soap are discussed. C. I.

Operating experience with anthracite filters [for water supplies]. H. S. R. McCurdy (J. New England Water Works Assoc., 1937, **51**, 37—40).—Sand and anthracite filters, constructed and operated identically, during the initial run at small load gave practically identical results. O. M.

Filter-bed troubles and their elimination [in water treatment]. J. R. Baylis (J. New England Water Works Assoc., 1937, **51**, 1—36).—Most filter-bed troubles where back-wash H_2O is adequate are attributable to the accumulation of compact coagulated mud. The mechanism of the accumulation and of the various troubles caused, together with various methods of cleaning, are discussed. Washing at high rates keeps the beds in better condition than washing at low rates, whilst surface washing by jets from a piping grid above the sand is recommended to keep the sand as clean as should be. To obtain the best results the vol. of " mud balls " in the top 6 in. of the bed should be kept $<$ 0·1% of the vol. of filling material, and a certain gradual transition of size at the sand–gravel junction is recommended to avoid " ridging " by " jet action." O. M.

Water-chlorination experience. F. O. A. Almquist (J. New England Water Works Assoc., 1937, **51**, 41—56).—The construction, location, and types of Cl_2 plant, together with methods of operating and testing, are discussed. O. M.

Experiences with chlorinating new water-mains. G. O. Adams and F. H. Kingsbury (J. New England Water Works Assoc., 1937, **51**, 60—68).—Difficulty in obtaining satisfactory bacterial results after chlorinating and thoroughly flushing a H_2O-main was due to the sol. matter of the jute packing, at the joints, supporting bacterial life. O. M.

Katadyn treatment of water, with particular reference to swimming pools. R. Shapiro and F. E. Hale (J. New England Water Works Assoc., 1937, **51**, 113—124).—Colloidal Ag added in minute dosage to sterilise H_2O is condemned, as it is ineffective on the 37° bacterial count, has a considerable time lag, is useless in presence of NaCl and NH_3 (which accumulates from contamination by swimmers), and there is a potential danger of argyrosis. Higher dosage gives quicker results, but is more expensive and causes turbidity. Cl_2 is more economical and cheaper. O. M.

Prevention of calcium deposits in process waters. Relative value of sodium metaphosphate and pyrophosphate. B. H. Gilmore (Ind. Eng. Chem., 1937, **29**, 584—590).—The relative benefits to be obtained from the use of $NaPO_3$ and $Na_4P_2O_7$ in detergent materials for use with hard waters were investigated. $NaPO_3$ was shown to be very much more suitable both for preventing alkaline-earth ppts. and redissolving them when formed as well as being capable of dealing with much higher concns. F. J. B.

Comparison of certain selective media used in water analysis. T. N. S. Raghavachari and P. V. S. Iyer (Indian J. Med. Res., 1936, **23**, 619—666). R. N. C.

Large-scale experiments on treatment of sugary-factory effluents. R. C. Srivastava and H. D. Sen (J. Sci. Tech. India, 1936, **2**, 25—38).—Solids are removed in settling tanks, bacterial oxidation is carried out with bacteria obtained by self-fermentation of the effluent, and colloids are then flocculated by neutralising with milk-of-CaO, the final oxidation being effected by means of $KMnO_4$; MnO_2 and colloidal matter carried down with it are filtered off through gravel and sand or stone chips. The conditions for the final product to conform to public health requirements have been studied. F. R. G.

Dusts.—See I. **Sewage sludge as fuel.**—See II. **Retting H_2O.**—See V. **H_2O for chrome dyeing.**—See VI. **Effluent from Na_2S manufacture.**—See VII. **Dust prevention.**—See VIII. **Sewage for soil.**—See XVI. **Air conditioning in milk plant.**—See XIX.

Patents.

Means for affording protection within living spaces against poisonous gases in the external atm. F. J. Russell (B.P. 464,248, 13.8.36, and Addn. B.P. 466,085, 15.10.36).—(a) A manual or power-operated, positive-type pump draws air from a level above the vitiated stratum and delivers it into the interior of the house etc. (b) Purifying means for the air is inserted in the conduit. B. M. V.

Respiratory apparatus for protection against noxious gases. J. L. Guillemin (B.P. 464,372, 5.5.36. Fr., 28.5.35 and 24.3.36).—The mask is of the closed-circuit type, the respiratory products being caused to flow over soda or potash, which does not cause any appreciable temp. rise as it is widely distributed in granular form on gratings in a removable container. O_2 is supplied separately. B. M. V.

Treatment of sewage. C. N. Windecker and C. E. Lyon (U.S.P. 2,043,458, 9.6.36. Appl., 6.10.32).—Raw sewage is filtered through a bed of chlorinated sludge, the mixture of new and old sludge being repulped, chlorinated, and partly returned to the original filter and partly dehydrated. The filtrate is inoculated for clarification and the sludge, separated by pptn., is returned for inoculation, or to the repulper or dewaterer. B. M. V.

Sewage [sludge] disposal apparatus. C. N. Windecker (U.S.P. 2,043,459, 9.6.36. Appl., 15.2.33).—Sludge, dried in the upper part of a rotary cylindrical kiln, is allowed to fall out at an intermediate point of the length, then mixed with fuel, and the mixture pulverised and injected through the lower end by primary air and burned to inorg. ash, which alone discharges from the lowest extremity. Each length of the kiln is provided with double walls and the lower with a refractory inner lining also. The upper annular space carries non-noxious products of combustion direct to the stack, wherein they give up their heat to the sludge. The lower annular space carries secondary air for combustion. A small part of the products of combustion pass in contact with the sludge up the upper bore and only the resulting very humid and noxious gases are passed through scrubbers and deodorisers before passing to the stack. B. M. V.

Sewage-sludge digestion and apparatus therefor. Dorr Co., Inc. (B.P. 462,941, 8.5.36. U.S., 21.6.35).—Sewage sludge, trade refuse, etc. is subjected to a primary thermophilic digestion at 49—60° in a smaller zone of 2—5 days detention period, followed by secondary mesophilic digestion at 26—32° in a larger zone of 20—30 days detention period, maintained in an alkaline condition. The fresh sludge is seeded with thermophilic sludge, and the thermophilically digested sludge is cooled before introduction into the secondary digester (*S*), utilising heat-exchange systems. The apparatus comprises a primary digester (*P*) having heating means adaptable for the relatively high temp. and a *S* adapted for a lower temp. Means are provided for feeding fresh sludge through a heat exchanger (*H*) to *P*, and sludge from *P* through *H* to *S*; also for by-passing sludge from *P* to seed the fresh sludge, and sludge from *S* to *P*, to correct acidity etc. if necessary. O. M.

Apparatus for purifying swimming-bath water [with chlorine]. J. A. Davenport (B.P. 467,351, 11.2.36).—On the assumption that the action of a chlorination or like plant in the bath itself is solely one of dilution of foul with pure H_2O, improvement is effected by withdrawing and returning the H_2O from and to a no. of distributed points which may be linked together either in series or parallel as advisable according to the bathing conditions. If series connexion is desired preferably two baths are connected to one purifier. B. M. V.

Sterilisation of water by means of chloroamine. United Water Softeners, Ltd. (B.P. 462,890, 2.11.36. U.S., 2.11.35).—An NH_4-zeolite (I) plant is used to supply the small amount of NH_3 required, by dividing the H_2O into two unequal streams, the smaller stream passing through the (I) and then re-uniting with the larger. Cl_2 may be added before or after such treatment. A base-exchange softener or sand filter may be incorporated. O. M.

Sterilisation of water and other liquids. G. Lakhovsky (B.P. 467,544, 13.11.36. Fr., 5.12.35 and 19.10.36).—A stopper for a bottle or the like comprises a wet electric primary cell (the outer casing being the positive element) from which depend two electrodes at least one of which has a bactericidal action. B. M. V.

Apparatus for sterilising, disinfecting, washing, and like purposes. Manlove, Alliott & Co., Ltd., and J. M. Hodges (B.P. 467,408, 16.11.35).—Steam and H_2O valves for a medical steriliser are operated in proper sequence by a hand-operated cam gear. B. M. V.