# BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

## B.—APPLIED CHEMISTRY

DECEMBER, 1938.

### I.—GENERAL; PLANT; MACHINERY.

**Temperature and heat-transfer relations in the working space of industrial furnaces. I. Heat flow and temperature fields.** H. Schwiedessen (Arch. Eisenhüttenw., 1937—8, 11, 363—374).—Theoretical and mathematical. Expressions are derived for calculating the heat absorbed by the charge from circulating gases and from the walls by radiation and convection. A. R. P.

**Chemical engineering unit process: oxidation.** D. B. Keyes (Univ. Illinois Bull., 1938, 35, No. 88, 44 pp.).—A survey of the principles underlying the plant employed for a wide range of oxidation processes. The production of $SO_2$, $SO_3$, and $HNO_3$ from $NH_3$ are specifically described, and attention is drawn to the exceptionally accurate control of temp. required for the partial oxidation of org. materials generally. F. J. B.

**Effects of exothermic reactions other than combustion in the technology of industrial heating. Manufacture [of calcium carbide] with the electric furnace.** H. Cartoux (Chaleur et Ind., 1938, 19, 419—421).—A heat balance for a $CaC_2$ furnace is given. Methods of utilising CO in the reaction $CaO + 3C = CaC_2 + CO$ are discussed. R. B. C.

**Surface temperature of a solid body. I, II.** T. Yoshii (J. Soc. Chem. Ind. Japan, 1938, 41, 240—244B).—The most convenient instrument for measuring this temp. is the surface pyrometer. It does not indicate the true surface temp., and the vals. when compared with those given by the elongation method are about 8% low. W. A. R.

**Diphenyl and diphenyl oxide as heat carrier.** W. Fritz (Arch. Wärmewirts., 1936, 17, 272; Chem. Zentr., 1936, ii, 3709).—The application of a eutectic mixture of $Ph_2$ and $Ph_2O$ as a heat carrier (cf. B., 1936, 767) is discussed. A. H. C.

**Boiler firing with brown coal.** H. Wagner (Wärme, 1938, 61, 551—556).—Tabulated data show the high efficiencies now obtainable with grate-firing. There is an upper limit to the size of grate which can be employed, above which coal-dust firing or Krämer-mill firing is recommended. R. B. C.

**Tube failures in boilers and superheaters.** E. Uhthoff (Wärme, 1938, 61, 687—692).—Illustrated examples of failures due to faulty design, feed-$H_2O$, defective maintenance, etc. are given, and suggestions for avoiding such failures discussed. R. B. C.

**Heat-transfer coefficients for water[-cooled steam] condensers.** E. Uber (Arch. Wärmewirts., 1938, 19, 263).—Calc. and experimental data for the heat transfer between the $H_2O$ and walls in four types of heat interchanger are given. R. B. C.

**Variation of heat-transfer coefficient with load on heating surface [in steam condensers].** C. Kämmerer (Arch. Wärmewirts., 1938, 19, 231—235).—A linear increase in the heat-transfer coeff. with increasing load on the heating surface has been observed by various workers during tests on steam condensers. It is shown by calculation of the heat-transfer coeff. on the steam side that the anomaly cannot be explained by means of the usual heat-transfer formulæ. R. B. C.

**Critical observations on modern plant for purifying boiler feed-water.** Haendeler (Wärme, 1938, 61, 665—667).—Examples are given of defective designs of purifying plant and of parallel designs in which the defects are avoided by suitable arrangement of preheaters, heat exchangers, and filters. R. B. C.

**Boiler operation as it affects prime movers.** S. E. Tray (Mech. Eng., 1938, 60, 475—480).—The effects in boiler-$H_2O$ of alkalinity, suspended and dissolved solids, and org. matter, and methods of counteracting their influence, and the causes of priming, foaming, and carry-over, are discussed. An electrical conductivity method of measuring solids in steam is described. R. B. C.

**Demineralisation of water by dissociation of salts.** E. Breuil (Chaleur et Ind., 1938, 19, 245—256, 291—298, 330—332).—Methods of softening boiler-$H_2O$, *e.g.*, by addition of CaO or zeolites, are reviewed. R. B. C.

**Prevention of calcium deposits [in water] by Calgon (metaphosphate).** C. Steiner (Textilber., 1936, 17, 507—508, 587—588; Chem. Zentr., 1936, ii, 2821).—The quantities of $Na_6P_6O_{18}$ (Calgon) necessary to prevent pptn. of Ca in $H_2O$ of varying hardness containing $Na_2CO_3$, soap, and mixtures of these were investigated. A. H. C.

**Optimal dimensions for settling tanks and filter beds [for boiler feed-water].** W. Wesly (Arch. Wärmewirts., 1938, 19, 237—240).—Tests carried out with chemically prepared $H_2O$ are described. Over 90% clarification was obtained when the tank diameter ($d$), the effective tank depth ($h$), and the flow of $H_2O$ per hr. ($W$) were related as follows: $h = 2{\cdot}55W/d^2$. The filtering efficiencies of gravel beds of 1—5 mm. particle size were determined. The optimum size was 3 mm. R. B. C.

**Evaporation of boiler salts.** B. Koch (Wärme, 1938, 61, 219—223).—For the purpose of determining whether the presence of salts in steam is due to evaporation or to mechanical carry-over from the boiler-$H_2O$, the partial pressures of NaCl and NaOH were calc. by means of Duhem's formula. Since the calc. salt contents of steam at various temp. are $\nless$ those found in practice it is concluded that the presence of salts in steam is not due to evaporation. The moisture content of the steam accounts for at least a part of the salts present. R. B. C.

**Influence of crystal separation on flow of melts.** E. Lips and H. Nipper (Giesserei, 1938, **25**, 369—372).—Particles of quartz or graphite of different sizes were added to solutions of $HgI_2 + KI$ of the same *d* and the change of $\eta$ was determined. The amount of graphite required to prevent flow of the liquid is $<$ the amount of quartz, due to the difference in particle shape. The casting of hot conc. solutions of $KNO_3$ into a glass spiral immersed in $H_2O$ was also investigated. With long pouring times (badly-conducting mould material) the castability depends on the kinematic $\eta$ of the liquid, but when solidification is rapid (mould of good thermal conductivity) the crit. concn. of crystals in the liquid is the controlling factor. A melt has optimum castability when it has low kinematic $\eta$ and high crit. crystal concn. C. E. H.

**Classified grinding research.** L. Andrews (Bull. Inst. Min. Met., Preprint, Oct., 1938, 25 pp.).—The necessity for standard units of measurement in connexion with grinding research is emphasised and the aggregate surface area in sq. cm./g. of sample is suggested as being suitable. The heat generated in a grinding plant is considered to be due to the mol. stretching and shearing of the strained suspending medium surrounding the solid particles, and the mol. agitation in particles not fractured by the blows received. The principles underlying the operation and the design of classifiers to be used for grinding research are investigated. F. J. B.

**Strength properties of brittle materials.** W. Weibull (Ingeniörs Vetensk. Akad. Handl., 1938, No. 149, 27 pp.).—By measuring the force required to produce cracks in a glass plate subjected to the pressure of steel balls of various diameters it was found that the ultimate strength depends on the rate of application of the load and that the relation between the breaking load and the rate of load application may be expressed by a linear extrapolation formula. If the plate is contiguous to certain electrolytes, *e.g.*, aq. $CuSO_4$ and $HNO_3$, the ultimate strength may increase by $>$ 100%. Auerbach's law (ultimate strength directly $\propto$ ball radius) was experimentally verified. The ultimate strength of glass and bakelite plates is probably determined by the max. tensile strength and not by the shearing stress or the shear-strain energy. R. B. C.

**Reflexions on rupture [of solid materials].** P. W. Bridgman (J. Appl. Physics, 1938, **9**, 517—528).—A generalised theoretical discussion is given of mechanical rupture from the viewpoint of mol. equilibrium and displacement. Effects observed at high pressures, including cases of rupture after the release of pressure, are described. J. A. K.

**Measurement of permeability of porous media by a radial-flow method.** O. T. Koppius and W. G. Holton (Physical Rev., 1937, [ii], **51**, 684).—A theory and method by which the permeability of a consolidated medium to gas and to liquid flow may be determined are presented. Data for diamond drill cores from oil sands are discussed. L. S. T.

**Alternate bending tests.** E. Erlinger (Arch. Eisenhüttenw., 1937—8, **11**, 455—456).—The machine described is constructed to apply stresses of $\pm 1{\cdot}5$ m.-kg. under a static bending moment of 1·5 m.-kg. with 1500 cycles of stress per min.; it can be used for testing sheet, round, and angular rods, tubes, etc. A. R. P.

**New sedimentometer.** E. Szinger (Chem. Obzor, 1938, **13**, 10—12).—A modification of the Andreasen apparatus and tests with suspensions of cement, brick dust, different sands, glass, calcite powder, etc. are described. The accuracy of observation is $\pm 0{\cdot}5\%$. (Cf. B., 1937, 852, 1285.) F. R.

**Moisture control.** R. S. McBride (Chem. Met. Eng., 1938, **45**, 520—524).—An illustrated description of a plant and controls for the Guardite process of conditioning goods is given. The goods (*e.g.*, grain, tobacco) are submitted to a pressure $<$ the v.p. of $H_2O$ at the prevailing temp. in a chamber. $H_2O$ at the necessary temp. is sprayed into the chamber and the pressure raised. This cycle is repeated until the desired $H_2O$ content of the goods is reached, the final moisture being introduced after heating the goods to the appropriate temp. by steam. D. K. M.

**[Apparatus for flotation and washing experiments.]** H. A. J. Pieters (Het Gas, 1938, **58**, 169—170).—A glass cylinder is constricted in the middle and ground internally so that the two halves can be separated from one another by means of a glass stopper fitting into the constricted part. The constriction may conveniently take the form of a ground joint, the bottom of the upper half of the composite cylinder fitting into the top of the lower half. The apparatus is particularly suited for carrying out washing tests with various liquids on coal, minerals, etc. S. C.

**Distillation. Some present-day problems.** W. Cowen (J. Inst. Fuel, 1938, **12**, 28—33).—The graphical method of McCabe and Thiele for determining the no. of ideal plates required for a given separation of a binary mixture, for which the necessary thermal and equilibria data are known, is described. It is shown that the data at present available on the factors affecting plate efficiency are either insufficient or too anomalous in character to permit a reasonable approximation to be made for the actual plate efficiency to be expected for a postulated output, thereby hindering the design of columns having the highest capacity for size and cost. It is considered that plate efficiency cannot be investigated to best advantage unless the effect of entrainment is studied simultaneously, preferably on the actual liquids used in industrial distillations. H. C. M.

**Azeotropic distillation in industry.** H. Guinot and F. W. Clark (Inst. Chem. Eng., Advance proof, Nov., 1938, 8 pp.).—The principles involved and the apparatus used in the azeotropic purification of

EtOH, EtOAc, $Pr^{\beta}_2O$, $CHMe(OEt)_2$, AcOH, $HCO_2H$, and $Ac_2O$ are given. K. W. P.

**Factors involved in plate efficiencies for fractionating columns.** D. B. Keyes (Univ. Illinois Bull., 1938, **35**, No. 90, 14 pp.).—Methods of attack on the problem of plate efficiency which have been so far worked out are discussed. F. J. B.

**Influence of operating conditions on the heat-transmission coefficient of Robert evaporators.** K. Jaroschek (Wärme, 1938, **61**, 654—659).—The influence of the rate of heat input and the level and *d* of the liquor on the efficiency of a steam-heated four-stage evaporator for the thickening of syrup was investigated. Data are tabulated. The reason why the rate of heat transference in the second stage must be $\nless$ that in the first stage is explained. The experimental work of Kirschbaum in this field was confirmed. R. B. C.

**Emulsions in industry. II.** H. L. Bennister and A. King (Chem. and Ind., 1938, 990—993).—The uses of emulsions in biology, medicine, pharmacy, cosmetics, and foods are discussed, with special reference to different emulsifying agents and their sp. advantages. F. M. F.

**Machinery used in spraying. V. Nozzle jets.** C. Davies and G. R. B. Smyth-Homewood (J. South-East. Agric. Coll., Wye, 1938, No. 42, 9—36).—Forms of distribution and relative atomisation produced by nozzles of varied types are recorded. A. G. P.

**Determination of moisture in technical (dusty) gases.** A. Schwartz (Messtech., 1936, **12**, 144—146; Chem. Zentr., 1936, ii, 3706).—An electric psychrometer fitted with a dust protector is described. A. H. C.

**Smoke-density measurements.** H. E. Bumgardner (Engineer, 1938, **166**, 372—373).—An instrument depending on the absorption of light over a path of adjustable length~~, with~~ indicator and/or recorder operated by a Se cell, is described and its data are compared with those of other instruments. A. R. Pe.

**New-type vacuum seal.** W. E. Bahls (Elect. Eng., 1938, **57**, 373—378).—A device for leading an electrical conductor into a vac.-, gas-, or air-tight metal container is described. Porcelain bushings are sealed to metal by glass which serves as the bonding agent. Ni–Co–Fe alloy is used for the metal sections of the structure. R. B. C.

**Danger in consequence of static electricity.** Meyer (Farbe u. Lack, 1938, 463—464).—Dangerous conditions may be produced by washing the hands with cloth containing benzine, liquids streaming through fibrous material or glass tubes, rubbing celluloid with wet muslin, centrifuging cryst. masses, washing wool and silk with benzine, lacquer spraying, the movements of liquids in their containers (*e.g.*, in stirrers and kneading machines), and during the filling of containers with liquids. Of these the last is the commonest cause of fires. Examples of each are cited. S. M.

**Coal pulverisers.**—See II. **Adsorption of gases.**—See VII. **Refractories [for boiler furnaces].**—See VIII. **Corrosion of steel water-pipes.**—See X. **Pptn. of dust from gases.**—See XI. **Centrifugal separators in oil and fat industry.**—See XII. **Distillation–rectification columns.**—See XVIII. **Mixing food. Artificial drying of agricultural products.**—See XIX.

### Patents.

**Heat-exchange tubes.** E. Green & Son, Ltd., and H. Livsey (B.P. 492,108, 22.4.37).—The tube walls are built up solidly to diamond or rhombus section (angles specified) and are disposed with the long diagonal in the direction of flow of the outer fluid; gills of rectangular shape, nearly touching their neighbours, are also provided. B. M. V.

**Spiral-plate heat exchangers for fluids.** A. Benteli (B.P. 492,241, 12.2.38. Switz., 25.2.37).—Three spiral passages are provided, the third being filled with insulation to improve the thermal efficiency. B. M. V.

**Immersion or under-water burners.** Silesia, Ver. Chem. Fabr. (B.P. 491,678, 8.6.37. Ger., 2.11.36).—The gases are burned with flameless combustion in a porous plate within a diving bell. B. M. V.

**Lime–zeolite water-softening processes.** R. Furness, H. J. Wheaton, and J. Crosfield & Sons, Ltd. (B.P. 484,494, 5.11.36).—Zeolite-softening to remove the remaining hardness is carried out after softening by $Ca(OH)_2$ has proved unsuccessful on account of the "delayed pptn." of $CaCO_3$ causing blockages etc. In the processes claimed, temporary hardness is first removed by $Ca(OH)_2$-softening, then the $H_2O$ is passed over "sulphonated coal" (prepared as described in B.P. 455,374; B., 1937, 13) to remove both free $Ca(OH)_2$ and $CaCO_3$ and finally through zeolite softener. This coal product is used in the "spent" base-exchange condition as the action depends on absorption. O. M.

**Apparatus for preparing disencrustants for scaling boilers.** J. Kobseff (B.P. 491,909, 8.11.37).—Apparatus to be placed over or near a boiler to form an emulsion of seed extract and $H_2O$ comprises three compartments separated from each other by foraminous partitions, the centre one containing seeds which are completely drowned in $H_2O$ circulated from and to the boiler via the other compartments. B. M. V.

**Cooling apparatus for viscous liquids.** J. H. Robertson (B.P. 491,731, 12.3.37).—In an oil cooler, the main regulation of the air shutters is effected by the $\eta$ of the oil, but a thermostatic control is also provided to prevent any substantial congealing of the oil due to overcooling. B. M. V.

**Jaw crusher.** Nordberg Manufg. Co. (B.P. 491,986, 5.5.37. U.S., 9.5.36).—A double-faced jaw, directly operated by an eccentric shaft, swings between two fixed jaws about a pivot at the top. B. M. V.

**Hammer mills.** Pennsylvania Crusher Co. (B.P. 491,632, 1.11.37. U.S., 2.11.36).—The apparatus is symmetrical and the rotation is reversed at intervals, whereby the hammers and screen bars are kept sharp. B. M. V.

**Grinding, pulverising, and like machines.** G. and W. Clark (B.P. 491,552, 21.6.37).—Means for securing a renewable grinding periphery is described. B. M. V.

**Apparatus for drying granular materials.** Air Control Installations, Ltd., and G. V. Ohölm (B.P. 492,178, 15.3.37).—A tower is claimed in which transverse $\Lambda$-shaped channels are alternately arranged for inlet and outlet of gases in each storey, and these are tapered to promote uniformity of flow. B. M. V.

**Mixing and kneading machine, particularly for plastic explosives or the like.** Norsk Spraengstofindustri A./S. (B.P. 491,644, 23.2.38. Norw., 4.2.38).—A bowl with sloping sides is rotated about its vertical axis, and a separately rotated mixing screw is approx. parallel to the side of the bowl but is not situated in the axial plane of the bowl. The downward pushing effect of the helix exceeds the amount of material brought to it by the rotation of the bowl. B. M. V.

**(A) Launder method for, (B) apparatus for use in, separating and sorting materials.** J. S. Withers. From Battelle Memorial Institute (B.P. 491,791 and 491,839, 4.3.37).—(A, B) The material is stratified while flowing down a launder (upward currents of liquid are preferably applied) and the heavy material is caught in wedge-shaped pockets the apical (lower) angle of which is adjustable by flaps, whilst other flaps adjust the angle of the outlet for compacted heavy material, the first angle determining the degree of separation and the second the rate of discharge. B. M. V.

**Filters.** J. Wiebe (B.P. 491,307, 28.11.36).—A rotary drum filter divided into a large no. (*e.g.*, 400 for a filter 2 m. in diameter) of cells is described, the period between removal of vac. and stripping of cake being very short. B. M. V.

**Filters.** United States Hoffman Machinery Corp., Assees. of H. C. A. Meyer (B.P. 492,234, 3.1.38. U.S., 3.2.37).—Scrapers for filter leaves are described. B. M. V.

**Filters or strainers.** T. C. Makins, and Ruston & Hornsby, Ltd. (B.P. 491,957, 7.1.37).—A plug in the form of a fluted column is inserted in a conduit for the oil supply to an engine or the like; the small clearances over the ridges of the flutes form the filtering apertures. B. M. V.

**Separation of liquids and solids.** Simon-Carves, Ltd., W. E. Raybould, and L. Wright (B.P. 492,039, 13.3.37).—A filter for coal slurries or the like is cleaned by back-flushing with a flocculating solution or suspension. B. M. V.

**Adjustable evacuation of deposits of material in liquids.** Soc. Anon. des Charbonnages de la Grande Bacnure (B.P. 491,566, 3.3.37. Belg., 4.3.36. Addn. to B.P. 474,903; B., 1938, 118).—Stream-lined obturators for underflow discharges are described. B. M. V.

**Means for controlling the evacuation of heavy materials from a jig wash-box for coal or other materials.** S. H. Gibson (B.P. 492,259, 12.2.37).—A float (controlling the discharge gate) is situated in a separate chamber which tends to empty through a const. orifice. The chamber is filled from the jig below the screen by a weir device which permits flow only at the crests of the waves; as the bed of heavier material becomes thicker, so the crests become higher and the float rises. Adjustment is facilitated by the provision also of an entirely independent supply of clear $H_2O$. B. M. V.

**Drying of sludge on the surface of a filter mat.** G. J. Fowler (B.P. 491,735, 18.8.37).—Flocculent sludge is dried by radiant heat projected on the upper surface of the mass while travelling on a filter mat. The surface may be scratched at intervals, and auxiliary heaters may be situated beneath. B. M. V.

**Apparatus for drying or cooling pastes and slurries.** I. G. Farbenind. A.-G. (B.P. 492,176, 15.3.37. Ger., 14.3.36).—A transport channel is vibrated (vertically is indicated) and transport effected by a band or chain conveyor therein. Excessive caking or adhesion may be prevented by toothed rolls. B. M. V.

**Regeneration of used bleaching clays and earths.** G. Stalmann, and Noblee & Thörl Ges. m.b.H. (B.P. 491,388, 9.6.37).—The entrained oil and the like are first removed by solvent extraction and steaming; the residue is then agitated, heated in air at 500—550° until combustible gases cease to be evolved, and thereafter cooled slowly. B. M. V.

**Apparatus for treating fibrous solids with gases.** K. A. Sherwin, and Imperial Chem. Industries, Ltd. (B.P. 491,858, 9.3.37).—Apparatus similar to a multi-deck roaster is adapted to the drying of fibrous material by provision of worm conveyors rotating about their horizontal axes (as well as around the axis of the tower) in place of the usual inclined rakes. B. M. V.

**Apparatus for degreasing non-absorbent articles by means of volatile solvents.** N. R. Hood, and Imperial Chem. Industries, Ltd. (B.P. 491,897, 12.3.37).—$H_2O$-cooling means for parts of the walls of the drying compartment and insulation to prevent undesired flow of heat are described. B. M. V.

**[Gas and liquid] contacting process and apparatus.** W. W. Triggs. From Centrifix Corp. (B.P. 492,305, 18.3.37).—The gas is caused to flow vortically and spirally (*i.e.*, with forward motion along the axis) and the liquid to flow from the centre outwards across the base of the vortex. Application to a fractionating tower is described. B. M. V.

**Cyclone dust separators.** H. C. Reeves (B.P. 491,431, 25.2.38).—A straight-through type of cyclone is provided with a convergent–divergent throat beyond the point where whirling is initiated, and the dust outlet is around the whole periphery at the largest part of the divergence. Subsequently the stream of gas, passing through ejector-like cones, may produce a suction on the dust-collecting chamber. B. M. V.

**Thermometers.** Short & Mason, Ltd. From K. H. Hubbard and L. E. Smith (B.P. 491,494, 1.3.37).—Good conductance between a thermometer bulb and a protecting thimble is afforded by interposition of a sleeve, or lune-shaped part-sleeve, of corrugated resilient metal. B. M. V.

**[Conical] gyratory crushers.** H. H. Rumpel (B.P. 491,436, 17.3.38).

**Valve[-operating] systems for use in water-treatment plant.** United Water Softeners, Ltd. From Permutit Co. (B.P. 491,535, 5.3.37).

**Heat-insulation products.**—See VIII. **Sealing-off vessels containing gas. Resistance thermometers.**—See XI. **Apparatus for clarifying liquors.**—See XVII.

## II.—FUEL; GAS; TAR; MINERAL OILS.

**Identification and correlation of coal seams.** A. E. Trueman (Sci. Progr., 1938, 33, 257—269).

**Radiographic examination of coal. Diffusion of aqueous solutions of lead salts through coal.** R. Beeching (J. Inst. Fuel, 1938, 12, 35—39; cf. B., 1938, 472).—In bright coal, the absorption results from the penetration of the solution into cracks, whilst in dull coal, quite apart from any penetration of cracks which might occur, there is a slow diffusion of the solution into the coal substance itself. Fusain is, in general, much more absorbent than durain. In the durain samples examined, the diffusion was more marked in the band with the highest ash content. Calculations based on measurements of the rate of diffusion of a Pb solution through Scottish splint coal show that the mean diameter of the capillaries in the coal is of the order of 50 mμ. H. C. M.

**Determination by a salt-flotation method of the quantitative relations between the bituminous and humic constituents of coal, and a new classification of coals based thereon.** P. D. Lisenko (Koks i Chim., 1938, No. 4, 10—15; No. 5, 30—35).—Finely-powdered coal is heated at 280° for 50 min., and the product agitated with 0·5% NaCl for 3 min., when the material rising to the surface consists mainly of bituminous coal. The fusibility index, $VA^{\frac{1}{2}}$, where $V$ is the % of volatile constituents and $A$ the % of flotational concentrate, is a more reliable index of the coking properties of coals than are plastometric indices. High $V$ with low $A$ is characteristic of young coals with a high humus content, low $V$ and $A$ of anthracites, and high $V$ and $A$ of young, and low $V$ with high $A$ of old, bituminous coals. The coking properties of coals can be predicted from their position on the $V$–$A^{\frac{1}{2}}$ diagram, and optimum compositions of coal mixtures may hence be derived. R. T.

**Cause of coal-mine fires explained by petrographical examination of coal.** B. Ferrari (Glückauf, 1938, 74, 765—774).—The relative inflammabilities of the petrographic constituents of the Robert coal seam, Westphalia, were investigated. The primary cause of fires was traced to the presence of pulverised vitrinite. Durain and fusain do not appear to be responsible for fires. R. B. C.

**U.S. Bureau of Mines coal-sampling truck.** R. H. Kudlich (Fuel, 1938, 17, 280—284).—The truck, which is used for sampling coal at the mine, is fitted with a swing-hammer crusher capable of crushing the gross sample (1000 lb.) to $<\frac{3}{16}$ in. in 5—15 min. and driven by a 20-h.p. petrol engine. The crushed coal is subdivided by means of a riffle attached to the discharge hopper of the crusher and is then further reduced to the 5-lb. laboratory sample by means of the U.S. Bureau of Mines-type riffle buckets. A. B. M.

**Review of standard methods used in various countries for sampling and analysis of solid fuels.** A. C. Fieldner and W. A. Selvig (Fuel, 1938, 17, 266—271).—Methods used in Austria, Czechoslovakia, Denmark, England, France, Germany, Greece, Norway, Rumania, Sweden, and the United States are briefly summarised. A. B. M.

**Use of the calorimetric bomb for determination of carbon in coal.** J. Adam (J. Chem. Met. Soc. S. Africa, 1938, 39, 1—6).—The $O_2$-inlet tube and the cup-holder are shortened to permit the introduction of about 100 c.c. of 0·2N-$Ba(OH)_2$ into the bomb without its interfering with the combustion of the coal. The latter (0·15 g.) is ignited in 25—30 atm. of $O_2$. After shaking for 5 min. to ensure complete absorption of the $CO_2$ the excess of $O_2$ is blown off slowly and the pptd. $BaCO_3$ transferred to a flask. The excess of $Ba(OH)_2$ is neutralised exactly with 0·2N-HCl (phenolphthalein), 100 c.c. of 0·2N-HCl are added, and the solution is boiled to expel $CO_2$. The excess of HCl is titrated with 0·1N-NaOH (Me-red). The method is rapid, and accurate enough for all practical purposes; it is of especial val. for the analysis of coals and oil shales of high ash content. A. B. M.

**Determination of pyrites in coal, rock, and pyrites concentrates.** Anon. (Glückauf, 1938, 74, 777—778).—Detailed laboratory regulations relating to the above, issued by the German Coke Oven Committee, are given. The Mantel–Radmacher technique (B., 1938, 120) is employed. R. B. C.

**Determination of volatile constituents [in solid fuels] in the electrically heated quartz crucible.** Anon. (Glückauf, 1938, 74, 778—779).—Detailed laboratory regulations relating to the above, issued by the German Coke Oven Committee, are given. The Radmacher technique (B., 1938, 1002) is employed. R. B. C.

**Considerations affecting selection of [coal] pulverisers.** S. H. Reid (Combustion, 1938, 10, No. 4, 26—28).—The effect of coal characteristics and desired fineness on mill capacity is discussed. Recommended finenesses for high- and low-volatile coals used for boiler firing are given. R. B. C.

**Sulphur content of peat and peat coke.** G. Keppeler and K. Wiese (Arch. Eisenhüttenw., 1937—8, 11, 623—625).—The S content of peat from high moors and of the coke from it is usually well below 0·2%, generally about 0·1%. When the S is determined by combustion in $O_2$ in a tube the S content of the ash is > when the sample is burned in a bomb with $O_2$ at 25 atm. A. R. P.

**Debasing of New Jersey peat.** L. N. Markwood (Ind. Eng. Chem., 1938, 30, 1199).—The peat is dried down to a moisture content <10%, immersed in 2% HCl, and then centrifuged, the resultant debased peat being used for the manufacture of nicotine-peat insecticides. Drying of the peat prior to the acid treatment is essential if difficulties in filtration are to be avoided. H. C. M.

**Extraction of lignite with organic solvents.** Weiler (Chem.-Ztg., 1938, 62, 761—762).—A review, mainly of patent literature. A. R. Pe.

**Action of solvents on Italian coals and lignites and hydrogenation of the extracts.** M. G. Levi, E. de Bartholomaeis, and F. Magaldi (3rd Cong. int. Carbonio Carb., 1937, Sept.; Studi Ric. Comb., 1936—7, 6, 259—274).—The extraction of 6 Italian coals with tetralin under pressure gives semi-liquid products which contain practically all the original combustible material. Hydrogenation of these extracts leads to products which are comparable as regards nature and yield with the products obtained by the direct hydrogenation of the original coal. It is not yet certain, however, whether the extraction process can be worked economically on the industrial scale. O. J. W.

**Bulk density of related brown coals.** E. Wölk (Braunkohle, 1936, 35, 650—654, 664—668; Chem. Zentr., 1936, ii, 3499).—The determination of the average density of strata of the lower Rhenish brown coal deposits is described. It depends on the wood content and the location of the coal in the seam (*i.e.*, the pressure of formation). A. H. C.

**Influence of the capillary fine structure of brown coals on their briquetting behaviour.** G. Agde and K. E. Vetter (Braunkohle, 1928, 37, 421—427).—The v.p. has been determined as a function of $H_2O$ content for the four brown coals studied previously (cf. B., 1938, 472), and the results have been used to calculate the size and distribution of the capillaries in the coals (cf. Anderson, B., 1914, 829). Three of the coals have similar capillary structures, whereas the fourth possesses a relatively large no. of capillaries of small diameter; the results can be correlated with the observed differences in the mechanical strength of briquettes prepared from the coals. A. B. M.

**Swelling phenomena of brown-coal briquettes and their prevention.** K. Fritzsche (Braunkohle, 1938, 37, 561—580).—The disintegration of brown-coal briquettes on weathering is due to the swelling of the coal in presence of $H_2O$, which can be correlated with the Ca humate content of the coal. Laboratory experiments show that this effect can be reduced by (*a*) acid treatment, (*b*) regulated drying and remoistening, (*c*) drying, steam treatment, and remoistening, and (*d*) drying, superheating (200°), and remoistening. A full-scale plant (described) has been operating the last-mentioned process for the last 2 years. The process is satisfactory from the viewpoint of economics as well as of efficiency. A. B. M.

**Improvement of quality of [brown-coal] briquettes by determining the optimum drying temperature and optimum size-grading of the raw material in a non-hygroscopic condition.** A. Vollmaier (Braunkohlenarch., 1938, No. 49—50, 30—82).—The optimum $H_2O$ content of coals of uniform composition for briquetting is independent of the drying temp. and size, but the hygroscopicity increases with the drying temp. according to a parabolic law. The higher is the drying temp. the lower is the bending strength of the briquette. If the raw material is made completely non-hygroscopic the strength of the briquette is reduced. The resistance of the briquette to $H_2O$ is increased by raising the drying temp., but is decreased by increasing the hygroscopicity of the raw coal. The *d* of the briquette decreases with rising drying temp. The expansion of non-hygroscopic briquettes is $<$ that of those made from hygroscopic material. The loosely-heaped, settled, and compacted wts. and the void vol. of individual sized fractions have a direct bearing on the *d* and bending strength of the briquette. The max. resistance to $H_2O$ is shown by briquettes from material $<0.5$ mm. size. The expansion of briquettes from individual sized fractions decreases with the diameter of the particles. The higher is the compacted wt. of a mixture of different sized particles the smaller is its void vol. and the greater the *d* and bending strength of the briquette. With proper size-grading, the conditions for the production of briquettes of max. bending strength are satisfied by dry material of 0—1 mm. diameter. The admixture of fractions of larger sizes reduces the bending strength in accordance with the size of the particles and the proportion of fraction added. Sieve curves for the optimum grading are compared with those for material used in practice. R. B. C.

**Oxidative influence of the atmosphere on coals from the South Moscow field at different temperatures.** N. Karavaiev and A. Ivanov (Monit. Prod. chim., 1936, 18, No. 207, 6—13; Chem. Zentr., 1936, ii, 3499—3500).—On heating or drying in air at 60—180° absorption of $O_2$ varies with composition and results in increasing (carbonyl) O and decreasing calorific val. A. H. C.

**Destructive distillation [of coal].** R. V. Wheeler (J. Inst. Fuel, 1938, 12, 8—19).—The Melchett Lecture. A complete account is given of work on this subject carried out during the past 28 years by the author and his collaborators. The general conclusions to be drawn from this work are as follows. With most bituminous coals having C $>80\%$ there is no extensive decomp. of any constituent at $<300°$. Between 220° and 300°, the major part of the free hydrocarbons in the coal distils unchanged. At 300°, or just above, any plant entities in the coal begin slowly to decompose; the gaseous products of the decomp. are rich in oxides of C, and the liquid products are $H_2O$ together with much heavy oil, mainly unsaturated hydrocarbons and neutral oxygenated compounds. The temp. range over which this decomp. occurs, viz., 310—350°, is nearly the same for all bituminous coals. At a well-defined temp., usually above 300°, marked decomp. of the ulmin compounds begins, the products being gaseous paraffins, $H_2O$, phenolic oils, and liquid aromatic compounds. This " active decomp. point " increases with the rank of the ulmin compounds and marks the breakdown of their nuclear structure. Over the range of bituminous coals studied (C 77—90%) it increased from 290° to 365°. Above the active decomp. point of the coal, ulmin compounds, organised plant entities, and resins decompose and distil simultaneously, yielding a complex mixture of liquid products. The exact contribution made by each ingredient of the coal to this distillate is difficult to trace, but the simultaneous liquation and decomp. of resins can be detected at about 325°, continuing to 375°. The amount of resins distilled unchanged is usually $<$ that extractable from the coal by solvents. H. C. M.

**Production of free-burning coke in continuous vertical retorts.** J. Jamieson and J. G. King (Inst. Gas Eng., 1938, Comm. 199, 34 pp.).—The carbonisation experiments were conducted on a setting of 4 Woodall–Duckham vertical retorts which formed part of a larger bench. The setting was specially equipped with its own collecting system and with facilities for measuring and sampling. Five coals (C 82%) drawn from four Scottish coalfields were selected for examination. The temp. of carbonisation normal to gas manufacture was lowered so that the coke was not heated for any length of time above 700°. The yield of gas varied from 10,000 to 12,000 cu. ft., or 52 to 60 therms, per ton of coal. The lump coke was tested empirically for combustibility and found to burn almost as well as a standard low-temp. coke. The average yield of coke per ton of coal carbonised was 12·1 cwt., of which 10·5 cwt. were suitable for sale as lump smokeless fuel for use with open grates. H. C. M.

**Failure of coke-oven walls by reaction with coal ash.** W. C. Rueckel (J. Amer. Ceram. Soc., 1938, 21, 354—360).—A comprehensive chemical, mineralogical, and phase-rule examination indicated that the $SiO_2$-brick walls were attacked by the coal ash, due to the high chamber-wall temp. used. The reducing action of the gases at the flame side of the wall limited the slagging effect to the layer on the oven side. Washing of the coal may prolong the life of the refractories. J. A. S.

**Hot patching of retorts by blowpipe spray-welding.** T. F. E. Rhead, S. K. Hawthorn, and V. H. Deacon (Inst. Gas Eng., 1938, Comm. 198, 48 pp.).—The evolution of a successful and practical process for repairing leaks in continuous vertical retorts by hot-patchng is described. The process in essence consists in spraying a refractory cement through an $O_2$–coal-gas flame, the cement forming adherent patches of fused material and filling up the leaks. Details are given of the cements and fluxes used and of the apparatus and technique adopted, together with the devices used for feeding the dry materials into the flame. The cost of repairs has thus been reduced by one half, and the period between cold repairs greatly extended. The subject is discussed from the viewpoint of the fundamental properties of adhesion and cohesion. H. C. M.

**Recent developments in externally-heated retorts for low-temperature carbonisation [of coal].** A. Thau (Glückauf, 1938, 74, 795—801).—Illustrated descriptions are given of various known processes. R. B. C.

**Suitability of Ruhr coals for coking at high and medium temperatures, with special reference to their preparation.** A. Kircher (Glückauf, 1938, 74, 725—732, 750—756).—Carbonisation tests at 600—1100° on 5-kg. coal samples in gas- and electrically-heated ovens are described. The temp. at the end of the coking period influences, and addition of finely-ground substances such as coke breeze and more mature coal to the charge improves, the coke strength. If the raw coal is crushed so that 80—90% is $<$2-mm. size all types of Ruhr coals, if suitably blended, can be utilised for coking. R. B. C.

**Caking coals of North China, with special reference to their coking properties.** A. and K. Shimomura (J. Fuel Soc. Japan, 1938, 17, 75—76).—The coals (volatile matter 20—30, ash content 9—17%) yield good-quality cokes. H. C. M.

**Swelling coals.** Anon. (Coal Carbonisation, 1938, 4, 153—155, 158).—The cause and detection of dangerous coal-swelling pressure in the coke oven are discussed. R. B. C.

**Influence of inorganic compounds on combustion of coal. I. Their effect on propagation of a zone of combustion in powdered coal.** H. E. Newall (Fuel, 1938, 17, 260—265).—The method of measuring the rate of propagation of the zone of combustion has already been described (cf. B., 1935, 291, 706). The powdered coal was impregnated with 1—4% of the inorg. compound by moistening it with an aq. solution of the latter and subsequently drying it over conc. $H_2SO_4$ in vac.; materials insol. in $H_2O$ were simply mixed with the coal. Many halogen compounds, *e.g.*, $FeCl_3$, $CaCl_2$, KBr, and some oxides, *e.g.*, $Fe_2O_3$, $MoO_3$, increased the rate of combustion, whereas $H_3BO_3$, borax, $Al_2(SO_4)_3$, $NaH_2PO_4$, etc. decreased the rate. Addition of 6—10% of the compounds in the latter group prevented initiation of the zone of combustion. A. B. M.

**Determination of coking residue.** C. Blacher (Brennstoff-Chem., 1938, 19, 365—366; cf. B., 1938, 1002).—The coal is heated in a suitable gas atm. (preferably coal gas which has been passed over coke heated at the gasifying temp.) until no further volatile matter is evolved. The crucible may be supported near the inner cone of a Teclu burner, the lid and upper part being simultaneously heated by a similar burner held in the hand. C deposited on the inner wall of the crucible by decomp. of the volatile matter is not included in the coking residue. The rate of evolution of volatile matter has been studied by heating the coal in a small Pt cup supported inside a Pt crucible. A. B. M.

**Investigations on solid domestic fuels and open fires at the Fuel Research Station. I. Methods and equipment.** A. Blackie. **II. Experimental work.** A. Blackie and J. M. Bruckshaw (J. Inst. Fuel, 1938, 12, 20—24, 24—27).—I. The tests on the burning qualities of coal in the domestic grate were made on somewhat similar lines to those on low- and high-temp. cokes (B., 1938, 123), except that it was usual to refuel at intervals and thereby to carry the test on for a longer period. The tests were also extended to include direct gravimetric measurements of the smoke concn., while simultaneously observing its optical density. A building recently completed at the Station and specially designed to facilitate the work is described.

II. Three coals were examined, and each coal, sized 1—3 in., was burned in the same stool-type grate joined to a 13-ft. flue. A general linear relationship was found to exist between the optical density and the concn. of solids in the smoke. On ignition the smoke emission rose rapidly to a max. and then decreased, each subsequent coal charge producing a rapid increase in the emission followed by a steady decrease to zero. On an average the total wt. of solids passing into the atm. was just over 1% of the coal burned. Up to a certain % there was a general tendency for the smoke to increase with volatile matter, but it was also found that for coals of roughly the same volatile matter the smoke increased with the caking index. A longer chimney flue resulted in an increased smoke emission. The size of coal has a pronounced effect on its combustion so that it is essential to use narrow limits of sizing in comparative work. Preliminary tests of certain methods of ignition and modifications of grate design show that large reductions of smoke emission can be obtained by such devices. H. C. M.

**Results attained with solid fuels used in open grates for heating living rooms.** W. Davidson and H. Hartley (Inst. Gas Eng., 1938, Comm. 200, 45 pp.).—The behaviour in open grates of both coking and non-coking bituminous coals, steam coals, anthracites, high- and low-temp. cokes, and pitch coke has been determined, using grates of a type most suitable for their burning. The highest radiant efficiency was attained with gasworks coke, which also proved the most economical in use. In the case of the cokes and coals, the efficiency was unaffected by the rate at which the fuel burned, when the grate was kept full. The radiant efficiency of the coke grates used was uninfluenced by the chimney pull. The properties desirable in cokes intended for use in open grates are enumerated; they include a high combustibility, low ash and moisture content, grading of the coke according to its combustibility, high bulk *d*, and uniformity of product. H. C. M.

**Wood distillation.** V. Charrin (J. Usines à Gaz, 1938, **62**, 407—408).—Wood is carbonised at 1000° in a continuous vertical retort having a rotating conical base whereby the charcoal is dropped into a $H_2O$-seal. The gas is quite free from $H_2S$, $NH_3$, and $C_{10}H_8$; its *d* is probably about 0·75 and its calorific val. about 4000 kg.-cal./cu. m. A. R. Pe.

**Wood charcoal and portable charcoal kilns.** N. C. Jones (Ind. Chem., 1938, **14**, 396—401).—Various types of portable charcoal kilns developed during recent years both in this country and abroad for the utilisation of waste forest wood are described. In general, a yield of 23—28% of charcoal is obtained. H. C. M.

**Industrial utilisation of fossil wood [woody lignite].** F. Seidenschnur and F. Winter (Braunkohle, 1938, **37**, 741—746).—Woody lignite, mixed with hard pitch in the ratio 70 : 30, is briquetted and carbonised in a current of superheated steam at 450—550°. Strong briquettes of low ash and S content are produced, particularly suitable for use in gas producer-driven motor vehicles. There is also obtained about 20% of an oily distillate, which can be readily hydrogenated. Similar briquettes are obtained when lignite from wood-sugar processes is treated in the same manner. A. B. M.

**Distillation of Italian lignites at low temperatures in presence of catalysts.** C. Padovani and D. Pagani (Energia Term., 1937, **16**, Nov.; Studi Ric. Comb., 1936—7, **6**, 247—257).—Distillation of Italian lignites in presence of a $Ca(OAc)_2$ catalyst containing Fe filings does not increase the yield of tar, nor is there any marked reduction in the amount of phenols in the distillation products of the tar, in contrast to the results obtained by Michot and Dupont with French and Spanish lignites. Distillation under pressure, however, appears to give more favourable results. Analyses of the products of distillation under various conditions are recorded. O. J. W.

**Properties of lignite briquette coke compared with that from coal.** H. Hock and O. Schrader (Braunkohle, 1936, **35**, 645—650; Chem. Zentr., 1936, ii, 3500).—The deviation of properties (porosity, *d*, reactivity, etc.) depends on the hard capillary nature of brown coal, of which, however, suitably pressed briquettes give satisfactory cokes despite their lack of softening power. A. H. C.

**Products of peat-coking plant.** F. Gödeke (Techn. in Landwirts., 1938, **19**, 67—68).—Analyses of peat, S products, tar, and coke are recorded. A. G. P.

**Fabricated porous carbon.** L. C. Werking (Trans. Electrochem. Soc., 1938, **74**, Preprint 29, 443—452).—The porosity is controlled by careful grading during manufacture. Articles are fabricated in the usual way and may be graphitised if necessary. J. W. C.

**Preparation of active charcoal from Peruvian woods.** M. N. del Aguila and J. Lopez (Bol. Soc. Quím. Peru, 1938, **4**, 115—121).—Satisfactory samples are obtainable from *Salix alba* and *Ochroma piscatoria* charcoals by activation with steam. 0·10-g. samples of these have an absorptive capacity for 0·00001% methylene-blue of 20·75 c.c. and 18·0 c.c., respectively, compared with 27·15 c.c. for Merck charcoal. Determination of the absorption of $H_2O$, PhOH, and antipyrine shows that similarly treated charcoals from *Sambucus nigra*, *Ricinus communis*, and *Populus alba* are not greatly activated. F. R. G.

**Possibility of utilising lignin in preparation of active charcoal.** B. Rassow and R. Lüde (J. pr. Chem., 1938, [ii], **151**, 191—203).—Tornesch lignin (I), obtained as a by-product of the saccharification of wood, is carbonised (*a*) by ignition in a covered Fe crucible, (*b*) by admixture with 25% aq. $ZnCl_2$ followed by desiccation, ignition in a covered crucible, and extraction with hot $H_2O$ or with conc. HCl followed by hot $H_2O$, (*c*) by admixture with aq. $Na_2SiO_3$ followed by 2N-HCl, filtration, desiccation, ignition, and extraction with hot conc. HCl and $H_2O$, (*d*) by treatment with 20% $Na_3PO_4$ at 100° and subsequent filtration, desiccation, ignition, and extraction, (*e*) by treatment with $P_2O_5$ at room temp. and then at dull red heat followed by treatment with boiling $H_2O$ or dil. HCl. With these samples decolorisation experiments are performed with 0·1N-I–KI, using const. vols. and periods of agitation but varying quantities of charcoal. More simply, decolorisation experiments are effected with 0·5% methylene-blue, using the drop method, which rapidly gives comparable and reproducible vals. Attempts to distinguish rapidly and conveniently between the sp. adsorptive powers of active charcoals for gaseous and dissolved solid substances are described. Gas-adsorption charcoal appears to have a greater retentivity for EtOH than has decolorising charcoal. Almost pure (I) is less suited than unchanged wood meal to the production of active charcoal, which, by the $P_2O_5$ method, gives a charcoal twice as active as that derived from (I). (I) is less reactive than the wood wool and is carbonised with difficulty, retaining its fibrous and cellular structure. In view of its ready availability the conversion of (I) by $P_2O_5$ into active charcoal nevertheless appears to be somewhat important. H. W.

**Medium-sized gasworks with horizontal retorts.** A. Nerrière (J. Usines à Gaz, 1938, 62, 255—257).—The plant and working methods which in the author's opinion are reliable, sparing of labour, and suitable for medium-sized works are described.

A. R. Pe.

**Developments in gas production in 1937. I.** H. Jordan (Brennstoff-Chem., 1938, 19, 380—385).—A review of German patents. A. B. M.

**Formation of producer gas under non-equilibrium conditions.** H. Cassan (J. Usines à Gaz, 1938, 62, 362—363).—In practice the time of contact is not always sufficient for attainment of equilibrium, and calculations based on the usual consts. are not valid. The efficiency of gasification can, however, be expressed as a function of the reactivity (*R*) (given empirically in terms of the proportions of total $CO_2$ and $H_2O$ decomposed) and a quantity (*X*) depending on the relative $[CO_2]$ and $[H_2O]$. Efficiencies so calc. for series of vals. of *R* and *X* are tabulated.

A. R. Pe.

**Use of oxygen and high pressure in gasification. III. Synthesis of gaseous hydrocarbons at high pressure. Rept. 43 of Joint Research Committee, Inst. Gas Eng. and Univ. Leeds.** F. J. Dent, W. H. Blackburn, and H. C. Millett (Inst. Gas. Eng., 1938, Comm. 190, 60 pp.; cf. B., 1938, 123).—Further experiments on the synthesis of gaseous hydrocarbons (chiefly $CH_4$) by the gasification of solid fuels in $H_2$ under pressure, generally 50 atm., using the $\frac{11}{16}$-in. diameter reaction tube, capacity 25—40 g. of fuel, are described. The pressure employed in all these tests was 50 atm. A considerably more extensive gasification of the fuel was obtained by continuing the hydrogenation to >800° (best, 900—950°). With coals and low-temp. cokes yields of 500—600 therms in gaseous hydrocarbons were obtained per ton of fuel, 70—85% of the C in the fuel being gasified. Similar results were obtained with cokes which had been prepared at temp. as high as 800°; with these, the advantage of raising the final temp. of hydrogenation was especially pronounced. The rate of gasification of fuels in $H_2$ was accelerated by the presence of alkalis, the influence of the alkali being most marked when hydrogenating a coke at relatively low temp. Thus, an 800° coke prepared from an intimate mixture of coal with 3 wt.-% of $Na_2CO_3$ gave 463 therms per ton in gaseous hydrocarbons when hydrogenated at 800°, whereas in absence of alkali only 140 therms were obtained. Addition of alkali also increased the ability of a coke to withstand heat-treatment without losing its reactivity towards $H_2$ and considerably reduced the caking properties of the coals used. In some of the tests with the alkali cokes the % $CH_4$ in the gas produced reached the max. permitted by equilibrium. Experiments on the effect of rate of $H_2$ supply and of rate of heating showed that during the initial stages of hydrogenation, *i.e.*, when the fuel was being raised in temp., the rate of hydrocarbon formation was determined primarily by the rate of heating, and that rates of hydrocarbon formation equiv. to 450 therms of 500 B.Th.U. gas per ton per hr. could be produced. A detailed description of a larger apparatus, with a retort 4 in. internal diameter and holding 1 kg. of fuel, with which it is hoped to study the liquid products produced and to determine the amount of heat absorbed or liberated in the reactions is given; some preliminary experiments already made in this apparatus are discussed. Data on the hydrogenation of $C_6H_6$, xylene, and anthracene at 50 atm./up to 850° are reported. H. C. M.

**Complete gasification of coal and methane synthesis. Progress report of experiments at the Fuel Research Station. I. Gasification of coal in water-gas plants. II. Catalysts for synthesis of methane from carbon monoxide and hydrogen. III. Complete gasification of pulverised coal.** J. G. King (Inst. Gas Eng., 1938, Comm. 197, 25 pp.).—I. Sized carbonaceous coals of low caking power have been successfully gasified in a modified water-gas plant to yield 67,000 cu. ft., or 205 therms, of gas per ton of coal, the output of gas per hr. being similar to that obtained when using sized coke. When gasifying high-volatile coals of low or medium caking power it was necessary to use a recuperator and to introduce a back-run into the cycle. With these latter coals yields of gas of 45,000 cu. ft., or 141 therms, per ton were obtained.

II. Mo sulphide catalysts were unsatisfactory, but experiments with a Co–$ThO_2$ catalyst have given encouraging results. When operating with the latter catalyst on S-containing synthesis gas, the loss of activity was practically independent of the quantity of S added and was a function of the time of treatment.

III. The vortex burner has been modified to gasify pulverised coal with steam and $O_2$ at atm. pressure, and an apparatus is being built to continue the investigation under pressure. H. C. M.

**[Theory of] gasification [of carbonaceous fuels].** Siron (J. Usines à Gaz, 1938, 62, 224—228, 284—288).—Formulæ are given, based on the Nernst heat theorem and the integration of the van 't Hoff isochore, whereby, the heats of reaction being known, the equilibrium consts. of the gasification reactions can be calc. Equilibria calc. for the dissociation of $H_2O$ and $CO_2$ and for the water-gas and producer gas reactions are compared with collected experimental data. A. R. Pe.

**Choice of coal [in gasworks practice].** D. J. Adriaanse (Het Gas, 1938, 58, 198—199).—From a discussion of the various practical factors involved, it is concluded that gas is made most cheaply from coking coals having low volatile contents. S. C.

**Action of inorganic mixed catalysts in the water-gas process.** C. Kröger (Z. Elektrochem., 1938, 44, 577—578).—The catalytic activity of alkali carbonate–metallic oxide mixtures is briefly discussed. C. R. H.

**Combustion processes in gases.** W. Jost (Angew. Chem., 1938, 51, 687—695).—A lecture on the nature and propagation of explosions in gases, and the mechanism of combustion in motor engines. E. S. H.

**Combustion properties of technical heating gases.** O. Knapp (Glashütte, 1938, 68, 553—556, 579—580).—The air requirements, rate of inflammation, flame temp., and heating powers of technical heating gases may be calc. from the properties of the component gases, and these enable the optimum conditions for combustion to be chosen. G. H. C.

**Combustion characteristics of town gas. III. Properties and method of use of the aëration test burner (model A). Rept. 42 of Joint Research Committee, Inst. Gas Eng. and Univ. Leeds.** J. W. Wood and A. H. Eastwood (Inst. Gas. Eng., 1938, Comm. 189, 34 pp.; cf. B., 1938, 126).—The precautions to be observed in the use of the burner, its constructional details, and methods of calibration are described in detail. The effects of atm. pollution on the indications of the instrument are examined, and also the consistency of readings of a particular burner over a prolonged period. The extent of variation of the A.T.B. no. of the gas sent out by a large undertaking is indicated by observations on the Leeds supply. The effects on A.T.B. no. of adding inerts and other constituents to this supply are also shown. (A.T.B. = Aëration Test Burner.) H. C. M.

**Detoxification of town's gas and the combustion properties of the gas.** F. Schuster (Brennstoff-Chem., 1938, 19, 357—359; cf. B., 1936, 725).—Detoxification of a suitable initial gas (coal gas + water-gas) by making use of the reaction $CO + H_2O = CO_2 + H_2$, but without subsequent removal of the $CO_2$, gives a gas having its calorific val., *d*, and flame velocity lying within the ranges characteristic of a normal town's gas; the val. (>12%) of the "inerts," however, falls outside the normal range. Subsequent removal of the $CO_2$ yields a gas having a lower *d* and a higher flame velocity than a normal town's gas. A. B. M.

**Oxide purification [of town's gas].** H. B. Avery (Gas World, 1938, 109, 348—350).—Correct adjustment of the $[O_2]$ and $[NH_3]$ in the gas is important. Excess of $O_2$ may cause local high temp. and caking, whilst $NH_3$ can react with $CS_2$ to produce $H_2S$, or with HCN to produce corrosive $Fe(CNS)_3$. A. R. Pe.

**Dry purification [of gas] in large coking and synthetic motor spirit plants.** F. Delarozière (J. Usines à Gaz, 1938, 62, 358—362).—The advantages, for heavy duty, of the Hamborn oxide towers (cf. B., 1933, 296, 759) over boxes are discussed. The rate of purification with simultaneous regeneration is limited by the slow reaction of the gaseous $O_2$, but it can be improved by isolating each unit at frequent intervals and circulating through it gas mixed with enough air to give 0·5—5% of $O_2$ (cf. B., 1936, 5). A. R. Pe.

**Use of a palladium tube in gas analysis.** A. G. Fleiger (Ind. Eng. Chem. [Anal.], 1938, 10, 544—547).—A method and apparatus for the analysis of mixtures consisting mainly of $H_2$ with small amounts of CO ($\sim$1%), $CH_4$ ($\ngtr$5 vol.-%), and higher hydrocarbons are described. The last-named are frozen out at −180°, and the $H_2$ is removed by diffusion through Pd at 300°. CO and $CH_4$ are burned over CuO at 250° and 800°, respectively, and the $CO_2$ formed is condensed at −180°. The residual $N_2$ is then measured. The method is suitable for vols. of 30—80 ml. Limitations in the use of a Pd tube in the analysis of such mixtures of gases have been investigated. In $H_2 + CH_4$, the presence of >5 vol.-% of $CH_4$ results in low vals. for $CH_4$ and high vals. for $H_2$, owing to the decomp. of $CH_4$ in contact with Pd at 300°. Accurate determinations of $H_2$ can be made by the Pd-tube diffusion method in mixtures of $H_2$ + CO containing $\ngtr$9 vol.-% of CO. L. S. T.

**Application of metallic calcium to gas analysis.** P. de Cori (Congr. int. Quim. pura apl., 1934, 9, VI, 225—236; Chem. Zentr., 1936, ii, 3336).—Absorption of $N_2$ begins at 370° and is quant. at 385°. $H_2$ is absorbed most readily at 360°. Ca absorbs $CO_2$ only weakly at 730—930°, absorption soon ceasing. $CH_4$ is only slowly absorbed at 530—650°, but at 700° a 1 : 1 $N_2 : CH_4$ mixture becomes richer in $N_2$ over Ca. Absorption of $O_2$ and $CO_2$ by $Ca_3N_2$ is also described. A. H. C.

**Recent developments in industrial instruments for measurement and control of gas temperatures.** C. Dupen (J. Inst. Fuel, 1938, 12, 40—46).—A detailed description is given of a new instrument, termed the Pyromaster, which comprises a potentiometer pyrometer, but in which there are no moving parts in the balancing mechanism except when a change in temp. takes place. The instrument can be successfully applied as a controller operating either electric or pneumatic control valves and devices. An illustrated account is given of an installation on a producer gas plant for controlling the producer gas outlet temp., the blast pressure, and the blast saturation temp. H. C. M.

**Spectroscopic determination of the temperature at different points in a flame or arc.** P. Coheur (Rev. Univ. Mines, 1938, 14, 650—652).—An image of the part of the flame or arc is obtained at the aperture of the spectroscope, and the temp. is determined by measuring the relative intensity of the rotating rays of the mol. bands emitted from the point under examination. The method is explained mathematically. R. B. C.

**Supply of propane in small containers.** M. SCHOLZ-FRICK (Gas- u. Wasserfach, 1938, **81**, 727—730).—The distribution of liquid $C_3H_8$ in portable containers small enough for domestic use and easily refilled by means of a hand pump from a reservoir is described. A. R. PE.

**Distribution of propane and carburetted air.** P. GERMAIN (J. Usines à Gaz, 1938, **62**, 273—284).—The propane ($C_3H_8$ 83, $C_3H_6$ 17%) from petroleum cracking is transported in containers holding 1 m. ton to distributing stations, whence it passes via suitable regulators to welded-steel mains of small diameter and Cu service-pipes. The gas being quite dry, no provision for drainage of pipes is made, and its volatility gives it an advantage over bottled $C_4H_{10}$, which may condense in cold weather. Appliances must be accurately made to inject the large vol. of primary air; the low flame speed prevents backfiring. Alternatively, a mixed cracking gas containing $C_3H_8$ 75—80% and $C_4H_{10}$ 25—20% may be distributed in admixture with 5 vols. of air, an automatic regulator for producing this "carburetted air" of calorific val. near that of ordinary town's gas being described. A. R. PE.

**Losses of phenols and cresols during working up of coal-tar fractions.** G. OZERSKI and E. TSCHERNOMORDIK (Koks i Chim., 1938, No. 4, 16—23; No. 5, 18—23).—Losses of phenols involved in the working up of coal tar fall into the following groups: effluent $H_2O$ 12, sludge 8·4, sulphate 1·7, exhausted gas 2·7, distillation residues 19, remaining in oil after extraction of phenols 27, decomp. during treatment 17·45, mechanical losses 11·7%. The chemical nature and val. of the individual fractions lost, and ways of reducing these losses, are discussed. R. T.

**Separation of polystyrenes from the xylene fraction.** P. P. KARPUCHIN and L. I. SLOMINSKI (Koks i Chim., 1938, No. 6, 35—41).—The fraction, b.p. 139—150°, obtained by rectification of the xylene fraction of coal-tar oil and containing 20% of styrene, is further rectified to yield 30% styrene (yield 5% of the original xylene). This is subjected to polymerisation by heating at 150—190° (24 hr.). The polymeride has a high $\varepsilon$ but is brittle. R. T.

**Properties of asphaltic bitumen in relation to the road.** F. H. GARNER (J. Inst. Petroleum Tech., 1938, **24**, 496—512).—The present knowledge of the chemistry of asphaltic bitumen and of its physical properties is summarised. T. C. G. T.

**Microscopical study of tar.** L. SABROU and E. RENAUDIE (J. Usines à Gaz, 1938, **62**, 248).—The disperse particles are characteristic for tars of different origins (*e.g.*, vertical or horizontal retorts). In the best road tars they have a chain-like structure. Microscopical control is useful in the production of tars and pitch paints. A. R. PE.

**High-pressure hydrogenation of various tars. II. Hydrogenation of various tars and oils in a continuous plant. III. Hydrogenation of middle oils obtained by hydrogenation of various tars and oils.** S. ANDŌ (J. Soc. Chem. Ind. Japan, 1938, **41**, 215—217B, 247—248B; cf. B., 1937, 865).—II. Crude low-temp. tar, the oil from it distilling above 200°, creosote oil, crude shale oil, and heavy mineral oil distilling above 250° have been hydrogenated at 460—480°/200 atm. over a Mo catalyst in a continuous plant having two chambers. The main products were hydrocarbons adsorbed by active C from the outlet gases, and 62—77% of oil which was fractionated into gasolines (yield 52—60%; b.p. <190°) having $C_8H_{18}$ nos. from 59 (shale oil) to 80 (creosote) running in the inverse order of their contents of paraffins and middle oils containing 54—91% of aromatics. There were no phenolic products.

III. The above middle oils on further hydrogenation at 480°/100 atm., were converted into gasoline and heavier fractions, both containing a higher proportion of aromatics than the corresponding products from the first treatment. A. R. PE.

**Rotary [oil-well] drilling mud. I. Effect of tannin on the viscosity.** P. Y. NARAYANA (J. Indian Inst. Sci., 1938, **21A**, 169—178).—The effects of a no. of tannin-containing materials in reducing the $\eta$ of the mud have been studied. The most effective was myrobalan powder. F. J. G.

**Method for determining the water content of [oil] sands.** H. G. BOTSET (Amer. Inst. Min. Met. Eng., Tech. Publ. 972, 7 pp.; Petrol. Tech., 1938, **1**, No. 3).—The petroleum is extracted from crushed oil sand with $CCl_4$ and the $H_2O$ with abs. EtOH. The $H_2O$ tolerance of equal vols. of the EtOH extract and $CCl_4$ is determined and is found to depend on the amount of $H_2O$ in the extract. The $H_2O$ is then calc. by use of experimentally determined curves. Temp. control is very important. Advantages and disadvantages of the method are outlined. T. C. G. T.

**Method of calculating oil-evaporation losses [from storage tanks].** W. F. ROGERS (Petrol. Eng., 1938, **9**, No. 9, 39—43; No. 11, 48—49, 52).—A formula relating oil loss and change in v.p. is given. R. B. C.

**Solvent extraction of Formosan petroleum oils. VIII. Solution temperature of mixtures of various organic solvents with *n*-hexane, *cyclo*-hexane, and benzene.** S. SYÔNO (J. Soc. Chem. Ind. Japan, 1938, **41**, 236—238B).—Solution temp. are given for various systems each composed of mixtures of equal vols. of one of 36 named org. solvents with $n$-$C_6H_{14}$ (I), *cyclo*hexane (II), $C_6H_6$ (III), or mixtures of pairs of these in various proportions. The solution temp. of a mixture containing a single hydrocarbon component diminishes in the order (I), (II), (III), and those of mixtures containing two in the order (I) + (II), (II) + (III), (I) + (III). Cyclic are superior to linear compounds containing similar polar groups in extracting hydrocarbons. $NH_2Ph$ is the most suitable solvent for determining unsaturated hydrocarbons in the gasoline fraction by means of the solution temp. A list of suitable solvents for the extraction of gasoline hydrocarbons is given. W. A. R.

**Solvent extraction of Formosan petroleum oils. IX. Aniline treatment of Syukkôtô gasoline fraction.** S. Syôno (J. Soc. Chem. Ind. Japan, 1938, 41, 253B; cf. B., 1938, 476).—The crit. solution temp. of a gasoline, containing 55% of aromatics, with various proportions of $NH_2Ph$ are given. The separated fraction of the gasoline has a slightly higher *d* than that yielded by refining with $H_2SO_4$ (cf. B., 1937, 1296). A. R. Pe.

**Separation of *iso*propylbenzene from a mid-continent petroleum by adsorption with silica gel and distillation with acetic acid.** J. D. White and F. W. Rose, jun. (J. Res. Nat. Bur. Stand., 1938, 21, 151—165; cf. B., 1935, 293; 1937, 314).—The fraction, b.p. 144—152°, after removal of $n$-$C_9H_{20}$ and xylenes, is redistilled and the aromatic constituents (3 vol.-%) are removed from the distillate, b.p. 102—106°/215 mm., by adsorbing on $SiO_2$ gel and distilling the adsorbed material with AcOH, followed by fractional distillation of the concentrate. $PhPr^{\beta}$ (0·03% of petroleum), b.p. 152·39°/760 mm., 98·4% pure, is obtained. $PhPr^{\alpha}$ is also probably present, and the residue consists mainly of naphthenic hydrocarbons. Data are recorded for the azeotropic distillation with AcOH of a synthetic 1 : 4 mixture of $PhPr^{\beta}$ and $n$-$C_9H_{20}$. A. T. P.

**Separation, by distillation with acetic acid, of the aromatic hydrocarbons from the fraction of a mid-continent petroleum boiling between 154° and 162°.** F. W. Rose, jun., and J. D. White (J. Res. Nat. Bur. Stand., 1938, 21, 167—184; cf. preceding abstract and B., 1937, 415).—The fraction is distilled with excess of AcOH to give a paraffin–naphthene mixture and an aromatic concentrate. Redistillation of the latter with AcOH removes all except aromatic hydrocarbons. The concentrate is then filtered through $SiO_2$ gel to remove gum, AcOH, $H_2O$, etc., and distilled to yield a fraction, b.p. 158·5—164·5°, containing probably $PhPr^{\alpha}$, $C_6H_4MeEt$, and $C_6H_3Me_3$. The method of separation by AcOH is applicable to the xylene fraction, b.p. 130—145°, and to the $C_6H_3Me_3$ fraction, b.p. 162—176°. Data are recorded for the separation of $PhPr^{\beta}$ and $n$-$C_9H_{20}$ from synthetic mixtures. A. T. P.

**Recent progress in chemical and physical refining of petroleum products. I. Purification of gas.** B. Kwal (Petrol. Eng., 1938, 9, No. 11, 33—34, 36).—Methods for removing $H_2S$ from refinery and natural gas, *e.g.*, the Girbitol and Seabord processes, are reviewed. R. B. C.

**Removal of deposits from solar oil scrubbers.** A. I. Brodovitsch and S. G. Faingold (Koks i Chim., 1938, No. 6, 33—34).—The deposits are only sparingly sol. in the ordinary org. solvents. They are best removed by emulsification in a mixture of solvent naphtha 50, $H_2O$ 47·5, and acidol 2·5%. R. T.

**Significance of the critical phenomena in oil and gas production.** D. L. Katz and C. C. Singleterry (Amer. Inst. Min. Met. Eng., Tech. Publ. 971, 17 pp.; Petrol. Tech., 1938, 1, No. 3).—The crit. phenomena of pure substances and mixtures are discussed and results of tests made on a mixture of (*a*) natural gasoline and natural gas up to a crit. pressure, and (*b*) crude oil and natural gas up to 9000 lb./sq. in., are reported. The application of the information to problems in oil and gas production is discussed. T. C. G. T.

**Raman spectrography in the analysis of hydrocarbon mixtures.** A. Andant (XIV Congr. Chim. ind. Paris [1934], 1935, Comm. 1; Chem. Zentr., 1936, ii, 3706).—Experimental technique and applications are discussed. A. H. C.

**Combination [oil-]cracking economics.** E. R. Smoley (Refiner, 1938, 17, 184—190).—The costs of cracking petroleum to gasoline in (*a*) a two-coil cracking plant, (*b*) a two-coil cracking and topping plant, and (*c*) separate cracking and topping plants are compared. R. B. C.

**Cracking of benzine and fuel oil (Pacura) with formation of ethylene.** C. Candea and C. Manughevici (Bull. sci. Ecole polytech. Timişoara, 1936, 6, 298—304; Chem. Zentr., 1936, ii, 2833).—Cracking of benzine in Cu tubes at 600—800° yields a gas ($H_2$ 9%, $C_2H_4$ and homologues 50%). A mixture of fuel oil and light oil (1 : 1) gave less $C_2H_4$ but more of its homologues, the total yield increasing with the contact time. A. H. C.

**Influence of high temperatures on cracking gases obtained from Rumanian petroleum (Moreni).** C. Candea and E. Macovski (Bull. sci. Ecole polytechn. Timişoara, 1936, 6, 305—315; Chem. Zentr., 1936, ii, 2834).—The gases when polymerised in a Cu tube at 750—800° yielded chiefly aromatic hydrocarbons. The yield of olefines (I) decreases and that of $H_2$ increases with rising temp. and increasing reaction time and hence cracked products must be rapidly removed from the reaction zone to ensure a gas rich in (I). A. H. C.

**Evolution of processes for preparation of motor spirit by catalytic reduction of carbon monoxide with hydrogen.** C. Berthelot (Chim. et Ind., 1938, 40, 434—460).—The development of the Fischer–Tropsch process is reviewed. A. B. M.

**Characteristics of modern Diesel fuels.** R. Heinze and M. Marder (Oel u. Kohle, 1938, 14, 833—843).—German, American, and British specifications are compared, test methods are described, and their significance is discussed. A. R. Pe.

**Alternative [Diesel] fuels. Consideration of case for vegetable oils.** Anon. (Auto. Eng., 1938, 28, 298).—Data obtained by Lever Bros. in the operation of transport Diesel engines on palm, cottonseed, arachis, and soya-bean oils are summarised. Preheating of the oil in order to reduce the $\eta$ is necessary. A 10% decrease in power output and a 10% increase in the sp. fuel consumption are obtained as compared with the use of standard Diesel oils. Arachis and palm oils are corrosive to Fe and Cu. Owing to their high cost vegetable oils cannot be economically employed in Great Britain for road transport. R. B. C.

**Piezo-electric indicator and its application to investigation of motor fuels.** H. Hintze (Petroleum, 1938, 34, No. 41, 1—6).—A convenient outfit, whereby oscillograms showing pressure or d*p*/d*t* as functions of time, crank angle, or piston travel may be observed or photographed, is described. The ignition lag of Diesel fuels can be directly observed. Applications to other cases of rapidly varying pressures are discussed. A. R. Pe.

**Initial distillation temperature and volatility of aeroplane fuel.** J. Zdárský (Chem. Obzor, 1936, **11**, 86—90, 108—113; Chem. Zentr., 1936, ii, 2839).—Directions for the use of the Engler–Holde–Ubbelohde apparatus are given and the influence on the observed temp. of rate of distillation, height of flame, temp. of cooling-$H_2O$, etc. is described. A. H. C.

**Stabiliser for gasoline–alcohol blends.** Y. Tanaka, T. Kuwata, and M. Aoki (J. Soc. Chem. Ind. Japan, 1938, **41**, 226—227b).—Alicyclic alcohols are more effective stabilisers than hydrocarbons, ethers, ketones, esters, and org. bases. The lowering of the crit. solution temp. caused by adding $n$ vol.-% of *cyclo*hexanol or terpineol to blends containing $\ngtr 30$ vol.-% of 94% EtOH is given by $\Delta T = Kn$, where $K$ is a const. characteristic of the stabiliser and depending on the proportions of the original blend and the aromatic content of the gasoline. A. R. Pe.

**Problem of detonation. Influence of the phenomena on design and development of the internal-combustion engine.** M. Serruys (Aircraft Eng., 1938, **10**, 143—151).—A lecture. R. B. C.

**Measurement of detonation [in internal-combustion engines].** F. Postlethwaite (Aircraft Eng., 1938, **10**, 201—205, 211).—The Royal Aircraft Establishment–Mullard detonation unit and meter are described. R. B. C.

**Control of combustion in internal-combustion engines by analysis of the exhaust gases.** E. Franchi (Rev. Fac. Cien. Quím. La Plata, 1936, **11**, 43—46).—The efficiency as fuels of petrol alone or mixed with $C_6H_6$ or EtOH, and also of $C_3H_8$ and cracked petrol, has been determined by the A.S.T.M. method D357–34T in which the calorific val. of the explosions in a standard automobile engine is obtained by analysis of the exhaust gases. The val. for petrol (6319) is increased by adding 30% of $C_6H_6$ (6637), by cracking (6849), and by adding 30% of EtOH (7107); the val. for $C_3H_8$ is 7155 kg.-cal./kg. F. R. G.

**Sulphur determinations from bomb washing titrations.** R. E. Kaufman (Ind. Eng. Chem. [Anal.], 1938, **10**, 538—540).—A correlation of corrections to be applied when determining S in fuel by means of a Parr bomb. F. N. W.

**Effect of temperature on gel strength of some Gulf Coast drilling muds.** B. I. Routh and B. C. Craft (Amer. Inst. Min. Met. Eng., Tech. Publ. 961, 7 pp.; Petrol. Tech., 1938, **1**, No. 3).—The shear strength of the muds increases with temp., but the increase is retarded by chemical treatment. The cylindrical shearometer is more suitable for field use than the Stormer viscosimeter. No definite relationship seems to exist between $\eta$ and shear strength. T. G. C. T.

**Principles of solvent dewaxing. III. Equilibria and computations for double-solvent systems.** M. Ba Thi, T. G. Hunter, and A. W. Nash (J. Inst. Petroleum Tech., 1938, **24**, 453—467).—Double-solvent equilibrium may be represented by the use of solid models such as regular tetrahedrons or equilateral triangular prisms. The most convenient graphical representation of isothermal equilibrium in a double-solvent system is the projection of the prism model on to its triangular base. Application to commercial dewaxing operations is not claimed. (Cf. B., 1938, 128.) T. C. G. T.

**Calorimetric analysis of paraffin [wax].** G. Verdonk (Chem. Weekblad, 1938, **35**, 741—743).—From the melting curves of technical paraffin waxes ($n_D^{70}$ 1·4333, 1·4334; $d_4^{70}$ 0·7768, 0·7744; mol. wt. 450, 410; $NH_2Ph$ point 120°, 121°; Br val. 0, 0), $n$-$C_{27}H_{56}$, $C_{31}H_{64}$, and $C_{32}H_{66}$, it is concluded that the waxes are mixtures of solid solutions of substances existing in two enantiotropic forms. S. C.

**Lubricating oils prepared from the synthetic product of the Fischer–Tropsch process (Kogasin).** H. Koch (Brennstoff-Chem., 1938, **19**, 337—343; cf. B., 1937, 408).—The $\eta$-pole height of the lubricating oils obtained by treating Kogasin fractions with anhyd. $AlCl_3$ falls (*i.e.*, the $\eta$ index rises) as the b.p. of the fraction used rises. At the same time the yield of lubricating oil falls correspondingly with the fall in olefine content of the higher-boiling fractions. The properties of the lubricating oils depend also on the conditions (*e.g.*, gas composition, catalyst used) of the original Kogasin synthesis. The synthetic lubricating oils contain 1—2 olefinic double linkings and about 1 naphthene ring per mol. (cf. B., 1935, 836, 934). Successive fractions (of increasing $\eta$) obtained by extracting the oil with $COMe_2$ show the same naphthene ring content; *iso*paraffins are apparently absent. Oils of the same mean mol. wt. may have different $\eta$-pole heights. The stability of the oils is improved by hydrogenation. The results of road tests are satisfactory. A. B. M.

**Lubrication. II. Experimental friction coefficients for thick-film lubrication at complete journal bearings.** F. Morgan and M. Muskat (J. Appl. Physics, 1938, 9, 539—546; cf. B., 1938, 1121).—Accurate measurements of the friction at a lubricated bearing are described. The results at low journal speeds are in close agreement with theory, a straight line through the origin being obtained on plotting the friction against $\eta N/P$, where $\eta$ is the lubricant viscosity, $N$ the journal speed, and $P$ the bearing load. Deviations occur at high speeds owing to frictional heating of the oil film. J. A. K.

**Significance of specific gravity of mineral lubricating oils.** J. Kubias (Chem. Obzor, 1938, **13**, 51—55).—The Hill–Coats $\eta$–sp. gr. const. ($H$) (B., 1928, 592) is significant only with natural mineral oils. In the case of synthetic, or treated natural, mineral oils the difference between the val. of the $\eta$-pole (the point of intersection of the $\eta$–temp. curves of oils of the same chemical character, which characterises the $\eta$ curve of an oil), calc. from $H$, and the observed val. gives a means of identification of such oils. Equations are given for $H$ for observations of $\eta^{50}$ in centipoises and $d^{15}$. The relation between $H$ and $\eta$-pole is given, but is only obeyed approx. even by natural mineral oils. The greatest deviations occur with thin oils, or where a dissolved solid phase (*e.g.*, paraffin) is present. F. R.

**Testing of hypoid lubricants.** C. F. Prutton and A. O. Willey (J. Soc. Auto. Eng., 1938, 43, 325—334T).—Film-strength machine, continuous-load, laboratory and road shock tests were made on 50 recognised commercial types of lubricant. The results indicate deficiencies in some of the lubricants under certain of the extreme conditions employed. Of the samples tested, those that passed the laboratory shock test lubricate hypoid gears satisfactorily under practically all other test conditions where normal temp. are used. The performance of the lubricants in the gear tests seems to bear but slight relation to film-strength data as obtained on laboratory test machines. R. B. C.

**Temperature-sensitivity of viscous oils.** D. J. W. Kreulen (J. Inst. Petroleum Tech., 1938, 24, 441—452).—It has been suggested that asphaltenes (I) and their associated compounds are responsible for that phenomenon by which the setting points and $\eta$ vals. of viscous oils vary according to heat treatment. In a study of the problem it is concluded that though there is some evidence of (I) acting as pour-point depressants, the phenomena may be quite well explained as ordinary wax and/or ceresin crystallisation. Above a crit. temp. of about 50° wax is dissolved, and cooling from above this temp. does not afford the system the advantage of crystal nuclei, and hence pour points will be lower than they would be otherwise. High $\eta$ will have a retarding influence on crystal formation. T. C. G. T.

**Efficiency of blast furnaces. Apparatus for flotation experiments.**—See I. **$C_2H_2$. Hydrogenation of $C_{10}H_8$. Absorption spectra of $C_{10}H_8$ hydrocarbons. Phenols from cornstalk lignin.** —See III. **Determining CO. Prep. of $H_2$.**—See VII. **Rept. of Refractory Materials Commee.**—See VIII. **Asphalt cements. Flow in bitumen-mineral mixtures. Bituminous concrete fillers.** —See IX. **Corrosion of metals by oils. Alaskan minerals. Al material for making products from coke-oven gas.**—See X. **[Bituminous] org. plastics. Asphaltites for enamel paint.**—See XIII. **Shoe creams.**—See XV. **Active charcoal for sugar decolorisation.**—See XVII. **Utilising coffee grounds.**—See XIX. **Determining PhOH in effluent $H_2O$.**—See XXIII.

**Erratum :**—On p. 120, col. 2, line 7 from bottom, *for* Rademacher *read* Radmacher.

See also A., I, 577, **"Knock" of hydrocarbons.** 588, **Origin of mineral oil and petroleum. Oil-field geology.** II, 438, **Tar hydrocarbons.**

## Patents.

**Production of ion-exchanging materials [from coal].** R. Furness, and J. Crosfield & Sons, Ltd. (B.P. 486,471, 13.3.37).—A material of high ion-exchange capacity is produced by treating coal (1 pt.) with a solution of $SO_2$ (<2 pts.) in liquid $SO_2$ at $-10°$ to $-15°$. F. M. L.

**Coking retort ovens.** Koppers Co. (B.P. 492,376, 15.2.37. U.S., 14.2.36).—The jamb structure of a coke-oven retort built of refractory materials consists of many vertically co-extensive brick courses with a vertically extending recess at the middle of the jamb face, metal plates covering the jamb on opposite sides of the recess, and a barrier to be inserted in the recess between the face plates to prevent leakage of gas. D. M. M.

**Production of coke in lump form.** Lurgi Ges. f. Wärmetechnik m.b.H. (B.P. 493,266, 14.3.38. Ger., 20.3.37).—Lump coke with a crushing strength of $\nless$75 kg./sq. cm. is produced from coal or lignite by dry-grinding the coal until $\nless$50% has a grain size of $\ngtr$0·2 mm., the remainder having grains up to 1 or 2 mm. The ground material is compressed in a ring roller-press at $\nless$1500 kg./sq. cm. and $\nless$40° into briquettes with a crushing strength of $\nless$120 kg./sq. cm. These are coked or subjected to low-temp. carbonisation to give the coke desired. D. M. M.

**Carbonisation processes and apparatus therefor.** H. A. Brassert & Co., Ltd., and F. Puening (B.P. 492,836, 18.6.37).—A liquid or liquefiable charge, *e.g.*, petroleum residue or coal-tar pitch, is coked in a horizontal coking chamber separated from lower regenerator chambers by two horizontal spaced floors having horizontal combustion flues between them. The upper floor is continuous, but the lower one has ducts connecting the combustion flues and regenerator chambers, these ducts protruding above the lower floor to prevent the passage through them of any liquid which may leak through from the upper chambers. D. M. M.

**Distillation-oven heating-gas flues.** T. Kretz (B.P. 492,543, 29.5.37. Ger., 30.5.36).—A distillation oven with metal walls has the heated heating gas directed against the outside of the metal walls in a large no. of minute jets of high velocity in order to obtain a high rebound effect; a more uniform heating of the oven wall thereby is claimed. D. M. M.

**Production of hydrocarbon products by destructive hydrogenation of solid carbonaceous materials.** H. E. Potts. From Internat. Hydrogenation Patents Co., Ltd. (B.P. 492,551, 22.7.37). —In the hydrogenation of such materials, *e.g.*, coal in the form of a paste in oil, the prepared paste, with added $H_2$ or a gas containing it, is heated to 300—440° at a pressure = that in the reaction space, passed through a zone of 15—50% (20—40%) of the volumetric capacity of the reaction space, where it is kept for some time, *e.g.*, 15—50% of the total time of heating, without release of pressure and at a temp. within 40° of that already mentioned, the temp. at the exit of the zone being $\nless$20° below that required for the reaction. The material is then heated to the reaction temp. and passed to the reaction zone. D. M. M.

(a—c) **Recovery or production of unitary cyclic compounds from products obtained in pressure extraction, (a) or destructive hydrogenation, of solid carbonaceous materials.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 493,307, 493,447, and 493,508, [a] 7.4.37, [b, c] 6.4.37. Cf. B.P. 435,254; B., 1936, 8).—(a) Products obtained from pressure extraction or mild hydrogenation of coal etc. are treated to separate the solid constituents, *e.g.*, by centrifuging, and then extracted with aliphatic ($C_{4-9}$) hydrocarbons, after which the layers are separated and the oil in the extract phase is fractionated. Unitary cyclic compounds are recovered from the resulting heavy oils. A treatment with liquefied hydrocarbons having $C_{1-3}$ at elevated temp. and pressure may precede the treatment with the $C_{4-9}$ hydrocarbons. (B) The extracts obtained from pressure extraction of coal etc. are subjected to thermal cracking at 450—750°/20—300 atm., in presence of catalysts if desired, without causing appreciable hydrogenation, the desired compounds being then separated by chemical or physical means. Alternatively, the extract may be fractionated before cracking is commenced. (C) The extracts are separated into groups rich in H and poor in H by treatment with selective solvents from each of two groups, one, *e.g.*, $SO_2$, $NH_2Ph$, etc., dissolving the fraction poor in H, whilst the other, *e.g.*, $C_2H_6$, $C_3H_8$, etc., ppts. the high-mol. wt. substances poor in H, *e.g.*, asphalt, resins, etc. The two layers formed are separated mildly and the fraction poor in H is destructively hydrogenated and/or dehydrogenated, the compounds to be recovered being separated by physical or chemical means. The fraction rich in H may be mildly hydrogenated. D. M. M.

**Production of water-gas.** Power-Gas Corp., Ltd., N. E. Rambush, and A. T. Grisenthwaite (B.P. 493,046, 30.3.37).—The generator is surrounded by a water-jacket where steam is generated at $<10$ ($\ngtr 3$) lb./sq. in. This steam is compressed to the pressure required for the generator either mechanically or by means of a steam jet. Outside steam is added if required, and the pressure increase in the jacket during the blow is $\ngtr 2$ lb./sq. in. D. M. M.

**Production of gas mixtures rich in hydrogen.** Ges. f. Linde's Eismaschinen A.-G. (B.P. 493,259, 3.3.38. Ger., 20.3.37. Addn. to B.P. 458,557; B., 1937, 208).—The $O_2$ used in carrying out the process of the prior patent is diluted with a vapour or gas, *e.g.*, $H_2O$ vapour, which forms only CO and $H_2$ by interaction with the hot coke, whereby the flame zone is increased so as to extend over the entire cross-section of the shaft without adversely affecting the composition of the gas mixture produced. A. B. M.

**Conversion of olefine hydrocarbons.** A. L. Mond. From Universal Oil Products Co. (B.P. 492,727—8, 25.3.37).—Olefines, *e.g.*, from cracking of petroleum, are converted into hydrocarbons with more C atoms by concurrent polymerisation and hydrogenation, by subjecting them simultaneously to the action of $H_2$, a polymerising agent, and a hydrogenating catalyst selected from the oxides and sulphides of metals of group VI*a*, *e.g.*, Cr, Mo, W, or U. The polymerising agent consists of (A) $AlCl_3$, $ZnCl_2$, $MgCl_2$, $H_2SO_4$, $H_3PO_4$, $HClO_4$, or $BF_3$, but the use of a solid polymerising agent comprising a phosphoric acid and a solid adsorbent is excluded; (B) a phosphoric acid and a solid adsorbent. D. M. M.

**Conversion of butanes into gasoline boiling-range liquids.** A. L. Mond. From Universal Oil Products Co. (B.P. 492,567 12.11.37).—The butanes from cracked gasoline are subjected to pyrolytic conversion at 540—615°/20—70 atm. and the products of $< C_3$ and of $C_3$ and $C_4$ are separated into light and intermediate fractions, respectively, the balance consisting principally of gasoline hydrocarbons. The intermediate fraction is treated with a solid phosphoric acid catalyst at 205—288°/10—70 atm. to produce a light gas fraction of $<C_4$ which is removed, a $C_4H_{10}$ fraction which is recycled for pyrolysis, and a gasoline fraction. D. M. M.

**Removing acid components from hydrocarbons or derivatives thereof.** N. V. De Bataafsche Petroleum Maats., Assees. of D. L. Yabroff and E. R. White (B.P. 492,789, 28.9.37. U.S., 7.5.37).—Org. acid-reacting components, especially mercaptans, are removed from hydrocarbons by treatment with a substantially saturated solution of alkali hydroxide, *e.g.*, NaOH, in aq. $(CH_2{\cdot}OH)_2$ (I) solution containing $\ngtr 75$ (25—75)% of (I). D. M. M.

**Obtaining polymerides from hydrocarbon gases.** Standard Oil Development Co., and I. G. Farbenind. A.-G. (B.P. 493,726, 21.5.37. U.S., 27.6.36).—Olefinic gas mixtures, *e.g.*, natural and cracked petroleum gases containing $C_4$, are polymerised with an acid catalyst, *e.g.*, $H_2SO_4$, under conditions whereby $CMe_2{:}CH_2$ is preferentially polymerised into di- and tri-polymerides, the polymerides are separated, and the heavier portion, mainly the tripolymeride, is first depolymerised and then repolymerised in liquid phase at $< -20°$ to produce a polymeride with mol. wt. $>1000$. D. M. M.

**Hydrocarbon fuel treater.** A. E. McManus, jun. (B.P. 493,415, 31.12.37. U.S., 20.3.37).—The fuel is passed through passages in the device, which is inserted in the feed-line to an engine, the walls of the passages being formed so that the fuel first blows between a material more electropositive than H, *e.g.*, C or Cu, and a material close to H in the electromotive series, *e.g.*, Pb, and then flows between the Pb and a material more electronegative than H, *e.g.*, Zn. D. M. M.

**Improving fuel oils by treatment with hydrogenating gases.** H. E. Potts. From Internat. Hydrogenation Patents Co., Ltd. (B.P. 493,470, 10.4.37).—Poor-quality fuel oils are treated with $H_2$ or a hydrogenating gas at 280—550° (300—400°)/$>50$ (200—600) atm. in presence of $\nless 10$ wt.-% of a hydrogenating catalyst. The treatment is continued only until the oils have gained $<0{\cdot}5$ wt.-% of $H_2$. D. M. M.

**Additions to fuels for internal-combustion engines.** H. E. MacKay and A. J. L. Greig (B.P. 492,754, 26.2.37).—A mixture of naphtha, $NaClO_4$, $NH_4NO_3$, ICl, and $PtCl_4$, with or without nigrosine and/or $C_{10}H_8$, is added to the fuel. D. M. M.

**Diesel fuel oils.** G. W. Johnson. From I. .G Farbenind. A.-G. (B.P. 493,084, 5.4.37).—The setting point of fuels containing wax is lowered and their $\eta$ increased by addition of $\ngtr 5$ (1)% of condensation products of high-mol. wt. aliphatic hydrocarbons and aromatic compounds containing O. An example quoted is the condensation product of chlorinated paraffin wax and $(C_6H_4)_2O$. D. M. M.

**Lubricants.** ARMOUR & Co. (B.P. 493,524, 10.4.37. U.S., 23.6.36).—A lubricant for metal bearings etc. consists of 4—95% of a ketonic material (I) in which one radical is a closed-ring radical and the other an alkyl radical having $\nless C_6$. A carrier vehicle or solvent may be used to deposit the (I) on the surface to be lubricated. A preferred ketone is $C_6H_3Me_2·O·C_{17}H_{35}$. D. M. M.

**Manufacture of lubricants.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 493,557, 15.4.37 and 25.3.38).—Aliphatic hydrocarbons (mol. wt. $\nless 170$) containing $\nless 13·5$ g. of H per 100 g. of C, or their derivatives containing O, are condensed in presence of a small amount (0·1—5%) of isocyclic compounds containing $\nless 3$ rings and preferably with b.p. >300°, *e.g.*, anthracene, phenanthrene, etc., or their alkyl derivatives or mixtures of two or more of them. A larger amount (5—20%) of cyclic compounds containing one or two rings must also be present, *e.g.*, $C_6H_6$, $C_{10}H_8$, etc., or their derivatives containing O, S, and/or N. $AlCl_3$ etc. may be used as condensing agent. The lubricants so obtained are valuable also as pour-point depressants and improve the $\eta$ index of ordinary lubricating oils. D. M. M.

**Preventing the formation of gum-like products in oils.** A. C. G. EGERTON (B.P. 492,516, 18.3.37).—Gum formation in oils, *e.g.*, lubricating oils for use in the combustion space of an internal-combustion engine or under similar conditions where N oxides are present, is prevented by addition, either to the oil or to the atm. containing the N oxides, of an inhibitor consisting of an aryl or alkyl derivative of urea. The alkylureas preferably contain two alkyl groups. The $Ph_2$ derivative is claimed. The inhibitor should amount to 0·5—5·0 wt.-% of the oil. D. M. M.

**Filters or strainers [for oil etc.]. Separating liquids and solids [coal slurries]. Evacuation of materials from coal wash-box. Regenerating bleaching clays etc. Cooler for viscous [oily] liquids.**—See I. **Oxidation products of paraffin hydrocarbons. Acrylic esters. Self-emulsifying compositions.**—See III. **$H_2$.**—See VII. **Road surfaces etc.**—See IX. **Rubber etc.**—See XIV.

**Erratum** :—On p. 1130, col. 2, line 25, *for* B.P. 477,928 *read* B.P. 477,923.

## III.—ORGANIC INTERMEDIATES.

**Synthesis of acetylene from carbon and hydrogen.** F. FISCHER and H. PICHLER (Brennstoff-Chem., 1938, 19, 377—380).—At the temp. of the C arc the reaction $2C + H_2 = C_2H_2$ should proceed practically to completion. When, however, a C arc was maintained in an atm. of $H_2$ (initial pressure 75—760 mm.) contained in $H_2O$-cooled $SiO_2$ flask the final $[C_2H_2]$ was only 1·2—2·2%. Much higher conversions (up to 94% of $C_2H_2$ in the end gas) were obtained by operating at reduced pressures, *e.g.*, 70 mm., and immersing the flask in liquid air during the experiment so that the $C_2H_2$ was condensed as it was formed. Small amounts of higher hydrocarbons and HCN (the initial gas contained some $N_2$) were also formed. A. B. M.

**Application of the Raman effect to the technical analysis of organic products.** R. SIPS (Congr. Chem. ind. Bruxelles, 1935, 15, I, 525—541; Chem. Zentr., 1936, ii, 3152).—Purification, stabilisation, and examination of the Raman spectra of chlorinated paraffins, olefines, and mixtures are described. Advantages are simplicity, rapidity, and certainty; disadvantages are low sensitivity and lack of quant. results. Homologous pairs (*e.g.*, $C_2H_4Cl_2$–$C_2H_2Cl_4$; $CCl_4$–$C_2H_2Cl_4$; $CCl_4$–$C_2HCl_3$) show lines of each component. A. H. C.

**Synthesis of ethylene chlorohydrin and ethylene glycol.** S. UENO and S. TAKASE (J. Soc. Chem. Ind. Japan, 1938, 41, 254—256B).—Introduction of $C_2H_4$ and $Cl_2$ into $H_2O$ gives small yields of $CH_2Cl·CH_2·OH$ (I), but when the concn. of (I) exceeds 7% large quantities of $C_2H_4Cl_2$ and $(CH_2·OH)_2$ (II) are produced. $CuCl_2$ and $NiCl_2$ have no catalytic action in formation of (I). Hydrolysis of (I) with aq. $Na_2CO_3$ or $NaHCO_3$ in an autoclave at 60—90° yields 85—90% of (II). J. D. R.

**Phase and reaction equilibria in the preparation of nitroglycol.** V. ÖHMANN (Ing. Vet. Akad. Handl., 1936, No. 139, 40 pp.; Chem. Zentr., 1936, ii, 3073).—Washing and nitration equilibria such as occur in the nitroglycerin (I) process are discussed. In the wash system mononitroglycol (II) is partitioned between $H_2O$ and dinitroglycol (III), but no association phenomena are observed as with (I). The const. ($k$) in the $HNO_3$ system is independent of the acid concn., but $k$ increases slightly in the neutral system with decreasing content and minor association of (II). The reaction and partition equilibria should be considered simultaneously in the $HNO_3$ system, association also accounting for the greater amount of dinitroglycerin than (I) in the respective systems with equal $H_2O$ content. The dissociation of $HNO_3$, $H_2O$ content of the oil phase, possible association of (I) and (III), etc. are also considered. A. H. C.

**Aërogel catalysts. Conversion of alcohols into amines.** K. KEARBY, S. S. KISTLER, and S. SWAN, jun. (Ind. Eng. Chem., 1938, 30, 1082—1086; cf. A., 1934, 609).—Comparison of the catalytic properties of several oxide aërogels for the vapour-phase conversion of BzOH and $Bu^{\alpha}OH$ into the amines by interaction with $NH_3$ shows that a mixed $Al_2O_3$–$Cr_2O_3$ aërogel is the most efficient catalyst of those examined. F. N. W.

**Infra-red absorption spectra of naphthalene hydrocarbons. Application to analysis of constituents of oils.** P. LAMBERT and J. LECOMTE (Ann. Off. nat. Comb. liq., 1938, 13, 111—126).—Spectra of 1- and 2-$C_{10}H_7·CH_2Ph$, 1 : 4- and 1 : 8-$C_{10}H_6(CH_2Ph)_2$, indene, and *iso*butylindene have been determined between 6—11 μ. and 12—19·5 μ. The spectra of these compounds are compared with those obtained previously (Publications scientifiques et techniques du Ministère de l'Air, 1933, No. 34) for $C_{10}H_8$ and its 1- and 2-Me, 1 : 6- and 2 : 6-$Me_2$, and

$H_{10}$- and $H_4$-derivatives. Further data are required for the prediction of spectra of given compounds and the analysis of mixtures. R. B. C.

**Normal and destructive hydrogenation of naphthalene. II.** S. Doldi (Annali Chim. Appl., 1938, 28, 301—310).—Hydrogenation of $C_{10}H_8$ under pressure with appropriate catalysts yields 98% of tetrahydronaphthalene. Data for the yields of light, middle, and heavy (lubricating) oils afforded by hydrogenation at 400° and 120 kg./sq. cm. are tabulated and discussed. F. O. H.

**Phenols from cornstalk alkali-lignin.** G. L. Bridger (Ind. Eng. Chem., 1938, **30**, 1174—1180).—Digestion (100°; 6·3 kg./sq. cm.) of 22·7 kg. of cornstalks with 2·3 kg. of NaOH in 227 l. of $H_2O$ affords a liquor from which crude lignin (9—10% yield) is obtained after concn. to $d^{90}$ 1·06, acidification, and further heating for 2 hr. at 100°. Destructive distillation of the lignin under varying conditions shows that under 140 mm. pressure the max. tar yield (17·7%) is obtained with a retort temp. rising to $\not<$400°, whilst the phenol content of the tar is increased (86·9% at 28 mm.) by lowering the pressure at which the distillation is conducted. On fractional distillation 40—55% of the tar is obtained as phenol fractions, amongst which PhOH, *o*- and *p*-cresol, guaiacol, *m*-5-xylenol, and 3-methoxy-*p*-cresol have been identified. F. N. W.

**Manufacture of dye intermediates.** A. E. Pinkney (Chem. Met. Eng., 1938, 45, 526—527).—A plant for sulphonation and condensation, *e.g.*, for the production of quinizarin, is described and illustrated. D. K. M.

**Oxidation processes. Azeotropic distillation.**—See I. **$CH_4$ synthesis. Synthesis of gaseous hydrocarbons. $C_3H_8$ containers. Separating polystyrenes from xylene fractions. $PhPr^{\beta}$ and aromatic hydrocarbons from petroleum.**—See II. **Al plant for making products from coke-oven gas.**—See X. **Unsaturated higher alcohols.**—See XII. **Detecting Br in org. compounds.**—See XIV. **Analysis of Pb acetates. Acetals in perfumery.**—See XX. **Mustard gas.**—See XXII.

See also A., II, 428, **Electrolysis of mixtures of nitrates with $CHMeEt{\cdot}CO_2Na$.** 430, **COMeEt.** 435, **Prep. of $AlMeCl_2$ and $AlMe_2Cl$.** 438, **Derivatives of 2 : 3-$C_{10}H_6Me_2$.** 443, **Prep. of amyl salicylates.** 465, **Determining $C_2H_4Br_2$.**

## PATENTS.

**Separation of propane and propylene from gas mixture.** I. G. Farbenind. A.-G. (B.P. 492,503, 14.2.38. Ger., 16. and 17.2.37).—$C_3H_8$ and/or $C_3H_6$ are extracted from gaseous mixtures with other hydrocarbons such as $CH_4$, $C_2H_6$, and $C_2H_4$ by washing with liquefied, normally gaseous, halogenated hydrocarbons, *e.g.*, MeCl, EtCl, $C_2H_3Cl$, under pressure at room temp., or at ordinary pressure at, *e.g.*, —20° to —45°. R. G.

**Manufacture of oxidation products from paraffin hydrocarbons of high mol. wt.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 490,785, 6.5.37. Addn. to B.P. 478,317; B., 1938, 1129).—Paraffins are aërially oxidised at $\not>$115° in presence of an alkali–Mn compound as catalyst in a solvent. The oxidation of paraffin wax in presence of $KMnO_4$ in $H_2O$ or $COMe_2$ is described. A. H. C.

**Polymerisation of mono-olefines.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 491,932, 11.3.37).—Mono-olefines (*e.g.*, $C_3H_6$) are polymerised in presence of a mixture of $H_3PO_4$ and $H_4P_2O_7$ of $d^{15} \not< 1{\cdot}90$ (1·90—1·99). A. H. C.

**Apparatus for carrying out polymerisations continuously.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 491,739, 25.3.37).—Polymerisation is carried out on a moving band in a gastight housing. Apparatus is claimed and the polymerisation of $C_2H_4$, *iso*-$C_4H_8$, and $CH_2{:}CH{\cdot}OBu^{\beta}$ by $BF_3$ described. A. H. C.

**Production of derivatives of ethylene.** E. W. Fawcett, and Imperial Chem. Industries, Ltd. (B.P. 492,322, 19.3.37).—Compounds of high mol. wt. are obtained by removal, wholly or in part, of halogen from halogenated derivatives (cf. B.P. 481,515; B., 1938, 625) of solid or semi-solid polymerides of $C_2H_4$ (cf. B.P. 471,590; B., 1937, 1309) by treatment with substances, such as $NH_3$, caustic alkalis, Na polysulphides, metals such as Zn or Na, metal alkoxides, or amines, capable of reaction with halogen or H halides; a liquid medium, *e.g.*, EtOH or $Et_2O$, may be present. R. G.

**Manufacture of vinyl chloride.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 492,980, 20.5.37).—HCl and $C_2H_2$ (which may be dil. as in the product of thermal or electrical treatment of hydrocarbons) are led over heated active C with continuous or periodic addition of Hg. A. H. C.

**Manufacture of β-halogeno-$\alpha\gamma$-butadienes.** I. G. Farbenind. A.-G. (B.P. 492,689, 25.3.37. Ger., 28.3.36).—β-Halogeno-$\Delta^{\alpha\gamma}$-butadienes (I) are prepared by splitting off HHal. from $\gamma\delta$-dihalogeno-$\Delta^{\alpha}$-butenes, *e.g.*, with alcoholic alkali or a *tert.* base ($C_5H_5N$), (I) being removed as formed by the vapour of an org. solvent, *e.g.*, MeOH or $C_5H_5N$, whereby polymerisation is prevented. A small amount of *p*-$C_6H_4(OH)_2$ is preferably present. R. G.

**Preparation of catalysts for the synthesis of methanol.** G. Natta (B.P. 492,073, 10.6.37. Italy, 10.6.36).—The reduction of CO to MeOH by $H_2$ or $H_2$ + steam is catalysed by ZnO prepared by decomp. an org. salt of Zn of which the m.p. is < the decomp. point [$Zn(OAc)_2$], preferably in an inert atm. at >1 atm. A. H. C.

**Production of aliphatic carboxylic acids.** A. Imhausen and C. Staennings (Märkische Seifenind.) (B.P. 491,927, 9.3.37. Ger., 10.3.36).—Hydrocarbons obtained by reducing oxides of C are oxidised by air to fatty acids in presence of heavy-metal salts of acids $C_nH_{2n-x}O_2$ ($n > 15$, $x > 5$) of the acrylic type. [Stat. ref.]. A. H. C.

(A) **Manufacture and use of** (A, B) **acrylic acid esters and polymerisation products thereof.** Röhm & Haas A.-G. (B.P. 491,800 and 491,894, [A] 8.3.37, [B] 12.3.37. U.S., [A] 7.3.36, [B] 12.3.36).—Acrylic esters of alcohols $C_{7-16}$ are prepared and polymerised by usual methods. The prep. of sec.-*octyl*, b.p. 107—109°/22 mm., *cetyl*, b.p. 205—210°/13 mm., and *lauryl acrylate*, b.p. 170—185°/21 mm., is described and the application of their polymerides (or copolymerides with other olefinic compounds) as constituents of lubricants, nitrocellulose lacquers, coating compositions, adhesives for laminated glass, and rubber-coating compositions is claimed. (B) Polymerides of acrylic esters of *sec.* and *tert.* alcohols (prepared from the alcohols and acrylic acid, halide, or anhydride) are harder than those of primary alcohols. sec.-*Bu*, b.p. 131—132°/765 mm., $Bu^{\gamma}$, b.p. 117—120°/759 mm., sec.-, b.p. 71—72°/37 mm., and tert.-*amyl acrylate*, b.p. 65—68°/49 mm., are described. The prep. of polymerides or copolymerides either alone, dissolved or dispersed in a liquid, or in presence of pigments, fillers, softening agents, or plasticisers, and their application as constituents of plastics, adhesives, etc., is claimed. A. H. C.

**Self-emulsifying compositions and aqueous emulsions thereof.** W. W. Triggs. From E. I. Du Pont de Nemours & Co. (B.P. 492,742, 21.1.37).—Compositions containing mono- or di-alkylated (Me or Et) *cyclo*hexylamine derivatives of alkyl sulphates ($C_{10-20}$), oils, waxes, or halogen derivatives thereof, and alcohols, aliphatic acids or esters as lubricating agents form emulsions in which $H_2O$ may be the internal or external phase; they are suitable for use in the production of lubricants, textile agents, etc. The use of abrasives to form buffing compounds is also claimed. A. H. C.

**Manufacture of aluminium salts of carboxylic acids.** W. W. Groves. From A.-G. f. Stickstoffdünger (B.P. 491,661, 6.3.37).—Neutral Al salts are made by the action of Al on the carboxylic acid in presence of a catalytic amount of the anhydride of the same or a lower acid. The prep. of salts of AcOH, $EtCO_2H$, $PrCO_2H$, and œnanthic acid is described. A. H. C.

**Manufacture of ketones and alcohols from olefines.** Usines de Melle, and H. M. E. Guinot (B.P. 492,726, 25.3.37. Fr., 28.3.36).—Olefines are treated with HOCl to give a chlorohydrin (I), the HCl formed being neutralised with NaOH and (I) is then separated from the NaCl solution, *e.g.*, by countercurrent washing with $C_6H_6$, treated with NaOH, and the resulting alkylene oxide (II) separated from the NaCl formed and from unchanged (I) by fractional distillation. (II) is then hydrogenated in the vapour phase in presence of a reduced metal catalyst at about 70° to give a mixture of ketone and alcohols. $Cl_2$, $H_2$, and NaOH necessary for the process are produced by electrolysis of the NaCl solutions obtained in the neutralisation of the HCl formed simultaneously with (I) and in the decomp. of (I) with NaOH. The prep. of a mixture of $COMe_2$, $Pr^{\beta}OH$, and a large proportion of $Pr^{\alpha}OH$ from $CMe{:}CH_2$, and of a mixture of COMeEt, $Bu^{\alpha}OH$, and $Bu^{\beta}OH$ from butylenes, using a Ni catalyst at 70° is claimed. R. G.

**Production of high-molecular quaternary ammonium compounds.** Färberei-A.-G. vorm. E. Stolte Nachf. & W. Missy (B.P. 492,699, 31.3.37. Ger., 4.12.36 and 6.1.37).—High-mol., $H_2O$-sol. quaternary $NH_4$ compounds are obtained by interaction of volatile *tert.* bases ($NMe_3$, $C_5H_5N$) with the products of conversion of N-containing derivatives (I) of saturated fatty acids of $\nless C_{10}$, or urethanes of saturated fatty alcohols of $\nless C_{10}$, with $CH_2O$ or its polymerides and H halide (HCl) or halogens ($Cl_2$). (I) may consist of acid amides or their $OH\cdot CH_2$ compounds, hydroxamic acids, hydrazides, urethanes, amidines, urea, or $CO(NH\cdot CH_2\cdot OH)_2$ acylated on one side with higher fatty acids. $CH_2O$ is unnecessary where (I) is a $OH\cdot CH_2$ compound. The products are particularly valuable for rendering textile materials permanently $H_2O$-repellent. R. G.

**Manufacture of basic methyl mercury nitrate.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,306, 18.3.37).—Basic Hg Me nitrate (approx. $HgMe\cdot OH,HgMe\cdot NO_3$) is prepared by the action of $<1$ mol. of $HNO_3$ on $HgMe\cdot OH$ or by the interaction of $HgMe\cdot OH$ and $HgMe\cdot NO_3$ in a solvent ($H_2O$). The compound may be obtained as a dry powder or prepared in presence of a filler. Bactericidal and fungicidal preps. (*e.g.*, for seed grain) are claimed. A. H. C.

**Manufacture of sodium phenate [phenoxide].** W. H. Garrett, S. Smith, and Monsanto Chemicals, Ltd. (B.P. 492,310, 18.3.37).—Crude NaOPh obtained by dissolving the product of fusion of $PhSO_3Na$ with NaOH in $H_2O$ is purified by concn. to 35—40%, allowing inorg. salts to separate at $>50°$, and then crystallising pure NaOPh by cooling to $<50°$. The use of the pure salt to prepare $o$-$OH\cdot C_6H_4\cdot CO_2H$ is also claimed. A. H. C.

**Manufacture of sulphonation products [textile assistants].** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 492,905, 31.3.37).—Interaction is brought about between a sulphonating agent ($H_2SO_4$, oleum, $ClSO_3H$), a hydroxyalkyl, polyhydroxyalkyl, polyglycol, or polyglycerol ether of an aromatic OH-compound, and an olefine having $\nless C_3$, and the product is optionally converted into an alkali-metal, $NH_4$, or org. base salt. Simultaneous alkylation of the aromatic nucleus and sulphonation (or $H_2SO_4$ ester formation) occur. *E.g.*, $H_2SO_4$ monohydrate (120 pts.) is added to $OH\cdot[CH_2]_2\cdot OPh$ (80) and di*iso*butylene (56) at 15°; the mixture is stirred at 20—40° until completely sol. in $H_2O$, diluted (ice), and neutralised with 32% aq. NaOH; the product is a foaming and washing agent. Similar products are obtained from Ph penta, hexa-, and deca-ethylene glycol ether, mixed $OH\cdot[CH_2]_2\cdot O\cdot C_6H_4Me$, tolyl glyceryl ether, β-naphthyl pentapropylene glycol ether, and *iso*dodecene, $CH_2{:}CMe_2$, *iso*heptene, and *iso*hexene. H. A. P.

**Manufacture of 1-amino-4-hydroxynaphthalene-8-carboxylic acid and of 4-hydroxynaphthostyril.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,987, 2.6.37).—In strongly alkaline solution diazo compounds, *e.g.*, diazotised $p$-$C_6H_4Me\cdot NH_2$, couple with 5 : $1$-$OH\cdot C_{10}H_6\cdot CO_2H$ in position 8, and reduction ($Na_2S_2O_4$) gives 1 : 4 : 8-$NH_2\cdot C_{10}H_5(OH)\cdot CO_2H$, converted by hot aq. acids into 4-hydroxynaphthostyril. H. A. P.

**Dye intermediates [for ice colours].** J. W. Leitch & Co., Ltd., A. E. Everest, and J. A. Wallwork (B.P. 492,476, 2.7.37).—The prep. of powders containing arylamides of 2 : 3-$OH\cdot C_{10}H_6\cdot CO_2H$ and/or $CH_2Ac\cdot CO_2H$, $Na_2SiO_3$, and small amounts of other alkaline-reacting salts, *e.g.*, $Na_2CO_3$, $Na_3PO_4$, and of dyebaths obtained by dissolving them in $H_2O$, is claimed. (Cf. B.P. 474,638; B., 1938, 38.) H. A. P.

**Manufacture of diazo compounds of 2-amino-1-[hydr]oxynaphthalenesulphonic acids containing nitro-groups.** Soc. Chem. Ind. in Basle (B.P. 491,398, 11.5.37. Switz., 14.5.36).—Diazo compounds derived from 2 : 1-aminonaphthol-6-, -7-, and -8-sulphonic and -4 : 6-, -4 : 7-, and -4 : 8-disulphonic acids are nitrated ($HNO_3$–$H_2SO_4$), the $NO_2$ entering position 4. The prep. of *Na* 4-*nitro*-2-*diazo*-1-*hydroxynaphthalene*-6-, -7-, and -8-*sulphonates* (both from the mono- and di-sulphonic acids) is described. H. A. P.

**Manufacture of [nitro]amino-compounds.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 490,364, 9.2.37).—*sec.* Monoamines, $NHR\cdot CH_2R'$, in which $CH_2R'$ has at least one negative substituent (OH, CO, $CO_2H$, CN, or $SO_3H$), are condensed with aromatic halogenonitro-compounds in which the halogen is labile. The products are dyes or intermediates for dyes. *E.g.*, the condensation of β-*m*-tolylaminopropionic acid with 1 : 2 : 4-$C_6H_3Cl(NO_2)_2$ (I) in alkaline aq. EtOH gives 2 : 4-*dinitrophenyl*-m-*tolyl*-β-*carboxyethylamine*, m.p. 152—155°. Similar *products* are described from (I) and 4-methoxy-β-*m*-tolyl-, β-1- or -2-naphthyl-, β-phenyl-, β-*n*-butyl-, and β-*o*-tolyl-aminopropionic acid, phenylglycine (m.p. 173—175°), and $CH_2Ph\cdot CH_2\cdot COMe$, from 6 : 1 : 2 : 4-$CO_2Na\cdot C_6H_2Cl(NO_2)_2$ and $NHPh\cdot [CH_2]_2\cdot SO_3Na$, from β-*p*-anisylaminopropionic acid and 4 : 4′ : 3 : 3′-$SO_2(C_6H_3Cl\cdot NO_2)_2$, and from $NHPh\cdot [CH_2]_2\cdot OH$ and 6 : 1 : 2 : 4-$SO_3Na\cdot C_6H_2Cl(NO_2)_2$. H. A. P.

**Manufacture of substituted aliphatic carboxylic acids.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 493,109, 31.3.37).—Arylated acetic or higher acids undergo nuclear substitution by interacting with halogenated aliphatic or alicyclic hydrocarbons in presence of a bivalent metal or its amalgam. Treatment of $Ph\cdot [CH_2]_2\cdot CO_2H$, $CH_2Ph\cdot CO_2H$, α-$C_{10}H_7\cdot CO_2H$, $CHPhMe\cdot CHMe\cdot CO_2H$, $CHPh\!:\!CH\cdot CO_2H$, and phenyl-lauric acid with $C_{14}H_{29}Cl$, *cyclo*hexyl chloride, and chlorinated petroleum fractions in presence of Zn, Zn–Hg, Cu, and Fe is described. The products are applicable as washing, wetting, and scouring agents. A. H. C.

**Manufacture of thioacetalsulphonic acids. [Moth-proofing agents.]** J. R. Geigy A.-G. (B.P. 492,938, 25.11.37. Switz., 25.11.36).—$H_2O$-sol. thioacetalsulphonic acids are made by condensing an aromatic aldehyde- or ketone-sulphonic acid (1 mol.), which may be substituted, with 2 mols., which may be the same or different, of a substituted or unsubstituted aromatic, hydroaromatic, araliphatic, or aliphatic mercaptan. Further, textiles are treated with the sulphonic acids to prevent attack by moths. Among examples, *o*-$CHO\cdot C_6H_4\cdot SO_3H$ (I) (88·5%; 23·5) dissolved in AcOH (100) with PhSH (22) is saturated with HCl, set aside for 6 hr., and then poured into aq. NaCl (500 pts.); the product is an oil easily sol. in $H_2O$. (I) is similarly condensed with *o*-, *m*-, or *p*-$C_6H_4Cl\cdot SH$ (II), *o*-$NO_2\cdot C_6H_4\cdot SH$, or with $CH_2Ph\cdot SH$ (III) (1 mol.) and (II) (1 mol.), or (III) (1 mol.) and $C_{12}H_{25}\cdot SH$ (1 mol.). Also *p*-$C_6H_4Ac\cdot SO_3Na$ (11) is condensed with (II) (15 pts.) with HCl in AcOH (85%; 180 pts.). K. H. S.

**Manufacture of iminazolines [4 : 5-dihydroglyoxalines].** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 492,812, 3.4.37).—2-Ketotetrahydroglyoxaline (I), or a derivative substituted at C by a hydrocarbon radical, is condensed with a monocarboxylic acid (other than $HCO_2H$) at temp. $<200°$ with elimination of $H_2O$ and $CO_2$; the products are obtained in pure form and good yield. Among examples, (I) (39) is heated at 250—260° and oleic acid (85·2) run in during 6 hr., then the temp. is raised to 280—300° for 18 hr. and the residue vac.-distilled, affording 2-*heptadecenyl*-4 : 5-*dihydroglyoxaline*, b.p. 228°/3 mm., m.p. 55°, in 85% yield. Similarly there are obtained 2-*heptadecyl*-, b.p., 230°/3 mm., m.p. 86—87°, -*pentadecyl*-, b.p. 220°/3 mm., m.p. 82—84°, -phenyl-, b.p. 188°/20 mm., m.p. 100—102°, -*propyl*-, b.p. 116°/16 mm., -α-, b.p. 210—250°/18 mm., m.p. 136°, -β-*naphthyl*-, m.p. 124°, -4′-*diphenylyl*-, b.p. 280°/11 mm., m.p. 197°, and -2′-*carbazolyl*-4 : 5-*dihydroglyoxaline*, m.p. 255—256° (decomp.). 2-Keto-4-methyltetrahydroglyoxaline and BzOH afford a mixture, b.p. 150—175°/3 mm., of 2-*phenyl*-4- and -5-*methyl*-4 : 5-*dihydroglyoxaline*. K. H. S.

**Manufacture of thiazoles unsubstituted in the 2-position.** F. Hoffmann–La Roche & Co. A.-G. (B.P. 492,637, 9.2.38. Switz., 12.3.37).—2-Thiolthiazoles are treated in acid (HCl) solution at about 60° with sufficient $H_2O_2$ to oxidise to $H_2SO_4$ the $SO_2$ formed, together with thiazoles unsubstituted in position 2, by decomp. of the intermediate unstable sulphinic acid; the $H_2SO_4$ is removed by pptn. with $BaCl_2$. The prep. of 4 : 5-*dimethyl*-, b.p. 156°, and 4-*methyl*-5-β-*chloroethyl*-*thiazole* (*hydrochloride*; *picrate*, m.p. 140°) and of 4-methyl-5-β-hydroxyethylthiazole is described. R. G.

**Polymerides from hydrocarbon gases. Unitary cyclic compounds from carbonaceous materials.**—See II. **Anthraquinone derivatives.**—See IV. **Condensation products.**—See XIII. **[Lactic acid from] distillery slop.**—See XVIII.

## IV.—DYESTUFFS.

**Determination of added mineral salts in dyes and other organic high-molecular materials.** A. Bohanes (Chem. Obzor, 1936, 11, 52—53; Chem. Zentr., 1936, ii, 2802).—The sample (2 g.) in a parchment thimble is extracted by boiling $H_2O$ (100 c.c., 5 hr.) and the salts are determined in an aliquot part of the extract. The method is suitable for the examination of Rosanthrene Bordeaux B, Gardinol WA, Igepon, etc. (cf. B., 1927, 211). A. H. C.

**Changes in dyes in Cl-bleaching. Wool dyes.**—See VI. **Colour development.**—See XXI.

See also A., II, 441, **Azo dyes from thiol- and methylthiol-β-naphthols.** 455, **Indigoid dyes.**

### Patents.

**[Manufacture of] monoazo dyes.** A. H. Knight, and Imperial Chem. Industries, Ltd. (B.P. 492,668, 23.3.37).—Monoazo dyes sol. in $H_2O$ are made by coupling the diazo derivative of a *p*-nitroamine of the $C_6H_6$ or $C_{10}H_8$ series free from $CO_2H$ or $SO_3H$ with a *Py*-tetrahydro-3-hydroxyquinoline (I) having alkyl or aralkyl attached to N (A) and H, halogen, or alkyl at 7 (B) (cf. B.P. 458,423; B., 1937, 883) and forming the sulphuric ester; conversely diazo compounds are coupled with the sulphuric ester of (I). The dyes are used for dyeing or printing cellulose acetate. Among examples (15) are the sulphuric esters of the azo dyes *p*-$NO_2\cdot C_6H_4\cdot NH_2 \rightarrow$ (I) A = Et, B = Me (red), 1 : 3 : 4-$NO_2\cdot C_6H_3Cl\cdot NH_2 \rightarrow$ (I) A = Bu$^a$, B = Me (reddish-violet), 4 : 1 : 2-$NO_2\cdot C_6H_3(CN)\cdot NH_2 \rightarrow$ (I) A = Et, B = H (reddish-violet), and 2 : 4 : 1-$(NO_2)_2C_6H_3\cdot NH_2 \rightarrow$ (I) A = Bu$^a$, B = Cl (reddish-violet). K. H. S.

**Manufacture of azo dyes.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 491,793, 4.3.37).—Diazo derivatives of arylamines free from $SO_3H$ are coupled with compounds aryl$\cdot$NX$\cdot$R$\cdot CO_2H$, where X is H, aryl, aralkyl, *cyclo*alkyl, alkyl, or a chain of $CH_2$ connecting with the aryl nucleus, and R is an alkylene radical having $\nless[CH_2]_2$. The dyes are sol. in $H_2O$ as alkali salts and are used for dyeing and printing cellulose esters and ethers; the dyeings are fast to light and do not change shade on washing. Among examples (12) are the azo dyes *p*-$NO_2\cdot C_6H_4\cdot NH_2$ (I) $\rightarrow OH\cdot[CH_2]_2\cdot NPh\cdot[CH_2]_2\cdot CO_2H$ (red), 2 : 4 : 6 : 1-$(NO_2)_2C_6H_2Br\cdot NH_2 \rightarrow$ *m*-$C_6H_4Me\cdot NMe\cdot[CH_2]_2\cdot CO_2H$ (violet), (I) $\rightarrow$ 2 : 5 : 1-$(OEt)_2C_6H_3\cdot NH\cdot[CH_2]_2\cdot CO_2H$ (blue-red), and 2 : 4 : 1 : 6-$(NO_2)_2C_6H_2(NH_2)\cdot CN \rightarrow$ *m*-$C_6H_4Me\cdot N(C_2H_4\cdot O\cdot C_2H_4\cdot OH)\cdot[CH_2]_2\cdot CO_2H$ (blue). Reference is made to B.P. 252,240 and 446,745 (B., 1926, 628; 1936, 878). K. H. S.

**Manufacture of azo dyes soluble in water.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 493,464, 9.4.37).—$H_2O$-sol. azo dyes are made by coupling any diazo compound (if of the $C_6H_6$ series preferably free from $SO_3H$) with compounds 7 : 1-$OH\cdot C_{10}H_6\cdot NH\cdot$alkylene$\cdot SO_3H$ (I) in which the $C_{10}H_6$ may also contain $SO_3H$. The violet, blue, or black dyes dye leather in the grain or throughout and also dye wool from an acid bath below the boil with good exhaustion. Among examples (13) are the dyes $NH_2Ph \rightarrow$ (I) (alkylene = $[CH_2]_2$) (grey-black), *p*-$NH_2\cdot C_6H_4\cdot OMe \rightarrow$ (I) (alkylene = $[CH_2]_2$; $SO_2H$ at 4) (grey-violet on leather), 2 : 4 : 1-$NO_2\cdot C_6H_3Cl\cdot NH_2 \rightarrow$ (I) (alkylene = $CH_2$; $SO_3H$ at 3) (grey on leather). K. H. S.

**Manufacture of diazotisable dyes.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,104, 12.3.37).—Diazo components already containing one or more azo groups are coupled with 1-aminophenylpyrazolones and the products condensed with nitroarylcarboxyl or -sulphonyl halides followed by reduction; alternatively the condensation step may precede coupling and reduction. Among examples (14), 4 : 3-$OH\cdot C_6H_3(CO_2Na)\cdot N{:}N\cdot C_6H_4\cdot NH\cdot CO\cdot C_6H_4\cdot NH_2$-*p* (I) (cf. B.P. 451,100; B., 1936, 978) is condensed with *m*-$NO_2\cdot C_6H_4\cdot COCl$, 5 : 2 : 4 : 1-$NO_2\cdot C_6H_2Cl_2\cdot COCl$, 3 : 5 : 1-$NO_2\cdot C_6H_3(CN)\cdot COCl$, or *m*-$NO_2\cdot C_6H_4\cdot SO_2Cl$, reduced, diazotised, and coupled with 1-*m*-aminophenyl-5-pyrazolone-3-carboxylic acid (II), or 1 : 2 : 5-$NO_2\cdot C_6H_3(SO_2Me)\cdot COCl$ is condensed with (II), coupled with the diazo derivative of (I), and the $NO_2$ reduced. The dyes afford yellow shades on cotton which are not altered by diazotisation and development with β-$C_{10}H_7\cdot OH$. K. H. S.

**Manufacture of diazotisable dyes.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 493,104, 30.3.37).—Yellow aminoazo dyes, $A\cdot N_2\cdot B\cdot NH_2$, where A = an aromatic or heterocyclic radical and B = an arylene radical not containing OH, are condensed with aroyl halides containing $NO_2$ or NHAcyl together with $NO_2$, CO, CN, or $SO_2$ and the amine is produced by reduction or hydrolysis. Alternatively, arylenediamines not containing OH are condensed with such aroyl halides (1 mol.), diazotised, and coupled with component A and free $NH_2$ is produced. Among examples (6), the dye 6 : 8 : 2-$C_{10}H_5(SO_3H)_2\cdot N{:}N\cdot C_6H_3Me\cdot NH\cdot CO\cdot C_6H_4\cdot N{:}N\cdot C_6H_3Me\cdot NH_2$-2 : 4 is treated with 1 : 3 : 6-$NO_2\cdot C_6H_3(COCl)\cdot SO_2Me$ (I) and reduced, or 1 : 3 : 4-$(NH_2)_2C_6H_3\cdot SO_3H$ is condensed with (I), diazotised, and coupled with the pyrazolone derived from dehydrothiotoluidinesulphonic acid and reduced, or 3 : 5 : 1-$(NO_2)_2C_6H_3\cdot COCl$ is condensed with *p*-$C_6H_4(NH_2)_2$, diazotised, and coupled with *o*-$OH\cdot C_6H_4\cdot CO_2H$ and one $NO_2$ reduced with $Na_2S$. When diazotised and coupled on the fibre with β-$C_{10}H_7\cdot OH$ the dyes afford yellower shades than the dyes of B.P. 367,675, 317,431, 303,026, and 8013 of 1911 (B., 1932, 432; 1929, 890; 1930, 277; 1912, 182). K. H. S.

**Manufacture of acid wool [azo] dyes.** I. G. Farbenind. A.-G. (B.P. 493,406, 8.12.37. Ger., 12.12.36. Addn. to B.P. 483,442; B., 1938, 890).—Dyes having properties similar to those of the chief patent are prepared by coupling diazotised amines, 1 : 5 : 2-$NH_2\cdot C_6H_3R'\cdot OR$, in which R is an alkyl of $\nless C_2$, or aryl or aralkyl, and R′ is an aliphatic or aliphatic-*cyclo*aliphatic radical of $\nless C_6$, with *N*-acyl derivatives of 1 : 8 : 3 : 6- or 1 : 8 : 4 : 6-$NH_2\cdot C_{10}H_4(OH)(SO_3H)_2$. Examples are the *dyes*: 2-amino-4-*iso*hexylphenyl $CH_2Ph$ ether → 1-2′ : 5′-dichlorobenzamido-8-naphthol-3 : 6-disulphonic acid, 2-amino-4-*iso*octylphenyl Et ether → 1-5′-chloro-2-*p*-xylylsulphonamido-8-naphthyl-3 : 6-disulphonic acid (I), 2-amino-4-*iso*octylphenyl $CH_2Ph$ ether → 1-*o*-tolyloxyacetamido-8-naphthol-3 : 6-disulphonic acid, and 3-amino-4-ethoxyhexahydrodiphenylmethane → (I) (all bluish-red). H. A. P.

**Manufacture of derivatives of azo dyes.** Soc. Chem. Ind. in Basle (B.P. 493,463, 9.4.37. Switz., 9.4.36).—Mono-, dis-, or poly-azo dyes, $R\cdot N{:}N\cdot R'$, where R = an end component consisting of a $C_6H_6$ nucleus containing OH *ortho* to N:N and other substituents if desired and R′ = a $C_6H_6$ or $C_{10}H_8$ nucleus which may be further substituted, are esterified in presence of a *tert.* base with an agent introducing $SO_3H$ into the OH. The esters have enhanced solubility in $H_2O$ and can be hydrolysed by acids in substance or on the fibre, thus regenerating the sparingly sol. dye. Among examples, the azo dye 2 : 1-$C_6H_4Me\cdot N{:}N\cdot C_6H_3Me\cdot NH_2$-3 : 4 → *p*-cresol (I) (6·8) is added to a solution of $ClSO_3H$ (10) in $C_5H_5N$ (II) (150), heated at 60—70° for 3—4 hr., steamed to remove (II), and the dye (III) salted. Cotton is printed with a paste of (III) (25), $H_2O$ (475), *m*-$C_6H_4(OH)_2$ (30), $N(C_2H_4\cdot OH)_3$ (20), and starch–tragacanth thickening (450 g.), dried, steamed for 3—5 min., treated for 30 sec. in a bath of aq. $H_2SO_4$ (35 c.c. per l.), and soaped; a brown print is obtained. The dyes dehydrothiotoluidine → (I) and 4-$NH_2\cdot C_6H_4\cdot N{:}N\cdot C_6H_2Me(OMe)\cdot NH_2$-2 : 5 : 4 → (I) are similarly used. Reference is made to B.P. 282,107 (B., 1929, 552). K. H. S.

**Manufacture of azo dyes containing metal.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 492,902, 30.3.37).—Polyazo dyes containing $\nless 2$ $SO_3H$ made by tetrazotising 4 : 4′-diaminodiphenyl-3 : 3′-dicarboxylic acid (I) and coupling with 2 mols. of azo component of which one or both are pyrazolones are treated with agents supplying $Cr^{III}$. The dyes are suitable for animal fibres, especially leather, affording shades of good fastness to light, washing, acid, and alkali. Examples are the dyes (I) → 1-(4′-sulphophenyl)-3-methyl-5-pyrazolone (II) heated for 3 hr. at 110° with $(HCO_2)_3Cr$ (red-orange), (I) → 1-(4′ : 8′-disulpho-β-naphthyl)-3-methyl-5-pyrazolone (Cr derivative, red), and 8 : 2 : 3 : 6-$OH\cdot C_{10}H_4(NH_2)(SO_3H)_2$ ← (I) → (II) (Cr derivative, brown). K. H. S.

**Manufacture of azo dyes.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,528, 18.3.37).—Tetrazo compounds derived from diamines $NH_2\cdot C_6H_4\cdot CO\cdot NH\cdot C_6H_3(NH_2)\cdot CO_2H$ ($CO_2H$ is *ortho* to $NH_2$) or their nuclear substitution products are coupled first (on the aminobenzoyl radical) with an *o*-hydroxyarylcarboxylic acid and then with a component coupling *ortho* to OH; if the last component contains $NH_2$ it may be diazotised and coupled with an *o*-hydroxyarylcarboxylic acid (I). Alternatively the azo dye $NH_2\cdot C_6H_3(CO_2H)\cdot N{:}N\cdot R\cdot OH$ is nitrobenzoylated, reduced, diazotised, and coupled with an *o*-hydroxyarylcarboxylic acid. The shades obtained on vegetable fibres when after-treated with metals are fast to washing and light and are superior to those of B.P. 338,111 (B., 1931, 243). Among examples (13), the first coupling product *o*-$OH\cdot C_6H_4\cdot CO_2H$ (II) ← *p*-$NH_2\cdot C_6H_4\cdot CO\cdot NH\cdot C_6H_3(NH_2)\cdot CO_2H$-4 : 5 is coupled with 1 : 4-$OH\cdot C_{10}H_6\cdot SO_3H$ (III) (bluish-red; red with Cu), 5 : 2 : 7-$OH\cdot C_{10}H_5(NHPh)\cdot SO_3H$ (ruby; garnet with Cu), monoazo dye *o*-$C_6H_4Cl\cdot NH_2$ → (acid) 8 : 1 : 4-$OH\cdot C_{10}H_5(NH_2)\cdot SO_3H$ (bluish-green with Cu). The dye of the first example is also made by diazotising 5 : 2 : 1-$NO_2\cdot C_6H_3(NH_2)\cdot CO_2H$, coupling with (III), treating with *p*-$NO_2\cdot C_6H_4\cdot COCl$, reducing, diazotising, and coupling with (II). K. H. S.

**Manufacture of dyes of the anthraquinone series.** (A) A. Carpmael, (B) W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 490,372 and 492,291, [A] 12.2.37, [B] 17.3.37).—(A) Increased fastness (to light) is claimed to result from the presence as a 4-substituent of 1-aminoanthraquinones of the group $NH\cdot CH(CH_2X)_2$ in which X is H or alkyl. *E.g.*, interaction of Na 1-bromo-4-aminoanthraquinone-2-sulphonate with $NH_2Pr^{\beta}$ and CuCl in aq. $Na_2CO_3$ at 80—90° gives *Na 1-amino-4-*iso*propylaminoanthraquinone-2-sulphonate* (blue), converted by glucose and NaOH into 1-*amino*-4-iso*propylaminoanthraquinone*, m.p. 180° (blue-violet on cellulose acetate), by KCN into the 2-*CN*-, hydrolysed to the 2-*$CO\cdot NH_2$* derivative (green-blue), and by 50% EtOH into the 2-*OEt*-compound (red-violet). 4-iso*Propylamino*-1-*benzamidoanthraquinone*, m.p. 241°, is prepared from the 4-Cl-compound and $NH_2Pr^{\beta}$. The prep. of 1-iso*propylamino*- (*A*) (red, m.p. 187°), 1 : 4-*di*iso*propylamino*-, and 1-*methylamino*-4-iso*propylamino-anthraquinone*, m.p. 216—217° [the last two from the leuco-1 : 4-diamine and the appropriate alkylamine(s)], and of 1-*amino*-4-sec.-*butylaminoanthraquinone* and its 2-*sulphonic acid*, and [from (*A*)] 4-*bromo*-, m.p. 120°, 4-*nitro*-, and 4-*benzenesulphonamido*-1-iso*propylamino-anthraquinone* is described. (B) The prep. is claimed by standard methods of $SO_3H$-free 1-amino- or -alkylamino-4-hydroxyalkylaminoanthraquinone-2- or -3- or 1 : 4-di(hydroxyalkyl)aminoanthraquinone-2-carboxylhydroxyalkylamides. The products are claimed to be $H_2O$-sol. dyes for cellulose acetate of good penetrative properties. *E.g.*, 1-chloro- (I), m.p. 213°, or 1-nitro-anthraquinone-2-carboxyl chloride is converted by heating with $NH_2\cdot[CH_2]_2\cdot OH$ (II) into 1-β-*hydroxyethylaminoanthraquinone-2-carboxyl*-β-*hydroxyethylamide*, m.p. 218—220°; this with Br and a little I in HCl at 20—25° gives the 4-*Br*-compound (III), m.p. 227°, which with (II) and a little $Cu(OAc)_2$ at 100° gives 1 : 4-*bis*-β-*hydroxyethylaminoanthraquinone-2-carboxyl*-β-*hydroxyethylamide*, m.p. 135°, a blue $H_2O$-sol. dye of good penetrating power for cellulose acetate: the same dye is obtainable from 1 : 4-diaminoanthraquinone-2-carboxyl chloride and (II), and a similar dye is obtained using $NH_2\cdot[CH_2]_3\cdot OH$ (IV) in the place of (II). The *chloride*, m.p. 218° ($SOCl_2$ in $PhNO_2$ at 100°), of 4-*bromo*-1-*aminoanthraquinone-2-carboxylic acid*, m.p. 316° (Br–HCl), gives with (II) and $Cu(OAc)_2$ at 100° 1-*amino*-4-β-*hydroxyethylaminoanthraquinone-2-carboxyl*-β-*hydroxyethylamide* (V), m.p. 172° (blue); a similar dye is obtained with (IV). Condensation of (III) with *p*-$C_6H_4Me\cdot SO_2\cdot NH_2$ and hydrolysis gives 4-*amino*-1-β-*hydroxyethylaminoanthraquinone-2-carboxyl*-β-*hydroxyethylamide* (violet). Similarly, the *chloride*, m.p. 153—154° (decomp.), of 4-*bromo*-1-*methylaminoanthraquinone-2-carboxylic acid*, m.p. 237—238° (decomp.), gives with (II) at 95° the β-*hydroxyethylamide*, m.p. 206—207°, and when heated for a longer time in the presence of $Cu(OAc)_2$ 1-*methylamino*-4-β-*hydroxyethylaminoanthraquinone-2-carboxyl*-β-*hydroxyethylamide* (green-blue), m.p. 207—208°. (V) is also prepared by converting (I) into its β-*hydroxyethylamide*, brominating, and condensing the *Br*-derivative with (II). H. A. P.

**[Preparation of] anthraquinone compounds [wool dyes].** S. Coffey, N. H. Haddock, C. Wood, and Imperial Chem. Industries, Ltd. (B.P. 491,493, 1.2.37).—Bright violet to greenish-blue dyes of good fastness to light, washing, and milling are obtained by sulphonating oxidised condensation products of leuco-1 : 4-diamino-, -1 : 4-dihydroxy-, or -1-amino-4-hydroxy-anthraquinones (the $NH_2$ may carry a hydrocarbon substituent) or their 5—8-OH- or -$(OH)_2$-derivatives with amines $NH_2 \cdot CHR'R''$ in which R′ is aralkyl and R″ is alkyl or aralkyl. *E.g.*, leucoquinizarin (I) is condensed with ββ′-*diphenyl*iso*propylamine* (II) [made by condensing $CO(CH_2Ph)_2$ with $HCO \cdot NH_2$ or $HCO_2NH_4$ and hydrolysing] in $C_5H_5N$, the product is air-oxidised, and the resulting 1 : 4-*bis*-ββ′-*diphenyl*iso*propylaminoanthraquinone* (III), m.p. 142°, is sulphonated (blue). 1 : 4-*Bis-α-benzylpropyl-*, *-γγ′-diphenyl*iso*amyl-*, m.p. 97—98°, and -β-*phenyl*iso*propyl-aminoanthraquinone*, m.p. 123—124°, are similarly prepared; condensation of (I) with $NH_2 \cdot CH(CH_2 \cdot CH_2Ph)_2$ in cresylic acid (IV) at 100° followed by oxidation gives 1-*γγ′-diphenyl*iso*amylamino-4-hydroxyanthraquinone*, m.p. 95—96° (sulphonation gives a violet wool dye). (III) is also made by condensing (II) with leuco-1 : 4-diaminoanthraquinone at 115—120°. Condensation of (II) with leuco-1 : 4 : 5-trihydroxyanthraquinone in (IV) at 100° gives the 5-*OH*-derivative of (III) (green-blue), and interaction of (II) with 1-*p*-toluidino-4-hydroxyanthraquinone and Zn dust in (IV) at 100°, followed by air-oxidation, gives 1-p-*toluidino*-4-ββ′-*diphenyl*iso*propylaminoanthraquinone*. Sulphonic acids of the above are described. H. A. P.

**Manufacture of anthraquinone derivatives [dyes].** Imperial Chem. Industries, Ltd. (B.P. 492,696—7, [a, b] 25.3.37. U.S., 25.3.36).—(a) Diaralkylaminoanthraquinones of val. as dyes for acetate silk and hydrocarbons are obtained by interaction of $SO_3H$-free aminoanthraquinones with aralkyl halides or sulphates at >160° in the presence of an alkali. *E.g.*, interaction of 1 : 4 : 5 : 8-tetra-aminoanthraquinone with $CH_2PhCl$ in excess at 140—175° gives 1 : 4 : 5 : 8-*tetra*(*dibenzylamino*)*anthraquinone* (yellow-green); 1 : 4-*di*(*dibenzylamino*)- (blue) and 1-*dibenzylamino-anthraquinone* (red) are similarly prepared. (b) Aralkylaminoanthraquinones are prepared by heating a nitro- or amino-anthraquinone (optionally further substituted by halogen, alkyl, OH, alkoxyl, $NO_2$, or $NH_2$) with an aralkyl alcohol. *E.g.*, 1 : 8-diaminoanthraquinone with excess of $CH_2Ph \cdot OH$ at 190—200° gives the 1 : 8-$(CH_2Ph)_2$ derivative (violet), and 1-nitro-2-methylanthraquinone with $CH_2Ph \cdot OH$ and $Na_2SO_3$ at the b.p. gives 1-*benzylamino-2-methylanthraquinone* (orange). The prep. of 1 : 5-*diamino*-4 : 5-*dibenzylamino*-, 1 : 8-*dibenzylamino*-4 : 5-*dihydroxy*- and -*dimethoxy*-, 2-*bromo*-4-*toluidino*-1-*benzylamino*-, 1-benzylamino-, 1-*amino*-8-*benzylamino*-4 : 5-*dihydroxy*-, 5-*nitro*-4-*benzylamino*-1 : 8-*dihydroxy*- (from 4 : 5-dinitro-1 : 8-dihydroxy-), and 1 : 8-*di*-β-*phenylethylamino*-4 : 5-*dihydroxy-anthraquinone* is described. H. A. P.

**Manufacture of chromiferous [anthraquinone] dyes.** I. G. Farbenind. A.-G. (B.P. 491,862, 10.3.37. Ger., 11.3.36).—Dyes containing $\not< 1$ $SO_3H$, and obtainable by condensing an $NH_2$-substituted aromatic *o*-hydroxycarboxylic acid with a 1 : 4-halogeno-hydroxy- or -amino-anthraquinone or its nuclear-substituted derivatives (cf. B.P. 452,424; B., 1937, 122), are treated with Cr compounds (salts; the formate and fluoride are used in examples). *Cr* compounds are described of the dyes obtained by condensing 4-bromo-1-aminoanthraquinone-2-sulphonic acid with 2 : 1 : 5-$OH \cdot C_6H_3(CO_2H) \cdot CO \cdot C_6H_4 \cdot NH_2$-*m*, 2 : 1 : 5 : 3-$OH \cdot C_6H_2(CO_2H)(SO_3H) \cdot NH \cdot CO \cdot C_6H_4 \cdot NH_2$-*p*, 3 : 2 : 1 : 5-$NH_2 \cdot C_6H_2(OH)(CO_2H) \cdot SO_3H$, 2 : 1 : 5-$OH \cdot C_6H_3(CO_2H) \cdot CH_2 \cdot C_6H_4 \cdot NH_2$-*p*, 2 : 1 : 5-$OH \cdot C_6H_3(CO_2H) \cdot SO_2 \cdot CH_2 \cdot C_6H_4 \cdot NH_2$-*p*, -*m*, and -*o*, and 2 : 1 : 3 : 5-$OH \cdot C_6H_2Me(CO_2H) \cdot SO_2 \cdot CH_2 \cdot C_6H_3(OMe\text{-}4) \cdot NH_2$-*m*. H. A. P.

**Manufacture of dyes of the phthalocyanine series.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 492,177, 15.3.37. Addn. to B.P. 469,139; B., 1937, 1183).—Halogenated phthalocyanines (containing 1—8 halogen atoms) are converted into dyes of greener shade by heating with alkyl or aryl ($C_6$ or $C_{10}$) mercaptans at 250—350° until the product contains at least one mercaptan radical (15 hr.). The reaction is conveniently carried out in a solvent and in presence of Cu and an alkali (KOH), and if necessary under pressure. In the examples, chlorinated Cu phthalocyanines are caused to interact with PhSH, *p*-$C_6H_4Me \cdot SH$, β-$C_{10}H_7 \cdot SH$, $C_{12}H_{25} \cdot SH$, and mercaptans from the alcohols of palm-kernel oil fatty acids. The *phthalocyanines* containing long alkyl chains are sol. in aromatic hydrocarbon solvents and may be used for coloring nitrocellulose lacquers. S. C.

**Manufacture of dyes.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 492,194, 19.3. and 14.4.37).—$H_2O$-sol. blue to blue-green dyes for both animal and vegetable fibres are produced by heating *o*-dinitriles (4 mols.) with bases of the $C_5H_5N$ (I) or quinoline (II) series (1—6 mols.) and halides of multivalent metals (of the Fe group and of Mg, Zn, Al, and Cu) (1 mol.). *E.g.*, *o*-$C_6H_4(CN)_2$ (III) (4 mols.) is heated with (I) (2 mols.) and $CoCl_2$ (2 mols.) in PhMe at 190°/6·5 atm.; the $H_2O$-sol. portion of the product is a blue dye for silk, viscose, or cotton. Similar dyes are prepared from (III), $CoCl_2$, and (II), (III), $ZnCl_2$, and (I), (III), $CuCl_2$, and (I), (III), $FeCl_3$, and (I), and (III), $ZnCl_2$, and (II). H. A. P.

**Manufacture of acid wool dyes.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,749, 23.2.37. Addn. to B.P. 469,763; B., 1937, 1184).—$NO_2$-compounds, 1 : 4 : 2-$C_6H_3YX \cdot NO_2$ or 4 : 4′ : 3 : 3′-$SO[C_6H_3Y \cdot NO_2]_2$, in which Y is halogen or alkoxyl, and X is CN, or alkyl- or the *cyclo*alkyl-sulphoxide group, are condensed with amines, $NHR \cdot Z \cdot NH_2$, in which R is aryl or *cyclo*alkyl and Z is arylene, and in which R and/or Z carries $SO_3H$, or with an aminocarbazolesulphonic acid. Examples are the *dyes* from 1 : 4 : 3-$CN \cdot C_6H_3Cl \cdot NO_2$ and 1 : 4 : 2-$NHPh \cdot C_6H_3(NH_2) \cdot SO_3H$ (I) [also from 1 : 4 : 3-$CN \cdot C_6H_3(OMe) \cdot NO_2$], 4-amino-4′- (II) and -2′-methoxy- (III), -4′-ethoxy- (IV), and -4′-acetamido-diphenylamine-2-sulphonic acid (V), 5-amino-2-*cyclo*hexylaminobenzenesulphonic acid (VI), 5-amino-2-naphthylaminobenzenesulphonic acid (VII), 3-amino-9-ethyl-, and 3-amino-carbazole-6-sulphonic acid; from 1-*chloro-2-nitrobenzene-4-methylsulphoxide* (VIII) and (I), (II), (III), (IV), (V), (VI), (VII), and 4-amino-3′ : 4′-dimethoxydiphenylamine-2-sulphonic acid; from 1-chloro-2-nitrobenzene-4-ethyl-, -propyl-, and -*cyclo*hexyl-sulphoxides, and 4 : 4′-*dichloro*-3 : 3′-*dinitrodiphenylsulphoxide* (IX), m.p. 162°, and (I), and from (IX) and (III), (VI), and (VII); they are orange to brown and have good fastness to light. (VIII) and (IX) are prepared by nitrating $p$-$C_6H_4Cl{\cdot}SO_2Me$ ($p$-$C_6H_4Cl{\cdot}SMe$ and $H_2O_2$) and $SO(C_6H_4Cl$-$p)_2$ ($SOCl_2$, PhCl, and $AlCl_3$), respectively. H. A. P.

**Manufacture of dyes and their application to the dyeing and printing of cellulose esters and ethers.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 490,945, 24.2.37).—Dyes for cellulose esters and ethers having at least one NRR′ in which R is H or an org. radical and R′ is an org. radical, R and/or R′ having reactive halogen, are condensed with thiosulphates to give $H_2O$-sol. thiosulphonates having affinity for the same fibres. The prep. of the final dyes from intermediates having the $S{\cdot}SO_3$ group, and the use of the products in dyeing, are also claimed. *E.g.*, diazotised 1-amino-5-methoxybenzthiazole is coupled with *Na β-butylanilinoethanesulphonate* {from $Cl{\cdot}[CH_2]_2{\cdot}NPhBu^a$ (I) and $Na_2S_2O_3$ in aq. EtOH at 100°} to give a blue-red $H_2O$-sol. *dye* for cellulose acetate, the *dye* $p$-$NH_2{\cdot}C_6H_4{\cdot}NO_2$ (II) $\rightarrow$ (I) is heated with aq. $Na_2S_2O_3$ to give a red *dye*, 1 : 4-di-α-chloro-β-hydroxypropylaminoanthraquinone is heated with $Na_2S_2O_3$ in aq. EtOH to give (probably) the mono-thiosulphonate (red-blue), and the dye from $p$-butyl-β-chloroethylaminobenzaldehyde and $CN{\cdot}CH_2{\cdot}CO_2Et$ is similarly converted into the *thiosulphonate* (green yellow); the *dyes* $o$-$NH_2{\cdot}C_6H_4{\cdot}NO_2 \rightarrow$ (I) (orange) and (II) $\rightarrow CH_2Ph{\cdot}NPh{\cdot}[CH_2]_2{\cdot}S{\cdot}SO_3Na$ (scarlet) are also described. H. A. P.

**Manufacture of vat dyes.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 492,043, 15.3.37).—*peri*-Naphthindenones having H or replaceable substituents, *e.g.*, halogen, $NO_2$, in the 7 or 6 and 7 positions are converted into vat dyes by heating with alkalis and oxidation of any leuco-compound formed. As starting materials are included derivatives of *peri*-naphthindenone having at 6 a cyclic radical joined by N and having a free *peri*-position. *E.g.*, 2-chloro*peri*-naphthindenone is heated with KOH–EtOH at 140° and the product oxidised to a violet vat *dye*; similar *products* are obtained from 2-amino- (grey), 2-dimethylamino- (violet), 2-α- and -β-anthraquinonylamino-, 2-pyrazoleanthronyl-, 2-5′-anthrapyrimidylamino-, 2 : 6-di-α-anthraquinonylamino-, 2 : 6-dipyrazoleanthronyl-, 2-α-anthraquinonyl-6-pyrazoleanthronyl-, benzoyl-, 2-chloro-6-α-anthraquinonylamino- (green), 2-benzamido-6-α-anthraquinonylamino-, and 2-chloro-6-*N*-pyrazoleanthronyl-*peri*-naphthindenone (blue). H. A. P.

**Nitroamino-compounds.**—See III.

## V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

**Influence of nutritional and climatic factors on wool growth and quality. I. Statement of problem and experimental procedure.** J. P. Sackville and J. E. Bowstead. **II. Laboratory methods of measuring wool character.** P. Larose and A. S. Tweedie (Canad. J. Res., 1938, **16**, D, 153—165, 166—173).—I. Wool growth and quality may be influenced by the time of shearing and by the level of nutrition of ewes, but not by temp., R.H., or intake of protein or minerals.

II. Methods are described for determining crimp, staple length, fibre length, tensile strength, elongation, diameter, moisture content, insol. wax, and suint. A. G. P.

**Staining method for detection of weathering in fleece.** F. G. Lennox (Counc. Sci. Ind. Res. Australia, 1938, Pamph. 83, 22—24).—The affinity of greasy fleece samples for methylene-blue is shown, by use of a simple staining method, to increase as a result of weathering. Experiments indicate that light is the chief agent involved in weathering, and that the increased dye affinity is due to changes in the $Et_2O$-sol. fraction of the wool yolk. C. S. W.

**Theory of wool felting.** Justin-Mueller (Rev. Gén. Mat. Col., 1938, 42, 378—381).—The author's theory, first suggested in 1904 (Bull. Rouen, p. 35), that wool felting is due to the production of a quasi-gelatinous surface by which fibres become mechanically stuck together, has been confirmed by experiment. The biuret test shows that a semi- or pseudo-hydrolysis takes place, the intermediate stage produced being a kind of protogel. Complete hydrolysis does not occur, as no S compounds are detected in extracts of fulled materials. Pretreatment with baths containing $H_2SO_4$, or acid Hg salts, produces a start of the pseudohydrolysis, which accelerates subsequent fulling. Tests with $Pb(OAc)_2$ or nitroprusside are indicated for the control of fulling. J. L.

**Carbonising of wool waste containing acetate rayon.** Anon. (Text. Mercury & Argus, 1938, 99, 594—595).—Recent German investigations (B., 1938, 1276) are discussed. A. J. H.

**Nature of the cuticle of cotton.** K. Schneider (Faserforsch., 1938, **13**, 121—128).—An artificial cuticle may be formed on bleached cotton or on regenerated cellulose fibres by surface esterification with stearic acid. When the fibre is swollen in cuprammonium hydroxide the artificial cuticle shows a spiral, fibrillar structure similar to that of the natural cuticle. Paraffin or Al salts, which confer waterproof properties on the cellulose but do not combine with it, do not show the characteristic cuticular behaviour. It is suggested that the natural cuticle is a surface compound between cutin and cellulose similar to the stearic ester. W. A. R.

**Geometric fineness of cotton fibres and associated cross-sectional features: their comparison by means of graduated scales.** E. Karrer and T. L. W. Bailey (Text. Res., 1938, 8, 381—389).—An improved and more rapid Hardy method (B., 1936, 924) and apparatus for preparing fibre cross-sections are described, and data obtained therewith, using numerous types of cotton, are given as the basis of a scheme for comparing and evaluating fibre fineness by means of cross-sectional area and shape. Various linear relations between certain physical measurements of the fibres are indicated. A. J. H.

**Determination of the maturity of cotton with polarised light.** E. R. Schwarz and G. G. Hotte (Textilber., 1936, **17**, 549—551; Chem. Zentr., 1936, ii, 2827).—Examination of cotton samples with polarised light is preferred to Clegg's method. The cross-section and wall thickness are distinctive both for cottons of different origins and for mature and immature thread. A. H. C.

**Action of light on cellulose fibres.** H. J. Henk (Textilber., 1938, 29, 730).—Very short (*e.g.*, 0·8 sec.) irradiation of cellulose (cotton) fibres with ultra-violet light produces polymerisation with consequent lowering of the Cu no. and alkali-solubility and increase of tensile strength (*e.g.*, 21·2%), whereas prolonged irradiation produces degradation and formation of oxycellulose (I). This degradation is accompanied by loss of wt. and commences with the formation of an alkali-insol. (I) (having no reducing CHO groups) by splitting off $CO_2$, and by loss of $H_2O$ resulting from oxidation of cellulose H. Further irradiation produces alkali-sol. (I) not accompanied by splitting off of $CO_2$. The degradation produced by irradiation is much influenced by the surface properties (mainly lustre) of the fibres. *E.g.*, lustrous Egyptian and mercerised cottons are less degraded than less lustrous Indian and non-mercerised cottons, respectively. Degradation may be accelerated by the presence of catalysts, *e.g.*, metals, red to yellow vat dyes, and basic dyes (the presence of the usual mordants, tannic acid and Katanol O, also promotes degradation). During irradiation of cotton, with and without pre-mordanting with Katanol O (I.G.), the mordanted fibre suffers a 25% higher loss of tensile strength. Irradiation of fibres mordanted with tannic acid destroys their increased affinity for basic dyes; Katanol O does not thus lose its mordant properties. The harmful effect on cotton of S (not Indocarbon) dyes during irradiation is due to formation of $H_2SO_4$. Jute containing tannins is strongly degraded during irradiation. A. J. H.

**Possibilities and limitations of *X*-ray methods for measuring the strength of raw cotton.** C. M. Conrad and E. E. Berkley (Text. Res., 1938, 8, 341—352).—*X*-Ray examination is superior to the Chandler bundle method as now used because it is twice as rapid, is independent of atm. conditions, preserves the test specimen, and is applicable to very short fibres. Its accuracy may, however, be reduced by (*a*) the presence of natural or added impurities (*e.g.*, fats and waxes) capable of imposing a diffraction ring on the 002 cellulose ring which is found to be most useful in determining strength from the *X*-ray patterns of cotton fibres, and (*b*) by pre-tendering treatments (*e.g.*, oxidation) which cause no corresponding change in the *X*-ray pattern. A. J. H.

**The flat bundle fibre [strength] test [for cotton].** H. R. Bellinson (Text. Res., 1938, 8, 421—428).—Apparatus is described for carrying out the rapid Chandler bundle test in which a bundle of 10,000 cotton fibres is broken as a unit. The results given indicate that the bundle strength is only 70% of that of the individual fibres. A. J. H.

**Manufacture of unretted flax fibres.** W. Rohs (Z. Ver. deut. Ing., 1938, 82, 805—810).—The unretted flax is mechanically delignified, wound on cross-spools, and treated with a circulating chemical reagent which removes adhesive and foreign matter and effects partial bleaching. The wet, decomposed thread is spun while wet and subsequently bleached. The advantages of the process over the warm-$H_2O$ retting process are discussed. R. B. C.

**Development of textile manufacture.** W. Weltzien (Textilber., 1938, 19, 409—410, 489—494).—The importance of research on cellulose fibres (cotton and rayon) with due regard to their colloidal nature is discussed and special reference made to the effect of the $H_2O$ content of such fibres on their properties from the viewpoint of yarn and fabric manufacture. A. J. H.

**Measurement of moisture in fabrics during continuous drying. I—III.** A. and K. Rossié (Textilber., 1938, 19, 403—404, 474—476, 543—545).—Available methods and apparatus are discussed critically and a new method which uses thermocouples is described. A. J. H.

**Effect of alkalis on the molecular chain length of chemically modified cotton celluloses, as shown by fluidity measurements on the derived cellulose nitrates.** G. F. Davidson (J. Text. Inst., 1938, 29, T195—218).—Since cuprammonium hydroxide is a strong base the fluidities of oxy- (I) and hydro-celluloses (II) determined in it correspond with the condition of the material after an alkaline treatment. When (I) or (II) is nitrated with an anhyd. $H_2SO_4$–$H_3PO_4$ mixture it is probable that little degradation occurs and the fluidity of the nitrate in $COMe_2$ corresponds more closely with the chain length of the original material. The relation between cuprammonium and nitrate fluidities is different for different types of (I); those prepared with alkaline oxidising agents (acidic type) resemble (II), but those prepared in acid solutions (reducing type) have lower cuprammonium fluidities for the same nitrate fluidity. These latter are sensitive to alkalis, and after boiling under pressure with dil. NaOH all types of (I) and (II) show the same relation between the fluidities measured under the two conditions. The tensile strength–cuprammonium fluidity relation is widely different for different types of (I), but the tensile strength–nitrate fluidity relations are more nearly the same. Acidic oxidation probably breaks the linkings between the $C_{(2)}$ and the $C_{(3)}$ in the glucose units in cellulose. By so doing the chain length remains unaffected and hence the tensile strength and nitrate fluidity are little changed; the mol. becomes, however, sensitive to alkalis, which complete the scission of the chain with a consequent rise in fluidity and fall in tensile strength. For testing purposes the cuprammonium fluidity is preferred as being simpler and as revealing latent damage which may result in a fall in strength during subsequent laundering. A. G.

**Hydrophilic properties of cellulose and its derivatives. VI. Hydrophilic properties of Cellulose hydrate which has fixed aluminium salts of higher fatty acids. (Moistureproof Cellophane. III.) VII. Softening process in cellulose sheet treated with aluminium soap solutions. (Moistureproof Cellophane. IV.)** K. Kanamaru, A. Shiratori, and T. Nakamura (Kolloid-Z., 1938, 84, 50—62, 323—334; cf. B., 1938, 1023).—VI. The influence of adsorption of Al soaps (palmitate, stearate, oleate, naphthenate) on the hygroscopicity and permeability to $H_2O$ vapour of Cellophane has been investigated. With increasing adsorption reversal of charge occurs; the hygroscopicity simultaneously falls to a min. at the isoelectric point, beyond which it increases. Similarly, measurements of permeability to $H_2O$ vapour, tensile strength, and elongation show a max. at a definite $[Al^{\cdots}]$, which corresponds with the isoelectric point.

VII. The hard sheet produced by waterproofing with Al soaps can be softened without impairment of the waterproofing properties by further treatment with cetyl alcohol, castor oil, or hydrocarbon oils. The softened sheet has greater extensibility and approx. the same adsorbent power. E. S. H.

**Conversion of cellulose hydrate into natural cellulose.** T. Kubo and K. Kanamaru (Z. physikal. Chem., 1938, **182**, 341—360).—*X*-Ray examination before and after treatment shows that heating of various forms of cellulose hydrate (I) (mercerised ramie thread, viscose and Cu silk) in some org. liquids or in gases at high temp. causes the arrangement of the crystallites to become more parallel. The effect is particularly pronounced when a liquid causes solvatation of the (I) or is very strongly polar [glycerin or $(CH_2{\cdot}OH)_2$]. There is also marked conversion of (I) into cellulose after heating in glycerin or $(CH_2{\cdot}OH)_2$ for $>30$ min. at $\not<200°$.

J. W. S.

**Fine structure of regenerated cellulose. I. Size of the "intermicellar" spaces in artificial fibres. II. Existence of two kinds of intermicellar space in artificial fibres.** S. Iwasaki and T. Miyamoto (J. Soc. Chem. Ind. Japan, 1938, **41**, 222—224B, 224—226B).—I. Load-extension curves for regenerated cellulose rayon in air, $H_2O$, and some primary alcohols are given. In $H_2O$, MeOH, EtOH, and $Pr^aOH$ the strength and work required for a 2% extension or rupture are diminished in comparison with the vals. in air or in $Bu^aOH$ and $C_5H_{11}{\cdot}OH$. It is concluded that the fibre contains primary intermicellar spaces $>$ the mol. of $Pr^aOH$ but $<$ that of $Bu^aOH$.

II. Similar data are given for regenerated cellulose rayon in org. acids and petroleum hydrocarbons. The strength and work of extension or rupture are diminished by $HCO_2H$ and AcOH, but not by higher aliphatic acids. In palmitic acid the extensibility is diminished, but the load required for 1% extension and the work of 2% extension are increased. The primary spaces are therefore $>$ the mol. of the AcOH but $<$ that of $EtCO_2H$. The existence of secondary spaces $>$ the mol. of octoic acid but $<$ that of palmitic acid is inferred. Rayons may be tested for strength and extensibility in an org. liquid in order to avoid the necessity for conditioning at const. R.H.

W. A. R.

**[Properties of] highly-crimped Zellwolle Phrix BK.** R. Jaeger (Textilber., 1938, **19**, 486—487).—The physical characteristics (fineness, and wet and dry tensile strengths and extensibilities) are tabulated for a new type of very highly-crimped rayon staple fibre, and knitted fabric patterns are given to show the greater softness and elasticity obtainable with this crimped instead of straight fibre.

A. J. H.

**Deterioration of artificial silk by insects.** A. Herfs (Textilber., 1936, **17**, 689—704; Chem. Zentr., 1936, ii, 3229).—The damage caused by textile, household, grain, wood, etc. pests and contributory mechanical factors are described.

A. H. C.

**Swelling of viscose artificial silk.** P. Thivet (Rev. univ. Soie, 1936, **11**, 401—402; Chem. Zentr., 1936, ii, 3228).—Primary (6·9—7·5%; increased by $H_2SO_4$, decreased by $Na_2SO_4$ or $ZnSO_4$) and secondary (*i.e.*, of the finished material; smaller and more const. and decreasing on thorough drying) swellings (estimated as wt. of $H_2O$ retained by 100 g. of dry artificial silk after centrifuging for 10 min. at 25° with a force of 1000 g./g. of moist material) are recognised. Stretching decreases the relative longitudinal swelling and ease of dyeing. A. H. C.

**Removal of fibres by dissolution.** J. Dupré-Chatel (Rev. univ. Soie, 1936, **11**, 335—341; Chem. Zentr., 1936, ii, 2824).—Suitable solvents are: for acetate silk, $COMe_2$; for nitrocellulose, $EtOH–Et_2O$; for benzylcellulose, aromatic hydrocarbons. Dissolution in $ZnCl_2$ or $Mg(NO_3)_2$ is not possible in presence of natural silk. $Ca(CNS)_2$ solution (*d* 1·35—1·36) dissolves all artificial silks and not cotton or wool, but the process presents technical difficulties.

A. H. C.

**Cellulose triacetate films.** K. Werner (Angew. Chem., 1938, **51**, 681—684).—An account is given of the mechanical properties of films of cellulose triacetate (I) prepared by evaporation or by coagulation of an AcOH solution in an aq. medium. Films containing 8—15% of $o\text{-}C_6H_4(CO_2Bu)_2$ (II) have low elastic extension but a plastic extension of 8—18%. The strength and elastic extension are increased by stretching during coagulation. The strength of a film from (I) of high $\eta$ is unaffected by an addition of 15—20% of (II), but the extensibility is increased. The same addition to (I) of moderately low $\eta$ diminishes the strength. Immersion in $H_2O$ for 24 hr. does not diminish the strength. W. A. R.

**Ethylcellulose films and plastics.** S. L. Bass and W. C. Goggin (Trans. Electrochem. Soc., 1938, **74**, Preprint 36, 559—577).—The prep. and the physical, chemical, and dielectric properties of such films and plastics are described. K. W. P.

**German [cellulosic and resinous] synthetic materials and their political and economic significance.** K. Mienes (Angew. Chem., 1938, **51**, 673—681).—A brief account is given of the applications of cellulose derivatives and synthetic resins in German industries. W. A. R.

**Pulp-yielding plants.** F. Hoyer (Faserforsch., 1938, **13**, 128—145).—A review of the actual and potential sources of cellulose pulp in Germany.

W. A. R.

**Pulp woods of Manchoukuo. IV. Analyses and cooking experiments of hard woods.** M. Shikata and T. Tatsuno (J. Agric. Chem. Soc. Japan, 1938, **14**, 942—950; cf. B., 1937, 893).—

Data are given for the amounts of ash, α-, β-, and γ-cellulose (I), pentosan (II), lignin, and substances sol. in $H_2O$, 1% NaOH, and $EtOH-C_6H_6$ in the hard woods *Fraxinus mandshurica*, Rupr., and *F. rhynchophylla*, Hance. The fibres in these are shorter than those in soft woods. Data are also given for η, Cu and Roe nos., and for the amounts of ash, α-, β-, and γ-(I), and (II) in unbleached pulps made from these woods by the $CaSO_3$ and NaOH processes, and also for the bleached pulps made by the action of $Cl_2$, followed by treatment with NaOH and bleaching powder. With both methods the α-(I) content varies from 88·2% to 92·4% and 195—243 kg. of bleached pulp are obtained from each cu. ft. of wood. In general, the $CaSO_3$ pulp contains less ash, (II), and α-(I) than the NaOH pulp.
J. N. A.

**Hardwood pulping for viscose rayon.** C. Carpenter and F. McCall (Rayon Text. Month., 1938, **19**, 538—539, 618—620).—Sulphite pulps have been prepared on a laboratory scale from 4 hardwoods of the South-eastern States (U.S.A.), and bleached and converted into viscose, which was spun into yarn. The yields of unbleached pulp were 40—43%, compared with 42% for longleaf pine under similar conditions. The bleached pulps had α-cellulose 89—91%, cuprammonium η 20—40 centipoises, Cu no. 2·3—3·0, and brightness vals. 82—87. Shredding and ageing were more rapid than with coniferous soda-celluloses. Xanthation and dissolution were satisfactory, but the solutions were hazy. The strengths and extensibilities of the yarns were = those from commercial pulps. Mixtures of hard and soft woods were satisfactorily processed.
W. A. R.

**Groundwood from blued pine.** W. Brecht, H. Schröter, and R. Süttinger (Papier-Fabr., 1938, **36**, 423—425).—The blueing of pine has no effect on the grinding consts., nor on the physical properties of the pulp produced, with the exception that the colour of the pulp is affected. Pulp from mildewed wood has a blue-grey tint as compared with that from sound wood.
D. A. C.

**Effect of moisture in the wood on production of groundwood from white spruce.** W. Brecht, H. Schröter, and R. Süttinger (Papier-Fabr., 1938, **36**, 421—422).—Increase in the $H_2O$ content of the wood (at room temp.) up to 32% produced a considerable increase in strength of test-sheets made from the pulp. There was also some increase in average fibre length, whilst the sp. power consumption was practically unaffected.
D. A. C.

**Effect of grinding temperature on resin content of the white-water in grinding white spruce.** W. Brecht, H. Schröter, and R. Süttinger (Papier-Fabr., 1938, **36**, 425—428).—Raising the grinder-pit temp. from 30° to 50° resulted in a substantial increase in strength and fibre length of the pulp, whilst the wetness and sp. power consumption decreased. Rise in temp. from 50° to 80° produced only very minor changes. At 30° the proportion in the white-$H_2O$ of the original resin in the wood is ~10%, and this steadily increases to 18% with rise in temp. up to 80°. The significance of this resin increase is pointed out in cases where there is a closed white-$H_2O$ system.
D. A. C.

**Blue coloration in wood pulp due to fungi.** E. Melin (Svensk Pappers-Tidn., 1936, **39**, 89—94; Chem. Zentr., 1936, ii, 2258—2259).—A lecture. Treatment of the $H_2O$ used with an antagonistic organism (*e.g.*, *Mycotoruloides*) is recommended as a preventive measure.
A. J. E. W.

**Wood pulp. VIII. Influence of pressure on digestion of lauan wood in bisulphite cooking.** E. Hu. **IX. Composition of beech wood.** C. K. Pak (J. Cellulose Inst., Tokyo, 1938, **14**, 314—315, 316—318; cf. B., 1938, 1140).—VIII. Three-stage cooking at 130°, viz., for 4 hr. at 8 atm., 2 hr. at 7 atm., and 2 hr. at 6 atm., gave pulp with 8·7% of lignin; increasing the first period to 5 hr., the other periods remaining as before, gave 3·3% of lignin, whilst cooking for 8 hr. at 8 atm. produced only overcooked pulp.

IX. Japanese beech contained moisture 10·25, ash 0·37, $EtOH-C_6H_6$ extract 1·83, $Et_2O$ extract 0·43, pentosan 24·58, and galactan 0·17%; mannan was absent. The lignin and cellulose contents were 24·95% and 56·64%, respectively, on the dry, fat-free sample.
D. A. C.

**Permanganate number and its application in determining the degree of cooking of eucalypt sulphate pulps.** P. B. Edwards and A. W. Mackney (J. Counc. Sci. Ind. Res. Australia, 1938, **11**, 185—200).—The $KMnO_4$ (I) and Cl nos. of the pulp are a measure of the lignin + NaOH-sol. substances present. Variation in (I) vals. may result from differences in the nature of the substances extracted by NaOH. The (I) method gives a rapid estimate of the degree of cooking, but is inadequate to replace lignin determinations in pulps in which wide variations are permissible.
A. G. P.

**Carbohydrates as a source of error in lignin determinations.** S. Schmidt-Nielsen and A. Opperud (Kong. Norske Vidensk. Selsk. Forhandl., 1936, **9**, 16—19; Chem. Zentr., 1936, ii, 3708).—The "lignin" content of some salt-$H_2O$ algæ (*Laminaria*, *Rhodymenia*) determined by treating with strong acid is due to humus and resin formation from carbohydrate and is not detectable by the thioglycollic acid method of Holmberg (A., 1936, 1515). Of carbohydrates examined according to Hilpert and Littmann (A., 1934, 1205), xylose, inulin, fructose, and fructose polysaccharides most readily yield "lignin," quant. discrepancy from Hilpert and Littmann being ascribed to temp. effects. Determination of lignin from the residue from acid treatment is therefore unreliable.
A. H. C.

**Nitric acid pulping. Analysis of the used acid pulping liquors.** E. R. Whittemore, J. D. Reid, and D. F. J. Lynch (Ind. Eng. Chem., 1938, **30**, 1192—1198).—The main acidic and salt constituents in $HNO_3$ pulping liquors are determined by conductometric titration (method described). A curve is obtained which shows characteristic inflexions corresponding with the various constituents, and the method, owing to its rapidity and simplicity, is recommended for works control. A selection of methods of chemical analysis of the various components of the liquor is given. A study of the conc. drain and wash liquors used for the digestion of bagasse showed that the $HNO_3$ consumption was 15 g. per 100 g. of bagasse. During concn. of these liquors by evaporation, however, org. acids are produced, the volatile constituents of which amount to $\sim$ 7·5% of the original acid used; these are lost during the concn. If the drain liquor only is used the acid consumption is 20 g. per 100 g. of bagasse, although 20% of this is due to washing losses, so that the nett consumption is about the same as when the wash liquor is included. When the $HNO_3$ is repeatedly re-used, $HCO_2H$ and AcOH are formed, which eventually reach an equilibrium concn. $NH_4NO_3$ is also formed at decreasing rates and may be a potential source of $NO_3'$. Reducing materials (sugars) increase rapidly and reach nearly 4% in the 12th cook. D. A. C.

**Purification of pulp.** L. Rys and A. Bönisch (Zellstoff u. Papier, 1938, **18**, 573—584).—Variables in the NaOH methods of refining pulps are investigated. The refining processes are divided into (*A*) extraction methods, using hot, dil. NaOH, and (*B*) mercerisation methods with cold, conc. NaOH. For both methods it is essential that suitable pulps be used; thus *A* requires a fairly soft but alkali-resistant pulp, whilst *B* necessitates the use of a fully bleached pulp. With *A*, increase in liquor concn., rise in temp., and prolonged reaction time all result in an increase in α-cellulose, for which a max. val. of 96·5% is reached. The α-cellulose content is also improved by chlorination before, and a HOCl bleach after, the NaOH process, whilst it is not affected by acid treatment in reducing the ash in the pulp. The use of $Na_2S$ and $Na_2SO_3$ during the process slightly raises the yield but lowers the α-cellulose content. With *B* increase in [NaOH] also results in a higher α-cellulose content. *B*, however, gives a max. val. of 98·5% of α-cellulose. The α-cellulose content is improved by $HNO_3$ pretreatment. It is considered that determinations of α-cellulose, Cu no., and $\eta$ of the pulp do not give a sufficiently clear indication of the progress of the refining treatment. D. A. C.

**Bleaching of pulp in America.** F. Kraft (Papier-Fabr., 1938, 36, 429—436).—The significance of the main geographical spheres of sulphite and sulphate pulp production in the United States is discussed, and methods of bleaching employed with these pulps together with recent developments in sulphate-pulp bleaching are surveyed. D. A. C.

**Significance of titanium-white pigments in the paper industry.** O. Hansen (Zellstoff u. Papier, 1938, **18**, 584—588).—The origin, production, and properties of $TiO_2$ as well as of various brands of $TiO_2$ pigments are described. The evaluation of $TiO_2$ for industrial purposes and its uses for paper are explained. D. A. C.

**Titanium compounds in paper-making.** M. Déribéré (Papeterie, 1936, 58, 729; Chem. Zentr., 1936, ii, 3226).—The fluoride, chloride, and oxalate of Ti give Ti tannates with tanning agents on cellulose materials and thence bright fast (red or yellow) lakes with basic dyes (the oxalate is suitable for vegetable dyes). Ti soaps are also used as mordants and impregnating agents, but Pb and Co titanates do not yet find industrial application. A. H. C.

**[Paper-]sizing problems.** E. Kurzhals (Zellstoff u. Papier, 1938, **18**, 588—590).—Examples of commercial resin sizing under different conditions are given, and it is considered that a size having a fixed composition will not suit all papers. On the other hand, adjustment of the free resin content is often desirable. Reduction in sizing degree of papers on storage is ascribed to $p_H$ effects. The Bewoid and Gillet sizes are briefly compared. D. A. C.

**Detection of genuine parchment paper.** E. Bohm (Z. Unters. Lebensm., 1938, 76, 362—365).—The maceration, alkali, amyloid, and $H_2SO_4$ tests are described and recommended. E. C. S.

**Active charcoal from lignin.** See II. **Phenols from cornstalk lignin.**—See III. **Abnormal wood.**—See IX. **Elastic hysteresis in yarns etc.**—See X. **Org. plastics.**—See XIII. **Cotton-plant fertilisation.**—See XVI.

See also A., I, 573, **Coagulation of cellulose ester sols.** II, 449—450, **Lignin.** 465, **Determination of pentosans and lignin relationship.**

## Patents.

**Scouring or cleaning of wool, sheepskins, and the like.** W. E. Fitzpatrick (B.P. 482,748, 2.10.36).—Greasy animal fibres are scoured by treatment in an aq. liquid containing $C_5H_5N$ or a homologue or derivative, and $NH_3$, together with an emulsifier, *e.g.*, soap and/or $Na_2CO_3$. The $C_5H_5N$ and $NH_3$ effect the removal of fatty matter and give better results. Unemulsified fatty material is removed from the liquid by mechanical means, *e.g.*, centrifuging. The treatment is conveniently carried out by use of two bowls (at 49° and 27—38°, respectively) containing scouring liquid, and a third bowl (at 21—27°) for rinsing. During treatment, the strength of the solutions is maintained by suitable addition of the reagents. R. J. W. R.

**Treatment [carding] of greased wool.** R. Haddan. From California Process Co. (B.P. 485,543, 16.11.37).—Unscoured or oiled wool is refrigerated, *e.g.*, at −26° to −51°, to congeal the grease on the fibres, and then carded (and, if desired, gilled) while still frozen, the operations being carried out, *e.g.*, in a cold chamber. The wool may be opened out either before or after freezing. R. J. W. R.

**[Apparatus for] liquid treatment of fibre.** J. H. Nightingall (B.P. 485,319, 24.3.37).—Apparatus for the treatment of *Phormium* etc. fibres is described and claimed. The fibres are supported on a system of lateral bars, which are attached to endless chains, and passed through the agitated treatment liquors. R. J. W. R.

**Drying of webs of fabric.** H. Seabrook. From E. Gessner A.-G. (B.P. 491,303, 31.3.38).—After leaving a loop dryer, the web is restrained between two belts, or a belt and a no. of rollers, moving at equal peripheral speed and is finish-dried by air taken from the loop dryer. B. M. V.

**Manufacture of tracing cloth for pencil drawings.** P. König (B.P. 483,011, 8.10.36).—Tracing cloth is covered with a layer of very finely-pulverised abrasive (pumice or glass powder) applied by coating or spraying in admixture with a binder (varnish, cellulose nitrate, or agar solutions). F. R. E.

**[Production of] stiffening material.** Brit. Celanese, Ltd. (B.P. 482,849, 30.4.37. U.S., 5.5.36).—A fabric base is impregnated with a solution of a cellulose derivative (I) (acetate, nitrate) which is near the point of pptn. The (I) is pptd. by removal of the solvent, *e.g.*, by the action of live steam. F. R. E.

**Manufacture of cellulose aceto-nitrates.** E. Berl (B.P. 483,474, 16.10.36).—Substantially anhyd. cellulose is nitrated at room temp. with a mixture of conc. (97—100%) AcOH and conc. (94—100%) $HNO_3$ containing $\nless 33\%$ of $HNO_3$, in presence of small quantities of $H_2SO_4$ and/or $H_3PO_4$ if desired, freed from waste acid mixture, washed with AcOH and $C_6H_6$, and acetylated with a mixture of $Ac_2O$ and $C_6H_6$ at temp. gradually rising to 25—30°. The product is afterwards washed, *e.g.*, with $C_6H_6$ and/or org. swelling liquids followed by cold and hot $H_2O$, and stabilised by addition of alkali or alkaline-earth salts of fatty and/or aromatic acids to the washing liquor. F. R. E.

**Production of mixed cellulosic esters.** "Afag" Finanzierungs A.-G. (B.P. 483,485, 19.10.36. Fr., 18.10.35).—A cellulose ester produced by esterification in presence of $H_2SO_4$ as catalyst is treated, while in swollen condition and without previous stabilisation or removal of catalyst residues derived from the esterification, with at least one substance containing a dissimilar acyl radical, *e.g.*, fatty acid or ester, or their substitution products, at elevated temp., and in presence of an inert diluent, if desired. F. R. E.

**Production of cellulose ethers.** E. I. Du Pont de Nemours & Co. (B.P. 482,885, 4.8.36. U.S., 1.8.35).—Low-substituted cellulose ethers insol. in $H_2O$ but sol. in aq. alkali are prepared by continuously impregnating alkali-cellulose sheet (produced by impregnation of wood-pulp board with alkali) with a liquid etherifying agent (I), *e.g.*, $CH_2Cl{\cdot}CO_2Alk$, glycerol monochlorohydrin, and subjecting to pressure to remove the excess of (I) over the amount required for the desired degree of substitution. The impregnated sheet is then stored for a suitable time for the reaction to proceed, and the resulting cellulose ether is purified by washing with $H_2O$. When using etherifying agents sol. in and stable to alkali, the impregnation with alkali and etherifying agent may be carried out simultaneously. 16 examples of suitable preps. are given. F. R. E.

**Manufacture of cork composition.** W. J. Tennant. From Crown Cork & Seal Co., Inc. (B.P. 482,539, 1.2.37).—Cork granules in preponderant vol. are coated with a binder mixture made by mixing bodied tung oil, a softening agent (*e.g.*, glycerol), and glue, and adding a hardener [*e.g.*, $CH_2O$, $(CH_2)_6N_4$, etc.] and optionally a resinous material (*e.g.*, PhOH– or urea–$CH_2O$ resins, etc.). From the coated cork, which preferably is stored in conditioned chambers, compositions are prepared by moulding, extruding, packing, rolling, or sheeting which have the unimpaired properties of cork and are also acid-, alkali-, and mould growth-resistant. J. W. Cr.

**Manufacture of artificial fibres resembling wool.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 482,280, 22.9.36).—Highly-ripened viscose is spun into an alcoholic (EtOH, MeOH) pptg. bath, and the fibres, preferably after cutting to staple length, are decomposed to regenerated cellulose by treatment with hot air, hot acid, or hot salt solution. F. R. E.

**Manufacture of artificial silk.** Brit. Enka Artificial Silk Co., Ltd., and J. B. R. de van der Schueren (B.P. 485,933, 26.11.36).—The wet filaments are wound under slight tension on to a rotating bobbin (claimed) having a substantially cylindrical tapering core consisting of two detachable portions. After removal of the bobbin core, the cylindrical, flat-ended package is washed, after-treated, dried, and twisted. F. R. E.

**Production of crimped artificial filaments, fibres, and the like.** D. Finlayson and R. G. Perry (B.P. 482,814, 30.7.36).—Staple fibres of org. derivatives of cellulose are softened (aq. $COMe_2$ in $\ngtr 30\%$ concn.) and subjected to pressure while laid across each other in criss-cross manner. Apparatus is described. (Cf. B.P. 479,347; B., 1938, 1153.) F. R. E.

**Production of a crimped and voluminous textile fibre from viscose.** Verein. Glanzstoff-Fabriken A.-G. (B.P. 483,404, 15.1.37. Ger., 15.1. and 20.3.36).—A gas-evolving substance (sulphite, bisulphite, carbonate, or bicarbonate) is added to the viscose, to the spinning bath, or to the unfixed filament after leaving the coagulating bath, or the unfixed filament is treated with gaseous $CO_2$ or $SO_2$. The untensioned filament, after stretching, twisting, or cutting to staple length if desired, is then passed into an acid bath (dil. $H_2SO_4$) so that it is decomposed slowly but completely with evolution of gas bubbles and with strong shrinkage. The crimped product is washed, after-treated, and dried without tension. F. R. E.

**Manufacture of silk and wool fibres in the form of an impalpable powder, and toilet preparations containing such product.** R. W. Lawson (B.P. 482,269, 22.9.36).—Wool or silk freed from impurities is treated with alkali to weaken without dissolving the fibres. The mass is neutralised, washed with $H_2O$, dried, and finely ground. F. R. E.

**Manufacture of artificial filaments, films, and similar materials.** W. A. Dickie and D. Finlayson (B.P. 482,216, 30.9.36).—The basic material consists of a polymeride of an unsaturated org. compound which contains ester groups (60—85% of the theoretical max. content) and esterifiable OH groups, but is free from $CO_2H$ groups and salts thereof, *e.g.*, polymerised vinyl acetate. F. R. E.

**Manufacture of artificial filaments, yarns, films, foils, and similar materials.** H. Dreyfus (B.P. 485,768, 1. and 21.12.36).—The filaments etc., having a basis of an org. ester of cellulose or a cellulose ether which is free from halogen and contains substituent radicals containing OH, $CO_2H$, and/or unsaturated or other (OAc) groups, or formed by the introduction of such radicals into regenerated cellulose materials, are treated, at elevated temp. and/or pressure, with or without halogenation (with $SOCl_2$), with a N-containing compound ($NH_3$ or an amine) in an inert medium ($C_6H_6$) if desired, to introduce non-acidic N into the cellulose derivative mol. Any $NH_2$ groups in the product may be alkylated or acylated. F. R. E.

**Manufacture of filaments, threads, foils, or sheets of cellulose esters or ethers.** J. G. Evans, A. Shepherdson, and Imperial Chem. Industries, Ltd. (B.P. 493,111, 31.3.37).—Small proportions of quaternary $NH_4$ salts $R{\cdot}X{\cdot}CH_2{\cdot}NR'R''R'''{\cdot}Y$, wherein $R = CH_2R''''{\cdot}$ or $COR''''{\cdot}$, $R''''$ being a saturated or unsaturated hydrocarbon radical of $\not< C_{11}$, $NR'R''R'''$ a *tert.* aliphatic base or a heterocyclic base such as $C_5H_5N$, and Y a univalent anion of an acid, *e.g.*, HCl, are incorporated into spinning solutions (in $COMe_2$) of cellulose esters or ethers from which filaments, threads, foils, or sheets are formed by wet- or dry-spinning processes; the materials so obtained are heated at $>70°$ (125—150°) and then washed, rinsed, and dried. The products are $H_2O$-repellent and have a soft handle, even after washing and dry-cleaning. R. G.

**Production of flexible [cellulosic] films by moulding.** Kodak, Ltd., Assees. of E. V. Derhoef (B.P. 482,995, 15.2.37. U.S., 15.2.36).—A layer of finely-divided cellulose derivative (acetate), preferably with a plasticiser, is placed between two moving bands, one of which may have a roughened surface, and subjected to heat and pressure.

F. R. E.

**Manufacture of shaped cellulose articles [from cuprammonium cellulose solutions].** I. G. Farbenind. A.-G. (B.P. 482,296, 26.9.36. Ger., 28.9.35). —The cellulose is pptd. in a neutral or alkaline medium in presence of acid esters of polyhydric alcohols ($\not> C_6$), or of their $H_2O$-sol. salts (Na glycerophosphate, the disulphuric or phosphoric ester of sorbitol, etc.), added either to the cuprammonium solution or to the aq. pptg. bath, whereby pptn. of $Cu(OH)_2$ is avoided. F. R. E.

**Hardening of cellulosic and other porous materials.** C. Luckhaupt (B.P. 482,847, 23.4.37. U.S., 23.4.36).—The materials are treated with non-aq. liquid terpin hydrate at $\not<115°$ by immersion or spraying, the temp. and duration of treatment being varied according to the degree of hardness desired. A colouring medium may be incorporated. F. R. E.

**Production of [non-adhesive] cellulose derivative sheets or films.** Kodak, Ltd., Assees. of J. B. Wells (B.P. 482,921, 15.3.37. U.S., 13.3.36).—A grainy dope containing finely-divided particles of uncolloidised cellulose derivative material (acetate) is coated on at least one surface of each sheet of cellulose derivative or regenerated cellulose.

F. R. E.

**Production of laminated materials.** Shellmar Products Co., Assees. of I. Gurwick (B.P. 482,436, 29.6.36. U.S., 21.8.35 and 15.5.36).—A sheet material is bonded to a second sheet by an adhesive, ink (*e.g.*, intaglio ink), or lacquer having adhesive properties, deposited from a surface (*e.g.*, a rotating cylinder) having a multitude of small depressions (thus preventing running and streaking of the colour and providing a uniform deposit), one sheet being transparent or translucent non-fibrous material (*e.g.*, regenerated cellulose, cellulose acetate, etc.) and the other the same or dissimilar (*e.g.*, paper, rubber, metal foil, etc.).

J. W. Cr.

**Manufacture of pulp for paperboard.** L. Mellersh-Jackson. From Coöperatieve Vereeniging Coöperatieve Stroocartonfabriek "De Eendracht" (B.P. 485,516, 6.7.37).—Straw pulp which has been produced by the $Ca(OH)_2$ process is well washed and any $Ca^{\cdot\cdot}$ ions present are displaced by addition either of acids to give $p_H$ 6—6·5, or of acid-forming salts to give $p_H$ 4·5—5·5. This may be done in the beater or on the board machine. In addition the pulp may be finally rendered alkaline with NaOH or aq. $NH_3$. It is claimed that each cation has a sp. effect, and that $Al^{\cdot\cdot\cdot}$ and $H^{\cdot}$ impart waterproofing properties to the board. D. A. C.

**Improving the colour of wood pulp.** H. B. Glass (U.S.P. 2,070,893, 16.2.37. Appl., 10.5.35).—Kraft pulp is bleached with aq. HOCl in which free HCl has been neutralised. The reaction temp. should be about 35° and the $p_H$ 4·5—6·0. The pulp is then washed and treated with $Na_2CO_3$ at 40—60° and $p_H$ 10·5—11·5 for 45—75 min. in order to dissolve out the colouring matter in the pulp. The pulp is washed and finally bleached again as above.

D. A. C.

**Treatment of pulp-mill waste cooking liquors.** G. H. Tomlinson (U.S.P. 2,070,632, 16.2.37. Appl., 10.3.32).—Waste sulphate liquor is conc. to about 50% of solids content and sprayed into the furnace of a modified $H_2O$-tube boiler at a point approx. midway between the tubes and an inclined hearth. The liquor spray impinges on one wall of the furnace, where it dries and drops in aggregates on to the hearth. Air is admitted on to the hearth to produce suitable conditions for combustion of the org. matter, whilst the recovered inorg. solids are collected as they flow from the hearth. D. A. C.

**Treatment of pulp residual liquor.** G. H. Tomlinson (B.P. 485,525, 7.10.37. U.S., 27.10.36).—Sulphite waste liquor is conc. (so as to contain about 50% of $H_2O$ and 3780 B.Th.U. per lb.) and sprayed into the furnace of a $H_2O$-tube boiler, where it is burned for raising process steam, under furnace conditions which will produce a dry, unfused ash. The ash, in the form of dust and containing mainly Ca salts, passes through the boiler together with the furnace gases, and is finally recovered in a cyclone separator. The plant, which is provided with an air preheater and a superheater, is described.

D. A. C.

**Manufacture of paper.** Penick & Ford, Ltd., Inc. (B.P. 485,700, 9.3.37. U.S., 7.5.36).—Starch for sizing purposes is heated in $H_2O$ to a point at which max. swelling occurs without disruption of the granules. Subsequent gelatinisation occurs at the drying cylinders. The initial swelling of the starch is controlled by addition of inhibiting agents (soaps, sulphonated vegetable oils, etc.) to the aq. suspension, and the final gelatinisation during drying of the paper may be aided by presence of alum, which renders the inhibiting agents insol. D. A. C.

**Production of staple fibres.** O. Miyaki (B.P. 483,161, 19.10.36. Jap., 29.10.35).

**Crêping webs of paper and other sheet material.** Zellstoff-fabr. Waldhof, and R. Haas (B.P. 493,183, 21.12.37. Ger., 20.1.37. Addn. to B.P. 466,733).

**Treating fibrous solids with gases.—**See I. **Mouldable articles from lignin-derivative material. Compositions containing film-forming esters.—**See XIII. **Tanning materials. Material resembling leather. Adhesive layers.—**See XV. **Protein compositions.—**See XIX. **Recovering $CS_2$ from effluent waters.—**See XXIII.

## VI.—BLEACHING; DYEING; PRINTING; FINISHING.

**Wetting agents in textile processing. II. Modified Herbig apparatus.** R. B. Forster, I. S. Uppal, and K. Venkataraman (J. Soc. Dyers and Col., 1938, **54**, 465—472; cf. B., 1937, 772).—Methods of evaluating the efficiency of wetting agents are discussed and a modified Herbig apparatus (cf. B., 1935, 795) is described in which the centrifuge spindle is rotated in a vertical position. The spindle can be moved to a horizontal position for immersion of the yarn; the liquor under test is held in a thermostat, enabling solutions to be examined at temp. up to 97°. The influence of concn., temp., $p_H$, presence of NaCl, and the quality of the yarn on the wetting power has been examined, employing this apparatus with a no. of commercial products including Na cetyl sulphate, a Na dialkylnaphthalenesulphonates, oleyl-*N*-methyltaurine (Na salt), $Na_3PO_4$, etc. The use of the apparatus in determining the efficiency in scouring grey cotton yarn with various agents is also described. R. J. W. R.

**Stabilisers in bleaching with hydrogen peroxide.** J. Porzky (Z. ges. Textilind., 1936, **39**, 451—452; Chem. Zentr., 1936, ii, 3223).—Alkalis (NaOH) and some metal salts ($CuSO_4$, $FeSO_4$) accelerate, $MgSO_4$ and acids inhibit, the decomp. of $H_2O_2$. Water-glass, Homogenite, and especially Gardinol are also stabilisers. A. H. C.

**Decomposition of perborate bleaching liquors.** Kehren (Z. ges. Textilind., 1936, **39**, 370—371; Chem. Zentr., 1936, ii, 3223).—Perborate which quickly decomposes in alkaline solution is stabilised by water-glass only in presence of Ca or Mg (*i.e.*, in hard waters) and under comparable conditions is not inferior to $H_2O_2$ as a bleaching agent. A. H. C.

**Analysis of bleaching and dyeing materials.** E. Duhem (Ind. textile, 1936, **53**, 399—400; Chem. Zentr., 1936, ii, 3727).—The following determinations etc. are described: $H_2O_2$ with $KMnO_4$; Fe in tartar emetic with $H_2S$; Sb with I; fats in Turkey-red oil by treating with HCl and extracting with $Et_2O$ (traces of fat are detected with camphor); preservation of albumin by sulphite; prep. of nitrocasein and its fixation on cotton; alizarin dyeing (alizarin soaps should be alkali-free); mordanting with tannin and use of oxidised $NH_2Ph$-blacks. Gum Senegal is stable indefinitely with glycerin. A. H. C.

**Chemical changes in dyes in the chlorine bleaching process.** E. Schilov (Textilber., 1936, **17**, 504—505, 734—736; Chem. Zentr., 1936, ii, 3224).—Cl-bleaching is a chlorinating degradation of the dye. The oxidation of various org. compounds and a modified arsenite method of determining hypochlorite in presence of a phenoxide are described. A. H. C.

**Examination of "sulphur stoved" and "sulphited" wool fabrics for sulphur dioxide and sulphite.** F. F. Elsworth and H. Phillips (J. Text. Inst., 1938, **29**, T219—226).—When wool bleached with $NaHSO_3$ or $SO_2$ is boiled with 5N-HCl the $SO_2$ liberated together with the sulphate formed equal the total increase in the S content of the wool. This val. is $>$ the content of free and combined [as *S*-cysteinesulphonate (I) groups] $SO_2$ as determined by distillation with dil. $H_3PO_4$, and the bleached wool contains some sulphate produced either by oxidation or by decomp. of (I) groups. A. G.

**Rôle of catalysis in textile chemistry. IV.** H. J. Henk (Textilber., 1938, **19**, 794; cf. B., 1938, 505).—The action and use of negative catalysts in hindering autoxidation processes are discussed with reference to the action of heavy-metal salts (*e.g.*, Cr, Al, and especially Cu complex salts) in protecting the wool substance and dyes which may be present during exposure to light [$CS(NH_2)_2$ and $(NaPO_3)_6$ are the preferred negative catalysts for this purpose since they cause no colour (dye) change], and the use of PhOH, *m*-$C_6H_4(OH)_2$, $NHPh_2$, and α- and β-$C_{10}H_7{\cdot}OH$ for inhibiting the aërial oxidation of linseed oil sizes and the simultaneous tendering of the cellulose fibres to which they are applied. A. J. H.

**Levelling agents for dyeing with substantive dyestuffs.** K. Stierwaldt (Textilber., 1936, **17**, 500; Chem. Zentr., 1936, ii, 2799).—0·5—1 g./l. of Peregal 0 or Eulysin A (I) is effective. (I) is alkaline and can frequently replace $Na_2CO_3$. A. H. C.

**Modern methods and equipment for processing wool.** E. W. Pierce (Canad. Text. J., 1938, **55**, No. 20, 29—32).—Reference is made to the advantages of degreasing wool by the "frosted-wool" method (B., 1936, 1033), the preferred use of $Na_4P_2O_7$ instead of $Na_6P_6O_{18}$ for preventing Ca-soap formation on account of its higher stability in boiling scouring liquors, the recommended use of a pre-addition of 50% of $N(C_2H_4{\cdot}OH)_3$ (to facilitate subsequent scouring) to the oleine lubricants commonly used in wool manufacture, and the methods used in dyeing wool tops, yarns, and piece goods. A. J. H.

**Wool oxidation [and its effect] in dyeing.** Anon. (Text. Mercury and Argus, 1938, **99**, 477—478).—The increased and reduced affinity for acid dyes produced by oxidising wool with $Cl_2$ and $H_2O_2$, respectively, is discussed with reference to the cystine linking in the wool mol. A. J. H.

**Wool dyes fast to sea-water.** G. Rudolph (Z. ges. Textilind., 1936, **39**, 517—518; Chem. Zentr., 1936, ii, 3197).—Alizarinecyanine-greens, sulphon-cyanine-black BB, alizarine-pure-blue B, FFG, FFB, Supranol colours, etc. (applied with $Na_2SO_4$ and AcOH or $HCO_2H$ or with $NH_4OAc$) are suitable for bright tones, Palatine Fast colours (applied with Palatine Fast Salt O and $H_2SO_4$) for medium, and metachrome dyes, indigosols, helindoles, and indigos for darker shades. A. H. C.

**Spontaneous combustion of oily textile materials [wool shoddy].** Kehren (Textilber., 1938, **19**, 735—737).—In investigations of two instances in which wool shoddy (containing fat and mineral oils which, after extraction, give a satisfactory Mackey test) ignited spontaneously during or shortly after the drying which followed dyeing with brown and black Cr dyes it was concluded that the deposition of Cr soap within the material during after-chroming was responsible. Curves are given to show the adverse effect on the Mackey test produced by heating fatty acids (not mineral oils) with aq. $H_2SO_4 + Na_2Cr_2O_7$. It is not dangerous to oil Cr-mordanted wool with oleine (oleic acid) since the Cr is so firmly bound to the wool that it does not react to form a Cr soap. A. J. H.

**Bibliography of methods for determining the causes of damage appearing in wool after dyeing.** B. A. Ryberg (Amer. Dyestuff Rep., 1938, **27**, 571—602p).—Methods involving the behaviour of wool towards acids, alkalis, bacteria and enzymes, dyes, swelling treatments, halogens, oxidation and reduction, and light are described with 236 references to the literature. A. J. H.

**Dyeing of "Wollstra."** W. Festerling (Deuts. Färber-Ztg., 1936, **72**, 407—410; Chem. Zentr., 1936, ii, 3197).—Pretreatment and precautions, dyeing (two-shade) with Anthranols and Supramines, Palatine Fast and Sirius colours, etc. are described. The technique of one-bath dyeing, suitability of "Halbwollechtbraun RL" and "Halbwollechtgrau GL," direct, diazotised, and developed wool dyes, and the application of Immedial leuco-dyes and dyeing of the cellulose acetate with Cellitone Fast colours and weak acid wool dyes with AcOH and Palatine Fast Salt O, are also described. A. H. C.

**Dyeing of artificial wool.** G. Rudolph (Monatschr. Text.-Ind., 1936, **51**, II, 44—46; Chem. Zentr., 1936, ii, 3197).—Dyeing of various forms of artificial wool is considered with particular reference to Immedial leuco-dyes. A. H. C.

**Dyeing and finishing of cotton yarn and cloth.** J. E. Meili (Canad. Text. J., 1938, **55**, No. 20, 32—34).—The principles of yarn and piece-goods mercerising (including bleaching) are described. Brief reference is made to a new ("Aridye") method of lacquer printing which uses synthetic resins (instead of nitrocellulose or albumin) for binding the pigment to the fabric. A. J. H.

**Japanese dyeing tannins. XXI. Influence of volume of solution on absorption of tannins by cellulose (contd.).** Y. Uyeda and Y. Ogawa (J. Soc. Chem. Ind. Japan, 1938, **41**, 248—249b; cf. B., 1938, 1024).—The absorption of tannin by cellulose is the higher, the lower is the temp. For a given cellulose : tannin ratio the absorption is the greater, the higher is the initial concn. of the tannin solution. W. A. R.

**Substantive dyeing of artificial fibres.** W. Weltzien and K. Windeck-Schulze (Angew. Chem., 1938, **51**, 729—736).—The physical chemistry of dye solutions, the influence of various factors (concn. of electrolyte, temp., type of fibre, etc.) on the dyeing process, and the constitution of substantive dyes are discussed with special reference to the dyeing of synthetic cellulosic fibres. R. J. W. R.

**Developments and problems in hose dyeing.** F. Weber (Textilber., 1938, **19**, 656—657, 727—729).—Dyeing methods suitable for hose knitted with one or more of the materials cotton, viscose and cuprammonium rayons (lustrous and matt), and real silk are discussed with reference to the practical difficulties of obtaining solid shades well-penetrated in the seams. A. J. H.

**Dyeing of iridescent hosiery.** H. Dixon (Amer. Dyestuff Rep., 1938, **27**, 520—522p).—The dyes and dyeing difficulties of producing a shimmering, multi-coloured appearance in silk hose are discussed. A. J. H.

**Dyeing and finishing of rayon hosiery.** R. M. Stribling (Amer. Dyestuff Rep., 1938, **27**, 489—496p).—Large-scale operations are described and discussed from the viewpoint of the type and condition of the hosiery, the dyeing machine, dyebath constituents, and the dyeing and finishing processes. A. J. H.

**Good penetration and levelling in dyeing with vat dyes.** H. Ellner (Textilber., 1938, **19**, 508—511).—Most of the difficulties encountered in applying vat dyes to cotton and viscose rayon (especially staple fibre) are due to incomplete wetting of the textile material and poor penetrative power of the dispersed dye particles; modifications of the normal dyeing process to avoid these difficulties are discussed. In one modification (suitable for piece goods, but not in "machine-dyeing" for materials in package form), Rongalite ($CH_2O$–$Na_2S_2O_4$) is used instead of $Na_2S_2O_4$, so that the temp. of the dye liquor may be raised to 90° instead of the usual 30—50°. A more generally useful modification consists in using a dye liquor prepared with $\leqslant$ the usual amounts of NaOH and $Na_2S_2O_4$ [Peregal OK and Humectol CX (I.G.) are added to maintain the vat dyes in such extremely fine suspension that their particles pass through an ordinary filter] at 30—80°, and adding $Na_2S_2O_4$ and NaOH from time to time during the dyeing process so that fresh leuco-dye is made available as it is exhausted from the dye liquor by the textile material; under these circumstances good penetration and levelling are obtained, and because of the presence of a min. amount of NaOH such a dye liquor exerts little swelling action on viscose-rayon staple fibre and is especially suitable for the vat dyeing of this fibre. A. J. H.

**Dyeing difficulties and faults. I. (A) J. D. Blakeley. II. (B) H. R. Heap. III. Faults which may occur in the application of azoic dyes to cotton piece goods. C. Child. IV. Methods of solving dyeing difficulties and faults. R. Humphries** (J. Soc. Dyers and Col., 1938, **54**, 454—455, 455—456, 456—458, 458—460).—A symposium.

I, II. Some problems encountered in normal dyeing practice are reviewed.

III. Dyeing defects which occur during the application of azoic dyes to cotton, including the formation of different shades and tones at the ends or selvedges of the fabric and unlevel dyeings, are described. The causes of, and means of overcoming, these defects are outlined.

IV. Possible causes of faults in dyeing are reviewed. These may be due to the dyestuff, unsuitable processing, or mechanical trouble; causes of staining, tendering, and fading are also considered. Laboratory procedure for determining the reasons for such defects is briefly indicated. R. J. W. R.

**Detection of methylcelluloses (Tylose) on yarn and fabric.** R. Brauckmeyer and F. Bühl (Textilber., 1938, **19**, 518—519).—$H_2O$- and alkali-sol. methylcelluloses (I) (Tylose TWA and 4 S, respectively; cf. B., 1938, 265) have an extraordinarily strong affinity for direct dyes and their presence on textile material consisting of cotton or cellulose (viscose and cuprammonium) rayon may be easily established by staining with a cold aq. 0·05% solution of Diamine Pure Blue FF followed by washing with $H_2O$, whereby the adhering particles of (I) are deeply stained whereas the cellulose fibres are left almost colourless; starch, dextrin, and glue also remain colourless. This test is satisfactory with dark-coloured material if a contrasting dye, *e.g.*, Congo-red or Benzopurpurine 4B, is used. Pelican ink 4001 and Neocarmine, and di- and tri-phenylcarmine solutions stain (I) blue and green, respectively, and much deeper than cellulose fibres. Fibres of (I) prepared by methylation of ordinary sulphite-cellulose show (when swelled in $H_2O$ or aq. NaOH) the characteristic spaced bulbous swellings produced by treating cotton fibres with cuprammonium solutions; photomicrographs are shown. Residual traces of (I) can be detected by the staining test in printed and finished fabrics in the printing of which (I) has been used as thickener (cf. Colloresin; B., 1937, 897). A. J. H.

**Seed husk of *Plantago ovata* in [textile] printing and finishing.** S. R. Ramachandran and K. Venkataraman (J. Soc. Dyers and Col., 1938, **54**, 462—464).—Husk powder from *P. ovata* seeds gives a stable gum with cold $H_2O$ which, when bleached, is satisfactory for printing and finishing. Methods of prep. and bleaching of the mucilage are described, a $Cl_2$ bleach at 100° being more effective than are peroxides. The product is compatible with aq. starch and gives a crisp handle on calico. It is also a good thickener for many types of dyes; recipes for its use in printing vat, basic, chrome, Indigosol, and acid (on silk) dyes and diazo salts (on naphtholated cloth) are given. The material is sensitive to alkali and is a possible substitute for methylated cellulose thickeners. R. J. W. R.

**Emulsified [starch] products for use in [textile] printing.** H. Gerber (Textilber., 1938, **19**, 804—807).—Starch thickening products suitable for replacing the usual starch + British gum + gum tragacanth thickenings in printing with vat, acid, basic, $NH_2Ph$-black, Rapidogen, and Rapid Fast dyes (typical printing recipes are given) are prepared by emulsifying potato starch with Emulgator [Transulphonic acid or Skomulgol 70P (I)] followed by addition of a neutral or alkaline coagulating agent (NaCl, NaCl + $Na_2CO_3$); such products are easily washed out of the fabric after printing, and because of their strong hydrophile properties they allow less glycerol to be used in the printing paste. Encouraging results were obtained in printing vat dyes with pastes in which the starch thickening was replaced by mineral oil or tallow emulsions prepared with the aid of Nekal AEM (I.G.) and (I). A. J. H.

**Measuring stick for textile-printing pastes.** W. H. Cady (Amer. Dyestuff Rep., 1938, **27**, 569—571P; cf. Glarum, B., 1937, 1326).—The control of printing pastes by measurement of their $\eta$ in a Stormer viscosimeter is emphasised. A. J. H.

**[Use of] organic acids for printing white reserves under Variamine Blue.** Anon. (Textilber., 1938, **19**, 520).—Lactic acid is more suitable than citric, tartaric (insufficiently $H_2O$-sol.), or glycollic acid for increasing the acidity of the usual $Al_2(SO_4)_3$ reserve pastes. AcOH and $HCO_2H$ are unsuitable because they volatilise sufficiently to prevent complete fixation of the Variamine Blue or naphtol colours adjacent to the parts printed with the reserve paste. A. J. H.

**Printing of white and coloured discharges on indigoid-dyed ground-shades.** A. Schürch (Textilber., 1938, **19**, 665—666).—Use is made of Discharge Salt Ciba W [(I), S.C.I.] (a mixture of $K_2CO_3$ and a quaternary $NH_4$ compound), which is found to give clear white discharges on indigoid-dyed grounds. A typical method for obtaining a white and red pattern on a blue ground is to print cotton fabric (dyed with Ciba Blue 2B) with a white discharge paste consisting of British gum thickening (450 g.), (I) (150), 50% ZnO paste (100), $H_2O$ (120), $K_2CO_3$ (150), and 30% anthraquinone paste (30), and also with a naphtol (for red) discharge paste consisting of Ciba Naphtol RTO (30 g.), aq. NaOH (*d* 1·33, 30 c.c.), EtOH (50 c.c.), $H_2O$ (110), neutral starch + gum thickening (450), (I) (150), $K_2CO_3$ (150), and 30% anthraquinone paste (30), followed by drying, steaming for 3—5 min. in an air-free Mather–Platt, developing in a bath containing 80 g. of Orange Salt (Ciba II) per l., souring at 40—50° in a bath containing 3 c.c. of conc. HCl per l., washing, passing through a boiling solution of 10 c.c. of waterglass per l., and soaping at the boil. Fabric patterns are attached. A. J. H.

**Printing of green shades with Rapid Fast, Rapidogen, and Indigosol dyes.** H. Gürtler (Textilber., 1938, **19**, 795—796).—Various expedients (*e.g.*, printing with Rapid Fast Yellow + Indigosol O or O4B, Rapidogen Green B, Indigosol Green IB, and Indigosol Yellow V, and mixtures thereof) used since 1912 to overcome the difficulty caused by absence of a satisfactory pure fast green member of these series of dyes (I.G.) up to the recent discovery of Indigosol Green I3G are described. A. J. H.

**Use of natural wool fat and preparations therefrom in wool finishing.** K. Jochum (Textilber., 1938, **19**, 807—809).—No definite advantages or disadvantages, from the viewpoints of carbonising (with aq. $H_2SO_4$) or scouring, were obtained by pre-impregnating wool materials with solutions in benzine or with aq. emulsions of raw and neutralised wool fats (acid vals. 42·22 and 1·17, respectively), but it was shown that the impregnated wool material could be satisfactorily freed from wool fat by scouring with Igepon-T or Igepal-L (I.G.) when scouring with soap was ineffective. A. J. H.

**Acetylation of silk fibroin by the action of acetic anhydride.** E. Carr (Text. Res., 1938, **8**, 399—405).—Quant. data on the acetylation of de-gummed Japanese white silk by $Ac_2O$ under various conditions are given. At room temp. acetylation proceeds very slowly so that the colour is unaffected and the free $NH_2$ groups are incompletely acetylated within 48 hr. and the tyrosine OH is only slightly acetylated within 7 days; the Ac content reaches 3·5% in 72 hr. Between 75° and 137° the degree of acetylation increases as the temp. rises, and at 125° pure $Ac_2O$ produces 7% of acetylation in 20—30 min. with inappreciable discoloration of the silk; more prolonged acetylation results in discoloration and weakening of the fibres with little further acetylation. The action of $Ac_2O$ on silk consists of two independent and concurrent actions: (1) simple acetylation unaccompanied by degradation or discoloration, and (2) an action involving discoloration and fibre weakening without considerable acetylation, and this appears to result from the presence of AcOH in the acetylating medium. The presence of NaOAc, but not AcOH, accelerates acetylation with $Ac_2O$. As in the case of ketenised silk (B., 1938, 494) acetylated silk obtained by the action of $Ac_2O$ gives negative Millon and ninhydrin reactions for Ac vals. of 7 and 3%, respectively. Hydrolysis of acetylated fibres in boiling $H_2O$ occurs only after the first 5 min. Towards dil. aq. alkali the acetylated tyrosine OH and $NH_2$ groups are very sensitive and indifferent, respectively. Acetylation is equally efficient whether the $Ac_2O$ is used as liquid or vapour, and the usual $H_2O$ present in the air-dry silk has no appreciable influence. A. J. H.

**Mercerisation of cotton–regenerated cellulose union fabrics.** O. Mecheels [with L. Schmitz and J. Weber] (Textilber., 1936, **17**, 725—727; Chem. Zentr., 1936, ii, 3224).—The swelling of regenerated cellulose is $\ngtr$ that of cotton in NaOH of *d* 1·26, but rapidly increases on dilution so that decomp. is rapid at *d* 1·09. Swelling in KOH is a max. at *d* 1·26, but decomp. is minimised by adding NaCl.

A. H. C.

**Mercerisation of cotton–regenerated cellulose union fabrics.** H. Rath (Z. ges. Textilind., 1936, **39**, 357—359, 371—372, 493—497; Chem. Zentr., 1936, ii, 3224).—Regenerated cellulose (I) is more sol. in alkali so that the optimum concn. is 10% NaOH instead of 15%. The union goods show increased swelling, stretching, and lustre at a lower temp. and the solubility of the regenerated (I) decreases and its textile properties are better retained with rising temp. at lower alkali concn. Differences in solubility are ascribed to differing degrees of maturity in (I) of one type, and a relation between length of glucose chains and alkali-solubility is suggested; *e.g.*, (I) types such as viscose (320—340 units) with lower Cu vals. and higher $\eta$ (*i.e.*, lower degree of polymerisation) are less sol. in alkali. The American practice of using KOH for mercerising is not favoured, but addition of NaCl to 10% NaOH is recommended. The mercerisation of 1 : 1 regenerated (I)–cotton mixture is described. A. H. C.

**Treatment of cotton–cellulose acetate union fabrics.** P. Barsy (Rev. univ. Soie, 1936, **11**, 405—411; Chem. Zentr., 1936, ii, 3196).—Scouring, singeing, de-sizing, and treatment with Marseilles soap in aq. $NH_3$ are described; $Na_6P_6O_{18}$ or triethanolamine oleate is preferred to sulphonated oils. Rolland's mercerising process (B., 1935, 302) is recommended. Dyeing with direct S or vat dyes (protecting the acetate silk from hydrolysis), with acetate colours and direct or diazotisable wool dyes (dianisidine or $\alpha$-$C_{10}H_7$·$NH_2$ base) is also described. Two-bath dyeing is specially useful for two-colour effects, the faster (acetate) dye being applied first. A. H. C.

**Viscose. LXXIX. After-treatment of viscose with diphenylthiourea–formaldehyde resins and its effect on the water absorption. LXXX. Effect of additions of impregnating agents to the thiourea–formaldehyde resin solutions.** G. Kita and Y. Konisi (J. Soc. Chem. Ind. Japan, 1938, **41**, 258B, 258—259B).—LXXIX. Impregnation of viscose fabric with $CS(NH_2)_2$–$CH_2O$ resin (I) diminishes the absorption of $H_2O$. When stearamide, $NH_4$ stearate, or a fatty alcohol is incorporated, the fabric does not increase in wt. in contact with $H_2O$. Impregnation with $CS(NHPh)_2$–$CH_2O$ resin does not diminish absorption of $H_2O$, but the wettability is $<$ after impregnation with (I).

LXXX. Addition of $NH_4$ soaps or Cu salts to the solution of (I) improves the strength of the impregnated fabric in hot $H_2O$. Addition of large amounts of $(CH_2{\cdot}NH_2)_2$, or pretreatment of the fabric with NaOH, HCl, $HClO_4$, or tannin solution, diminishes it.

W. A. R.

**Crease-resistant finishing of textiles.** J. Auerbach (Textilber., 1938, **19**, 512—515).—The crease-resistance of a textile material (fabric) is largely influenced by the twist of the constituent yarns and their interlacing, the type of fibre, and its moisture content. High twist and porosity and low $H_2O$ content favour resistance to creasing, and the crease-resistances of viscose rayon, linen, cotton, cuprammonium and acetate rayons, silk, and wool increase in the order named. The crease-resistance of a cellulose fibre depends on the degree of orientation of the micellæ and the shape of its cross-section. The use of synthetic resins for making cellulose materials crease-resistant is discussed with special reference to practical details of the Tootal process described (cf. B.P. 304,900; B., 1929, 352). An alternative crease-resistant finish consists in impregnating fabric with a solution containing (per l.) Kaurit KF (I.G., 200 g.), 25% aq. $NH_3$ (5 c.c.), catalyst P I and P II (I.G., 6 g. each), tartaric acid (3—4), and Igepon-T (1—2 g.), followed by drying and heat-treatment as in the above process; this padding liquor decomposes within 2 hr. Crease-resistant finished rayon has increased dry (5—22%) and wet (30—73%) strength.

A. J. H.

**[Properties of] non-thermoplastic cellulose derivatives for textile sizing and finishing.** K. Sponsel (Textilber., 1938, **19**, 738—739).—The uses and properties of some cellulose ether products, *e.g.*, Tylose (Kalle), Cellophas (I.C.I.), Hortol (Böhme Fettchemie), and AT Cellulose B and Bz Cellulose (I.G.), are discussed briefly. These ethers are especially useful for binding weighting substances (China clay, $Al_2O_3$, $TiO_2$, etc.) in fabrics so as to withstand repeated washing. A. J. H.

**Conductometric determination of borax in gloss starch and evaluation of technical borax.** V. Konn (Chem. Obzor, 1936, **11**, 68—71; Chem. Zentr., 1936, ii, 2821).—1 g. of starch is extracted for 10 min. with 100 c.c. of $H_2O$ at 20° and borax determined empirically from the conductivity.

A. H. C.

**Waterproofing of cotton duck and canvas.** F. B. McLain (Amer. Dyestuff Rep., 1938, **27**, 507—517).—Coating and impregnating methods and plant are described and the resulting finishes obtained with compositions comprising mainly waxes, bitumen, asphalt, plasticisers, pigments, and fillers are compared. A. J. H.

**$p_H$ control in [textile] waterproofing.** G. Durst (Textilber., 1938, **19**, 739—740).—The importance of $p_H$ control of the one- or two-bath padding liquors used in waterproofing cotton fabrics with Al soaps is emphasised, especially when the process involves padding the fabric with solutions of $Al_2(SO_4)_3$ (I), $(HCO_2)_3Al$ (II), $Al(OAc)_3$ (III), or basic Al acetate (IV), followed by drying. Using bromocresol-green as indicator, padding liquors ($d$ 1·045) containing (I), (II), (III), and (IV) were shown to have $p_H$ 3·7, 4·25, 4·4, and 5·4, respectively. The $HIO_3$–starch reaction (cf. Jeanprêtre, B., 1916, 1171) is found very suitable for determining the $p_H$ of the Al salt solutions, and it allows easy detection of the presence of (I) in solutions of (II), (III), and (IV). $p_H$ control of the soap solutions used is not important. One-bath padding liquors (Al salt emulsions) usually have $p_H$ 4·0—4·5; they coagulate towards $p_H$ 7·0, so that $p_H$ control is required in the continuous padding of vat-dyed fabric (this usually contains residual alkali). A. J. H.

**Testing of textiles for waterproofness.** W. M. Scott (Amer. Dyestuff Rep., 1938, **27**, 479—482).—Available methods are critically reviewed.

A. J. H.

**[Testing of] permanent finishes [on textiles].** K. H. Barnard (Amer. Dyestuff Rep., 1938, **27**, 567—568p).—Tests suggested in a Committee Report of the Amer. Assoc. of Text. Chemists and Colorists are described. They involve measurement of the loss of wt. (a max. of 10% is allowed), stiffness and resiliency (25% max., as measured preferably by Schiefer's flexometer), lustre, and thickness (max. 10%) after the fabric is 5 times washed (for cotton) at 71° with a solution containing 0·5% of soap and 0·2% of $Na_2CO_3$ in a rotary laundry machine, then rinsed, dried, damped, and hot-ironed, or (for rayon) 5 times dry-cleaned in Stoddard's solvent containing 0·4% of $H_2O$, 0·4% of $Bu^{\gamma}OH$, and 6·7% of a (specified) dry-cleaning soap. A. J. H.

**Bleaching pulp.**—See V. **Rubberised material.**—See XIV. **Myrobalan extract in cotton dyeing.**—See XV. **Textile-processing wastes.**—See XXIII.

PATENTS.

**Soaking of natural or artificial silk.** G. F. Rayner. From Warwick Chem. Co. (B.P. 485,398, 11.12.36. Cf. B.P. 477,066; B., 1938, 1153).—The materials, *e.g.*, gum silk, are treated in a bath containing a negatively-charged dispersion of the soaking oil (a neutralised sulphonated oil, *e.g.*, olive or neatsfoot oil) to which is added also an $NH_4$ salt which gradually generates acid and so discharges the oil dispersion on to the fibre. A (3 : 1) $(NH_4)_2SO_4$–$(NH_4)_2SiF_6$ mixture may be used as discharging agent, and, where hygroscopic effects are required, glycerol may be added. Silk is treated at 27—38° and rayon at 51—60°, the $p_H$ of the bath being 9.8—10, falling to 7 on completion of soaking (8—15 hr.). R. J. W. R.

**Dry cleaning [of wearing apparel etc.].** United States Hoffman Machinery Corp., Assees. of G. E. Bowdoin and W. Strobridge (B.P. 483,542, 12.10.36. U.S., 12.10.35).—After treating the goods with an inflammable hydrocarbon solvent, the major portion of the solvent is removed mechanically, and the materials are afterwards agitated in a current of air at a temp. $\not>$ (preferably slightly below) the flash point of the solvent. Air at a temp. $>$ the flash point may subsequently be used. R. J. W. R.

**Production of coloured discharges on [vat-]dyed goods.** Soc. Chem. Ind. in Basle (B.P. 492,166, 10.3.37. Switz., 10.3.36. Addn. to B.P. 482,184; B., 1938, 640).—Dye derivatives (I) of the type described in the chief patent are printed together with an alkaline oxidising agent., *e.g.*, $K_3Fe(CN)_6$, on goods previously coloured with vat dyes; on steaming, the vat dye is discharged and colour is produced from (I) by hydrolysis. H. A. P.

**Coloration of textile fabrics.** H. C. Olpin and G. H. Ellis (B.P. 493,519, 9.4.37).—Coloured effects are obtained by dyeing below 80° fabrics consisting of commercial cellulose acetate (I) (52—54% Ac) and esterified yarn (II) (60—62·5% Ac) (cf. B.P. 448,816—7 and 448,917; B., 1936, 830) with $H_2O$-sol. dyes which have affinity for (I) only. Such dyes contain one hydrophile group which has no strong auxochrome effect, *e.g.*, $O{\cdot}SO_3H$, $SO_3H$, or two or more aliphatic OH. Further, (II) may be superficially hydrolysed and dyed with a direct cotton dye. In the examples, a fabric woven of (I) and (II) is dyed from a bath of 30 times its wt. containing $Na_2SO_4$ (40%) and 2 : 4 : 6-

$(NO_2)_2C_6H_2(SO_3H)\cdot NH\cdot C_6H_4\cdot NH\cdot C_6H_3Me$-4 (1% on wt. of fabric) at 80°; (I) is dyed yellow, while (II) is not coloured. The dyes $p$-$NO_2\cdot C_6H_4\cdot NH_2 \rightarrow NPhEt\cdot C_2H_4\cdot OH$ and 1-amino-4-anilinoanthraquinone-2-sulphonic acid are similarly used. K. H. S.

**Dyeing or analogous fluid treatment of textile fibres.** J. Brandwood (B.P. 482,817, 4.7.36).—The slubbing or roving is wound on a tube, around which is placed a fabric sleeve. The wound material may then be removed, placed on a perforated tube, and treated with the liquid. Apparatus is claimed. R. J. W. R.

**Manufacture of water-insoluble azo dyes on the fibre.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 492,290, 17.3.37).—Mono- or di-amino-safranines are diazotised and coupled on the fibre with acylacetic arylamides or pyrazolones, the salts of which have affinity for the fibre, to form azo dyes insol. in $H_2O$; the direct shades are maroon, blue, and green and by mixing with other diazo compounds brown and black shades fast to washing are obtained. Among examples, cotton is grounded with 4 : 4′-di(acetoacetamido)-*oo*′-tolidide and developed with the diazo derivatives of safranine (currant) 6-amino-3-diethylamino-7-methyl- (navy blue), 3-diethylamino-6-*p*-aminoanilino- (bluish-green), or 3 : 6-di-(*p*-aminoanilino)-10-phenylphenazonium chloride (dark green). K. H. S.

**Increasing the affinity for dyes of articles of cellulose, cellulose derivatives or polymer[ide]s soluble in organic solvents.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,743, 21.1.37).—Cellulose (natural or regenerated), cellulose derivatives, *e.g.*, the triacetate, and polymeric resins sol. in org. solvents, *e.g.*, polystyrene and polyvinyl chloride, are given affinity for acid dyes and increased affinity for other dyes by incorporation of products of interaction (not made *in situ*, and containing unaltered sulphonic ester groups) of sulphonic acid esters of carbohydrates with $NH_3$, amines, or urea, thiourea, or their substitution products. The products may be added either during manufacture of a cellulose derivative etc., *e.g.*, in the manufacture of cuprammonium or acetate artificial silk, or to the finished fibre as an emulsion in a medium having a swelling action. Suitable treatment products are obtained by interaction of sol. starch in aq. NaOH with an emulsion of $PhSO_2Cl$, and condensation of the resulting ester with $C_5H_5N$, $CH_2Ph\cdot NH_2$, $NH([CH_2]_2\cdot OH)_2$, urea, thiourea, or mixtures of these. H. A. P.

**Printing and dyeing with ester salts of leuco-vat dyes.** Durand & Huguenin A.-G. (B.P. 492,931, 26.10.37. Ger., 26.10.36).—The use is claimed of printing pastes of the leuco-ester salt, $NH_4ClO_3$, $NH_4$ vanadate, and (optionally) $(NH_4)_2S_2O_8$, or their equivs. (*e.g.*, $NH_4Cl + KClO_3$). Pretreatment with acids is unnecessary, and enhanced stability of the printing paste is claimed. 19 examples are given. H. A. P.

**Printing cellulosic materials.** D. P. Milburn, and Imperial Chem. Industries, Ltd. (B.P. 491,931, 10.3.37).—Compounds $R\cdot X\cdot CH_2\cdot NR'R''R'''Y$, where R = a saturated or unsaturated aliphatic radical or the residue of a fatty acid containing $\not< C_{12}$, X = O, S, NH, or NH substituted by alkyl, acyl, or alkyl carbonate, NR′R″R‴ = a *tert.* aliphatic or heterocyclic base, and Y = a univalent anion, are added to printing pastes which after application to cellulosic fabrics and fixation by steaming form areas which resist dyes, so producing white patterns on a coloured ground. Alternatively the resist is coloured, *e.g.*, by stabilised ice-colour components developed by acid steaming at the fixation stage. The dyeing process is carried out at low temp., otherwise the resist effect is impaired. Among examples, cotton fabric is printed with a paste made below 40° of stearamidomethylpyridinium chloride (I) (4), diacetone alcohol (5), starch–tragacanth thickening (50), and $H_2O$ (41 pts.), the fabric is dried, steamed for ¼ hr., and grounded with Soledon Jade Green or Orange R., dried (hot air, not rolls), and developed by passage through 2% aq. $H_2SO_4$, washed, soaped, and dried; a white pattern on a green or orange ground is produced. Further, a paste containing a diazoamino-compound of 1 : 4 : 2-$C_6H_3MeCl\cdot NH_2$ and and 2 : 3-$OH\cdot C_{10}H_6\cdot CO\cdot NH\cdot C_6H_4Me$-*o* is mixed below 40° with paste containing (I), cotton is printed, dried, steamed in the vapours of AcOH and $HCO_2H$ for ¼ hr., then padded with Soledon Jade Green, and the last-named developed; the effect is a red pattern on a green ground. K. H. S.

**Printing of cellulosic materials.** D. P. Milburn, and Imperial Chem. Industries, Ltd. (B.P. 492,157, 10.3.37).—The production of resist effects in printing is claimed to arise from the use in the printing paste of an aliphatic carbimide of $\not< C_{13}$. *E.g.*, by printing an emulsion of $n$-$C_{17}H_{35}\cdot NCO$, starch, and $H_2O$ (containing $n$-$C_{16}H_{33}\cdot O\cdot SO_3Na$), drying, steaming for 15 min., and then padding with Soledon Jade Green XS, a white-on-green print is produced. Similarly by adding to the above printing paste a normal ice-colour paste, printing as before, and then dyeing with a solubilised vat dye or a vat dye, or chrome or ice colour, clear-cut two-colour effects are produced. H. A. P.

**[Assistants for] printing *NN*′-dihydro-1 : 2 : 2′ : 1′-dianthraquinoneazine dyes.** A. Davidson, S. T. McQueen, and Imperial Chem. Industries, Ltd. (B.P. 491,896, 12.3.37).—*NN*′-Dihydro-1 : 2 : 2′ : 1′-dianthraquinoneazine and its halogen and OH-derivatives give prints of good depth and purity of shade when used in pastes containing alkali carbonates instead of the hydroxides if *NN*′*N*″-trialkyl- (alkyl of $\not> C_5$) or triaralkyl-trimethylenetriamines (-hexahydro-1 : 3 : 5-triazines) (aralkyl of $\not> C_8$) are incorporated in the printing paste. H. A. P.

**Imparting hydrophobic properties to fibrous materials or like substances.** W. W. Groves (B.P. 485,593, 23.11.36. Ger., 23.11.35. Addn. to B.P. 463,300; B., 1937, 539).—The process of the prior patent is applied to nitrogenous natural or synthetic fibrous materials of high mol. wt., *e.g.*, wool, silk, etc., to give $H_2O$-repellent effects. The treated materials also have increased resistance to chemical attack, and different dyeing properties. *E.g.*, wool is impregnated in a 1% solution of stearamide in $CCl_4$, dried, and treated for 20 min. in a solution of $CH_2O$ (50 g.) and lactic acid (5 g.) in $H_2O$ (1 kg.). The material is then dried at 50°, and heated at 135—140° for 10 min. R. J. W. R.

**Treatment of cellulose fabrics.** L. G. Lawrie, D. Ward, and Imperial Chem. Industries, Ltd. (B.P. 482,942, 5.8.36. Addn. to B.P. 439,880; B., 1936, 272).—Natural or regenerated cellulosic fabrics are treated with aq. caustic alkali of $>11\%$ (11—13%) concn. and then with a halogen-free αβ-alkylene oxide, *e.g.*, $(CH_2)_2O$ or glycide ($\frac{1}{6}$—$\frac{1}{3}$ mol./$C_6H_{10}O_5$ unit), are afterwards subjected to a mechanical finishing treatment, *e.g.*, lustring, calendering, etc., to modify the surface qualities. This may be carried out on damped fabric and at raised temp. R. J. W. R.

**Production of patterns on woven and like fabrics of vegetable fibres.** Heberlein & Co. A.-G. (B.P. 484,094, 29.10.36. Switz., 12.6.36).—The fabrics are treated locally with parchmentising or swelling agents [$H_2SO_4$, $Ca(CNS)_2$, $ZnCl_2$], followed by local application of shrinking agents so that the pattern effects obtained with the two types of reagents partly overlap. The treated fabrics may subsequently be dyed. *E.g.*, bleached and mercerised cotton muslin, printed with a gum reserve, is passed through $H_2SO_4$ (*d* 1·61) at 10° for 7 sec., washed, dried, again printed to a different but partly overlapping design with a gum reserve, and treated with aq. NaOH of mercerising concn. R. J. W. R.

**Production of lustre patterns on fabrics of silk or artificial silk.** C. Wirth (B.P. 485,559, 20.10.36).—The fabric is impregnated with a dil. $AlCl_3$ solution (*e.g.*, of *d* 1·04), and the desired pattern produced by pressing at raised temp., *e.g.*, by calendering at 40—160°. R. J. W. R.

**Finishing treatment of [knitted cotton] fabrics.** W. R. Cooke (B.P. 483,471, 15.10.36).—The materials, especially interlock cotton goods, are rendered more absorbent, softer, and unshrinkable by scouring with a dil. detergent solution (soap + $Na_2CO_3$ at the boil), followed by treatment with NaOH (*e.g.*, on a jig with a 5% solution at 77—82°). The goods are then rinsed, bleached (*e.g.*, with $Cl_2$ at 21°), and degreased by treatment with an org. solvent. The goods may afterwards be dyed and again treated with $H_2O$, soap, and a degreasing solvent. R. J. W. R.

**Treatment of [cellulosic] textile fabrics.** Calico Printers' Assoc., Ltd., L. A. Lantz, and A. L. Morrison (B.P. 483,571, 21.10.36).—Materials containing cellulosic fibres (especially regenerated cellulose rayon) are rendered more resistant to the tendering action of light by formation of a PhOH– or urea–$CH_2O$ resin on the fabric or yarn. The material is first impregnated with an aq. solution of the initial condensate, and the resin then rendered insol., *e.g.*, by heat, conc. aq. $CaCl_2$, etc., the final resin content being 3—8%. Other characteristics, *e.g.*, softness and crease-resistance, are unaltered. Examples describe the application of urea– and dicyanodiamide–$CH_2O$ condensation products. R. J. W. R.

**Production of animalised fibres.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 493,509, 15.3.37).—Compounds insol. in $H_2O$ and containing N and S obtained by interaction of $(CH_2)_2NH$ (I), its homologues, or C- or N-substituted derivatives, with $CS_2$ are added in finely-divided form to spinning dopes. In examples, (I) 15% concn. (1000) is mixed with Latetoll (250) as thickening agent, and $CS_2$ (270) added dropwise; after stirring at 40—50° and setting aside for some hr., a mass is deposited from the emulsion and the liquor (II) is siphoned off. (II) (400) is stirred with viscose (600) and the mass added to more viscose (9400 g.), producing a dope which filters well and has good spinning capacity. The emulsified condensation product from $(CH_2)_2NMe$ and $CS_2$ made in presence of gelatin is similarly used and the finished fibres are dyed like wool. K. H. S.

**Production of [crease-resistant] cellulosic or non-cellulosic fabrics or yarns.** W. Clark & Sons, Ltd., and W. Graham (B.P. 482,746, 1.10.36).—The material is mercerised and then impregnated with an aq. solution containing $CS(NH_2)_2$ (5—10%) and MeCHO (3·75—7·5%), the concn. being insufficient to produce stiffened effects. After drying rapidly at $<110°$ (100—110°), the material may be lightly soaped to give an improved handle. R. J. W. R.

**Enhancing the resistance of textile fabrics to creasing.** Soc. Chem. Ind. in Basle (B.P. 482,818, 4.8.36. Switz., 3.8.35 and 6.7.36).—The materials are impregnated with an aq. solution containing a $CH_2O$ condensation product (which resinifies under the action of acid) and an $NH_4$ salt of a strong acid, *e.g.*, $(NH_4)_2SO_4$, $NH_4H_2PO_4$, etc., which becomes acid at $<100°$, and are finally dried. *E.g.*, viscose fabric is impregnated with a solution of $CO(NH{\cdot}CH_2{\cdot}OH)_2$ (160), $NH_4Cl$ (10), $NaH_2PO_4$ (5), and a softening agent (4 g.) in $H_2O$ (1 l.), pressed, and dried at $<100°$. [Stat. ref.] R. J. W. R.

**Treatment of textile materials with rubber.** Rubber Producers Res. Assoc., Wool Industries Res. Assoc., R. H. Wilsdon, and C. M. Blow (B.P. 483,496, 22.10.36).—Textile fibres are treated with an aq. solution of a soap (2%) giving a positive ion comprising a long-chain aliphatic residue ($\nless C_8$) (cetylpyridinium bromide, cetyltrimethylammonium chloride, cetyldimethylsulphonium methosulphate) and are then immersed in an aq. dispersion (containing preferably $<5\%$) of rubber so that the latter is deposited on the fibres. (Cf. B., 1938, 900.) D. F. T.

**Apparatus for shrinking fabrics.** Bleachers' Assoc., Ltd., and G. Bennett (B.P. 491,588, 3.2.37).—The working surface of the blanket of a shrinking machine is coated with latex, which is then pptd. and vulcanised, the final product being preferably Duprene. B. M. V.

**Self-emulsifying compositions. Quaternary $NH_4$ compounds. Sulphonation products. Dye intermediates. Substituted aliphatic acids. Mothproofing agents.**—See III. **Derivatives of azo dyes. Dyeing and printing.**—See IV. **Colloidal wool fat.**—See XII. **Artificial leather.**—See XV.

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

**Manufacture of caustic soda and alumina from salt and bauxite.** V. S. Dubey, Y. P. Varshney, and R. S. Sharma (Proc. Nat. Acad. Sci. India, 1938, **8**, 40—48).—The process has been evolved to utilise raw materials available in India. Barytes from Alwar State ($SiO_2$ 2·82, $Al_2O_3$ 0·28, $Fe_2O_3$ 0·11, BaO 62·78, CaO 0·94, MgO 0·76, $SO_3$ 32·38%) and bauxite from Katni ($SiO_2$ 1·85, $Al_2O_3$ 58·83, $Fe_2O_3$ 3·50, $TiO_2$ 6·11, CaO + MgO 0·08, volatile matter 28·80%) were ground together to $<$200-mesh and heated at 1150—1500° (optimum 1400°) in varying proportions, of which the best was 100 : 60 with 1% of added C. 60% of the BaO could be extracted with $H_2O$ in the form of $BaO,Al_2O_3$ (I) and the remainder of the BaO and $Al_2O_3$ recovered as sulphates, the $SO_2$ produced being used to convert the NaCl into $Na_2SO_4$. The solution of (I) by seeding with $Al(OH)_3$ and $NH_4Cl$ yields $Al(OH)_3$, the filtrate from which with $Na_2SO_4$ gives $BaSO_4$ and 1% NaOH solution. The process is successful on a semi-commercial scale. F. R. G.

**Lime-water.** R. Monnet (Bull. Sci. pharmacol., 1936, **43**, 204—213; Chem. Zentr., 1936, ii, 3144).—An improved prep. is described. $Ca(OH)_2$ is determined by titrating with 0·1N-HCl, using phenolphthalein; the neutralised ($HNO_3$) solution should give no ppt. with $AgNO_3$, $BaCl_2$, or $H_2S$. Alkali hydroxide is detected by pptg. Ca with the calc. amount of 3·55% $(NH_4)_2C_2O_4$ and testing for excess of oxalate. A. H. C.

**Accelerated method of determining moisture content of ammonium sulphate.** G. N. Tiutiunnikov and K. I. Kotova (Koks i Chim., 1938, No. 4, 23—24).—A method depending on distillation from xylene is described. R. T.

**Sanitary value of sodium metaphosphate in dish-washing. Relative value of film prevention and auxiliary chemical disinfection.** G. O. Hall and C. Schwartz (Ind. Eng. Chem., 1938, **30**, 23—26).—Bacteriological tests showed the superiority of a detergent containing $NaPO_3$ (cf. B., 1937, 540) over cleaners consisting of (*A*) $Na_4P_2O_7 + Na_2SiO_3$ or of (*B*) $Na_3PO_4$. NaOCl sterilises only the surface of the alkaline-earth soap film produced by *A* and *B*, and the necessity for its use with the film-preventing metaphosphate detergent is questionable. I. C. R.

**Detection of lime in magnesite.** F. Schwarz (Mikrochim. Acta, 1938, **3**, 126—128).—The solid MgO is treated on a watch-glass with a few drops of N/3 aq. $NH_4$ citrate and then with thymolphthalein. After a few sec. the CaO particles appear blue and can be counted. J. W. S.

**Preparation, composition, and chemical behaviour of complex silicates of magnesium, calcium, strontium, and barium.** L. T. Kardos and J. S. Joffe (Soil Sci., 1938, **45**, 293—307).—Ca and Mg silicates prepared by interaction of the chlorides with $Na_2SiO_3$ at different $p_H$ levels are examined. Comparison is made of the electrodialysable bases in these products with those in soil colloids previously saturated with Ca or Mg. Data are utilised in a discussion of the structure of the complex silicate micelle. A. G. P.

**Determination of phosphide and phosphate in calcium carbide.** K. Zieke (Z. anal. Chem., 1938, **114**, 193—197).—The powdered substance containing phosphide and phosphate is dropped gradually into $H_2O$ in an apparatus from which all $O_2$ has been removed by $N_2$. The P hydrides are absorbed in aq. Br and Br + NaOH, and finally determined as phosphomolybdate. The residual $PO_4'''$ is determined similarly. Details of procedure are given. A method for phosphide only, accurate to 0·3% P, is based on the fluorescence colour obtained with a Hg-vapour lamp. L. S. T.

**Distribution of boron in Alsatian potash salt beds.** G. Bertrand (Ann. Agron., 1938, **8**, 1—5).—The coloured K deposits contain more B than do the pale or colourless deposits. The zones close to the clay contain most B. A. W. M.

**Design for a phosphate furnace.** H. A. Curtis and R. C. Heaton (Chem. Met. Eng., 1938, **45**, 536—540).—The design of an electric furnace for smelting phosphate rock is discussed. D. K. M.

**Bauxite deposits of Soviet Russia.** F. Hoffmann (Metall u. Erz, 1938, **35**, 339—342).—The Russian bauxite deposits at Tichvin, S.E. of Lake Ladoga and of Kuschva and Alapajevsk in the Urals are described. The Kuschva deposit contains $Al_2O_3$ 56—60, $SiO_2$ 2—6, $TiO_2$ 2—3, $Fe_2O_3$ 12—20, and $H_2O$ 8—12%; it has not yet been fully explored or developed. The other two deposits are of much lower grade and contain only 45% of $Al_2O_3$ together with $SiO_2$ 15, $Fe_2O_3$ up to 24, and CaO up to 8%; probably $5 \times 10^6$ tons of ore are available, but its use in the manufacture of Al presents many difficulties. A. R. P.

**Beneficiating ferruginous bauxites through chlorination.** C. G. Fink and V. S. de Marchi (Trans. Electrochem. Soc., 1938, **74**, Preprint 34, 509—533).—The removal of Fe ore and other impurities from low-grade bauxites by direct chlorination is slow and wasteful. The optimum temp., rate of $Cl_2$ flow, and time of reaction have been determined for a new method in which the mineral is first roasted with S. Subsequent chlorination at 600° removes 90% of the $Fe_2O_3$, $>$50% of the $TiO_2$, and 14% of the $SiO_2$ within 5 min.; the loss of $Al_2O_3$ is only 9%. K. W. P.

**Extraction of alumina from high-aluminous raw materials. III.** S. Nagai and J. Katayama (J. Soc. Chem. Ind. Japan, 1938, **41**, 253—254B; cf. B., 1938, 1032).—Study of the extraction of Manchurian clay (I) (cf. B., 1937, 1335) was extended to ratios of (I) : $CaCO_3$ : $Na_2CO_3$ = 35—50 : 60—30 : 0—30, at 1200°, 1250°, 1300°, and 1350°. Best results were obtained by heating the materials in the ratio 40 : 50 : 10 at 1350—1300° for 1 hr. and extracting by boiling with 2% aq. $Na_2CO_3$. 94—95% of the $Al_2O_3$ was recovered. I. C. R.

**Production of alumina from clay, kaolin, and other siliceous aluminium ores by way of aluminium sulphite, [as disclosed in] the patent**

**literature.** W. Machu (Metall u. Erz, 1938, **35**, 499—510).—The alkaline process of $Al_2O_3$ recovery is not suitable for siliceous ores which constitute Germany's main Al resources. Recovery as $Al_2(SO_3)_3$ (I) by the action of $SO_2$ on clay (Goldschmidt process) shows great promise. Patent literature on this and similar processes is critically reviewed, and the properties of (I) and its aq. solutions are discussed.
I. C. R.

**Preparation of alumina and barium compounds from barium aluminate. I.** K. Akiyama, J. Kajima, and H. Aiba (J. Soc. Chem. Ind. Japan, 1938, **41**, 218—219b).—Ba aluminates were prepared from pure $Al_2O_3$ and $BaCO_3$ by heating for 1 hr. at 1400° or at 1480°, and the clinkers were finely ground to $<$4900-mesh for extraction. In all cases better recovery was obtained with the higher ignition temp. $BaO : Al_2O_3$ in the ratio 65 : 35 gave the best results, $>$93% recovery of both BaO and $Al_2O_3$ being obtained on extraction with $H_2O$, and of $Al_2O_3$ with $Na_2CO_3$ and $Na_2SO_4$ solutions. Similar clinkers containing 4% and 8% of $SiO_2$ ($SiO_2 : Al_2O_3 = 0{\cdot}2$ and $0{\cdot}4$) gave $Al_2O_3$ recoveries of 92% and 56% on extraction with $H_2O$, and 95% and 95% with alkaline solution (5% $Na_2CO_3 + 0{\cdot}5$% NaOH). Hence, the $SiO_2$ content should be limited to 5% and 8% in the $H_2O$ and alkali extraction processes, respectively. BaO recovery was 57% and 45%.
I. C. R.

**Bulk production of hydrogen.** D. Brownlie (Ind. Eng. Chem., 1938, **30**, 1139—1146).—Possible processes for $H_2$ production are enumerated, and those in commercial use employing water-gas, coke-oven gas, petroleum gases, and electrolysis are reviewed, with particular reference to recent developments.
I. C. R.

**Absorption of gases and gas mixtures by special carbons.** E. Husung (Z. tech. Physik, 1936, **17**, 289—301; Chem. Zentr., 1936, ii, 3157).—Adsorption on Norite, G 1000, and coconut-shell C (I.G. Farbenind.) which had been degassed in a high-frequency furnace was examined in an apparatus containing no taps. From permanent gases $O_2$ may be removed at room temp., A and $N_2$ at $-78°$ to $-183°$. The latter are desorbed on simple evacuation but desorption of $O_2$ needs a higher temp.
A. H. C.

**Determination of dissolved water in liquefied gases.** C. W. Perry (Ind. Eng. Chem. [Anal.], 1938, **10**, 513—514).—$H_2O$ is frozen out of solution by subjecting the vapour of the gas to a low-temp. area of recondensed gas in a glass freezing-bulb cooled by liquid air or other suitable refrigerant. The $H_2O$ in the bulb is finally weighed. The method is applicable to any gas with a b.p. between that of the refrigerant and approx. $-18°$, and is more accurate than are similar methods involving absorption by $P_2O_5$, the colouration of $CoBr_2$, and dry-bulb thermometry.
L. S. T.

**Determination of carbon monoxide in gas and air, particularly at low concentrations.** H. A. J. Pieters and K. Penners (Het Gas, 1938, **58**, 252—257).—The "wet" $I_2O_5$ method (in $H_2SO_4$ containing 10% of $SO_3$) is recommended for gases containing $>0{\cdot}1$ vol.-% and the hæmoglobin method for those containing $0{\cdot}003$—$0{\cdot}1$% of CO. Convenient apparatus and detailed instructions for applying these methods are described.
S. C.

**Crystal separation and flow of melts. Oxidation processes. Making $CaC_2$ in electric furnace. Sedimentometer.**—See I. **Determining pyrites.**—See II. **Ti-white pigments.**—See V. **Borax. Decomp. of perborate liquors.**—See VI. **[Salts of] V. Al plant for making products from coke-oven gas.**—See X. **NaOH and $H_2SO_4$ by electrolysis.**—See XI. **$NaBO_3$ in washing powders.**—See XII. **Pb chromate and Ti pigments.**—See XIII. **$CO_2$ from molasses.**—See XVIII. **Analysis of Pb acetates.**—See XX. **Electrophoresis of Pt and Au hydrosols.**—See XXIII.

See also A., I, 580, **Prep. of violet Cr alum.**

## Patents.

**Recovery of sulphuric acid from sulphuric acid solutions of sulphates [from manufacture of titanium oxide or steel-pickling liquors].** O. and E. Mantius (B.P. 483,821, 19.9.36. U.S., 22.11.35).—The sulphate solution is conc. by evaporation in vac. at $\not>$93° until most of the sol. sulphate is pptd. in solid, granular form. The acid is separated by stratification and decantation, or filtration, and the residue treated with an additional quantity of the original sulphate solution. The separated acid is then further evaporated in vac. at 120—150° to ppt. the fine particles, which are separated and, together with occluded acid, added to the original mixture of acid and solid granules.
W. J. W.

**Manufacture of alkali metals and alkali hydroxides.** T. Wood (B.P. 484,997, 12.11.36).—NaCl or $Na_2SO_4$ is heated in an induction furnace in absence of air and under reduced pressure with a non-volatile base (CaO) and coke; Na is volatilised and can be condensed or passed into $H_2O$ to produce NaOH.
F. M. L.

**Oxidation of chromium sulphate to chromic acid.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 486,153, 26.2.37).—PbO, $PbCO_3$, or $Pb(OH)_2$ is suspended in aq. NaOH and the mixture boiled; the solid residue is then separated, washed, dried, and ground with $Na_2CO_3$. The mixture is heated at 780° in a current of air in a rotary tube furnace, leached with $H_2O$ while still hot, and dried at 70—80°. After washing free from alkali, the product is used for oxidation of $Cr_2(SO_4)_3$ in $H_2SO_4$ solution; the residue from the oxidation process is re-treated as above.
F. M. L.

**Manufacture of sintered dolomite.** Klöckner-Werke A.-G. (B.P. 486,490, 1.9.37. Ger., 1.9.36).—A dense, highly refractory sinter is produced from a normally unsuitable soft natural porous dolomite or magnesite, by heating it until acidity is lost and then slaking it; excess of $H_2O$ is removed and the residue formed into cakes, which are dried by hot air and finally sintered in a rotary furnace.
F. M. L.

**Production of pure magnesium compounds, more particularly magnesium oxide.** Ges. zur Verwertung Chem.-Tech. Verfahren Vaduz (B.P.

484,136, 6.5.37. Austr., 9.5. and 23.6.36).—A mixture of HCl and steam, containing $Cl_2$ to oxidise Fe and Mn impurities, is passed at 100—500° into a tower packed with lumps of dolomite or magnesite, the liquor produced being circulated through the tower until its concn. is sufficient for $MgCl_2,6H_2O$ (I) to separate on cooling. Impurities other than Ca may be pptd. by adding caustic magnesite. Ca can be removed, when necessary, by addition of $H_2SO_4$ and/or $MgSO_4$. (I) is dehydrated and then calcined with superheated steam (300—1000°). $HNO_3$ may be used instead of HCl. I. C. R.

**Manufacture of acid sodium fluoride.** Seri Holding Soc. Anon., Assees. of Soc. Anon. Processi Privative Industriali (B.P. 486,380, 16.9.37. It., 15.10.36).—A continuous process is described in which HF and powdered NaCl are introduced into saturated brine, whereby $NaHF_2$ is pptd.; this is removed and the HCl gas discharged and collected. F. M. L.

**Manufacture of alkali subsilicates.** Pennsylvania Salt Manufg. Co. (B.P. 482,698, 17.8.37. U.S., 17.9.36. Cf. B.P. 477,518; B., 1938, 1157).—Alkali subsilicates ($Na_2O : SiO_2 \nless 1 : 1$) are prepared by mixing solid water-glass, *e.g.*, $Na_2O,3\cdot3SiO_2$, preferably <100-mesh, with the required amount of ground NaOH, and, if desired, a little $H_2O$, and heating the mixture, while stirring continuously, to a temp. < the m.p., *e.g.*, 100—250°, to produce a substantially sol., dry, friable mass or powder. A technically anhyd. product is obtained by heating the first product, *e.g.*, in an externally heated rotary dryer, to 300—600° (450°). Other materials, *e.g.*, $Na_3PO_4$, $Na_2CO_3$, may be incorporated during the process. The production of subsilicates with $Na_2O : SiO_2$ ratios of 1, 1·25, 1·5, and 2 : 1 is claimed. I. C. R.

**Production of dicalcium phosphate and calcium nitrate solution.** Kunstdünger-Patent-Verwertungs-A.-G. (B.P. 484,037, 25.5.37. Swed., 13.6.36).—Phosphate rock is dissolved in 50% aq. $HNO_3$, the solution diluted with aq. $Ca(NO_3)_2$ (I) or $H_2O$ so that the concn. of free $P_2O_5$ in the acid solution is $\ngtr 8$ g./100 c.c., and the ratio F (as $H_2SiF_6$) : $Al_2O_3$ is adjusted to 2—3 : 1 by adding a F compound, or pptg. a complex salt containing F and Al (cf. B.P. 467,843; B., 1937, 1336). An aq. slurry of $CaCO_3$ and (I) is added slowly so that the concn. of free acid is $\nless 1$ g. of $P_2O_5$/100 c.c., when the greater part of the Fe and Al is pptd. (30—35°). Neutralisation is continued slowly until the remainder of the Al and Fe is pptd. and $CaHPO_4$ begins to form, and then more rapidly. Formation of needle crystals, which are difficult to filter, is thus prevented. The mother-liquor contains 35—40% of (I). I. C. R.

**Production of aluminium oxide from bauxite and like aluminium-containing substances.** R. Scholder (B.P. 486,255, 8.5.37. Ger., 11.5.36).—Bauxite is leached with NaOH containing NaCl so that the ratio <1·8 (1·1) mol. of $Na_2O$ : 1 mol. of $Al_2O_3$ is maintained. Increased efficiency with less cost is claimed for the process. F. M. L.

**Production of compounds of Paris-green type.** S. Bálint (B.P. 483,739, 26.10.36. Hung., 26.10.35).—$As_2O_3$ is added to a neutral or acid solution or gel of $Cu(OAc)_2$ and the mixture heated to ~100°, or, preferably, to >100° (160°) under pressure. $Cu(OAc)_2,3Cu(AsO_2)_2$ is pptd., and the mother-liquor is regenerated by adding $Cu(OAc)_2$ (or AcOH with CuO, $CuCO_3$, or Cu and air) and $As_2O_3$. Cu salts of other weak acids, *e.g.*, lactic or tartaric acid, may be used. I. C. R.

**Expanding or exfoliating vermiculite and other similar mineral substances.** Brit. Zonolite Products, Ltd. From F. E. Schundler & Co., Inc. (B.P. 485,503, 17.3.37).—The particles after mining are graded to a uniform size, dried at low temp., and then heated at $\ngtr 1090°$ to produce expanded material. Apparatus for the last operation is claimed consisting of an inclined furnace with a variable angle of inclination. The raw material is fed in at the top and collected at the bottom on a conveyor. The angle is adjusted so that the particles fall slowly enough to allow expansion to take place, but rapidly enough to prevent interference of one particle with another. T. W. P.

**Manufacture of hydrogen.** I.G. Farbenind. A.-G. (B.P. 483,426, 4.5.37. Ger., 8.5.36).—Steam, mixed with $O_2$ or, *e.g.*, waste hydrogenation gas (after removal of hydrocarbons $>C_3$, and cracking with $H_2O$ at 1100°), is passed into a producer under such conditions that the resulting gas contains 5—15% of CO. $CO_2$ and $H_2S$ are removed by washing, *e.g.*, with aq. $NH_2\cdot CHMe\cdot CO_2Na$, at $\nless 1$ atm., and the gas is subjected to catalytic conversion with steam. The $CO_2$ formed may be washed out, and the combined washing liquids regenerated by heating. The gas, which contains 0·1—1·0% of CO, may be used directly, *e.g.*, for hydrogenation. I. C. R.

**Production of reactive hydrogen.** D. Gardner (B.P. 483,406, 19.1.37).—At. H is produced continuously or intermittently by forming an alkali or alkaline-earth hydride, *e.g.*, LiH, by passing $H_2$ into Li at 500—700°, and subsequently decomp. the LiH by heating to a high temp. in absence of $O_2$, $H_2O$, or gases containing $O_2$, or by electrolysis. The $H_2$ may first be passed into an "accumulator" consisting of Pd sheets, from which it may be obtained continuously. I. C. R.

**Salt-bath furnaces.**—See XI. **$PbCrO_4$ colours. Mn and Ti pigments.**—See XIII. **Zeolitic fungicides.**—See XVI.

## VIII.—GLASS; CERAMICS.

**Flue gas analysis and [the importance of] kiln atmosphere in glass-melting.** Anon. (Glashütte, 1938, 68, 503—506, 537—540).—Simple methods of gas analysis enable the best oxidation-reduction balance to be maintained in the kiln atm. Excessively oxidising conditions lead to increased $[SO_3'']$ in the glass, disturbing the other components and increasing the rate of attack of the tank. The colour of the glass is also affected (*e.g.*, $Fe^{II} \rightarrow Fe^{III}$). The objections to using Fe tubes to withdraw samples of hot gases from flues may be overcome by coating them with an Al paint, which oxidises to form a protective layer of $Al_2O_3$. G. H. C.

**Production, examination, and prevention of drops in glass from tanks.** J. Lamort (Sprechsaal, 1936, 69, 250—251; Chem. Zentr., 1936, ii, 671).—Corrosion of the pot at the level of the glass surface may lead to drops of very viscous silicates of high m.p. falling into the melt; this is especially marked with pots containing $>20\%$ of $Al_2O_3$. This effect may be minimised by sloping off the top of the pot to a point beneath the glass surface. H. J. E.

**Fusibility of variously graded sands for glass.** L. Springer (Sprechsaal, 1938, **71**, 477—479).—The actual fusion of the mix proceeds more slowly with a coarse sand than a fine one, but as the clearing is faster the whole process may be slightly quicker. There is a slightly increased risk of inhomogeneity, which may be met by a slightly increased alkali content, and presence of 3—4% of $H_2O$. Round-grained sands fuse more slowly than those with elongated grains on account of the smaller surface accessible for attack. G. H. C.

**Phase reactions of silica.** C. Koeppel (Sprechsaal, 1938, **71**, 499—501, 509—510).—The literature of the various rapid and slow inversions of $SiO_2$, the accompanying vol. changes, and the effect of mineralisers and liquid phases is summarised. G. H. C.

**Inversion of quartz to tridymite. XV, XVI. Microstructures of experimental silica brick made of (XV) Tamba quartzite and (XVI) Dairen quartzite.** S. Kondo and T. Yamauchi. **XVII—XVIII. Thermal expansion of experimental silica brick made of (XVII) Tamba, and (XVIII) Dairen, quartzite.** S. Kondo, T. Yamauchi, and S. Miura (J. Soc. Chem. Ind. Japan, 1938, **41**, 221—222B, 250—251B; cf. B., 1937, 1338).—XV. Microscopical observation of $SiO_2$ bricks indicates that Na mineralisers are effective for tridymitisation and $NH_4Cl$ and C for cristobalitisation. The crystals of tridymite develop well in pores. The mineralising action of $NH_4Cl$ or C varies with the fineness of quartzite, that of fine grain being remarkable. Single mineralisers are less effective than combined ones.

XVI. Effects of mineralisers are similar to those in Tamba quartzite. Some specimens from mineralisers of the $NH_4Cl$ and C series contain much residual quartz. The slow inversion of Dairen quartzite may be due to its relatively smaller alkali and $Fe_2O_3$ content. To strengthen the action of the mineralisers, Dairen must be ground more finely than Tamba quartzite.

XVII. Thermal expansions of $SiO_2$ brick prepared from Tamba and Dairen quartzites are determined, in order to estimate their commercial val. and to determine the relation between kind of mineraliser and rate of inversion. Tridymite (I) and cristobalite brick can easily be made commercially. (I) is obtained by mineralisers such as $Na_2O$ and $Na_2O,2SiO_2$. Generally, bricks rich in (I) show a fine appearance and are of min. expansion. Combined mineralisers are more effective than single ones.

XVIII. Dairen is not so suitable as Tamba quartzite for preparing $SiO_2$ bricks, although bricks of (I), of almost similar excellent quality, are obtained. A. T. P.

**Practical control of the raw materials for glass-making.** C. Deneuville (Céramique, 1938, **6**, 186—188).—The control of the principal materials (glass sands, $CaCO_3$, $Pb_3O_4$, $Na_2CO_3$, $K_2CO_3$) is discussed, with reference to the optimum grain-size and to the nature and max. permissible amounts of the impurities. Schauer's colorimetric methods (cf. Sprechsaal, 1935, no. 40) for the routine determination of $Fe_2O_3$ and C in glass sands are described. A. L. R.

**Annealing of glass.** C. Deneuville (Céramique, 1938, **6**, 217—223).—The purpose and principles of annealing, and the methods employed with hollow ware, window and plate glass are described. Theoretical considerations, in which reference is made to the effects of temp. on the rate of strain relaxation, and of the composition of the glass on the annealing temp., show that the process is most quickly carried out by annealing at temp. slightly (*e.g.*, 20°) above the lower annealing temp., which permits rapid cooling; heating for a short time at higher temp. (*i.e.*, near to the upper annealing temp.) necessitates a much longer time of cooling. A. L. R.

**Self-hardening as a method for increasing the strength of glass.** I. I. Kitaigorodski (Compt. rend. Acad. Sci., U.R.S.S., 1938, **19**, 711—714).—Fast- and slow-hardening glasses were welded together into a sandwich, the latter being the inner layer, and the specimens were fritted at 700—800° in a muffle furnace. The impact strength of the resulting glass is $\gg$ that of ordinary hardened glasses and is comparable with that of "securites." The fragments of fracture are small and have blunt edges. Similar results were obtained with sandwiches in which ordinary soda glass and that containing 0·1% of CoO were used. F. J. L.

**Arsenic in glass melts.** Zschacke (Glashütte, 1938, **68**, 607—609).—Present-day theories of the rôle and behaviour of As compounds in glass are reviewed and considered to be inadequate. Further experiments on a manufacturing scale are required. G. H. C.

**Fining of glass melts by sound-waves.** (A) V. Klein. (B) F. Krüger (Glastech. Ber., 1938, **16**, 232—233, 233—236).—(A) Introductory.

(B) Experiments are described in which the removal of gas bubbles from glycerin and from a molten glass at 1350° was greatly accelerated by the flocculating action of ultrasonic waves (16,000 cycles/sec.) generated by a magnetostriction oscillator. J. A. S.

**Good and bad glasses.** Anon. (Glashütte, 1938, **68**, 698—699).—A glass resistant to $H_2O$ loses only traces of alkali after one washing, whereas poor glasses continue to do so for a long while, and this may affect the contents of a bottle or ampoule (*e.g.*, wine, alkaloids); on filling a second time no alkali may be lost, but the surface is so affected that flocks of $SiO_2$ become detached and float in the liquid. After rinsing, such glasses often dry smeared, owing to matter dissolved during cleaning. Good glasses are particularly necessary for vessels which have to be heated, *e.g.*, for sterilisation, pasteurisation, etc., or for use in the tropics. G. H. C.

**Bubble formation in glass in working in the flame.** J. Enss (Glastech. Ber., 1936, **14**, 255—256; Chem. Zentr., 1936, ii, 3168).—Bubble formation is due to diffusion of $H_2$ from the flame into the hot glass, or, in the case of a CO flame, to diffusion of at. O. H. J. E.

**"Smearing" of glass and its avoidance.** E. Felsner (Keram. Runds., 1936, **44**, 340—341; Chem. Zentr., 1936, ii, 3168).—The effect may be due to faults in composition and working, or to excess of $Al_2O_3$, especially if added as sulphate. H. J. E.

**Clouding of cooled glassware on reheating.** G. Bulle and A. Dietzel (Sprechsaal, 1936, **69**, 358—359; Chem. Zentr., 1936, ii, 3167—3168).—An instance of surface devitrification is described. It is specially liable to occur in alkali-rich Na–Ca glasses (alkali 16—18, $SiO_2 > 74\%$). H. J. E.

**Changes in the transparency of glasses with temperature below and above the transformation point.** A. Klemm and E. Berger (Glastech. Ber., 1936, **14**, 194—206; Chem. Zentr., 1936, ii, 3167).—The temp. coeff. of transparency changes discontinuously at the transformation point. The transparency of colourless glasses was independent of the thermal history of the specimen, but for many coloured glasses this was not so. H. J. E.

**Cause of optical inhomogeneity in glass.** Anon. (Glashütte, 1938, **68**, 577—578).—Analytical data from glass showing waves and striæ indicate that parts of a glass melt which have received slightly differing treatments acquire slightly differing viscosities and that these never become perfectly mixed. G. H. C.

**Effect of fluxing materials on strains in glazes.** W. Schwabe and Z. Syska (Sprechsaal, 1938, **71**, 487—489).—The deformation during cooling of a glazed ceramic strip 85 mm. long and 3 mm. thick was recorded on a rotating drum. Experiments in which the glaze contracted more than the strip (*i.e.*, tension) corresponded with crazing, and the opposite condition (*i.e.*, compression) caused the glaze to flake off. In a series of glazes based on the composition $0{\cdot}5PbO + 0{\cdot}5Na_2O + 0{\cdot}1Al_2O_3 + 1{\cdot}5SiO_2$, a reduction of tension accompanied the replacement of $Na_2O$ by $K_2O$, and a steady increase of compression when $Na_2O$ was successively replaced by an equiv. quantity of PbO, CaO, FeO, SrO, BaO, $SnO_2$, $ZrO_2$, ZnO, $B_2O_3$, and MgO. Excess of PbO gave rise to a yellow colour. G. H. C.

**Effect of glass colour on setting rates in manufacture of glass bottles.** O. G. Burch and C. L. Babcock (J. Amer. Ceram. Soc., 1938, **21**, 345—351).—Direct measurements were made of the rate of cooling (over the range $\log \eta = 3$—6) of a Pt crucible of molten glass suspended in free air. Green and amber flint glasses cooled more rapidly than colourless glasses. This behaviour (due to the higher radiating power of the coloured glass) explains the higher machine output possible with coloured glasses. J. A. S.

**Instrument for controlling the decoloration of glass.** L. Demkina (Tech. Phys. U.S.S.R., 1937, **4**, 380—382).—The construction and use of the instrument, which is essentially a combination of a photometer and a wedge colorimeter, is described. The instrument is suitable for determining the necessary concns. of colouring matter required to ensure colourlessness and the least possible diminution in transparency, and for evaluating the degree of colourlessness in a finished glass. C. R. H.

**Determination of the transformation point of compound glasses by measurement of their viscosity.** E. Jenckel and A. Schwittmann (Glastech. Ber., 1938, **16**, 163—170).—The isothermal fibre-elongation method of measuring the fluidity ($\phi = 1/\eta$) was applied to the following glasses around their f.p.: Jena technical, $Na_2O$–$SiO_2$ systems containing 5·7—34·3% $Na_2O$, and the diborates of Na, Ca, Ba, and Pb. The temp. at which the Jena glasses had $\log \phi = -2{\cdot}8$ were consistent, within experimental error, with the transformation point ($T$) determined previously from the thermal expansion and electrical-resistance characteristics. $\log \phi = -2{\cdot}8$ was therefore taken as a criterion of $T$. In the $Na_2O$–$SiO_2$ glasses this relationship was true for the range 17—35% $Na_2O$, but not $<17\%$ $Na_2O$, owing to the incidence of crystallisation. The $T$ vals. of the borates were approx. $\propto$ the m.p. of the oxides. $d \log \phi/dT$ for glasses similar in composition (*e.g.*, the Jena series) runs parallel with the coeff. of expansion, as can be deduced theoretically from Andrade's equation relating sp. vol., $\eta$, and temp. The effects of "elastic after-working" due to elastic and viscous flow at the f.p. are measured and discussed. J. A. S.

**Nature of the transformation point [in glasses].** E. Jenckel (Glastech. Ber., 1938, **16**, 191—198).—A general discussion leads to the conclusion that the transformation point is only a f.p. Criticisms of the paper with a reply by the author are appended. J. A. S.

**Fluorescence of glass.** P. Gilard, L. Dubrul, and D. Crespin (Verre et Silicates Ind., 1938, **9**, 253—257, 266—270; cf. B., 1938, 272).—A general discussion of the subject and literature is followed by qual. observations on the fluorescence properties of glasses containing Fe, Pb, Ni, Co, Mn, U, Nd, Ce, Au, Cu, Ag, S, Se, and CdSe–CdS. J. A. S.

**Structure of glass as indicated by fluorescence effects.** R. Tomaschek and O. Deutschbein (Glastech. Ber., 1938, **16**, 155—163).—The ions of Eu, Sm, etc. in the solid and often in the liquid state exhibit sharp emission and absorption fluorescence spectra induced by radiation with ultraviolet light, cathode rays, etc. A small amount (1%) of Eu or Sm ions in solid or liquid solution with the compound to be examined serves to provide relatively sharp spectra from which the type of mol. structure may be determined. Comparison of the spectra of the various members of the system $2SrO,B_2O_3$–$SrO,8B_2O_3$ in the cryst. and glassy states (at −186°) and of various $Na_2O$–CaO–$SiO_2$ glasses both in the solid state and in solution indicates that the glassy state is quite distinct from both the cryst. and liquid states. The spectra comparisons are consistent with Zachariasen's theory that a glass is a weak and irregular network of the cations. J. A. S.

**Tensile tests of glasses.** W. L. Schwalbe, A. E. Badger, and W. B. Silverman (J. Amer. Ceram. Soc., 1938, **21**, 333—338).—Measurements were made on 12 glasses of known composition in the form of fibres 0·6—0·8 mm. diameter, loaded at 1 lb./min. An apparatus of special design is described. The fractured surfaces showed two distinct and characteristic areas: a smaller, smooth area corresponding with the removal of a wedge-shaped fragment of glass extending from the origin of fracture, and the larger remaining area, which had a rippled surface. The smooth area increased with decrease in breaking load. The relationship load–log (smooth area/total area) was linear. The glasses were compared by using the tensile strengths corresponding with fractures exhibiting a "smooth area" 1% of the total area. No attempt was made to measure the distribution of the stresses, and therefore the strength vals. (23—33 kg./mm.) are not actual strengths. J. A. S.

**Apparatus for determination of tensile strength [of glass].** E. Rexer (Glastech. Ber., 1938, **16**, 263—266).—Apparatus suitable for measurements of (*a*) rods 1·4 mm. in diameter and (*b*) fibres from liquid air to furnace temp. is described. The accuracy of individual measurements was $\pm 1\%$ and the spread $\pm 10\%$ and $\pm 50\%$ for rods and fibres, respectively. J. A. S.

**Use of standard discs in the strain testing of glassware.** E. J. Gooding (J. Soc. Glass Tech., 1938, **22**, 243—249T).—The Hartford Empire Co. has produced calibrated, mounted sets of discs exhibiting 5 degrees of temper (strain) for use in the polariscope examination of samples. The Glass Container Assoc. of America proposes to issue the standards to its members. J. A. S.

**Dielectric losses in glass.** N. Bogoroditski and V. Malishev (Tech. Phys. U.S.S.R., 1935, **2**, 324—332).—The relationship between the dielectric losses in glasses and their composition has been investigated in order to find the best glass for high-frequency use. Glasses of the type metallic oxide–$B_2O_3$ were examined, two classes being used: (1) $B_2O_3$–$Na_2O$ or –$K_2O$, and (2) $B_2O_3$–PbO or –BaO. The losses were determined at frequencies of $2 \times 10^6$ and 50. Those glasses with high resistance have dielectric losses which vary little within a certain temp. range at both high and low frequencies, the loss angle being approx. the same over both frequency ranges. The loss angle changes very little with concn. of alkali oxide in the glass. The dielectric loss in these glasses cannot be attributed entirely to ohmic and dipole losses. A. J. M.

**Efficiency of enamelling muffles.** R. Aldinger (Glashütte, 1938, **68**, 681—684).—The heat actually needed to bring the ware up to enamelling temp. is only about 6% of that actually supplied in fuel. Use of larger kilns, reduction of mass of racks etc. in proportion to that of ware, and a rigid sequence for the racks of ware to follow one another in and out of the kiln all help to improve efficiency. G. H. C.

**Mineral spar in the enamel industry.** C. P. Ottersbach (Sprechsaal, 1936, **69**, 502—503; Chem. Zentr., 1936, ii, 3166).—Felspar with 2·39% of Fe oxide may be used by adding $KNO_3$ or $NaNO_3$ to eliminate colour due to Fe. Use of this felspar in place of the usual material with $\ngtr 0{\cdot}6\%$ of Fe oxide improves the acid-resistance, and addition of 3—6% of $SnO_2$ as opacifier is no longer necessary. The $SnO_2$ may also be replaced by an antimonate. H. J. E.

**Melting temperature and usefulness of enamel.** L. Vielhaber (Emailwaren-Ind., 1936, **13**, 188—189; Chem. Zentr., 1936, ii, 670).—The optimum relationship between the m.p. of the groundcoat and that of subsequent coatings (which should be more easily fusible) is discussed. H. J. E.

**Low-boron enamels.** H. Kirst (Glashütte, 1938, **68**, 540—542).—The properties of an enamel depend, not only on the gross composition, but on the manner of combination of the component oxides in the raw materials. Although there is no satisfactory substitute for $B_2O_3$, which serves to improve fusibility, reduce expansion, and hinder devitrification, it is possible to overcome the effects of its partial or complete omission by careful choice of or previous combination of some of the raw materials. In an example, most of the $SiO_2$ and felspar for an enamel containing only 1·7% of $B_2O_3$ were pre-fused with part of the $Na_2CO_3$, and this material was used in the final melt. G. H. C.

**Development of the ground-enamel for sheet iron.** R. Aldinger (Glashütte, 1938, **68**, 610—612).—The introduction of Co and Ni oxides to secure adhesion of enamel to Fe was due to Rinman between 1890 and 1900. Before then good adhesion was seldom achieved, and ware had to be cooled extremely slowly to avoid cracking away. G. H. C.

**Cracks in cast-iron enamel.** H. Lang (Glashütte, 1936, **66**, 602—606; Chem. Zentr., 1936, ii, 3166—3167).—Precautions for avoiding cracks are reviewed. H. J. E.

**Relation between gases and fish-scaling in enamelling.** H. Hoff and J. Klärding (Stahl u. Eisen, 1938, **58**, 914—916; cf. B., 1938, 651).—On heating enamel slips (predried at 110—135°) in a stream of dry $N_2$ at 460°, 0·5—1·0% of $H_2O$ was recovered, whilst on heating to 935° appreciable amounts of gas of approx. composition $3CO_2 + H_2$ were evolved. On steel plates the gas evolution was increased 3—4 times and its composition was about $3H_2 + CO_2$, probably by the action of $H_2O$ on Fe. The gas liberated when the enamel parted from the plate in the cold was mostly $H_2$. G. H. C.

**Determination of pores in enamel.** H. Edner (Glashütte, 1936, **66**, 333—334; Chem. Zentr., 1936, ii, 676).—The electrolytic method of examining enamel surfaces for porosity is reviewed. The surface to be tested is made one electrode of a cell containing aq. KCl or $K_2SO_4$, and observations of the current across the enamel layer are made. H. J. E.

**Surface tension of vitreous enamel frits at and near firing temperatures.** W. H. Harrison and D. G. Moore (J. Res. Nat. Bur. Stand., 1938, **21**, 337—346).—A method for measuring the $\gamma$ at high temp. of liquids of high $\eta$ comprises measurement of the pull on a hollow, vertical Pt cylinder, the bottom edge of which is at the level of the undisturbed liquid. Measurements with fused NaCl and with a molten enamel frit accord with determinations by the bubble-pressure method. The mean $\gamma$ for several commercial enamel frits is 250 dynes/cm. at 850° and increases with rising temp. Additions of clay + borax or of $SnO_2$ have little effect on the $\gamma$ of an enamel frit. J. W. S.

**Use of zirconium compounds as opacifiers for glazes.** J. Löffler (Ber. Deut. Keram. Ges., 1938, **19**, 228—235).—The factors determining the suitability of a material as an opacifier are discussed. Comparison under similar conditions of the whiteness of $ZrO_2$, $PbZrO_3$, and $Na_2ZrSiO_3$, suspended in an org. medium, showed that the whiteness increased the more the $n$ of the suspensoid exceeded that of the medium. Vals. of $n$ for various compounds of $ZrO_2$ (with $Na_2O$ and $SiO_2$) are given; of the available Zr compounds only $ZrSiO_4$ (under special conditions) and $PbZrO_3$ are successfully used as opacifiers; the latter is disadvantageous in being yellow and stable only in heavy Pb glasses of high $n$. An examination of which Zr compounds were stable in melts of the type $RO,Al_2O_3,2—8SiO_2$ was made by $X$-ray methods, and showed that $ZrO_2$ was stable in the following:
$K_2O,Al_2O_3,2—6SiO_2$; $BaO,Al_2O_3,2—6SiO_2$;
$Na_2O,Al_2O_3,2—4SiO_2$; $CaO,Al_2O_3,2—4SiO_2$;
$ZnO,Al_2O_3,2SiO_2$; $PbO,Al_2O_3,2SiO_2$;
$MgO,Al_2O_3,1·5SiO_2$. In the remainder (of higher $SiO_2$ content) $ZrSiO_4$ was found and certain melts showed both $ZrO_2$ and $ZrSiO_4$; free $ZrO_2$, although very sol., was found in the two particular melts $K_2O,Al_2O_3,8SiO_2$ and $Na_2O,Al_2O_3,6SiO_2$. It was anticipated and shown that $ZrO_2$ (8—10%) was an excellent opacifier for these commercial glaze batches: $0·4PbO,0·3CaO,0·3K_2O,0·3Al_2O_3,2·1SiO_2$ and $0·5PbO,0·25CaO,0·25K_2O,0·25Al_2O_3,2·5SiO_2$. The particles of $ZrO_2$ in the glaze act as nuclei for the formation of gas bubbles, the removal of which by means of "purifiers" (NaCl, $As_2O_5$) is discussed. Comparative whiteness and lustre vals. are given for a series of tile glazes containing $ZrO_2$ as opacifier, which show that on the average 8—10% of $ZrO_2$ gave the same degree of whiteness as 10—11% of $SnO_2$, but that the lustre of the $ZrO_2$ glazes was somewhat inferior. A. L. R.

**Clay minerals.** G. Keppeler (Ber. Deut. Keram. Ges., 1938, **19**, 159—176).—Present knowledge of the principal constituents of clays is summarised, and an examination of the properties ($X$-ray pattern, $H_2O$ absorption, $H_2O$ evolution on heating, thixotropic and surface characteristics) of Ca- and Na-bentonites, Zettlitz kaolin, Kärlich blue clay, and halloysite is described, in which the materials showed characteristic differences by which they may be distinguished. $X$-Ray analysis, which is considered to be the most certain means of identifying the principal constituents of clays, may yet fail to detect impurities occurring in small amounts and, especially, in finely-divided form. In such cases their presence may be established by measurement of the properties indicated above. Such measurements indicated that montmorillonite was probably a constituent of the Kärlich blue clay which, on $X$-ray analysis, had shown only the pattern of the principal constituent kaolinite. A. L. R.

**Clay minerals.** W. Noll (Ber. Deut. Keram. Ges., 1938, **19**, 176—205).—The characteristics, occurrence, and properties (crystal structure, chemical and optical properties, base-exchange capacity) are described for the clay minerals, which are classified into the following types: (1) kaolinite, (2) montmorillonite, (3) halloysite, (4) mica, and (5) minerals rich in MgO. Minerals of group 1 (kaolinite, anauxite), occurring in ceramic clays (principally) and in common clays, lose most of their combined $H_2O$ sharply at 400—450° on heating. Those of group 2 (montmorillonite, beidellite, nontronite) lose most of their combined $H_2O$ below 110°, and the rest gradually at temp. up to 500°; they are characterised by high $H_2O$ absorption (accompanied by intercryst. swelling) and base-exchange capacity, and occur principally in fuller's earths, bentonites, and clay soils. Their $X$-ray patterns are very similar. Halloysite differs from kaolinite only in having two more mols. of $H_2O$, which are evolved at 50° with the production of meta-halloysite closely resembling kaolinite in crystal structure. The recently-discovered mica-type minerals occur in schist and common clays, and marls; they differ from "normal" mica in composition (ranging from $K_2O,2H_2O,3Al_2O_3,6SiO_2$ to $0·5K_2O,2H_2O,2·5Al_2O_3,7SiO_2,nH_2O$) and in having a definite though weak base-exchange capacity. The MgO-rich minerals may be regarded as mixtures of the sepiolite series (*e.g.*, meerschaum) with montmorillonite (free from alkaline earths) or with hydrated aluminosilicates. Minerals of yet doubtful constitution include leverrierite, intermediate in properties between kaolinite and muscovite; allophane, and the so-called amorphous constituents of clays, which in many cases have been shown to be cryst. The methods are summarised by which clay minerals (kaolinite, montmorillonite, sericite, etc.) have been prepared by heating (at 300—400°) hydrated $Al_2O_3$ and $SiO_2$ in alkaline or acid solutions. A. L. R.

**Chemistry of clay. IV. Chemical behaviour of fuller's earth.** H. Carlsohn (Angew. Chem., 1938, **51**, 699—702; cf. B., 1938, 1099).—The amount of $H_2O$ taken up by several earths under different conditions and the degree of adsorption of Sudan-red by the moist and dehydrated earths have been determined. The Sudan-red reaction can be used for determination of the amount of acid clay substances in the earth. The catalytic activity of the earths with respect to oil of turpentine is influenced considerably by pretreatment of the earth with aq. salts or acids. E. S. H.

**Fractionation of a clay into closely monodispersed systems.** F. H. Norton and S. Speil (J. Amer. Ceram. Soc., 1938, **21**, 367—370).—The separation of a Florida kaolin into 6 fractions for subsequent examination was best carried out by deflocculation (avoiding undue agitation which may break up the kaolinite "worms"), followed by settling and treatment in a Sharples supercentrifuge. Good agreement

was found between the settling-rate and microscope-measurement methods of particle-size determination.
J. A. S.

**Soda water-glass and the purification of kaolins.** A. Debecq (Verres Silicates ind., 1936, 7, 285; Chem. Zentr., 1936, ii, 3169).—Addition of 1% of aq. water-glass (*d* 1·35—1·39) assists in keeping the finest kaolin particles in suspension, and gives an improved separation. H. J. E.

**Hydrothermal action of alkali solutions on kaolin. II.** S. Nagai (J. Japanese Ceram. Assoc., 1937, **45**, 605—614; Zement, 1938, **27**, 427; cf. B., 1937, 548).—The Na–kaolin compound is readily formed at atm. pressure, and after drying at 110° contains $1H_2O$. The K compound is formed in saturated steam at 150—180°, but reaction is not complete until 210—232° is reached. Most of the combined $H_2O$ is lost at 50°. When heated with 5% aq. $CaCl_2$ or $MgCl_2$ at 232—263° these compounds give products of the type $0{\cdot}5R^{I}_2O,0{\cdot}5R^{II}O,Al_2O_3,2SiO_2,nH_2O$, where $R^I = K$ or Na and $R^{II} = Ca$ or Mg. Pyrophyllite ("Rosekiado") was converted by aq. NaOH solution at 180—210° into $Na_2O,Al_2O_3,2SiO_2,nH_2O$ and Na silicate, and with aq. KOH above 210° into the corresponding K compound. These products were identical with those from kaolin. Pyrophyllite could be separated from kaolin because the reaction between the former and alkali is incomplete at atm. pressure. The mixture is treated with 20—30% aq. NaOH and filtered. G. H. C.

**Nepheline syenite: a new ceramic raw material from Ontario.** H. S. Spence (Amer. Inst. Min. Met. Eng., 1938, Tech. Publ. 951; Min. Tech., 1938, **2**, No. 4, 9 pp.).—The rock, which is recovered by open quarrying, consists of albite 45—55, microperthite 7—22, microcline 8—19, nepheline 13—25, muscovite 0—3, and magnetite 0·6—7%. By suitable crushing the Fe minerals can be removed and a product containing ~0·06% $Fe_2O_3$ obtained; this material is being extensively used in the Canadian and American glass industries. Detailed descriptions are given of the quarrying and dressing operations employed in recovering a good grade of product.
A. R. P.

***X*-Ray methods for determination of molecular structure, and their application in ceramics.** A. Karsten (Céramique, 1938, **6**, 181—185).—The Laue and Debye–Scherrer methods, and three types of commercial *X*-ray apparatus, are described. Examination of the raw material established that steatite which, on firing, expanded and gave rise to cracking, had a characteristic (fibrous) crystal structure which differed from that of the normal material. A. L. R.

**Application of dry mixing in the whiteware and refractory industries.** F. A. Fix (Bull. Amer. Ceram. Soc., 1938, **17**, 351—354).—The technique of dry mixing pre-milled raw materials followed by plasticisation by spraying $H_2O$ on the material while it is still in the mixer is described. The process has the advantages of quickness, cheapness, and accuracy of mixing. Greatly improved results have been achieved by the application of the process to electrical porcelain and refractories, floor- and wall-tile bodies, stoneware, china, heavy refractories and saggars, and casting slips. J. A. S.

**Expansion characteristics of kyanite and kyanite–clay mixtures when heated.** G. R. Pole and D. G. Moore (Bull. Amer. Ceram. Soc., 1938, **17**, 355—366).—Measurements were made up to 1450° on pressed pieces (bonded, if necessary, with dextrin) and slip-cast pieces. The rate of expansion of kyanite (I) increased with rise of temp. and increase of particle fineness. The max. expansion of (I) and of (I)–clay mixtures increased with the particle size and with the (I) content, respectively. The porosity of (I) specimens increased beyond 1450° and with pressed pieces the increase was ∝ the max. expansion. The greatest increase in max. porosity was given by the clay mixture with the coarsest (I) particle. Cast test-pieces behave similarly. For the production of dense refractories the (I) must be finely ground (<325-mesh), and porous products may be made by the use of sawdust. J. A. S.

**Casein milk fat as a foam depressant in casein–clay slips.** G. A. Richardson and N. P. Tarassuk (J. Dairy Sci., 1938, **21**, 172—173).—Oxidised fat is more effective in preventing foaming than fresh fat, and old casein shows less tendency to foam than fresh casein. W. L. D.

**Transparent whiteware and porcelain.** J. Wolf (Sprechsaal, 1936, **69**, 325—328, 339—341, 355—358; Chem. Zentr., 1936, ii, 3169—3170).—A review and discussion of the properties of material intermediate between whiteware and porcelain.
H. J. E.

**Origin of sweat-marks on hard porcelain.** F. Dettmer (Ber. Deut. Keram. Ges., 1938, **19**, 235—236).—The work of Kieffer and Czech (B., 1938, 1298) confirms the author's findings that these marks occur during reducing conditions at the end of the firing period, and that the major cause is interaction of $SiO_2$ and $H_2$ (at >1200°), giving $SiH_4$, which is converted into Si or $SiO_2$ on the admission of air and during cooling. Other contributory factors are S compounds in reducing gases and Cl compounds resulting from coal. $SiO_2$ is the chief constituent of the specks, but other substances occur in smaller amounts, *e.g.*, $Al_2O_3$ and CaO in whiteware and Mn and Fe oxides in ivory glazes. A. L. R.

**29th Rept. of the Refractory Materials Joint Committee. (A) Action of alkalis on refractory materials. X. Reactions of sodium chloride vapour with refractory materials at 1000° and conditions leading to volatilisation of brick constituents. XI. Alteration in strength when refractory materials are exposed to potassium chloride vapour at 1000°.** F. H. Clews, H. M. Richardson, and A. T. Green. **(B) Effect of hydrocarbon gases on refractory materials. VI. Effect of methane on certain firebricks.** E. Rowden. **(C) Action of slags on refractory materials. II. Corrosive action of lime on aluminous, fireclay, and silica bricks.** W. Hugill, R. L. Ainsworth, and A. T. Green. **(D) Refractoriness-under-load test. VI. Behaviour**

**of refractory materials at high temperatures under increasing load.** F. H. Clews, W. F. Ford, and A. T. Green. (E) **Behaviour of sillimanite mixes on being pressed. II. Variations in texture at different depths of the pressed block.** F. H. Clews and A. T. Green. (F) **Measurement of apparent porosity.** H. H. Macey and F. H. Clews. (G) **Jointing cements. VIII. Properties of some commercial jointing cements.** F. H. Clews, H. M. Richardson, and A. T. Green. (H) **Examination of samples of silica brickwork taken from a vertical retort and showing evidence of pronounced alkali attack.** F. H. Clews, W. Hugill, and A. T. Green. (I) **Research and refractory materials.** F. H. Clews and A. T. Green (Inst. Gas Eng., 1938, Comm. 193, 77 pp.; cf. B., 1938, 165).—(A) The main result of the reaction between the NaCl vapour and the clay or $SiO_2$ refractory is a migration of small amounts of constituent oxides to the refractory surface, where they may become completely volatilised. The migration proceeds much more rapidly in dry air or $O_2$ than in presence of steam. It is concluded that conversion into chlorides takes place within the refractory and reconversion into oxides at the surface. In some cases the Fe oxide so conc. at the surface promoted the decomp. of CO and the growth of C aggregates. Exposure of fireclay, sillimanite, $SiO_2$, and siliceous materials to KCl vapour at 1000° for periods up to 150 hr. resulted in appreciable changes in their moduli of rupture, but these changes could not be related to the accompanying changes in dimensions of the specimens. Fireclay materials suffered a marked decrease in strength, whereas siliceous materials greatly increased in strength, $SiO_2$ materials being but little affected.

(B) Experiments on the effect of $CH_4$ have been continued, and it appears that after a somewhat variable induction period in which the Fe spots are brought to a reactive condition $CH_4$ decomposes directly into C and $H_2$. The growth of the C depositions around the Fe spots causes the disruption of the brick. In some cases the Fe spots are not activated and then such bricks resist disintegration.

(C) The corrosive action of CaO itself has been investigated by slag-test method (2). In general, pure CaO had more pronounced corrosive and penetrative effects than the $CaO–Al_2O_3–SiO_2$ slags examined previously. For clay products the depths of corrosion (in which the brick structure is obliterated) decreased roughly as the $Al_2O_3$ contents increased, but the depths of penetration of liquid products beyond the corrosion zone were at a min. for bricks of about normal fireclay composition.

(D) A third variant of this test, the maintained temp.–increasing load method, has been applied to $SiO_2$ bricks. The results show a good deal of variation, but average vals. can be used to discriminate between the different brands available. $SiO_2$ bricks are unable to support a load of 50 lb./sq. in. for long periods at temp. $>$50° below those at which failure occurs in the normal method.

(E) The permeability and the grain-size distribution at different depths of the pressed block depend on the type of pressing, whether from the top only, from the top and bottom simultaneously, or from the top and bottom successively. In addition, the granular constitution of the original mix has a marked effect on the type of variation obtained.

(F) An account is given of the measurement of apparent porosity of 19 specimens by several types of procedure and an attempt is made to evaluate the inherent and random errors associated with each method.

(G) 22 commercial cements were examined for refractoriness, behaviour under compression and tension at temp. up to 1300°, grain size, workability, drying and firing contractions, and strength of unfired joints and joints matured at 1300°, in an attempt to determine the quality of cements in commercial use and also to assign a comparative val. to various synthetic cement mixes under investigation. In general, the cements appear to have adequate workability, but a no. of them seem inferior in mechanical stability at high temp. to the brick with which they would be used. Three new methods for evaluating the working properties of cements are described.

(H) A detailed account is given of the effects on the retort structure resulting from carbonising salty coals under moderate conditions of temp. The ill-effects were mainly to be found on the flue side of the retort.

(I) A review of the past year's work in refractory materials. H. C. M.

**Selection of refractories.** B. Thomas (Iron Coal Trades Rev., 1938, **137**, 537—538).—Materials suitable for metallurgical, pulverised-fuel-fired, and mechanically-stoked boiler furnaces are discussed. R. B. C.

**Production of fused mullite for refractories.** H. M. Kraner (J. Amer. Ceram. Soc., 1938, **21**, 360—366).—The mineralogical constitution of the range of fused $SiO_2–Al_2O_3$ mixtures is discussed with reference to the phase-rule diagram and is illustrated by a no. of photomicrographs. J. A. S.

**Relationship between composition and refractoriness-under-load of commercial chrome–magnesite bricks.** A. E. Dodd (Trans. Ceram. Soc., 1938, **37**, 427—435; cf. B., 1938, 1298).—In tests on 36 commercial bricks a general relation was found between refractoriness-under-load ($R$) and composition ($Al_2O_3$, $Cr_2O_3$, and MgO content); it is concluded that, for max. strength at high temp., the $Al_2O_3$ content should be $\ngtr$8% and the $Cr_2O_3$ and MgO should be present in approx. equal amounts. Variations in the $SiO_2$ (3—9%) and $Fe_2O_3$ (10—20%) contents, and the partial replacement of MgO by CaO, appeared to have little effect on $R$. A. L. R.

**Refractoriness-under-load of chrome–magnesite bricks.** A. E. Dodd (Trans. Ceram. Soc., 1938, **37**, 436—442; cf. preceding abstract).—When maintained for 5 hr. at 1500° under 50 lb./sq. in., chrome–magnesite bricks showed considerable subsidence, which bore no direct relation to the results of the standard under-load test, in which the fail temp. was 200° or higher. It is concluded that, in order to classify the bricks according to their ability to withstand stress at high temp. (*e.g.*, in sprung roofs of basic open-hearth steel furnaces), the maintained temp. test is necessary. A. L. R.

**Practical application of hot-face insulating bricks.** J. W. Jackson (Metallurgia, 1938, 18, 206—208).—The advantages and limitations of the application of hot-face insulating bricks, *i.e.*, high-porosity firebrick which is insulating and does not need backing, are discussed. A good range of mechanical properties is now available in such bricks, but they are liable to spalling and should be tested *in situ*. They may need an overlay of refractory at danger spots. A greater uniformity of temp. is attained and fuel saved, especially in intermittent furnaces. S. J. K.

**Linear thermal expansion of "beta-alumina."** J. B. Austin (J. Amer. Ceram. Soc., 1938, 21, 351—353).—The results of repeated measurements of the thermal expansion (interferometer method) of a fused "$\beta$-$Al_2O_3$" ($Al_2O_3$ 92·25, $SiO_2$ 0·2, FeO 0·3, $K_2O$ 4·47, $Na_2O$ 1·03%) exhibited a non-cyclic behaviour, with the curve tending towards that of an aggregate of $\alpha$-$Al_2O_3$. The $\beta$-$Al_2O_3$ appears to be an alkali aluminate which decomposes during the test. The $SiO_2$ apparatus was severely etched by alkali vapours given off by the specimen. J. A. S.

**Strength of brittle materials. Sedimentometer. Vac. seal.**—See I. **Failure of coke-oven walls. Hot-patching of retorts.**—See II.

## Patents.

**Melting and refining of glass and similar material.** N.V. Maats. tot Beheer en Exploit. van Octrooien (B.P. 482,532, 24.12.36. U.S., 28.12.35).—An electrically heated furnace is described in which the glass batch is melted and allowed to flow in a thin layer down a vertical surface (*e.g.*, the resistor itself), whereby the glass is very rapidly "fined." J. A. S.

**Apparatus for handling molten glass.** W. W. Triggs. From V. R. Cornelius (B.P. 491,846, 3.3.37).—A feeder or other device which needs to be kept cooler than the glass it handles is provided with passages in which a limited const. quantity of vaporisable liquid is boiled and recirculated by the vapour-lifting effect only, it being condensed in a separate cooler. B. M. V.

**Annealing of glassware.** Hartford–Empire Co., Assees. of D. G. Merrill (B.P. 491,954, 11.12.36. U.S., 2.3. and 22.9.36).—The temp. of the hot part of a tunnel lehr is regulated by combustion gases, the generation and distribution of which are claimed in detail. B. M. V.

**Decoration of glass and ceramic sheets, tiles, and other products.** F. D. Parkinson (B.P. 491,562, 2.3.37).—The surface is chemically cleaned and coated with a liquid film, and the material of the pattern then applied while in suspension or solution in a liquid which is immiscible with the film liquid. After drying, a third liquid may be applied to modify the patterns and the whole is fritted. A second pattern may be applied over the first. B. M. V.

**Saggars.** Wiltshaw & Robinson, Ltd., and T. Newman (B.P. 491,427, 14.2.38).—Ridges forming a grid pattern are formed on the base which supports the ware. B. M. V.

**Ceramic colouring matters.** Deuts. Gold- u. Silberscheideanstalt vorm. Roessler (B.P. 485,493, 2.2.37. Ger., 3.2. and 4.12.36).—A green, heat-resisting colouring matter is prepared by calcining at 1100—1500 (1200—1450°) a finely-ground mixture of oxides or compounds containing $Cr_2O_3$ 23—55 and BeO 77—45%. The shade and properties of the colour may be modified by addition of $Al_2O_3$ and/or $SiO_2$. In place of the oxides of Be and Cr, the hydroxide, nitrate, silicate, or natural compounds of Be, and $CrO_3$ or the nitrate or dichromate of Cr may be employed. J. A. S.

(A) **Heat-insulation products.** (B) **Production of plastic refractory materials.** (C) **Manufacture of heat-insulating slabs.** (D) **Methods of forming [heat-insulating] plastic objects.** (E) **Manufacture of plastic bricks, blocks, slabs, tiles, and the like.** Brit. Zonolite Products, Ltd. From F. E. Schundler & Co., Inc. (B.P. 485,507—11, 17.3.37).—(A) A porous product is made by burning a mixture of clay with 40—60% of powdered charcoal. $\frac{1}{2}$—2% of hair may be included. (B) An exfoliated, heat-resisting mineral is bonded with high-$Al_2O_3$ cement. *E.g.*, a plastic refractory comprising exfoliated vermiculite (I) 50—70 (50—60), calcined fireclay 10—25 (15—20), plastic fireclay 5—15 (5—10), and high-$Al_2O_3$ hydraulic cement 15—35 (20—30)% is claimed. Powdered C may be included. (C) Granules of (I) have their surface coated with hot asphalt (without penetration into the pores) and are then moulded into slab form (in paper recepticles, if desired) by pressure. An automatic plant is described. (D) (I) is mixed with clay and $H_2O$ containing a bonding agent such as pitch residues, Na silicates, or cereal product (together with hair, if necessary), moulded, and dried. (E) An inner body of a felted mass of (I) is provided with an outer protective shell of the same material bonded with sufficient binder (*e.g.*, cereal products etc.) to give the requisite strength. J. A. S.

**Manufacture of refractory composition.** Union Carbide & Carbon Res. Labs., Inc., Assees. of C. E. Macquigg (B.P. 485,871, 28.11.36. U.S., 11.12.35).—The tridymitisation of quartz during the burning of a $SiO_2$ brick is accelerated (with the advantages of shorter burning time etc.) by pre-calcining the quartzite with a small amount (*e.g.*, 2 wt.-%) of a mineraliser consisting of the halides or silicofluorides of the alkali and/or alkaline-earth metals. The tridymitised material is then crushed, bonded with aggluminating agents (Si esters or CaO), and burned to give strength. J. A. S.

(A, C) **Manufacture of abrasive articles.** (B, D, E) **Bonded abrasive articles.** W. J. Tennant. From Carborundum Co. (B.P. 491,654—5 and 491,658—60, 6.3.37).—(A) A disc-like core of synthetic resin is first formed with partial consolidation by moderate pressure and is then surrounded by an outer abrasive annulus containing diamonds (*D*) and by an intermediate annulus containing abrasive (*A*) which is less hard than diamond, both bonds being of heat-hardenable resin; the whole is then pressed at a higher pressure and cured. (B) In a diamond wheel, the particles of *A*, *e.g.*, fused $Al_2O_3$ or SiC, are mixed in the same zone as *D*, the hardness of *A* being $> 9$ Moh, their average linear size $<\frac{1}{2}$ that of *D*, but their mass many times that of *D*. CaO is a useful constituent of the bond. (C) Especially for side and corner wheels, a thin abrasive strip or strips (one for each working face) is/are applied to the interior of a mould with the abrasive inwards; the core material is then charged in and the whole pressed and cured. The particles nearest the strip are preferably *D* and should be oriented normal to the surface; they are backed by *A* as specified in (B) above. (D) Aggregations are preformed of *D* or hard carbide (BC) and a metallic bond; the aggregations are bonded with no voids by means of a softer, resinous material. (E) *D* or other very hard and costly abrasive, also *A* if desired, is/are first mixed with powdered precured resin (phenolic, to the *C*-stage) and a binder of uncured resin, the whole being then cured to the *C*-stage. B. M. V.

**Manufacture of abrasive-coated articles.** W. J. Tennant. From Carborundum Co. (B.P. 492,319, 19.3.37).—The bond is a viscous solution of a normally solid resin in a heat-hardenable synthetic resin, both being preferably phenolic; setting is effected by final heating. B. M. V.

**[Metal supports for moulds during the] drying of pottery ware and similar goods.** W. Boulton, Ltd., and F. Beardmore (B.P. 491,988, 14.5.37).

**Acrylic esters.**—See III. **Metal–ceramic substance connexions.**—See X. **Sealing-off vitreous vessels containing gases.**—See XI.

## IX.—BUILDING MATERIALS.

**Constitution of Portland cement. II.** K. Koyanagi, S. Katoh, and T. Sudoh (Zement, 1938, 27, 363—367; cf. B., 1938, 59).—A high-$Al_2O_3$ (10·57%) Portland cement clinker was ground and fractionated centrifugally as previously. Although Bogue's method of calculation indicated no $3CaO,SiO_2$ (I) in the heaviest fraction, *X*-ray photographs showed an appreciable amount. The lattice of the $3CaO,Al_2O_3$ (II) in the clinker was smaller than that of the pure mineral. Working with pure materials, mixed crystals were formed on adding $4CaO,Fe_2O_3,Al_2O_3$ to pure (I), with enlargement of the lattice; addition of (I) to (II) caused shrinkage of the lattice, the max. amount of which agreed with that of (II) in cement. G. H. C.

**Effect of glass content on heat of hydration of Portland cement.** W. Lerch (J. Res. Nat. Bur. Stand., 1938, 21, 235—240).—The heats of hydration ($\Delta H$) of a no. of cements with different glass contents (*c*) have been determined by the heat of dissolution method. The heat evolved at 7—28 days from mixing depends on the cement composition and *c*, the latter having a direct and also an indirect effect due to the variation of the compound composition. After 3 days $\Delta H$ is not consistently related to *c*, but at 7—28 days $\Delta H$ increases with *c*. Causes of the variation of $\Delta H$ are discussed. A. J. E. W.

**Reactions in the solid state at high temperatures. XVIII. Tricalcium silicate, the most important component of Portland cement clinker.** W. Jander (Angew. Chem., 1938, 51, 696—699).—A review of published work. E. S. H.

**Relation of compositions and heats of dissolution of Portland cement clinker.** H. Insley, E. P. Flint, E. S. Newman, and J. A. Swenson (J. Res. Nat. Bur. Stand., 1938, 21, 355—365).—The results of chemical and microscopical analyses of commercial Portland cement clinkers are compared. There are slight discrepancies in the contents of $3CaO,SiO_2$, $2CaO,SiO_2$, $3CaO,Al_2O_3$, and $4CaO,Al_2O_3,Fe_2O_3$ as determined by the two methods. The cryst. compounds are not pure, but contain materials in solid solution. The observed heats of dissolution are in accord with those calc. from the analyses, but the assumptions on which these calculations are based are inexact. J. W. S.

**Quick-setting and heat-evolving cements. V. Hydraulic properties of cements.** K. Akiyama (J. Soc. Chem. Ind. Japan, 1938, 41, 249—250B; cf. B., 1938, 516).—Cements having activity indices $<1$ and CaO content $<30\%$ are examined. High-aluminous cements are very slow in setting, but hardening properties improve with decrease of $SiO_2$ content. Quick-setting and heat-evolving cements of good quality are found within the limit of CaO content $<30\%$. A. T. P.

**Influence of various kinds of calcium sulphate on properties of cement.** G. Mussgnug (Zement, 1938, 27, 303—307).—The effect runs parallel to the solubility of the $CaSO_4$. Ground into a rotary-kiln clinker of low $Al_2O_3$ modulus, $>1\%$ of $CaSO_4,0·5H_2O$ (I) caused a flash set. Small amounts of (I) made the cement $H_2O$-repellent. Normal setting times were obtained with 2—6% of $CaSO_4,2H_2O$ (II). 1—3% of $CaSO_4$ (III) causes a quick set, 6% retards the set to 4 hr. With (III) the mix requires more $H_2O$. Higher temp. (30°) accelerates the set slightly in all cases, especially with (II). The strength of dry-consistency mortar increases to a max. at 3—5% (III) in each case and then decreases, but with plastic mortar the strength increases continuously with (III). High (III) content does not affect expansion during 28 days' storage in $H_2O$, but shrinkage is decreased. 1% of (I) produces the same expansion in presence of 1·2% of free CaO as 3—4% of (II) or (III). G. H. C.

**Rapid testing of cement on the site.** D. De Simone (Ann. Lavori Pubbl., 1938, 76, 558—562; Road Abs., 1938, 5, No. 540).—An impact-testing apparatus (the Zamboni pleximeter) for use in the rapid testing of cement and concrete is described. Cylindrical test-pieces, made in a specified way, are fixed horizontally and subjected to impact on one end from a hammer swinging through a graduated arc, the angle of rebound of the hammer being measured and correlated with compressive strength. The same specimen may be tested at different ages. T. W. P.

**Corrosion of concrete by chloride solutions.** V. M. Moskvin (Kalii, 1938, No. 2, 23—27).—Corrosion by NaCl, KCl, and $MgCl_2$ solutions is discussed. A concrete containing $\nless$275 kg. of puzzuolana cement per cu. m. should be used. Portland cement is not recommended. The $H_2O$–cement factor should be $\ngtr$0·65. Some practical suggestions, with illustrations, for laying the cement are made. D. G.

**Improvement of concrete admixtures.** L. Palotás (Zement, 1936, 25, 305—311; Chem. Zentr., 1936, ii, 675).—Various empirical relationships between the quantity of cement and the grain size of admixed material are reviewed and discussed. H. J. E.

**Composition and testing of bituminous concrete fillers.** H. Nüssel (Bitumen, 1936, 6, 99—104; Chem. Zentr., 1936, ii, 3036).—Bituminous fillers should pour at 200° and the constituents should not separate on melting. Ductility at low, stability at high, temp. and adhesion to stone are desirable qualities. Methods of testing and mixing are summarised. A. H. C.

**Calcium sulphate plasters.** W. R. Pippard (Dept. Sci. Ind. Res., Building Res. Bull., 1938, No. 13, 16 pp.).—A new classification of the plasters is proposed, the two main groups being the hemihydrate and the anhyd. The former contains $CaSO_4,0\cdot5H_2O$, with and without retarders; the latter is further subdivided into lightly burnt, moderately burnt, hard burnt, and anhyd. types. The general properties of importance in plastering are described and details of the characteristics of, and precautions to be taken with, each type are given. Present proprietary makes are tabulated according to type. T. W. P.

**Heat-treatment for asphalt cements.** L. V. Garrity (Mich. State Highway Dept., Highway Res. Census, 41.321; Road Abs., 1938, 5, No. 533).—An examination is described of three methods of heating to study changes in ductility and penetration of asphalt cements due to the effects of heat and air. Treating sand–asphalt mixes in an oven at 163° gave different characteristics to the bitumen from those of practice. The 100-penetration asphalt content test had inherent defects giving erratic results. Blowing air through the material at 200° for a definite time correctly duplicated the changes observed in practice. T. W. P.

**Determination of flow in asphalt bitumen–mineral mixtures.** R. N. J. Saal (Arch. tech. Mess., 1936, 5, T. 8, 2 pp.; Chem. Zentr., 1936, ii, 3037).—The determination of penetration, stability, and resistance to pressure is recommended. Deviation of theory from practice is mentioned. A. H. C.

**Acid-proof lutes and their properties.** J. Knížek (Chem. Obzor, 1938, 13, 113—116).—Acid-proof lutes may be of org. or inorg. material, the hardening of the latter being caused chiefly by the separation of silicic acid from the $Na_2SiO_3$ solution. The lutes are slow- or quick-hardening, the latter being produced by addition of acids, or neutral or basic salts which give insol. silicates. Addition of $Na_2SiF_6$ aids the hardening. A new lute "Jodasta C" is described, a strong acid being used to etch the surface of the granules of the filler, the size of which is carefully regulated. F. R.

**Weathering of building stones.** R. J. Schaffer (Chem. and Ind., 1938, 943—947).—The effects of atm. pollution, frost, sol. salts, and biological agencies in causing decay of building stones are described. Preventive measures against attack include: for new buildings, selection of durable stone, suitable mortars etc., and suitable design; for existing limestone buildings, washing with $H_2O$ at regular intervals minimises decay. Stone preservatives are not usually effective. Laboratory tests for assessing the weathering quality of stone are outlined. T. W. P.

**Decomposition and deaëration of clay.** K. O. Schulz (Tonind.-Ztg., 1936, 60, 577; Chem. Zentr., 1936, ii, 672).—Weathering of the clay may be replaced by a steam treatment, followed by cooling in absence of air. H. J. E.

**Heat- and sound-insulation of buildings.** A. Miller (Chem. and Ind., 1938, 982—990).—The materials and methods of construction for heat- and sound-insulation are described and compared. In general, materials for heat- and sound-insulation have low and high *d*, respectively. T. W. P.

**External rendered finishes. Survey of continental practice.** F. L. Brady and L. F. Denaro (Dept. Sci. Ind. Res., Building Res. Bull., 1938, No. 16, 33 pp.).—Cracking and crazing of continental rendered finishes are relatively rare and the finish can be relied on to be weatherproof. A description of the materials used, the methods of application, and the methods of finishing the rendering is given. Mixtures of lime and cement are most commonly used as the binding medium; cement alone is rare and CaO alone has poor durability. The material is applied by throwing-on for all coats and never by laying-on, whilst a roughness of texture in finishing (*e.g.*, as obtained by scraping) is common and appears to reduce risk of moisture penetration, to induce more uniform weathering, and to minimise crazing. The choice of texture for various states of atm. pollution and for architectural design is discussed. T. W. P.

**Properties of Australian timbers. III. *Pinus radiata*, D. Don. (*P. insignis*, Doug.). *Insignis*, Monterey, or Remarkable pine.** (Counc. Sci. Ind. Res., Australia, 1938, Pamph. 81, Div. Forest Prods., Tech. Paper 28, 31 pp.).—The mechanical and physical properties of timber from *P. radiata*, and its uses, durability, methods of grading, and preservative treatment, are described. Various kiln-drying and pressure-creosoting schedules and an extensive bibliography on the pulping of pines are given in appendices. E. A. R.

**Composition of abnormally developed wood.** J. Wiertelak and I. Garbaczówna (Rocz. Nauk roln. lésn., 1936, 36, 395—405; Chem. Zentr., 1936, ii, 3378—3379).—Narrow annual rings of the wood of *Fraxinus americana* and of *Abies pectinata* are richer (8%) in lignin and hence have a lower transverse strength (cf. B., 1933, 698), but poorer in material sol. in $Et_2O$–$COMe_2$ or $C_6H_6$–EtOH, broader rings containing more cellulose. A. H. C.

***X*-Ray investigations of the structure of wood.** W. I. Caldwell and K. Lark-Horovitz (Physical Rev., 1937, [ii], **51**, 998—999; cf. B., 1934, 799).—Only cellulose patterns were observed in wood samples graded according to origin, conditions of growth, mechanical properties, and fibril angle. No indication of the lignin pattern was found. The presence or absence of fibre structure depends on the fibril angle; when this is large the pattern is more homogeneous. Compressed and spring woods have less pronounced fibre structure than has summer wood. L. S. T.

**"Physiological" drying of beech wood.** A. A. Jatsenko-Chmelevski (Compt. rend. Acad. Sci. U.R.S.S., 1938, **20**, 185—188).—Sawing the bases of trunks to a depth of several in. 2—3 months prior to felling had little effect on the $H_2O$ content of the wood. Marked drying occurs if felled trees are left with the tops intact. A. G. P.

**Swelling of birch wood.** N. A. de Bruyne (Nature, 1938, **142**, 570—571).—Hasselblatt's data (B., 1926, 747) fit the equation $s = a(\epsilon - 1)^{\frac{1}{2}}$, where $s$ is the swelling measured as an extension per unit length and $a$ is a const. The equation is in accord with Sementschenko's theory of absorption (A., 1927, 1136). L. S. T.

**Dry rot in wood.** K. St. G. Cartwright and W. P. K. Findlay (Dept. Sci. Ind. Res., Forest Products Res. Bull. No. 1, 1938, 39 pp.; cf. B., 1934, 501).—The dry-rot fungi are described and methods for the detection and treatment of dry rot are given in detail; preventive instructions for the use of new timber in building construction are included.

E. A. R.

**Wood preservation.** K. Peschek (Österr. Chem.-Ztg., 1938, **41**, 299—305).—A survey of the conditions of timber decay, and of the methods of preservation by impregnation. E. A. R.

**Mycological testing of wood preservatives. II. Arsenical substances.** W. Baverdamm (Angew. Bot., 1937, **19**, 18—42).—Tests of a no. of preservatives are recorded. The general use of As preps. and methods of testing are discussed.

A. G. P.

**Sedimentometer.**—See I. **Tar. Asphaltic bitumen for roads.**—See II. **Refractory jointing cements.**—See VIII. **Dust collection [in cement works].**—See XI. **Adhesion of wood plastics.**—See XIII.

Patents.

**Manufacture of expanded cement articles.** W. P. Witherow (B.P. 492,280, 16.3.37. U.S., 2.4.36).—A large mass of cement embodying a gas-generating agent is poured into a trough and the articles are formed by pressing down therein a gang mould, having no top or bottom, before the expansion is completed. B. M. V.

**Manufacture of light-weight mineral material.** Brit. Zonolite Products, Ltd., Assees. of P. S. Denning (B.P. 485,512, 17.3.37. U.S., 27.3.36).—Relatively fragile granules of exfoliated vermiculite are reinforced by coating with a liquid carbonaceous material (*e.g.*, coal-tar pitch) and then destructively distilled to produce a hard C residue on the granules. The application of the product in the heat-treatment of metals is also described and claimed. T. W. P.

**Manufacture of (A) [heat-]insulating materials [as slabs]; (B) products containing vermiculite. (C) Heat-insulating cements.** Brit. Zonolite Products, Ltd. From F. E. Schundler Co., Inc. (B.P. 485,504—6, 17.3.37.)—(A) Expanded vermiculite, vermiculite laminæ, and small amounts of fibre are mixed with cement slurry, and cast in moulds with perforated sides. Excess of $H_2O$ is removed by pressure or suction. Portland or Mg oxysulphate cement is suitable as binder. An example of the mix ratio is (by wt.): vermiculite 100, cement 45, fibre 18 pts. The laminæ and fibres are said to lie along the length of the block when finally prepared, and thereby increase the thermal resistance across the block. (B) Expanded vermiculite for use as an aggregate with a Mg oxysulphate cement is purified by floating in aq. $MgSO_4$, allowing the impurities to sink, and either removing the float material to mix with $MgSO_4$ solution and MgO, or removing the heavy material and mixing the remainder with MgO. (C) An exfoliated, inorg. porous heat-insulating material (*e.g.*, exfoliated vermiculite, 60—70) is mixed with an org. fibrous material (*e.g.*, hair, 0·5—2) and a mineral substance (*e.g.*, fireclay, 20—30%) to act as a binder after heating. Asbestos fibres (10—15%) may also be added to the mix. The org. fibre is intended to hold the composition together before firing and to cause pores to form after firing. Preferred proportions are given. T. W. P.

**Production of light or coloured road surfaces, floorings, and the like.** J. R. Geigy A.-G. (B.P. 486,009, 20.11.36. Ger., 21.11.35).—A mass is prepared from a light-coloured, pulverulent filler, with or without inorg. or $H_2O$-insol. org. dyes, and a $H_2O$-insol. org. binder (a resin, wax, oil, etc.). This is mixed with a black or dark-coloured mass comprising mineral fillers with tars or bitumens. T. W. P.

**Preparing road-surfacing products.** Soc. de Recherches et de Perfect. Industr. (B.P. 493,898, 13.12.37. Addn. to B.P. 430,061; B., 1935, 853).—Fine coal filler is incorporated in an aq. emulsion of tar, bitumen, or the like, stabilised by addition of carragheen (I), carob bean, gelatin, etc. A suitable composition is bitumen 35, filler 15, and $H_2O$ 50% [as a 1% solution of (I)]. D. M. M.

**Stabilising soil mixtures.** Internat. Bitumen Emulsions, Ltd. (B.P. 489,767, 3.2.37. U.S., 10.2.36).—Soil mixtures containing $\not< \sim 15\%$ and 5% of particles with diameter $<0{\cdot}074$ and $<0{\cdot}001$ mm., respectively, are stabilised by mixing with them at room temp. $\not<$ enough $H_2O$ to bring the consistency of the mixture to the plastic limit and an aq. emulsion of bituminous material $<$ enough to act as binder by itself but enough to coat the particles with a thin adsorbed film of bitumen capable of preventing re-absorption of $H_2O$ by the smaller particles. The mixture is then air-dried without further mechanical mixing. D. M. M.

**Production of plywood, composition boards, and building slabs.** A. Wiggenhauser (B.P.

491,973, 18.3.37 and 3.3.38).—Almost any form of cheap cellulosic material is mixed with a skim-milk or curd binder, with or without a pptg. or hardening medium such as rennet, $CH_2O$, CaO, or cement; the mixture is moulded, pressed, and heated. B. M. V.

**Production of coloured asbestos-cement [tiles, sheets, etc.].** Turner & Newall, Ltd. (B.P. 493,386, 23.7.37. Austr., 23.7.36).

**Moulding of composite [concrete–stone] blocks for building, paving, and like purposes.** A. B. Taylor (B.P. 491,397, 6.5. and 2.10.37).

**Heat-insulating slabs etc.**—See VIII. **Rubber–cement plastics.**—See XIII. **Adhesive layers.**—See XV.

## X.—METALS; METALLURGY, INCLUDING ELECTROMETALLURGY.

**Temperature and heat-transfer relations in the working space of industrial furnaces. II.** H. Schwiedessen (Arch. Eisenhüttenw., 1937—8, **11**, 431—442).—Expressions are derived and graphs constructed for determining the heat relations in steel-treating furnaces. A. R. P.

**Calorimetric determination of heat losses [in metallurgical furnaces] due to small quantities of unburned flue gas.** W. Bühne (Arch. Wärmewirts., 1938, **19**, 275—277).—A sample of the flue gas cooled to room temp., and if necessary mixed with air, is burned over an electrically heated Pt spiral inside a special type of calorimeter (described), and the rise in temp. of a measured quantity of cooling-$H_2O$ and the current consumption are measured. Experiments carried out with air–$H_2$, air–town's gas, and synthetic flue gases show that an accuracy of $\pm 3\%$ is possible. R. B. C.

**Peripheral distribution of gases in the blast furnace.** H. W. Johnson (Blast Furn. Steel Plant, 1938, **26**, 590—594, 689—693).—Four holes were made in the same horizontal plane about 10 ft. below the normal stock line and at 90° to each other. Thermocouples were inserted through the holes and the temp. was recorded 48 in. beyond the wall and at 6-in. intervals up to the wall. Gas samples were taken at the wall and in the stock column. Tables and graphs correlate temp. and the CO and $CO_2$ contents of the gas samples. The relation between variations in the peripheral gas distribution and furnace-operating conditions is discussed. R. B. C.

**Efficiency of the blast-furnace process.** J. B. Austin (Amer. Inst. Min. Met. Eng., Publ. 943, 1938, 25 pp.; Met. Tech., 1938, **5**, No. 5).—Calculations show that the material and thermal efficiencies of the blast furnace, considered both as a smelter and as a gas producer, are high. Whilst improvements in design, in control of operation to give a uniform product, and in reducing heat loss by radiation and conduction are to be expected, there is little hope of making a substantial reduction in coke consumption below that achieved by the best modern practice. R. B. C.

**Operation of coke-oven gas-fired open-hearth furnaces with increased additions of brown-coal dust.** C. Kreutzer (Stahl u. Eisen, 1937, **57**, 1397—1403).—To avoid excessive corrosion of the chequerwork in the recuperators when a high proportion of brown-coal dust is used to enrich the gases, the upper courses should be built of bricks containing $>50\%$ of $Al_2O_3$ and the cross-section of the bricks should diminish from top to bottom to allow dust and slag to fall freely. High-$Al_2O_3$ packings are practically unattacked by the slags produced from the coal ash, so that these can actually be melted off the bricks when too much has accumulated to allow free circulation of the gases. A. R. P.

**Development of the smelting of low-grade iron ores on the basis of energy and heat-economy considerations.** E. Senfter (Stahl u. Eisen, 1937, **57**, 1373—1381).—Low-grade Fe (*e.g.*, Dogger) ore with $\sim 20\%$ Fe can be economically treated by roasting it on a mechanical grate and smelting the product with CaO to obtain a fluid slag containing $SiO_2$ 43, $Al_2O_3$ 20, CaO 28, and MgO 5%. The coke consumption in smelting, provided that the charge is free from moisture and $CO_2$, is about 1050 kg./ton of pig Fe produced. The Fe contains C 2·5, Si 2, Mn 0·2, P 2, and S 0·5% and is suitable for use in place of scrap Fe in steel production. A. R. P.

**Benefits from use of high-iron concentrates in a blast furnace.** C. E. Agnew (Amer. Inst. Min. Met. Eng. Tech. Publ. 956, 1938, 5 pp.; Met. Tech., 1938, **5**, No. 5).—The smelting technique developed by an American firm for New Jersey and eastern Pennsylvania magnetite ores, so that they could compete with the more easily reduced Lake hæmatites, is described. Successful results were obtained by reducing the $SiO_2$ content of the ore before sintering. R. B. C.

**Blast-furnace slags.** R. S. McCaffery (Blast Furn. Steel Plant, 1938, **26**, 598—600, 702—703, 719).—The operation of the blast furnaces at Corby steelworks on Nottinghamshire Fe ores is described. Desulphurisation of the Fe is effected outside the furnace in a ladle by means of soda ash, fluorspar, and limestone. The types of slag which give uniform furnace operation are discussed. R. B. C.

**Cupola operation.** D. J. Reese (Trans. Amer. Found. Assoc., 1938, **46**, 173—194).—Cupola design, especially with respect to the most economical size, and cupola operation and control are discussed. Tables show coke-bed heights for corresponding blast pressures, and wts. of coke and Fe charges for cupolas of various diameters. R. B. C.

**Close cupola control.** M. J. Gregory (Foundry, 1938, **66**, No. 6, 38—41, 115—116; No. 7, 24—27, 74).—The technique adopted by an American firm for producing Fe castings to ten different specifications from base Fe obtained from charges of cast Fe, steel scrap, and pig Fe is described. R. B. C.

**[Device to] catch cupola smoke.** Anon. (Foundry, 1938, **66**, No. 8, 32, 86).—A wet dedusting plant connected to cupolas at an American foundry is described. R. B. C.

**Cupola fallacies.** D. J. Reese (Foundry, 1938, 66, No. 5, 72—73, 146).—An empirical formula relating melting rate to fuel-burning rate, and Fe to coke ratio and blast pressure, is given. Recommended bed heights for given blast pressures are tabulated.

R. B. C.

**Enrichment of hæmatite ores by flotation.** G. G. Bring (Jernkont. Ann., 1938, **122**, 139—169).—Owing to the chemical similarity of the ore and the gangue, flotation of oxide ores is more difficult than of sulphides. The low purity of the concentrate necessitates double or treble flotation and the use of cheap reagents. Swedish hæmatite (I)–quartz and –magnetite have been investigated. Grinding to $< 0{\cdot}2$ mm. and preliminary removal of magnetite magnetically and of apatite by flotation with Na oleate and water-glass at $p_{\rm H} \nless 7$ are necessary. Oleic acid is the best collector for the (I) flotation, other fatty acids being less effective and more expensive. As foaming agents, brilliant-green (in acid solution), pine oil (in alkaline solution), and proprietary sulphonated fatty acids are suitable. Fe, Cu, Pb, and Al salts are useless as activating agents, and tend to give undesirable activation of the gangue. PhOH activates (I) weakly. A large no. of gangue depressants have been investigated. HCl or $H_2SO_4$ alone at $p_{\rm H}$ 3—4, or with water-glass at $p_{\rm H}$ 5—6, suppresses the flotation of quartz, felspar, amphibole, and pyroxene, but at $p_{\rm H}$ 2—3 (I) is also suppressed. Whilst $H_3PO_4$, Na phosphates, and $SO_2$ are somewhat effective, NaOH ($p_{\rm H}$ 10), $Na_2SO_3$, $NaHSO_3$, $Ca(OH)_2$, starch, and dextrin have no effect. Chloramine-T is a powerful depressant for (I). The best separations occur with quartz > felspar, mica, chlorite > amphibole, pyroxene > epidote. The flotation of Fe silicates has not yet been accomplished. From an ore containing 20—25% Fe, concentrate containing 60—65% and gangue 5—10% Fe may be obtained. The costs of various treatments are discussed.

M. H. M. A.

**Concentration of Lorraine [iron] ores.** M. Boileau (Chim. et Ind., 1938, 40, 631—637).—The ores consist of minute nodules (usually) of hæmatite and a cement which may be clayey, calcareous, or ferruginous. The calcareous ores are best treated by physical methods, *i.e.*, disintegration by crushing, roasting, or suddenly-released steam pressure, followed by magnetic separation, which appears more promising than flotation, washing, etc. Physical methods may also be used for ores consisting mainly of siliceous nodules in a ferruginous matrix. In other cases chemical methods will be necessary. A. R. Pe.

**Roasting of spathic iron ore in the Siegerland.** E. Plotzki (Arch. Eisenhüttenw., 1937—8, **11**, 263—272).—Laboratory- and large-scale tests show that all the $CO_2$ is expelled by heating the ore at 600°; raising the roasting temp. has no effect on the rate of expulsion of $CO_2$, but this rate increases with increasing rate of passage of air through the charge up to a max. of 0·5 cu. m. of air per kg. of charge per min. Increasing the height of the furnace up to 11 m. increases its output without increasing the proportion of fines. The economics of the roasting process are discussed.

A. R. P.

**Arsenic in iron ores and the possibility of expelling it during smelting.** W. Luyken and L. Heller (Arch. Eisenhüttenw., 1937—8, **11**, 475—481).—As generally occurs in Fe ores as arsenate and in ordinary smelting operations passes directly into the metal, from which it is very difficult to eliminate. It can be partly removed from the ore by a reducing followed by an oxidising roast; a similar result is obtained by giving the ore a magnetising roast and passing the product over an electromagnetic separator. Chloridising roasting and a roast with 5% of pyrites remove considerable quantities of As. A. R. P.

**Properties [and classification] of pig irons.** F. Roll (Giesserei, 1938, 25, 321—324).—Curves illustrating the relation of combined C to Si for several kinds of German hæmatite Fe have been plotted from the analyses of a large no. of samples. The mean curve and the degree of scatter of the individual points are characteristic of the different irons. The method of classification is discussed in relation to the usual method of examination of the fracture. C. E. H.

**Influence of other constituents on reactions between liquid iron, iron–manganese silicates, and solid silica.** F. Körber (Stahl u. Eisen, 1937, 57, 1349—1355).—The effects of C, P, S, Ni, and Cr in the steel bath and of CaO, $Al_2O_3$, and $TiO_2$ in the slag on the equilibria between molten Fe and a MnO–FeO silicate slag on an acid hearth are illustrated graphically and briefly discussed. Mn in low-C steel tends to reduce the $SiO_2$ in the hearth and pass into the slag, but with higher C this tendency is reduced; at 1400° metal with 3% C, 2% Si, and 10% Mn has no action on $SiO_2$, but at 1500° 1% and at 1600° 2·6% of Mn passes into the slag and the metal is enriched correspondingly in Si. P in the metal reduces the tendency for the Mn to react with $SiO_2$, whilst S increases it; small additions of Ni have little effect, but larger amounts tend to keep the Mn in the metal layer. Additions of CaO, $Al_2O_3$, or $TiO_2$ to the slag result in relatively high losses of Mn from the metal. A. R. P.

**Use of bauxite in basic open-hearth furnaces.** F. H. Schönwälder (Stahl u. Eisen, 1937, 57, 1381—1382).—Washed German bauxite containing $Al_2O_3$ 40—46, $Fe_2O_3$ 21—27, $SiO_2$ 5—10, and $TiO_2$ 3·5—5% can be used instead of fluorspar for obtaining the necessary fluidity in desulphurising slags when the amount of S to be removed from the steel is relatively small; if much S has to be removed a relatively small addition of $CaF_2$ towards the end of the refining is sufficient. The advantage of bauxite over fluorspar is that it has practically no action on the refractory lining of the furnace. A. R. P.

**Heats of formation of iron slags from the constituent oxides.** H. Richter and W. A. Roth (Arch. Eisenhüttenw., 1937—8, **11**, 417—419).—The heats of formation of various steelworks slags have been determined by dissolving the slags in a mixture of HF and HCl. The vals. obtained increased with the base/acid ratio in the slags, as is the case with Na silicates. A. R. P.

**New type of charging apparatus for furnaces for determination of oxygen in iron by the hot-extraction method.** F. Willems (Arch. Eisenhüttenw., 1937—8, **11**, 627—628).—Various types of charging heads for introducing the sample into the hot crucible in the high-vac. furnace are illustrated and described. A. R. P.

**Determination of copper in pig iron and steel.** W. Åström (Arch. Eisenhüttenw., 1937—8, **11**, 515—516).—The metal is dissolved in 10—14% $H_2SO_4$ and the insol. containing the Cu is collected on a glass-wool filter, washed free from $FeSO_4$, and dissolved in HCl and $KClO_3$. The solution is treated with aq. $NH_3$, filtered, and used for the colorimetric determination of Cu. W steel is dissolved in dil. $H_2SO_4$ with the aid of a little $HNO_3$, the solution is evaporated until $SO_3$ fumes are evolved, cooled, diluted with $H_2O$, and filtered to remove $WO_3$. The filtrate is boiled with 5 g. of Cu-free steel turnings and the ppt. is treated as described above. A. R. P.

**Photocolorimetric determination of vanadium in iron ores and slags.** H. Pinsl (Arch. Eisenhüttenw., 1937—8, **11**, 293—296).—The finely-ground material is fused with $Na_2O_2$ in a Ni crucible and the mass dissolved in $H_2O$; without filtration an excess of $HNO_3$ and $H_2O_2$ is added and the solution boiled until it has a pure green colour. After cooling, the vol. is made up to 250 c.c. in a graduated flask and 100 c.c. of it are treated with 1 c.c. of 15% $H_2O_2$; the remainder is diluted with 1·5 c.c. of $H_2O$ to act as a comparison standard. Both solutions are then transferred to 150-c.c. wedges and the extinction coeff. is measured, using a Hg-vapour lamp and first a Hg 578 and then a Hg 546 filter. From the results obtained the V content is determined by reference to a graph. Ti does not interfere. A. R. P.

**Chemical changes in cast iron in the cupola.** J. T. Mackenzie (Found. Tr. J., 1938, **59**, 43—47, 54).—The reactions taking place in the various zones of the cupola, and the effect of the type and size of coke, coke ratio, blast vol. and pressure, and addition of steel scrap on changes occurring in the melting zone are discussed. R. B. C.

**Heat-conductivity of technically pure iron and various steels.** H. Esser, W. Eilender, and E. Pütz (Arch. Eisenhüttenw., 1937—8, **11**, 619—622).—The heat-conductivity of electrolytic Fe decreases linearly with rise in temp. from 0·208 g.-cal./cm./sec./° c. at 100° to 0·120 at 500°. With increasing C content the conductivity falls sharply up to 0·2% C, then much more slowly. Alloying with Cr and Ni strongly reduces the conductivity. The vals. for austenitic steels are $\ll$ those for pearlitic steels and increase linearly with rise in temp. A. R. P.

**Primary crystallisation of cast iron.** W. Patterson (Arch. Eisenhüttenw., 1937—8, **11**, 463—465).—When hypoeutectic cast Fe is allowed to solidify, the primary crystals consist of solid-solution dendrites; this is followed by solidification of the binary and higher eutectics, the ternary phosphide eutectic solidifying last in layers surrounding the spherical islands of the binary eutectics. Minor constituents such as TiC and TiN which separate from the melt prior to the dendrites concentrate along the boundaries of these and in the eutectics; sulphides, on the other hand, are irregularly distributed throughout the non-dendritic portion of the metal. A. R. P.

**Influence of conditions of solidification on the primary crystallisation of grey cast iron.** P. Tobias and K. Casper (Giesserei, 1936, **23**, 201—205; Chem. Zentr., 1936, ii, 682—683).—Graphite lamellæ orient themselves at right-angles to the Mn sulphide crystals which first form. H. J. E.

**[Surface-]hardening of unalloyed cast iron with the oxy-acetylene flame.** K. Bossert (Giesserei, 1938, **25**, 158—164).—The effects of operating conditions and plant design on the resulting hardness and structure of the surface have been investigated. C. E. H.

**Influence of manganese on hardening and tempering of cast iron.** J. E. Hurst (Found. Tr. J., 1938, **58**, 545—548).—The properties of centrifugally-cast Cr–Fe containing 0·91—3·10% Mn are studied. Mn increases the hardness but decreases the permanent set val., tensile strength, and modulus of elasticity. Oil-quenching from 875° increases the hardness but lowers the last two properties, the changes becoming smaller with increasing content of Mn. Quenching at temp. up to 800° improves the tensile strength but decreases the hardness. R. B. C.

**System for investigation of the mechanical properties of cast iron.** J. E. Hurst (Metallurgia, 1938, **18**, 197—200).—Tests, developed from piston-ring tests, for the determination of ultimate breaking strength and modulus of elasticity, and both simple testing devices and accurate testing machines, are described. Procedures for determining resilience or toughness val., permanent set, elastic hysteresis, and internal stress, and also for the prep. of the ring-form specimens, are given. S. J. K.

**Mechanical properties of high-quality grey iron.** K. Knehans (Tech. Mitt. Krupp Tech. Ber., 1938, **6**, 102—108).—Data obtained in various physical tests on three types of grey cast Fe containing 2·7—3·3% C illustrate the improvements which have taken place in the properties of this material since German standards based on tensile strength were established in 1933. R. B. C.

**Nickel–boron cast iron for resistance to abrasion.** W. F. Hirsch (Met. Progr., 1938, **34**, 230—232, 278).—The production and properties, *e.g.*, tensile strength and hardness, of Xaloy or IR. Metal [Fe containing C 2·5—3·25, B 0·7—1·0, Si 0·5—1·5, Mn 0·5—1·25, Ni 3·5—4·5, P 0·05 (max.), and S 0·05 (max.)%] are described. The material is highly resistant to wear and is used for pump liners, machine-tool bushings, etc. R. B. C.

**Thin-walled grey cast iron and its resistance to wear, with special reference to piston rings.** M. von Schwarz (Giesserei, 1936, **23**, 257—262; Chem. Zentr., 1936, ii, 683).—Wear tests are described on $>50$ samples with total C 3·5—3·72, Si 1·76—3·40, Mn 0·45—0·92, P 0·12—0·83, S 0·03—0·22, Ni 0·32—1·0, Cr 0·25—0·6, and Mo 0·72%. The structure should be uniformly pearlitic and should contain no free ferrite. The graphite should not be too coarse. H. J. E.

**Growth of cast iron for piston rings at temperatures up to 700°.** F. Bollenrath and K. Bungardt (Stahl u. Eisen, 1938, 58, 1111—1113).—Experiments on cast irons containing (approx.) C 3·8, Si 3, Mn 0·8, P 0·7—1·0, Cr 0·1—0·5, and Mo 0·3—0·8% show that measurable growth occurs by heating at 450°. Rate of growth and total growth are the greater the higher is the temp. On heating at 585° the rate of growth is very slow during the first 30—45 min., then increases rapidly, and reaches a max. after 3—4 hr. Rate of growth and total growth decrease as Cr and Mo are increased. M. A.

**Risers or gates for some special non-ferrous and alloyed and high-test iron castings.** C. Brisbois and A. E. Cartwright (Trans. Amer. Found. Assoc., 1938, 46, 219—256).—Good results have been obtained by pouring castings (bronze, brass, Monel, nickel-silver, and alloyed Fe) directly through risers, a strainer core being used in the riser head. The technique of the method is described and its advantages, *e.g.*, the feeder head is kept hot and metal is saved, are discussed. Types of sand suitable for the moulds and strainer cores are indicated. R. B. C.

**Centrifugally-cast [iron] cylinder liners [for internal-combustion engines].** W. A. Geisler and H. Jungbluth (Tech. Mitt. Krupp Tech. Ber., 1938, 6, 96—101).—The structures and properties of liners made of unalloyed and alloyed Fe, martensitic steel, and nitride-hardened steel are compared, and the advantages of centrifugal casting over sand-casting discussed. R. B. C.

**Determination of boron in cast iron and steel.** J. L. Hague and H. A. Bright (J. Res. Nat. Bur. Stand., 1938, 21, 125—131).—The sample (5 g.) is dissolved in HCl (*d* 1·18) and oxidised with 30% $H_2O_2$. The solution is distilled with MeOH in presence of $CaCl_2$, and the $B(OMe)_3$ formed is hydrolysed with aq. NaOH. The solution containing $H_3BO_3$ is made neutral to Me-red, and the $H_3BO_3$ titrated (phenolphthalein) with 0·1n-NaOH in presence of mannitol. Full practical details are given. Any residue insol. in HCl is fused with $Na_2O_2$, and the aq. extract treated similarly. Se and Te do not interfere; Ge causes small positive errors. The results are accurate to 0·002% for steels containing ~0·1% B. A. J. E. W.

**Overheating and refining of grey cast iron.** E. Bremer (Foundry, 1936, 64, No. 1, 26—27; Chem. Zentr., 1936, ii, 682).—The construction of a special furnace for preparing grey cast Fe parts for the glass industry is described. The C content of the Fe may be reduced to 2%, whilst up to 30% of alloyed materials (*e.g.*, Si, Mn, P, Cr, Ni, etc.) may be added to the Fe with only small oxidation losses. H. J. E.

**Copper in [grey] cast iron.** A. J. N. Smith (Found. Tr. J., 1938, 58, 537—540; 59, 8—11).—Tests show that the liquid solubility of Cu in Fe is ~5·5%. The equilibrium solid solubility was not determined, but under normal casting conditions Fe can dissolve 3·5% of Cu without the appearance of free Cu in the microstructure. In amounts up to 3·5% Cu acts as a graphitising agent, being $\frac{1}{5}$ as powerful as Si. Cu in excess of this % reverses this effect and causes an increase in chill. No tendency to decompose the carbide of pearlite was noted. The hardness of Fe is increased by Cu dissolving in the matrix, although since Cu acts as a graphitising agent it may simultaneously reduce the hardness by causing the decomp. of free cementite. In absence of the graphitising effect the hardness increase is about 10—11 points Brinell for each 1% of Cu. The influence of Cu on the transverse and tensile strength is favourable. The impact-resistance of Fe shows improvement with the first 1—2% of Cu. In general, the mechanical properties reach their optimum val. between 1 and 2% of Cu. Cu has little influence on the microstructure of Fe. It causes grain refinement of the pearlite and graphite. Free cementite is decomposed, but no new constituent is introduced into the structure until free Cu appears (at 3·5%). Cu in quantities up to 1% improves Fe from the viewpoint of shrinkage. Addition of Cu with one of the chilling elements Mn, Cr, or Mo results in improved hardness and strength. Addition of Cu + Mn or Cu + Mo gives a martensitic structure. R. B. C.

**Atmosphere control in annealing of malleable iron.** E. G. de Coriolis and R. J. Cowan (Trans. Amer. Found. Assoc., 1938, 46, 1—18).—The correct use of different atm. during annealing considerably reduces the annealing time. A wide range of gas compositions can be made available if proper control is exercised. The operation of continuous and intermittent annealing furnaces is discussed. R. B. C.

**Change of Young's modulus of elasticity by magnetisation in iron and carbon steels.** M. Yamamoto (Sci. Rep. Tôhoku, 1938, [i], 27, 115—136).—An apparatus is described with which the effect of magnetisation on Young's modulus of elasticity (*E*) in annealed Armco Fe and different kinds of C steels has been measured by the method of magnetostrictive oscillation. All samples showed an increase in *E* with magnetisation, the rate of increase, *I*, in weak fields being > that in stronger fields. For a given field, $\Delta E/E$ decreases continuously with increase in C content, and *I* gradually diminishes. $\Delta E/E$ against the intensity of magnetisation gives a discontinuous curve with three stages. Fair agreement was found between the observed change of *E* produced by strong magnetisation in Armco Fe and that calc. from the theory of Akulov and Kondorsky (A., 1933, 1237). In the change of *E* by magnetisation the initial susceptibilities of Fe and C steels are important factors. W. R. A.

**Study of the A0 point of iron by diffusion of hydrogen.** W. R. Ham and W. L. Rast (Trans. Amer. Soc. Met., 1938, 26, 885—902).—A study has been made of the thermal crit. points occurring between 55° and 920° in pure Fe containing known % of C. A pronounced discontinuity occurs in the rate of diffusion–temp. curves at temp. comparable with those at which the A0 point is known to occur. This diffusion discontinuity cannot be removed by complete decarburisation and is believed to be due to electronic rearrangement in the Fe lattice. The effect of C contamination on the A2 and A3 points of Fe is found to be in agreement with generally accepted views. R. B. C.

**Solubility of hydrogen in the iron lattice.** M. Widemann (Berg u. Hüttenm. Monatsh., 1938, **86**, 129—132).—Sieverts' work is reviewed. R. B. C.

**Significance of the terms troostite and sorbite.** J. R. Vilella and L. R. Cooper (Met. and Alloys, 1938, **9**, 223—229).—The definitions contained in the 1912 Report of the Internat. Assoc. for Testing Materials are critically examined and shown to be incompatible with experimentally observed structures using modern technique. The principles with which a proper nomenclature should accord are laid down, and a new set of definitions is suggested. S. J. K.

**Graphitisation in high-purity iron–carbon alloys.** C. Wells (Trans. Amer. Soc. Met., 1938, **26**, 289—344).—Graphite has been developed in alloys having C 0·13—2·89% at 700°. Cementite is found to be unstable at $<$ the eutectic temp. Under the same conditions of heat-treatment, the rate of graphitisation in an alloy containing 2·98% C is greater in a vac. than in a $H_2$–hydrocarbon atm. Microscopical and dilatometric studies indicate that the rate of graphitisation is greatly increased by the presence of graphite nuclei, and the rate of decomp. of carbide into graphite $+$ austenite is considerably increased as the temp. is raised. Evidence shows that in hypereutectoid alloys two austenites of similar mass and containing in solution the same [C] may have at the same temp. two different vols., depending on whether the C comes from graphite or carbide. The mechanism of graphitisation is discussed, and it is shown that graphite may form directly from austenite as well as from carbide. The effect of the rate of heating and cooling (2—$\frac{1}{8}$°/min.) on the diagram of superheating and undercooling in partly graphitised alloys containing up to 0·95% C is discussed. An Fe–graphite equilibrium diagram for the vicinity of the eutectoid is given. R. B. C.

**Production carburising [of iron].** E. F. Davis (Trans. Amer. Soc. Met., 1938, **26**, 607—645).—The development of the cementation process is reviewed. The construction and operation of modern carburising installations and factors affecting carburising costs are discussed. R. B. C.

**Physical and chemical characteristics of carburising compounds and their handling in production.** S. L. Widrig (Trans. Amer. Soc. Met., 1938, **26**, 687—705).—The various types of solid carburising compounds and the materials from which they are made are reviewed. The importance of good adhesion of the energising agent to the base charcoal is stressed. R. B. C.

**Commercial carburising containers.** R. W. Roush and A. C. Dames (Trans. Amer. Soc. Met., 1938, **26**, 646—686).—The evolution of the carburising container is reviewed. The compositions and properties at working temp. of various heat-resisting container alloys, their merits and limitations, the types and causes of failures in containers, and methods of repair are discussed. Container design is illustrated. R. B. C.

**Influence of grain size and temperature on bending strength of Armco iron, carbon steel, and zinc.** G. Welter and S. Danielecki (Wiadom. Inst. Met., 1935, **2**, 6—9; Chem. Zentr., 1936, ii, 537—538).—Armco Fe shows a considerable decrease in strength with increase in grain size or fall in temp.; with C steel (0·22% C) the variation in strength as these factors are changed is smaller. Temp., but not grain size, affects the strength of Zn. H. J. E.

**Recrystallisation of temper-hardening alloys.** H. Bumm and H. G. Müller (Metallwirts., 1938, **17**, 903—910).—Alloys containing Fe and Ni in the ratio 59:41 and containing 0, 1·0, 2·7, 6·0, 8·1, 10·8, and 13·1% Cu were annealed in $H_2$ at 1000°, quenched, cold-rolled to strip, and annealed at 300—800°. The charges in coercive force, initial permeability, and resistivity during annealing were investigated, and an *X*-ray examination was also made. The rate of grain growth and the time of annealing necessary to initiate recrystallisation are important characteristics of the recrystallising process. Increase in the Cu content decreases the former and increases the latter quantity. A higher temp. is necessary in order to cause incipient recrystallisation in the Cu-rich alloys. The mechanism of the process is discussed in the light of the results and of recent work on crystals of salts. C. E. H.

**Relation between separation processes and magnetic hardness for permanent-magnet alloys of the iron–nickel–aluminium and iron–nickel–copper systems.** H. Bumm and H. G. Mülle (Wiss. Veröff. Siemens-Werken, 1938, **17**, 63—73).—The variation of the coercive force, initial permeability, electrical resistance, and *X*-ray pattern of quenched permanent-magnet alloys of the above systems with time has been investigated, and the connexion between magnetic hardness and the hardening processes is thus followed. In the case of Fe–Ni–Al alloys it was shown that a heterogeneous decomp. into two space-centred phases occurs in the state in which the alloy is magnetically useful. The coercivity max. of Fe–Ni–Cu alloys is reached when the separation has already ended. The coercivity max. corresponds with a definite degree of coagulation of the heterogenous phase. A. J. M.

**Metallic coatings.** Anon. (Steel, 1938, **102**, No. 25, 60—65).—The Martin process for coating one metal with another is described. For covering Fe with Al the Fe is heated at 750—1100° in a reducing atm., *e.g.*, $H_2$, town's gas, or dissociated $NH_3$, containing gaseous $AlCl_3$. Al replaces Fe atom by atom. Photomicrographs are given. R. B. C.

**Behaviour of nitrogen and hydrogen in the melting [of steel] in the open-hearth furnace.** C. Schwarz (Arch. Eisenhüttenw., 1937—8, **11**, 355—362).—The $H_2$ content of steel made in the open-hearth furnace is independent of the method of heating, but is the greater the more highly reducing is the furnace atm. and the higher is the temp. of the steel when the surface of the metal is unprotected by a slag layer. $H_2$ can be introduced into the melt by adding damp deoxidising materials such as Fe–Si or Ca-containing substances (*e.g.*, Ca–Al alloy). The use of Fe–Mn-containing nitride results in a high

N content in the steel, but the rate of refining has no effect on the amount of N absorbed. In the duplex process, however, the N is removed at a rate which is 0·0175 times the rate of decarburisation, but reabsorption of N may take place during the deoxidation stage, prior to addition of Fe–Mn. In general, steel made in acid-lined furnaces takes up less N than that made in basic-lined ones. A. R. P.

**Influence of pouring time and addition of aluminium on the grain size of steel.** I. Fetschenko-Tschopiwski and T. Palmrich (Arch. Eisenhüttenw., 1937—8, **11**, 405—408).—Steel containing 0·45% C was made in a 40-ton basic open-hearth furnace and deoxidised with $CaSi_2$ and the effect of additions of various proportions of Al in the ladle on the structure and notched-bar impact strength determined. The results show that the tendency to coarse grain growth is increased, and the temp. at which this occurs is lowered, the longer is the time that the charge is kept in the ladle; these effects are attributed to reaction between the metal and the ladle lining, resulting in an increase in the FeO content of the metal. By reducing the time in the ladle, by removing the slag before tapping the steel into the ladle, and by covering the steel in the ladle with a thick layer of CaO the amount of Al required to obtain a satisfactory metal can be reduced to 450 g./ton of steel. A. R. P.

**Causes of formation of sandy streaks on [steel] mill bars.** H. Grewe and R. Rückert (Arch. Eisenhüttenw., 1937—8, **11**, 421—429).—During the casting of steel the MnO in the metal and in entrapped particles of slag reacts with the clay substance ($Al_2O_3,2SiO_2$) in the refractories, forming liquid glasses from which corundum, mullite, sillimanite, and rhodonite crystals separate, together with spinel-like substances; loosening of the clay bond of the refractories also allows small particles of the grog material to become entangled in the glassy slag, and this mixture separates in streaks on the surface of the bars. These streaks are much less common when highly siliceous refractories are used instead of chamotte. A. R. P.

**Following the refining process in the Thomas [steel] converter by means of waste-gas analyses.** R. Frerich (Stahl u. Eisen, 1938, **58**, 1138—1143).—The partition of $O_2$ among CO, $CO_2$, and non-volatile oxides ($SiO_2$ etc.) is plotted from measurement of the blast and waste-gas analyses taken at intervals of 1—2 min. High blast rate and consequent high temp. favour the reduction of metallic oxides by C, but if these conditions are maintained during the dephosphorising period considerable loss of Fe in the slag may result. A. R. Pe.

**Automatic regulation of temperature and pressure inside a [steel] heat-treatment furnace.** M. Javelle (Mét. et Corros., 1938, **13**, 94—98). R. B. C.

**Influence of furnace atmospheres on scaling of mild steel at temperatures from 1200° to 1400°. Inst. Gas Eng. Gas Research Fellowship Rept., 1936—8.** A. A. Taylor and J. W. Cobb (Inst. Gas Eng., 1938, Comm. 196, 41 pp.; cf. B., 1937, 44).—The rate of scale formation in the "neutral" atm. increased very rapidly with the temp., particularly as the liquefying temp., determined as 1340—1350°, was approached. At temp. above this, rapid formation of liquid scale occurred, the amount of scale depending on gas velocity and being directly $\propto$ time of exposure. The further scaling produced by addition of $SO_2$ and of free $O_2$, both alone and together, to the "neutral" atm. also increased with the temp., but their effects were less marked, due to the greatly increased scaling caused by the "neutral" atm. alone. Scaling in atm. free from or containing S was reduced slightly by addition of CO; thus, the presence of 4% of CO reduced the scaling in the former by 15%, and in the latter by 3—6%. H. C. M.

**Third Report of the Steel Castings Research Committee. I. Introduction. II. Fluidity of iron–carbon and other iron alloys.** (A) **Fluidity of alloy steels.** J. H. Andrew, G. T. C. Bottomley, W. R. Maddocks, and R. T. Percival. (B) **Ruff fluidity test.** T. R. Walker, R. J. Sarjant, and T. H. Middleham. **III. Copper-steel castings.** M. Alexander. **IV Strength and ductility of cast steel during cooling from the liquid state in sand moulds.** ([illegible]. II.) H. F. Hall. **V. First report of Moulding Materials Sub-Committee.** (i) **Methods of testing moulding sands.** K. W. Slack and W. J. Rees. (ii) **Elutriation methods.** T. R. Walker, R. J. Sarjant, K. W. Slack, and W. J. Rees. (iii) **Compression strength of moulding materials.** T. R. Walker, K. W. Slack, W. J. Rees, R. J. Sarjant, M. Brown, and W. H. Salmon. (iv) **Refractoriness of moulding materials.** K. W. Slack, W. J. Rees, and R. J. Sarjant. (v) **Synthetic moulding sands.** T. R. Walker, F. N. Lloyd, K. W. Slack, and W. J. Rees. (vi) **Moulding compositions.** K. W. Slack and W. J. Rees. **VI. Bibliography.** Anon. (Iron & Steel Inst., Spec. Rept. 23, 1938, 294 pp.; cf. B., 1937, 45).—II. (A) The fluidity of Fe–C alloys containing Si, Cu, Cr, and Ni was determined, using the standard spiral mould, and the f.p. and m.p. of each alloy were measured. Curves for temp. of standard fluidity (12 in.)–composition follow the liquidus curves closely. Temp. is a more important factor for fluidity than composition. (B) Experiments made in two works show that the Ruff test (using a straight horizontal channel) gives promising correlation with the founder's verdict on the metal. Fluidity is definitely related to temp. The effect of varying composition has been studied.

III. 1% of Cu improves the mechanical properties of low-alloy steels and renders the castings susceptible to hardening below the crit. range.

IV. The tensile strength of steels of varying Mn and S contents was determined during cooling. A form of test casting which gives a satisfactory indication of susceptibility to hot-tearing is described.

V. (i) Methods of testing in current use are summarised and compared. (ii) The Crook and Boswell elutriators are compared and the need for standardising velocity is stressed. Two quick control methods for grading are described. (iii) Tests for green and dry strengths have been investigated and lines of standardisation are indicated. (iv) A Pt-strip sintering test is described and results for a no. of sands are given. (v) The effects of $H_2O$ and addition agents on the bonding power of various clays were studied. (vi) Types of grog and the prep. of moulding compositions have been investigated. Promising new home sources of suitable sands are described.

VI. A very complete bibliography on the manufacture, properties, and testing of steel castings is given. S. J. K.

**Control of [foundry sand] drying plant.** R. Liebetanz (Giesserei, 1938, 25, 328—329).—The importance of the temp. of the hot gases entering the drying drum is emphasised, and the effect of different running temp. on the coal consumption is shown. C. E. H.

**Influence of additions of up to 0·1% of boron on the tensile properties of cast steel with 0—5% of nickel.** G. Naton and E. Piwowarsky (Arch. Eisenhüttenw., 1937—8, **11**, 283—286).—Addition of 0·02—0·1% B to mild steels with 0·13—0·24% C and up to 5% Ni increases the tensile strength and hardness both in the normalised and in the quenched and tempered states. Tempering of the B-free steels at 50—150° produces a more or less pronounced decrease in hardness, whereas similar treatment of the same steels to which B has been added has either no effect on the hardness or produces slight pptn.-hardening. B causes considerable grain-refinement in the cast steel and also produces a fine-grained structure on tempering. A. R. P.

**Effect of deoxidation treatments on ductility of cast steels.** A. P. Gagnebin (Trans. Amer. Found. Assoc., 1938, **46**, 133—162).—The ductility (*D*) of heat-treated cast steel is directly related to the distribution of the sulphide inclusions. Steels with chains of sulphides arranged in a network around the primary grains have low *D* because stress concns. cause failure through the sulphide links, whilst steels with globular sulphides randomly distributed have high *D*. The arrangement of the sulphides depends largely on the O content of the melt, a high O content causing random distribution, and a low O content resulting in the network formation. A crit. amount of O is required for sound ductile steel and it is difficult to control this variable; porosity may develop because of insufficient deoxidisers, or low *D* may result because of an insufficient O content promoted either by reducing conditions during melting or by the use of a strong deoxidiser, *e.g.*, Al. A melting technique which produces steels of high *D*, high impact-resistance, and a high yield ratio is described. It involves the oxidation of the melt, followed by deoxidation with Si–Mn, Ca, and Al, which kills the steel and causes random distribution of the sulphides. R. B. C.

**Influence of additions of up to 20% of manganese on the structure and properties of cast [steel] alloys with 30% of chromium.** R. Kluke (Arch. Eisenhüttenw., 1937—8, **11**, 615—618).—The compound FeCr appears in the cast structure of 30% Cr steel when the alloy contains $>$10% Mn and 1% C, or $>$15% Mn with 0·35% C; annealing at 600—1000° for 100 hr. has no effect on the quantity or structure of the FeCr particles. Up to 13% Mn improves the tensile properties of 30% Cr steels at all temp., but reduces the creep limit at 600—700°. Even small amounts of Mn deleteriously affect the corrosion- and heat-resistance of Cr steel. A. R. P.

**Effect of aluminium on properties of medium-carbon cast steel.** C. E. Sims and F. B. Dahle (Trans. Amer. Found. Assoc., 1938, **46**, 65—132).—There is a crit. quantity of Al which will give complete deoxidation (elimination of FeO) and min. ductility (*D*) and impact-resistance. The mechanism of producing low *D* is to cause the sulphide to ppt. as a eutectic in the primary grain boundaries. Smaller amounts of Al allow the sulphides to ppt. as globules with no change in *D*, but they deoxidise the steel. Amounts of Al large enough to leave an excess form $Al_2S_3$ which lowers the solubility of the complex sulphides to the extent that they ppt. earlier as irregular masses which give *D* vals. amost as high as in absence of Al. Al additions to cast steels containing $<$0·025% S do not affect *D*, but may increase the impact-resistance. Mn up to 1·50% affects the strength but has no influence on *D*. The effect of size of Al addition outweighs that of variations in furnace practice, although the latter can affect *D* directly. R. B. C.

**Box-annealing of thin [steel] sheets. Realisation of optimum thermal conditions in the tunnel furnace.** R. Gadret (Chaleur et Ind., 1938, **19**, 321—329, 445—449, 483—486).—The advantages and disadvantages of the tunnel furnace for effecting microstructural changes in thin steel sheets are discussed. Annealing experiments carried out in order to prevent deformation of the edges and buckling of the sheets are described. R. B. C.

**Influence of the constituents of carbon steels on their tensile strength in the forged and annealed state.** F. Onitiu (Bull. sci. École polyt. Timişoara, 1935, 6, 139—144; Chem. Zentr., 1936, ii, 685).—Soft, medium, and hard steels were cast under the same conditions, forged to 90% reduction of cross-section, and annealed below the A3 point. The effect of C, Mn, Si, and P on the tensile strength, *R*, expressed in kg./sq. mm., is given by $R = 26·1 + 53 \times C + (11·6 + 40·8 \times C^2) \times Mn + 11 \times Si + 77·3 \times P$. The effect of S was negligibly small. H. J. E.

**Influence of degree of forging and heat-treatment on the alternate bending strength of various alloy steels for constructional purposes.** M. Schmidt (Arch. Eisenhüttenw., 1937—8, **11**, 393—399).—A large ingot of steel containing Cr 0·85, Ni 3·18, and Mo 0·32% was forged to bars of various thicknesses and the static mechanical properties, impact strength, and fatigue limit in alternate bending were determined after annealing at 830—870°, quenching in oil or air, and reheating at 630°. The vals. for the ductility and notched-bar impact strength of specimens cut in the direction of working were much superior to those of specimens cut transversely thereto, but the fatigue limit of the two specimens differed by $<$15%. Determinations were also made of the tensile properties, notched-bar impact strength, and fatigue limit of polished and notched specimens of 8 other constructional steels after heat-treatment to obtain various tensile strengths. The results show that the notch-sensitivity in endurance tests decreases with decreasing tensile strength, but bears no definite relation to the structure. The relation between the fatigue limit and tensile strength is improved by tempering above 500°. A. R. P.

**Effect of tempering quenched hypereutectoid steels on the physical properties and microstructure.** C. R. Austin and B. S. Norris (Trans. Amer. Soc. Met., 1938, **26**, 788—849).—The literature dealing with the reactions occurring in C steels below the eutectoid inversion, and with their effect on the physical properties, is critically reviewed. The difference in the reaction to tempering of hypereutectoid C steels of similar composition after quenching from 1000° is discussed in terms of electrical resistivity, magnetisation, coercive force, hardness, and microstructure. The differences in the behaviour of steels, particularly with respect to graphitisation at 650°, are illustrated by data obtained on the physical properties and by metallographic records. Austenitic grain size has an influence on the behaviour of the steels during tempering. R. B. C.

**Influence of repeated cold-working on the properties of chromium–molybdenum and nickel–chromium–molybdenum steels for high temperatures.** E. Greulich and H. Zschokke (Arch. Eisenhüttenw., 1937—8, **11**, 401—404).—Repeated cold-working with intermediate annealing widens the temp. range in which steels with (*a*) C 0·5, Cr 1·3, and Mo 0·6 and (*b*) C 0·15, Ni 1·5, Cr 0·75, and Mo 0·8% soften on heating and reduces the max. vals. of all their tensile properties; this is ascribed to the conversion of the lamellar pearlite into granular cementite. In the soft state induced by repeated cold-drawing and annealing, the fatigue limit is $\ll$ in the hot-rolled and heat-treated state, but it can be restored to this latter val. by a final heat-treatment. The resistance to creep at 500° is similarly affected by mechanical and heat-treatment. A. R. P.

**Decomposition of the solid solution in stainless steels of the "non-corroding 6" type during cold-rolling.** M. Vosdvijenski and G. Sergeev (Tech. Phys. U.S.S.R., 1935, **2**, 257—269).—Sheets of stainless steel after hardening or hot-rolling were cold-rolled and the crystal structure was investigated by *X*-ray analysis. Hardening at 1150° was sufficient to produce a pure austenite steel, but decomp. takes place on rolling. The greater is the speed or intensity of deformation the slower is the decomp. From a knowledge of the velocity–deformation curve for a given type of steel it is possible to obtain any desired properties in the steel at a given degree of rolling. The decomp. does not occur uniformly throughout the sheet, but is greatest at the surface. This is due to irregular distribution of the stresses set up in rolling, and to a smaller extent to a reduction of the C content due to combustion during hardening. A. J. M.

**Drilling capacity of plain steels.** H. Opitz and H. Jansen (Arch. Eisenhüttenw., 1937—8, **11**, 385—391).—The drilling properties of C steels are controlled by the C content, structure, and especially the hardness. Tables and graphs are given showing the relation between the hardness, the diameter of the drill, and the optimum rate of drilling. A. R. P.

**Special type of percussion deformation in steel (Krawz–Tarnawski effect).** N. Davidenkov and I. Mirolubov (Tech. Phys. U.S.S.R., 1935, **2**, 281—298).—The nature of the intermediate layer in this effect (microstructural change of a hammered steel) has been investigated. The heat evolved in the formation of the layer and the effect of the energy and velocity of the blow on its formation were determined. The hardness of the layer and the *d* of a sample with and without the layer were found. Two hypotheses are put forward to explain the formation of this layer. A. J. M.

**Hard-surfacing alloys.** F. E. Garriott (Steel, 1938, **102**, No. 24, 58—61).—The resurfacing of steel mill rolls by the arc-welding process, using Fe–Mo electrodes, is described. R. B. C.

**Alloy steels designed for specific uses.** V. T. Malcolm (Foundry, 1938, **66**, No. 7, 32—33, 80, 83; No. 8, 28—29, 76—78; No. 9, 30—31, 65—66).—The influence of Ni, Cr, W, and Mo on the grain structure and physical properties of steel is discussed. Recommended compositions of alloy steels for various purposes, and notes on melting and casting technique, are given. Experiments on the heat-treatment of steels containing W and Mo have shown that temp., and to a smaller extent time, determines structural characteristics. The material should be heated slightly below the crit. transformation point, followed by a normal period of heating just above the crit. temp. R. B. C.

**Commercial gas carburising [of steel].** L. D. Gable and E. S. Rowland (Trans. Amer. Soc. Met., 1938, **26**, 706—742).—The development of gas-carburising is reviewed. Commercial carburising installations are described with reference to the gases used and methods of operation. Variables affecting the depth and nature of the case are discussed, and recommendations with regard to their control given. R. B. C.

**Dry cyaniding [of steels].** R. J. Cowan and J. T. Bryce (Trans. Amer. Soc. Met., 1938, **26**, 766—787).—The processes of continuous nitriding and continuous gas-carburising have been combined to produce a case similar to a cyanide case. The results obtained with different steels by various modifications of the process are presented in a series of micrographs and charts. R. B. C.

**Physico-chemical principles of the decarburisation and scaling processes in iron and steel.** C. Wagner (Arch. Eisenhüttenw., 1937—8, **11**, 449—454).—The decarburisation of steel by gas mixtures containing CO and $CO_2$ depends on the sum of the partial pressures of these two gases, $(p_{CO} + p_{CO_2})$, on the ratio $p_{CO_2}/p_{CO}$, and on the temp. To prevent with certainty oxidation of steel on heating, the above ratio should be $<0{\cdot}3$. Expressions are derived for calculating the progress of decarburisation with time of contact with the gases, assuming that the diffusion of C in Fe is the slowest part of the process; with very thin sheet the time of decarburisation is determined by the reaction at the gas–metal boundary.

Assuming that the oxidation of metals proceeds by the movement of ions and electrons, the rate of formation of the oxide phase can be expressed mathematically; the theoretical vals. so obtained agree closely with the results obtained in the oxidation of iron to wüstite. If the diffusion inside the solid oxide film is the slowest partial reaction and therefore determines the time of oxidation, the process follows the simple time law of Tammann; this law does not always hold good since the nature and stability of the oxide film also play an important part in the oxidation process. A. R. P.

**Development of high-strength steels for large structures.** P. Hoff (Stahl u. Eisen, 1938, 58, 1053—1057).

**Galvanising quality.** R. W. Sandelin (Steel, 1938, 103, No. 1, 44, 56, 61).—Spots on galvanised steel were found to be areas where Zn has diffused into the steel base, leaving dull Fe–Zn alloy at the surface. The galvanising technique should be suited to the steel used. R. B. C.

**Influence of impurities and thermal treatment on corrosion of bar steel.** J. Czochralski and J. Milej (Wiadom. Inst. Met., 1935, 2, 10—15; Chem. Zentr., 1936, ii, 370).—Samples from the centre of the bar (C 0·8, Mn 2%) had a lower corrosion-resistance than those from the surface, owing to the higher concn. of impurities. Heated samples with a lamellar pearlitic texture were less resistant than were those with granular cementite, but hardened specimens did not show this effect. H. J. E.

**Influence of deformation on corrosion of steel water-pipes.** A. Skapski and E. Chyzewski (Mét. et Corros., 1938, 13, 21—34).—Sections of steel pipes (analyses given) were subjected to static deformation (*D*), placed in aq. NaCl + $H_2O_2$, $Na_2SO_4$, $FeSO_4$, or $H_2SO_4$, or in a suspension of humic acid in $H_2O$, and the losses in wt. in 200 hr. were measured and checked with data obtained when using the Todt corrosimeter. *D* does not influence the corrosion rate (*C*) of steel pipes in corrosive media (even if saturated with $O_2$) having $p_H > 4$. Corrosion, however, is accelerated by acid media of $p_H \sim 2$ and by high concn. of salts containing dissolved air. In a suspension of humic acids saturated with air *D* does not affect *C*, but if such a suspension is saturated with $O_2$ *C* is increased. R. B. C.

**Relation of soil properties to corrosion of buried steel.** W. F. Rogers (Ind. Eng. Chem., 1938, 30, 1181—1188).—Corrosion tests on cold-rolled steel in three soils, viz., corrosive (*A*), non-corrosive (*B*), and river sand (*C*), are reported. The soil was dried, ground to <20-mesh, mixed with the required amount of $H_2O$ (or alkali or salt solution), placed in glass jars, with the specimen, and tamped to the required degree of packing (*i.e.*, air content). *A* with 15% of $H_2O$ gave severe corrosion at all packing densities; *A* with 20—35% and *B* with 15—35% of $H_2O$ gave severe corrosion only at low packing densities, the max. variation of corrosion rates being 31 : 1 and 56·5 : 1, respectively. Decreasing the resistivity of *C* from 12,000 to 100 ohms/cm. by adding aq. NaCl of different concn. resulted in a slight increase of corrosion (1·5 : 1); the effect of $p_H$ was small. The controlling factor is the presence of $O_2$ in the soil. Examinations of a large no. of soil samples from two pipe-lines showed no correlation between $p_H$ or resistivity and corrosion. I. C. R.

**[Resistance of] nitrided austenitic manganese steel [to sea-water corrosion].** (Sir) R. A. Hadfield (Dept. Sci. Ind. Res., 1938, 17th [Interim] Rept. Commee. Inst. Civ. Eng., 31).—Tests have failed to confirm Satoh's statement (B., 1936, 278) that this material never rusts in sea-$H_2O$, and it is added that the heat-treatment involved is just that required to destroy the valuable properties of Mn steel and render it extremely brittle. P. G. McC.

**Spent [steel] pickle liquor.** Anon. (Steel, 1938, 103, No. 4, 35—36, 61).—The introduction of the continuous rolling process of making steel strip has resulted in the use of a high acid concn. in the pickling bath. A process for obtaining an innocuous effluent from spent liquor is described. The liquor is neutralised; Fe salts are pptd., filtered off, dried, and compressed. The material obtained has good heat-insulating properties. R. B. C.

**Behaviour of different sulphuric acids in strip-steel pickling plants.** W. Ufer and A. Döring (Stahl u. Eisen, 58, 1938, 1107—1111).—The rate of pickling of the steel and the acid consumption vary with the type of $H_2SO_4$ used (contact or chamber). The difference in the action of various acids is accentuated by presence of Cl′ or $NO_3'$; inhibitors had little effect on the process. Both from the technical and economical viewpoints, pickling is most efficient with $H_2SO_4$ of 15% concn. M. A.

**Limitations of *X*-ray and gamma-ray irradiation of steel.** R. Berthold (Berg u. Hüttenm. Monatsh., 1938, 86, 128—129).—A discussion. R. B. C.

**Use of *X*-rays as an aid in iron and steel research.** W. Schmidt and E. H. Schulz (Berg u. Hüttenm. Monatsh., 1938, 86, 161—166).—A review. R. B. C.

**Preferred method of making the McQuaid–Ehn grain-size test [for steels].** I. Fetschenko-Tschopiwski and A. Stanislawski (Arch. Eisenhüttenw., 1937—8, 11, 287—292).—It is recommended that the cementation be carried out at 900° for 4 hr., using a 60 : 40 mixture of wood charcoal and $BaCO_3$. A. R. P.

**Magnetic compensation method for testing steel structure.** M. Dehtyar (Tech. Phys. U.S.S.R., 1935, 2, 586—590).—Apparatus with advantages over the author's earlier (1934) differential device is described to test the temper of high-speed tool steels. I. McA.

**Recognition of faults in steel structures by magnetic, non-destructive methods.** H. Hänsel (Arch. Eisenhüttenw., 1937—8, 11, 497—502).—Some examples of the Fe-filings method of determining faults in or near the surface of small castings, springs, etc. are given and discussed. A. R. P.

**Static and dynamic tensile tests on austenitic manganese steels.** H. Krainer (Arch. Eisenhüttenw., 1937—8, **11**, 279—282).—Vals. obtained for the various mechanical properties on 91 Mn steels are shown in a table and in numerous graphs. The val. of an austenitic Mn steel for constructional work is considered to be best defined by the yield point, elongation, and sp. hardening. The last-named property is in dynamic tests > in static tests, whereas the vals. of the other two properties are smaller, as also is the tensile strength. With increasing C content the hardness, tensile strength, and yield point increase, but the elongation reaches a max. at 1·1% C; increase in the Si content improves the hardness and yield point only whilst addition of Ni up to 4% reduces the hardness and strength but slightly increases the elongation. Cr and V increase yield point and hardness but reduce the resistance to deformation, whilst Cu reduces the hardness and tensile strength. A. R. P.

**Differential dilatometer [for steel].** J. PAILLARD (Ingénieurs, Arts et Métiers, 1938, **92**, 72—74).—A recording dilatometer which simultaneously gives two cooling curves, one for a standard rod of Pyros steel and the other for the steel under test, is described. A calculation shows how to ascertain the hysteresis. R. B. C.

**Weld-sensitivity of chromium–molybdenum steels.** W. EILENDER and R. PRIBYL (Arch. Eisenhüttenw., 1937—8, **11**, 443—446).—Welding fissures develop in Cr–Mo steels as the result of the increased resistance to deformation of the steels between 600° and 700°, due to crystal segregation. The composition of the steel and the type of furnace in which it is made have no influence on the development of these fissures. Their formation may be prevented by overheating the steel and by deoxidising with $CaSi_2$ and Al or with Fe–Mn and Fe–Si. A. R. P.

**Welding fissures in chromium–molybdenum steels.** P. BARDENHEUER and W. BOTTENBERG (Arch. Eisenhüttenw., 1937—8, **11**, 375—383).—In the $O_2$–$C_2H_2$ welding of steels containing 1—1·2% Cr and 0·2—0·4% Mo the best joints are obtained by giving the metal a sufficiently long and thorough melting, using a welding rod containing 1·8% Ni. The tendency to develop hair-cracks is increased by increasing the C, Al, P, and especially the S content of the steel. Subsequent cold-hammering has no effect on weld-sensitivity. Cracking always occurs during the time the steel is passing through the transformation range and is therefore ascribed to stresses caused by the consecutive pearlite and martensite transformations accentuated by the presence of heat stresses and to reduction of oxide inclusions by $H_2$ absorbed during welding; this absorption is the greater the coarser is the grain size. A. R. P.

**Weldability by the oxy-acetylene process of chromium–molybdenum steels used in aircraft construction.** W. BONHOMME (Rev. Univ. Mines, 1938, **14**, 457—461).—Data on hardness, strength, expansion, and contraction in the vicinity of welds in sheet steel containing C 0·25, Cr 0·8, and Mo 1·15% are given. R. B. C.

**Use of *X*-rays to determine safety factor of welded high-pressure pipe-lines.** M. ROŠ and E. BRANDENBERGER (Berg u. Hüttenm. Monatsh., 1938, **86**, 167—173).—A practical discussion. R. B. C.

**Testing of clad steel sheets.** W. RÄDEKER (Stahl u. Eisen, 1938, **58**, 1153—1160).—A test for the adhesion of the clad layer is described. Two small specimens of the sheet are hard-soldered together on the coated sides and steel rods are welded to the other sides, the composite specimen being subjected to a tensile test. Results of tests on Cu-, Ni-, and stainless steel-clad sheet are given. The behaviour of the materials in hardness, bending, impact, and corrosion tests is described, and the effects of welding are discussed. C. E. H.

**Determination of carbon in iron and steels.** S. SHINKAI (J. Soc. Chem. Ind. Japan, 1938, **41**, 217B).—Experiments show that in an absorption train soda-lime (3 tubes) will itself absorb the $H_2O$ produced by interaction between NaOH and $CO_2$, and no other desiccant is required. I. C. R.

**Rapid determination of phosphorus in mild steel.** T. P. HOAR (Analyst, 1938, **63**, 712—717).—The phosphomolybdate method, in which copptn. of As is avoided by pptn. from tepid solution, is shown to be trustworthy for $\nless$0·4 mg. of P per g. of Fe. The alkalimetric procedure is replaced by a colorimetric method involving reduction to Mo-blue with $SnCl_2$. Correction is made for a small pptn. error, which is const. under the specified conditions, for amounts of P between 0·6 and 1·2 mg. E. C. S.

**Photometric determination of tungsten in steel.** G. BOGATZKI (Z. anal. Chem., 1938, **114**, 170—181).—The red colour obtained with $WO_3''$ and a solution of quinol (I) in conc. $H_2SO_4$ is utilised for the photometric determination of W in tool- and high-speed steels, including those with high Cr and Mo contents. Interference by $Fe^{\cdot\cdot\cdot}$ and Mo is removed by addition of a reducing agent ($SnCl_2$ + $H_3PO_4$), and a correction is introduced for large amounts of Cr. $V^{\cdot\cdot\cdot}$, Ni, Al, Cu, Mn, and Ta do not interfere, but Ti and $NO_3'$ must be absent. Small amounts of $H_3PO_4$ are without effect, but the displacement produced in the extinction curve by the presence of $Cl'$ must be taken into account. W must be in the sexavalent condition, and $H_3PO_4$ is added to inhibit reduction of the $WO_3''$ by the $SnCl_2$. Ti with (I) in $H_2SO_4$ gives a red colour, which is stable on dilution with $H_2O$. The colour obtained with W weakens on dilution with $H_2O$, but addition of more (I) counteracts this. Details of procedure, including a micro-method, for the determination of W in steels are given, and data comparing the photometric with a gravimetric method are recorded. L. S. T.

**Potentiometric determination of molybdenum and copper in steel.** E. SCHAEFER (Arch. Eisenhüttenw., 1937—8, **11**, 297—302).—The steel (1 g.) is dissolved in 15 c.c. of a 1 : 2 mixture of 1 : 1 $HNO_3$ and 1 : 1 HCl, 15 c.c. of $H_3PO_4$ (*d* 1·7) being added if W is present. When red fumes cease to be evolved 5 c.c. of conc. HCl are added, followed by 100 c.c. of hot $H_2O$ and a few crystals of $FeSO_4$ to destroy the remaining $HNO_3$. CuS and $MoS_3$ are then pptd. by addition of saturated aq. $Na_2S$, the washed ppt. is ignited at 450°, the residue dissolved in HCl, and traces of Fe are

removed by pptn. with aq. $NH_3$. The filtrate is made just acid with HCl, treated with 10 c.c. of 1 : 1 HCl and 5 c.c. of 10% aq. KCNS, diluted to 200 c.c., and titrated potentiometrically with aq. $TiCl_3$, using a Pt gauze as stirrer and indicator electrode and a saturated calomel reference electrode. Cu is titrated first, being pptd. as CuCNS, and the $Mo^{VI}$ is then reduced to $Mo^{V}$, the end-point of both titrations being marked by a well-defined decrease in potential.
A. R. P.

**Spectroscopic analysis of steel alloys.** G. Landsberg, S. Mandelstam, S. Tuljankin, and W. Zeiden (Tech. Phys. U.S.S.R., 1935, 2, 574—585; cf. Schliessmann, B., 1935, 64).—Method and apparatus designed for rapid works practice are described, with applications. From standardised arc spectra, line-intensity criteria based on visual observation of homologous pairs are given for the semi-quant. determination of Cr, V, Mn, Co, W, Mo, and Ni.
I. McA.

**Melting of non-ferrous alloys.** N. K. Patch (Foundry, 1938, 66, No. 4, 33—34, 82; No. 5, 71, 138).—The operation of pit-type furnaces is discussed.
R. B. C.

**Composition and treatment of iron and steel crucibles for melting [metals].** E. R. Thews (Iron Steel Ind., 1936, 9, 249—252; Chem. Zentr., 1936, ii, 685).—For melting Zn a cast Fe with 3·5—4·0% C, of which 90% should be present as carbide, and Ni 2·5, Cr 1·23%, or a white cast Fe with approx. 3% Cr, is used. A coating of water-glass mixed with kaolin minimises attack by the molten Zn. For melting Al a crucible with C 3·75, Fe carbide 0·5, Mn 0·8, Si 2·75, Cr 0·55, S 0·12, and P 0·42% is used. Addition of $\ngtr$2% Ni increases the resistance to molten Al. For molten Pb a container with C 3—3·5 and Si 5—6% is recommended.
H. J. E.

**Rate of dissolution of iron, manganese, and ferromanganese in molten copper.** J. Czochralski and T. Beriszwili (Wiadom. Inst. Met., 1935, 2, 24—26; Chem. Zentr., 1936, ii, 686).—The rates of dissolution in Cu at 1150—1200° were measured. Mn dissolves very rapidly and Fe only slowly. Mn in ferromanganese (I) dissolves three times as rapidly as the Fe with which it is associated. Fe in (I) dissolves much more slowly than does pure Fe.
H. J. E.

**Mechanical properties of tin–copper alloys.** W. Broniewski and Z. Wawrzynkiewicz (Rev. Fond. mod., 1936, 30, 147—151; Chem. Zentr., 1936, ii, 686).—Quenching in $H_2O$ from 720° influences the mechanical properties only for alloys with $>$12% of Sn. Data are recorded. The hardness increases slowly with Sn content for $<$12% Sn and rapidly for 12—26% Sn. The impact strength decreases slowly up to 12% Sn and rapidly from 13 to 17% Sn.
H. J. E.

**Chemical analysis of [antimony–tin] alloys.** V. Beneš (Chem. Obzor, 1938, 13, 139—141, 161—163).—Busse's method is examined. On dissolution in $HNO_3$, the Sb separates quantitatively from the solution together with the Sn, without evaporating to dryness, only when the latter is present at least in the ratio 3Sn : 1Sb. Reduction is carried out by Pb, the presence of Sb helping to make the reduction of $Sn^{\cdot\cdot\cdot\cdot}$ complete. Sb is determined with $KMnO_4$ and Sn iodometrically, satisfactory results being obtained.
F. R.

**Transformation of β-tin into the α-form.** M. Tschertok (Tech. Phys. U.S.S.R., 1935, 2, 591—597; cf. Komar, A., 1935, 1311).—Temp. (−10° to −76°), grain size, and plastic deformation affect the transition in mono- and poly-cryst. plates. The linear speed of transition is a max. at −30°; it increases with decreasing grain diameter $<$1 mm. The nature and accelerated growth of α-nuclei caused by plastic deformation are described, with photomicrographs, and these confirm theory. I. McA.

**Irregular dilatometric anomalies in aluminium–copper alloys with approximately 12% of aluminium.** A. Boutillier (Compt. rend., 1938, 207, 498—500; cf. B., 1937, 48).—If a specimen of the alloy is cooled rapidly after formation of the β-solution by heating at $>$580°, the anomaly corresponding with the production of the hardening phase is succeeded by a rapid expansion at 370—280°; on reheating, a corresponding contraction occurs at 400—450°. The transformation may be repeated by successive cooling and heating, but is ultimately inhibited by dissociation of the hardening phase. If the initial cooling is slow the direction of the anomaly is reversed, although the physical properties of the specimen are not changed. The crit. velocity of cooling for the change of sign is not well-defined, but varies with the specimen and its previous heat-treatment. The anomaly is attributed to a reversible transformation in the hardening phase.
A. J. E. W.

**Mechanical properties of some copper alloys at room temperature.** W. Broniewski (Rev. Mét., 1938, 35, 333—348, 385—396).—The mechanical properties of Cu and its alloys with Si, Ni, Mn, Zn, Sn, and Au are reviewed. A study of Cu–Si alloys containing up to 6% Si shows that the best combination of properties is obtained in alloys containing 4% Si. In the case of Cu–Al alloys, with the appearance of the γ-phase in annealed alloys or of the β-phase in quenched alloys the hardness and strength are increased but the elongation is decreased. The Al content should be $\ngtr$9·5% owing to loss of ductility. In pure α-alloys the elongation is increased by increasing the purity of the Al and by cold-rolling, but when the α-range is exceeded the greatest elongation is obtained in alloys containing Si as an impurity. In Al–Cu alloys the best combination of properties is obtained with 6% Cu. These alloys, suitably heat-treated, possess properties = those obtainable with duralumin. Experiments on the age-hardening of duralumin showed that hardening due to Si is of the same order as that due to $CuAl_2$, but $<$ that due to $Mg_2Si$.
M. A.

**Methods of joining copper alloy products. VIII. Sheets.** I. T. Hook (Metal Ind., N.Y., 1938, 36, 427—429; cf. B., 1938, 1308).—Bronze welding and the fusion welding of Cu alloy sheets are described.
L. S. T.

**Influence of beryllium on brass. I. Structure.** W. Koch and P. Röntgen (Metallwirts., 1938, 17, 997—1003).—Alloys containing Cu 56—72%, Be

0·1—1%, and Zn the remainder were examined microscopically in the cast condition and after rolling, annealing, and quenching. Be has a pronounced grain-refining action, and displaces the $\alpha/\alpha + \beta$ and $\alpha + \beta/\beta$ phase boundaries of the Cu–Zn system to higher Cu concns. It reduces the solubility of Cu in the $\alpha$ and $\beta$ solid solutions more strongly than does Al. Two new constituents appear in specimens having a ground-mass of $\alpha$ solid solution, and one resembling an intermetallic compound is seen in alloys containing $\beta$. These have not been identified. C. E. H.

**Magnetic determination of iron in brass.** W. Gerlach (Metallwirts., 1938, **17**, 660—661).—A simple ferromagnetic apparatus, capable of determining $\sim$0·003 mg. of Fe per cm.$^3$ of brass (0·0002%) is described. The test indicates only the amount of Fe which has separated from solid solution, and the ratio of this amount to the total Fe content has been determined in the case of a no. of samples. C. E. H.

**Influence of composition and structure on mechanical properties of $\alpha$–$\beta$-brass.** H. Unckel (Metallwirts., 1938, **17**, 389—394).—Tensile, hardness, and impact tests were carried out on seven Cu–Zn alloys containing 57·34—63·59% Cu, and the average grain size and proportions of $\alpha$ and $\beta$ were determined. Specimens were examined after hot-pressing, followed by quenching from 550—850°. The mechanical properties were determined by the amount and distribution of the $\beta$. In drawing tests on the quenched alloys the $\alpha$ was deformed more than the $\beta$, the force necessary depending on the amount of $\beta$ present. The change in properties on drawing was similar for all alloys. C. E. H.

**Production and properties of age-hardenable 5% nickel-bronze castings.** T. E. Kihlgren (Trans. Amer. Found. Assoc., 1938, **46**, 41—64).—The mechanical and physical properties of Cu 58, Sn 5, Ni 5, and Zn 2% in the as-cast and heat-treated states are described. The presence of 0·05% of Pb in the bronze retards age-hardening. Si retards ageing, but the effect of small amounts (0·05—0·10%) can be diminished to a considerable extent by raising the ageing temp. and increasing the Ni content (up to 5·5%). Foundry and moulding techniques are described. R. B. C.

**Formation, stability, and structure of nickel carbide.** R. Kohlhaas and W. F. Meyer (Metallwirts., 1938, **17**, 786—790).—Specimens of Ni were carburised at different temp. and subjected to $X$-ray examination. The only compound formed is $Ni_3C$, which is produced between 240° and $\sim$ 580°. It is metastable above 420—500°, the separation of C being due to the equilibrium in the Ni between the carbide, diffused carburising gases, and their decomp. products. The cryst. structure of $Ni_3C$ is rhombic (not hexagonal as previously supposed) and probably isomorphous with $Fe_3C$ and $Co_3C$. C. E. H.

**Electrical properties of manganin after different thermal treatments.** A. Schulze (Metallwirts., 1938, **17**, 437—439; cf. B., 1937, 1220).—The tensile strength of manganin shows a min. and the temp. coeff. of resistance a max. val. after annealing at $\sim$ 250°. The thermo-e.m.f. against Cu is small and is little affected by variations in the annealing temp. It is concluded that 400° is a suitable temp. for the ageing of standard resistance wires, and figures are given showing the constancy of 10- and 1-$\Omega$ resistances during 6 months after this treatment. The variations were $<10^{-6}\ \Omega$. Determinations have been made between 400° and —200° of the resistivity and temp. coeff. after ageing at 400°. The latter is only 5—10% of the val. after the usual ageing at 140°. C. E. H.

**Galvanising problems from the [zinc] metallurgist's viewpoint.** W. M. Peirce (Iron Age, 1938, **141**, No. 21, 34—36).—Factors which determine successful galvanising by the hot-dip process, *e.g.*, time of immersion and composition of the Zn, are discussed. The effect of the presence of Al on the composition of the Fe–Zn layer is examined in relation to the problem of fluxing. R. B. C.

**Sizing of zinc dust by sedimentation.** A. Siff (J. Chem. Met. Soc. S. Afr., 1938, **38**, 448—463).—The apparatus consists of a glass tube, 100 cm. long and 27 mm. internal diameter, which can be vibrated by means of two electric-bell mechanisms the hammer heads of which are replaced by small rubber stoppers. The Zn dust (1 g.) is agitated with 10 c.c. of $CCl_4$ and the mixture rinsed into the inverted tube and allowed to settle for 15 min.; the tube is then filled with $CCl_4$ and inverted into a trough of the same liquid. Fractions of the dust are collected at the lower end after various times, which are calc. from Stokes' law for the various-sized particles. Separation is clean, variations in $\eta$ and temp. are simply and easily allowed for, and the height of fall for all particles is the same. A. R. P.

**Influence of alloy constituents on properties of zinc die-castings.** E. T. Richards (Giesserei, 1938, **25**, 375—376).—The effects of variations in composition on the mechanical properties, corrosion-resistance, and dimensional permanence are briefly reviewed. C. E. H.

**Corrosion of lead by stray currents.** S. Reiner (Z. Metallk., 1938, **30**, 277).—Tests made in 1% aq. NaCl with current from a 2-v. accumulator indicate that wrappings of bitumen-impregnated paper and jute are insufficient to afford complete protection to Pb cables buried in damp, salty soils. A. R. P.

**Influence of elements on properties of lead. VII. Influence of composition on creep rate of industrial lead.** J. N. Greenwood and H. K. Worner (Proc. Austral. Inst. Min. Met., 1936, No. 104, 385—422; cf. B., 1937, 144).—Rolling induces work-hardening in Pb containing additions ($\not>$0·1%) of other elements. Certain annealed Pb specimens show an "ageing" effect in the creep phenomena observed. The effects of up to 0·1% of Ag, Sb, Bi, and Zn, respectively, on the creep rate of Pb in the rolled and annealed states, at stresses of 500 and 350 lb./sq. in., were investigated. All four elements form solid solutions at that concn. Ag increases hardness and resistance to creep, and decreases grain size after rolling; at 350 lb./sq. in. min. extension is obtained with 0·03% Ag. Sb at 350 lb./sq. in. has little influence, but gives increased creep rate at 500 lb./sq. in. A little Bi causes marked increase in the initial creep rate of rolled alloy; in annealed alloys Bi has very slight effect. Zn slightly reduces the creep rate. Alloys with 0·01% Sb and 0·005% Bi, respectively, are very susceptible to grain growth. S. J. K.

**Influence of composition on properties of lead. VIII. Influence of copper.** J. N. Greenwood and C. W. Orr (Proc. Austral. Inst. Min. Met., 1938, No. 109, 1—24; cf. preceding abstract).—Alloys containing up to 0·3% Cu were investigated. Addition of Cu up to the eutectic composition (0·06%) has little effect on the hardness of Pb, though the alloys age-soften slightly. Types of creep curve obtained are discussed. The alloys were tested for creep, under stresses of 350 and 500 lb./sq. in., in the as-rolled and annealed (15 min. at 100° and 24 hr. at 125°) states. Up to 0·01% Cu increases the creep rate; further additions cause a rapid decrease. This initial increase may be associated with a limited solubility of Cu in Pb. Vibration superposed on direct stress appreciably increases the creep rate; even then, with 0·06% Cu, at 350 lb./sq. in. the stretch is $<1\%$ during the first year and the rate of creep at the end of that period $<0·5\%$ per annum. Cu increases the stability of the crystal lattice, reducing the tendency to recrystallise under stress. The beneficial effects of Cu depend on the state of dispersion and thus commercial application calls for careful control. S. J. K.

**Lead–antimony–arsenic alloys.** A. Väth (Metallwirts., 1938, 17, 879—881).—The *d*, hardness, and compressive strength of alloys containing up to 18% of Sb and 9% of As have been determined. Addition of up to 2·5% of As (eutectic concn.) rapidly increases the hardness of Pb–Sb alloys, but further additions cause a more gradual increase. As has a greater hardening effect on alloys which are hypereutectic with respect to Sb, giving alloys with high compressive strength but a tendency to brittleness. Alloys low in Sb, with As in excess of the eutectic concn., do not possess high compressive strength. The Pb–Sb–As alloys have good fluidity and casting properties. C. E. H.

**Modified permanganate method for determination of antimony in commercial lead and high-lead alloys.** R. G. Myers (Philippine J. Sci., 1938, 64, 365—371).—The alloy (1 g.) is dissolved in 15 c.c. of conc. $K_2SO_4$ and 5 g. of $KHSO_4$ and, after cooling, 15 c.c. of $H_2O$ are added; when the insol. sulphates have settled, the clear liquid is decanted off, the sulphates are washed with two lots of 10% tartaric acid solution by decantation and dissolved in 40 c.c. of hot 33% $NH_4OAc$ solution, and the clear liquor so obtained is rinsed into the decanted solutions to which 10 c.c. of HCl have been added. The mixture is boiled for 1 min., cooled to 5—8°, and titrated with 0·1N-$KMnO_4$. This procedure avoids errors due to occlusion of $Sb^{III}$ compounds in the $PbSO_4$ ppt. obtained by the usual method. A. R. P.

**Sodium–lead alloys by carbon reduction.** G. L. Putnam (Ind. Eng. Chem., 1938, 30, 1138).—Mixtures of anhyd. NaOH (10 g.) and pulverised petroleum coke (1·6 g.) with Pb (10 g.) (*A*) and without Pb (*B*) were heated in a covered crucible at 750° until evolution of $H_2$ ceased. Dissolution of charge *B* in $H_2O$ yielded $H_2 \equiv 3\%$ of Na. Pb–Na alloy from *A* contained $\sim 5\%$ of Na, $\equiv$ yields of about 50%, based on the amount of $Na_2CO_3$ produced ($6NaOH + 2C \rightarrow 2Na_2CO_3 + 2Na + 3H_2$). In 15 min. at 750° the $NaOH \rightarrow Na_2CO_3$ conversion was $>90\%$. Reduction of $Na_2CO_3$ was much more difficult than that of NaOH, the Pb–Na alloy from $Na_2CO_3$ (7·5), coke (2·5), and Pb (25 g.) containing 0·79% of Na after 4 hr. at 1000°. C reduction of CaO, $BaCO_3$, and $SrCO_3$ in presence of Pb was not achieved; K compounds were more easily reduced than those of Na. The process may be suitable for producing Na–Pb alloys as a step towards $PbEt_4$. I. C. R.

**Stability of some alloys for springs compared.** L. L. Stott and R. W. Carson (Met. & Alloys, 1938, 9, 233—236).—The drift (creep) of stressed spring alloys was determined, using a very sensitive recording electronic micrometer. Rating the drift for Be–Cu, after optimum heat-treatment ($\ngtr 20$ min. at 345°), as 1·0, the vals. for nickel-silver and phosphor-bronze are 1·4 and 2·8, respectively. S. J. K.

**Welding of Herkuloy.** R. Steinmetz (Weld. Eng., 1936, 21, No. 4, 28–31; Chem. Zentr., 1936, ii, 689).—Operating details are given. A borax–fluoride flux is preferred. H. J. E.

**Mineralogical characteristics affecting the concentration of a semi-oxidised lead–silver ore.** R. E. Head (Amer. Inst. Min. Met. Eng., 1938, Tech. Publ. 939; Min. Tech., 1938, 2, No. 4, 9 pp.).—Low-grade Ag ores from Tintic, Utah, contain galena, anglesite, cerussite, plumbojarosite, chalcopyrite, chalcocite, enargite, tetrahedrite, and pyrite in a gangue of oxidised Fe minerals, quartz, limestone, and numerous decomposed silicates. The Ag occurs in the tetrahedrite, as pearcite and argentojarosite, and in the native form finely disseminated in the oxidised Pb minerals. Crushing the ore to 150-mesh liberates the greater part of the valuable minerals, but the resulting $PbCO_3$ and $PbSO_4$ slimes are difficult to float. The anglesite and cerussite occur in light and dark forms, both very rich in Ag; the floatability of these forms differs so that it is difficult to find a combination of reagents which will float both. The argentojarosite and some of the metallic Ag particles are also very difficult to float. A. R. P.

**Milling complex gold–silver ore at La Mazata, Mexico.** O. P. Dolph (Min. and Met., 1938, 19, 237—238).—The ore consists of galena, pyrite, sphalerite, and argentite in a gangue of quartz, calcite, rhodochrosite, and pyrolusite; it averages Pb 0·9, Zn 1·2, Fe 4·2, Mn 4%, Au 3·3 and Ag 571 g./ton. Those parts of the ore-body with a high $MnO_2$ content yielded sometimes only 5% of their Ag content to KCN solution. Present practice consists in stage-grinding the ore, classifying the pulp, thickening the overflow with $Ca(OH)_2$, and floating the underflow from the thickener with a xanthate–Aerofloat mixture using starch as a gangue depressant. The froth is recleaned and the final concentrate shipped to a smelter; the tailings from the rougher machine are thickened and cyanided. The flotation concentrate assays (g./ton) Au 88 and Ag 15,500, the tailing Au 0·9 and Ag 121, and the cyanide residue Au 0·3 and Ag 60. A. R. P.

**Cold welding of silver.** A. Butts and G. R. Van Duzee (Trans. Electrochem. Soc., 1938, **74**, Preprint 32, 487—496).—Under const. high pressure the welding time decreases rapidly as the temp. is raised from 200° to 400°. 200° is the lowest practical welding temp. The effect of surface impurities on the weldability is discussed. J. W. C.

**Application of the determination of minerals in polished sections to the study of the mechanical dressing of a gold-bearing ore.** M. Legraye (Bull. Soc. géol. Belg., 1936, **59**, 197—203; Chem. Zentr., 1936, ii, 1585).—The zones and minerals with which free Au is associated in the Au-bearing ores of Salsigne have been determined by microscopical examination of polished sections. Enrichment of the Au occurs mainly in the mispickel-bearing zones. L. S. T.

**Treatment of [auriferous] smelter residues from Costerfield, Victoria.** J. G. Hart (Chem. Eng. Min. Rev., 1938, **30**, 345—346).—Scoria from smelting the antimonial Au ore contains Sb 5·06% and Au 7·4 dwt./ton; the Au particles are finer than 20 μ. and are therefore not completely exposed by grinding to 325-mesh. Cyaniding after grinding to 88% through 200-mesh extracts only about half the Au with a KCN consumption of 3 lb./ton. A. R. P.

**Treatment of auriferous stibnite ores.** J. G. Hart (Chem. Eng. Min. Rev., 1938, **30**, 213—214).—The use of alkaline solutions in the cyaniding of Au ores or tailings containing $Sb_2S_3$ or $Sb_2O_3$ leads to poor extractions of Au since the thioantimonates or antimonites formed are powerful reducing agents and absorb the dissolved $O_2$ in the cyanide solutions, thus preventing dissolution of the Au. A. R. P.

**Air-slaked lime in cyanidation [of gold ores].** F. N. Hanlon. B. H. Moore (Chem. Eng. Min. Rev., 1938, **30**, 229—230, 230—231).—Explanations are suggested for O'Brien's observation (B., 1938, 388) that air is better than $H_2O$-slaked CaO for neutralising acidity in antimonial Au ores before cyaniding. Both writers ascribe the effect to the lower $Ca(OH)_2$ content of the former base, since $Ca(OH)_2$ dissolves Sb compounds which deoxygenate the $H_2O$ (cf. Hart, preceding abstract). A. R. P.

**Cyanidation of antimonial [gold] ores.** G. H. Payne, W. G. Clarke, and B. H. Moore (Chem. Eng. Min. Rev., 1938, **30**, 344—345).—Cyanide tests on partly oxidised tailings containing 3·68% Sb and $>1$ oz. of Au per ton showed that high alkalinity in the leach liquors resulted in dissolution of $Sb^{III}$ compounds, which absorbed the dissolved $O_2$ necessary for dissolution of the Au. Good extractions of Au were obtained by Wilfley-table concn. followed by cyanidation of the tailings, using no protective alkalinity; the KCN consumption was 1·93 lb./ton. A. R. P.

**Cleaning up of old gold reduction works and sites and treatment of certain current by-products.** E. Davey (J. Chem. Met. Soc. S. Afr., 1938, **38**, 441—446).—Methods used in recovering the Au from made-up grounds around the reduction works, smelting ash dumps, sumps, drains, and floors in the mill, smelting furnaces, various conveying and treatment apparatus, and Cu amalgamating plates are described; they consist of combinations of gravity, smelting, and cyanide treatment. A. R. P.

**Assay of gold in cyanide solution.** J. T. King and S. E. Wolfe (Chem. Eng. Min. Rev., 1938, **30**, 265—266).—The solution is treated with an excess of $Cu_2Cl_2$ solution to ppt. all the CN′ as AuCN and CuCN. The ppt. is coagulated by adding a few drops of 10% aq. $Na_2S$ or some filter pulp, collected, washed, dried, and fused with PbO and fluxes to obtain a Pb button for cupellation. A. R. P.

**Spectrographic examination of assay beads for platinum, palladium, and gold.** J. Seath and F. E. Beamish (Ind. Eng. Chem. [Anal.], 1938, **10**, 535—537).—A qual. spectrographic procedure has been developed in order to minimise the time required for determining Pt, Pd, and Au in ores. A method whereby Ag–Pt and Ag–Pd beads can be sparked for the detection of traces of Pt and Pd is described. In the systems Ag–Pt, Ag–Pd, and Ag–Au, arcing of 10-mg. Ag beads will detect 0·0004 mg. of Pt, and 0·0001 mg. of Pd or Au; the more prominent lines are recorded. 0·0006 mg. of Pt or Pd can similarly be detected in 10-mg. Au–Pt or Au–Pd beads. With Ag and Au beads containing two or more Pt metals, the limits of detection are of the same order of magnitude, and when the proportions of Ir, Rh, and Ru in the bead are low ($\ngtr$0·05 mg. in 10 mg.) there are no line interferences. L. S. T.

**Manganese.** A. W. Groves (Imp. Inst., London, 1938, 164 pp.).—The distribution of Mn ores throughout the world, and the production, properties, and uses of Mn are comprehensively reviewed. R. B. C.

**System manganese–vanadium.** H. Cornelius, W. Bungardt, and E. Schiedt (Metallwirts., 1938, **17**, 977—980).—Ten alloys containing 0·5—80% V were examined for hardness and structure. All are very brittle, particularly those containing $<10\%$ V, and the Mn-rich alloys are extremely hard. With increasing V the m.p. rises, at first slowly and then rapidly, exceeding that of Pt when the V content is $>60\%$. The solid-solubility of V in Mn is $\sim5\%$ at high temp. *X*-Ray and microscopical examination indicated three compounds, one of which is probably MnV. C. E. H.

**Chemical technology of vanadium.** V. Přistoupil (Chem. Obzor, 1938, **13**, 4—10, 34—41, 55—60).—A review. F. R.

**Cemented tungsten carbide alloys.** W. P. Sykes (Amer. Inst. Min. Met. Eng. Tech. Publ. 924, 1938, 11 pp.; Met. Tech., 1938, 5, No. 4).—The structures of typical Co-cemented WC alloys are described. Photomicrographs and *X*-ray photograms are given. R. B. C.

**Mineral industry of Alaska in 1936.** P. S. Smith (U.S. Geol. Surv., 1938, Bull. 897-A, 107 pp.).—Production data for Au, Ag, Cu, Pb, Pt metals, Sn, coal, petroleum, and miscellaneous minerals are recorded. L. S. T.

**Investigations in ore dressing and metallurgy.** C. S. Parsons (Canada Dept. Mines, 1937, No. 785, 1—156).—Detailed reports are given of gravity concn., flotation, and cyaniding tests on 11 Canadian Au ores, of flotation tests on a blende–chalcopyrite–pyrite ore, and of classification and table-concn. tests on a complex chromite ore. Brief accounts are also given of extraction tests on numerous complex ores and of several metallographic investigations on steels. A. R. P.

**Special methods for concentrating and purifying industrial minerals.** G. W. Jarman, jun. (Amer. Inst. Min. Met. Eng., 1938, Tech. Publ. 951; Min. Tech., 1938, 2, No. 4, 10 pp.).—Induction and electrostatic separators and a modern air-flotation table are described, and some examples of their use in mineral separations are given. A. R. P.

**Modern flotation reagents, their classes and uses.** R. C. Whiting (Min. and Met., 1938, **19**, 185—188).—A review of the functions of frothers, collectors, depressants, activators, and conditioners used in modern flotation work. A. R. P.

**Pulverised fuel in the drop forge and press shop.** Anon. (Iron Steel Ind., 1938, **11**, 547—550, 587—590).—The advantages of using pulverised fuel for firing forge furnaces are discussed, and systems of firing employed by various British metallurgical firms described. R. B. C.

**Calculation of the temperature [distribution] in strongly heated rods and wires.** J. Fischer (Z. Physik, 1938, **110**, 397—427).—Equations are derived for the temp. distribution in rods, wires, and bands of metal when heated strongly either electrically or indirectly at one end. Radiation, convection, and conduction are taken into account. H. C. G.

**Thermal conductivity of some alloys for gas containers at higher temperatures.** F. Bollenrath and W. Bungardt (Metallwirts., 1936, **15**, 368—370; Chem. Zentr., 1936, ii, 366).—Data are given for six alloys. The optimum thermal conductivity was possessed by alloys with Al 92·04, Cu 4·01, Ni 1·94, Fe 0·22, Mg 1·57, Si 0·21, and Mn 0·01% (pressed) and Al 87·71, Cu 10·73, Cu 1·10, Ni 1·10, Fe 0·01, Mg 0·30, Si 0·12, and Zn 0·03% (cast). Mn additions ~1·73% decrease the thermal conductivity. H. J. E.

**Deformation, heat-treatment, and solubility [of metals and alloys].** Anon. (Korros. u. Metallschutz, 1936, **12**, 2—27; Chem. Zentr., 1936, ii, 539).—Data for the solubility in 0·1N-HCl at 20° after varying mechanical and thermal treatments are given with special reference to the hot- and cold-rolled soft Fe (C 0·06, Mn 0·50, S 0·03%); annealed cast steel (C 0·22, Si 0·33, Mn 0·87, P 0·08, S 0·08%); Siemens–Martin steel (C 0·24, Si 0·25, Mn 1·13, P 0·05, S 0·02%); 70 : 30 brass (Cu 69·80, Zn 30·20%, traces of Pb, Fe, Sn, and Ni); 71 : 28 : 1 special brass (Cu 70·70, Zn 28·00, Pb 0·1, Sn 1·2%); 72 : 27 : 1 special brass (Cu 71·82, Zn 26·57, Pb 0·40, Sn 1·06, Fe 0·15%); 70 : 29 : 1 special brass (Cu 69·84, Zn 29·08, Sn 1·05%, traces of Pb and Fe); 25 : 75 Ni–Cu (Cu 74·14, Ni 24·40, Pb 0·86, Sn 0·26%, traces of Fe, Mn, and Co). The effects of grain size on solubility and changes in electrical conductivity and electrode potential accompanying dissolution are discussed. H. J. E.

**Distortion of metals by cold-working.** H. A. Wainwright (Proc. Inst. Mech. Eng., 1937, **137**, 311—332).—A review of recent work and modern theories of the mechanism of plastic deformation. A. R. P.

**Creep of metals under static and repeated stress.** F. C. Lea (Metallurgia, 1938, **18**, 213—214).—The importance of a knowledge of creep phenomena in engineering design, especially where elevated temp. are involved, is stressed, and is illustrated by experimental results. S. J. K.

**Elastic hysteresis in wires, sheets, and yarns.** I. J. Saxl (Physical Rev., 1937, [ii], **51**, 596).—Quant. methods for routine measurements of elastic after-effects have been worked out and applied to the development of new textile materials and other products. L. S. T.

**Wear tests for hard metals, cast iron, and light metals on the Nieberding wear-testing machine.** R. Zimmer (Forsch. Metallk., 1935, Folge, **18**, 61 pp.; Chem. Zentr., 1936, ii, 688).—Among hard metals, the carbides showed an extraordinary resistance to wear. Cast irons for piston rings and cylinder castings were tested, and the most suitable structure for rings was found to be a pearlitic structure with irregularly distributed graphite particles of moderate size. Addition of $\not>$0·5% of Cr and $\not>$1·3% of Ni increased the wear-resistance of cylinder castings. Comparative data for a large no. of light-metal alloys are recorded. H. J. E.

**Simple determination of the hardness, tensile strength, and elongation [of metals].** F. König (Z. Metallk., 1938, **30**, 267—268).—For making comparative hardness tests on metals a simple machine is described in which the load is measured on a spring balance and applied by means of a lever. To determine tensile strengths of small test-pieces the ends are mounted in grips, one of which is fixed and the other attached to a spring balance which is then pulled horizontally by means of a hand-screw until the specimen breaks; an indicator moving over a semicircular scale records the elongation. A. R. P.

**Various measurements of hardness.** Trx-Chalons (Rev. Fond. mod., 1936, **30**, 160—161; Chem. Zentr., 1936, ii, 687).—A diagram is given for correlating Brinell hardness vals. with vals. obtained in other tests. H. J. E.

**Diffusion of hydrogen through metals.** W. Baukloh and W. Wenzel (Arch. Eisenhüttenw., 1937—8, **11**, 273—278).—The rate of diffusion of $H_2$ through Armco Fe is increased slightly at low temp. by roughening the surface, but at higher temp. this difference disappears. Up to 650° $H_2$ diffuses through steels with up to 4% Mn at a rate which is decreased by about 4% for every 0·1% increase in the C content; the % Mn present has little effect up to 650°, but at higher temp. diffusion is the less rapid the higher is the Mn content. In all cases there is a sudden sharp decrease in the permeability of the steel to $H_2$ at the $\alpha$–$\gamma$ transformation. Coating the steel with Cu does not appreciably reduce the permeability to $H_2$ unless the coating is relatively thick and non-porous. The results obtained by earlier workers are discussed and a theoretical explanation of the diffusion of $H_2$ into steel during pickling, which takes into account the effects of As, S, and other impurities on the process, is advanced.

A. R. P.

**Absorption of oxygen by molten metals.** W. Lange (Z. Metallk., 1938, **30**, 274—276).—When $O_2$ is blown over molten Cu a marked rise in temp. occurs until the metal is saturated with $Cu_2O$, after which the temp. falls; oxidation in the first stage is controlled solely by the rate of supply of the gas. Similar but less marked effects are obtained with molten Pb, Sn, Ni, Mn, and Fe. No rise in temp. is observed on passing a rapid stream of $O_2$ over molten Ag. A. R. P.

**Corrosion of metals by oil.** J. Dintilhac (Métaux, 1936, **11**, 71—90; Chem. Zentr., 1936, ii, 540).—Corrosion tests of 18 months' duration on Ni and Cr–Ni steels, bronze, Pb, duralumin (I), and Elektron (II) in moist neutral and acid oils show an enhanced effect in the action of the org. acids due to the presence of $H_2O$. (I) was resistant to the acid oils, but steels, bronzes, Pb, and (II) were corroded.

H. J. E.

**Corrosion with simultaneous permanent and elastic deformation.** W. O. Kroenig and A. J. Boulitscheva (Korros. u. Metallschutz, 1936, **12**, 73—81; Chem. Zentr., 1936, ii, 692).—Data are recorded for the corrosion of sheet Al, duralumin, brass, and Fe in 3% aq. NaCl + 0·1% $H_2O_2$, N-NaCl + 1% HCl, and 0·5N-HCl. The electrode potential of the metal or alloy was displaced by increasing strain in the direction of less noble metals, and the corrosion-resistance was diminished. With elastic deformation, brass, Fe, and duralumin showed a tendency to intercryst. corrosion. H. J. E.

**Thermo-magnetic investigation of rust.** A. Michel and M. Gallissot (Mét. et Corros., 1938, **13**, 144—147).—Graphs obtained by plotting the magnetic attraction of rust against temp. are discussed with reference to changes in cryst. structure. R. B. C.

**[Sand] mould surface defects.** H. W. Dietert (Found. Tr. J., 1938, **59**, 70—72).—The expansion and contraction of various sands rammed into cylindrical blocks when heated from room temp. to 1400° were measured. The temp. was raised either uniformly by 5°/min., or suddenly by introducing the test-piece into a heated electric furnace. Expansion decreased with increase in clay content, a fall in sintering temp. of the clay, and addition of cereal binders. Sands with high expansion or contraction yield castings which are defective owing to scab formation. R. B. C.

**Different types of metal surfaces.** E. Werner (Oberflächentech., 1938, **15**, 179—180).—Methods of producing highly polished, matt, and coloured surfaces on the common metals and on plated articles are briefly discussed. A. R. P.

**Metallurgical surface analysis by *X*-rays.** L. von Hámos (Jernkont. Ann., 1938, **122**, 170—174).—Secondary *X*-rays from a metallic surface are focussed onto a photographic plate by reflexion from a crystal. Improvements in the author's apparatus are described (cf. A., 1937, I, 479).

M. H. M. A.

***X*-Ray photographs of macrostructure [of metals] in relation to fatigue strength.** H. Möller (Berg u. Hüttenm. Monatsh., 1938, **86**, 148—152).—The interpretation of *X*-ray photographs is discussed in relation to examples.

R. B. C.

**Microstructural *X*-ray testing [of metals].** A. Kufferath (Aircraft Eng., 1938, **10**, 252—254).—Various types of *X*-ray testing apparatus are diagrammatically described, and the applicability of the method to aircraft production is discussed.

R. B. C.

**Fundamentals and recent results of investigation of fine-structure in deformed and fatigued materials by means of *X*-rays.** F. Regler (Berg u. Hüttenm. Monatsh., 1938, **86**, 133—145).—The use of *X*-ray reflexion diagrams for studying the effects of forging etc. on metals is discussed with reference to the significance of interference lines. Photographs are given. R. B. C.

**Irradiation with *X*-rays. Method of glancing rays.** M. Vozdvishenski (Tech. Phys. U.S.S.R., 1935, **2**, 270—273).—A method of examining welded joints by *X*-rays is described. A. J. M.

**Quantitative definition of non-metallic inclusions in metals and alloys.** J. Czochralski (Wiadom. Inst. Met., 1935, **2**, 34—37; Chem. Zentr., 1936, ii, 537).—A microscopical method of defining the no. and magnitude of inclusions is discussed.

H. J. E.

**Advances in the field of metal separation.** W. Kroll (Metall u. Erz, 1938, **35**, 252—254, 282—286).—Metals can be freed from impurities or separated from one another in alloys by adding one or more metals or metalloids which produce (*a*) a compound of high m.p. which has a low solubility in the remainder of the molten metal, (*b*) a constituent of low m.p. which may be liquated from the remainder, (*c*) separation of the mixture into two almost immiscible layers, (*d*) pptn. of the impurity by reducing its solubility, (*e*) extraction of the impurity into a second layer immiscible with the bulk of the molten metal (principle of partition). Examples of the use of these principles in modern metallurgical operations are discussed. A. R. P.

**Amalgamation as an aid in metal analysis.** W. Boehm (Metall u. Erz, 1935, **32**, 543—544; Chem. Zentr., 1936, ii, 657).—Alkalis are determined in alkali-hardened Pb bearing metals by treating a sample with 300 c.c. of $H_2O$ and sufficient Hg to cover the metal. On boiling, the Pb amalgam is not decomposed, but the alkali and alkaline-earth metal amalgams form hydroxides. The boiling solution is treated with $CO_2$, filtered, and the alkali carbonate in the filtrate determined in the usual way. H. J. E.

**Polarographic method as applied to chemical analysis of metals.** A. Walkley (J. Proc. Austral. Chem. Inst., 1938, **5**, 291—311).—A general account

of the principles and technique of the method is given. Advantages and limitations are discussed, and examples of the use of the method described.
L. S. T.

**Torsional endurance strength of beryllium–nickel and beryllium–contracid spring wire at temperatures up to 300°.** W. Hellwig (Forsch. Geb. Ingenieurw., 1938, 9, 165—176).—A method enabling the torsional endurance strength of the wire material to be ascertained without injuring its surface has been developed and employed for measurements on Be alloys and Cr–Mo–V-, Cr–Ni–W-, and C–Si–Mn–Cr–V-steel.
R. B. C.

**Production of magnesium.** R. Freitag (Kohle u. Erz, 1936, **33**, 168; Chem. Zentr., 1936, ii, 1426).—MgO is reduced by C at 2000°. On introduction of cold $H_2$, the Mg vapour condenses as dust, which is distilled in a vac. The method is cheaper than the electrolytic process.
L. S. T.

**Effect of iron on magnesium.** W. R. D. Jones (Metallurgist, 1937—8, **11**, 157—158).—The effect of 0·03—0·26% of Fe on the mechanical properties of Mg in the cast, worked, and heat-treated conditions has been determined. In the cast condition the properties are slightly improved by small amounts of Fe, but amounts >0·14% are detrimental. Fe has a slight adverse effect on the properties of rolled specimens. The amounts of Fe likely to be picked up in industrial operations would have no important effect.
C. E. H.

**Regulations on safety arrangements regarding magnesium alloys.** H. H. Böhm (Metallwirts., 1938, 17, 925—932).—Recent German regulations concerning the melting, casting, and working of Mg-rich alloys are explained, and recommendations made for the carrying out of operations on these alloys with the min. risk of fire. In the case of grinding, methods of exhausting and pptg. the Mg dust are described.
C. E. H.

**Deformation of crystal networks by rolling and drawing.** H. Unckel (Z. Metallk., 1938, **30**, 252—258).—The type of flow produced by rolling, drawing, or stretching pure metals or single-phase alloys differs from that of homogeneous, isotropic materials owing to variations in the grain size and orientation of the crystallites, the difference being greatest in pure stretching and least in drawing, but in all cases the deformation of the individual crystallites is fairly regular. With two-phase alloys, *e.g.*, $\alpha + \beta$-brass, Fe–Cu, Cu–Al, Mg–Al, and Si–Al alloys, deformation of the softer phase is controlled to some extent by that of the harder and hence is not so uniform throughout the specimen as is the case with pure metals; this effect is especially noticeable in the rolling or drawing of alloys in which a hard phase has been pptd. along the grain boundaries by heat-treatment.
A. R. P.

**Influence of hot-ageing on properties of copper–magnesium–aluminium alloys.** P. Brenner (Z. Metallk., 1938, **30**, 269—273).—Ageing of modern Duralumin alloys at 150° raises the yield point and impact strength but reduces the fatigue limit and increases the notch effect on endurance. Aircraft structures can therefore be made lighter provided that sharp dimensional changes and bends are avoided; cladding with pure Al is recommended to avoid danger of corrosion-fatigue failures.
A. R. P.

**Endurance limit of workable aluminium alloys.** H. Westhoff (Z. Metallk., 1938, **30**, 258—265).—From a crit. analysis of published data on the endurance of Al alloys in the Wöhler test it is concluded that an accurate forecast of the behaviour of an alloy in practice can be made only when the Wöhler curve is constructed from the results of tests made over a wide range of stress cycles.
A. R. P.

**Casting of pure and alloyed secondary aluminium.** W. Guertler (Giesserei, 1938, 25, 183—190).—The refining of Al scrap is described, and the principles on which the methods are based are discussed.
C. E. H.

**Casting and Eloxal treatment of aluminium and its alloys.** H. Röhrig (Giesserei, 1938, 25, 190—193).—The appearance and protective val. of Eloxal films on Al-base castings are governed by the soundness and structure of the alloy. Precautions necessary in welding castings prior to Eloxal treatment are described.
C. E. H.

**Behaviour of separated structural constituents in the electrolytic oxidation of aluminium alloys and their influence on some properties of the oxide films.** H. Röhrig and E. Käpernick (Metallwirts., 1938, 17, 665—668).—Particles of Si are unchanged when the Al is oxidised, but when added elements are present as aluminides (*e.g.*, Cr, Mn, Fe, Cu, V, Ni) these constituents are oxidised with the Al, causing a darkening of the oxide film. The thickness of the film on binary Al alloys varies according to the nature of the added metal, other conditions being const. Al–Cr alloys give thin and Al–Mn alloys thick films, whilst intermediate results are obtained with other alloys. The effect of different heat-treatments and of localised heating during welding on the colour of the anodic film is illustrated in the case of an Al–Mg–Si alloy.
C. E. H.

**Aluminium material in the manufacture of chemical products derived from coke-oven gases.** J. Bally (Rev. Aluminium, 1938, 15, 1155—1166).—Al plant for $NH_3$ oxidation and for the manufacture of $HNO_3$, $NH_4NO_3$, $Ca(NO_3)_2$, $CH_2O$, $COMe_2$, $C_2H_4(OH)_2$, $(CH_2)_6N_4$, and plastics is described and illustrated.
A. R. P.

**Automatic furnaces for heat-treating large Diesel [engine aluminium-alloy] parts.** J. H. Loux (Met. Progr., 1938, 34, 237—240).—The stock, loaded on trays, passes into a solution-treatment furnace, is quenched, and then enters an ageing furnace at predetermined times.
R. B. C.

**Influence of cold-working on strength and corrosion-resistance of an aluminium alloy with 7% of magnesium.** K. Bungardt (Metallwirts., 1938, 17, 707—708).—The tensile properties were altered in a normal manner by 5—60% reduction by cold-rolling, and the fatigue strength was slightly increased. The resistance to corrosion during 50 days in the salt-spray test and 340 days in the D.V.L.

immersion test was not appreciably affected by cold-rolling. C. E. H.

**Strength of Elektron alloys at elevated temperatures under static tensile stress.** H. Vosskühler (Metallwirts., 1938, **17**, 935—941).—The proof stress, tensile strength, elongation, reduction in area, and Brinell hardness have been determined between 20° and 300° for the commercial Elektron (Mg) alloys in the sand-cast, chill-cast, and pressed conditions. The results are considered in relation to the composition and structure. C. E. H.

**Determination of the solubility of zinc in aluminium from the expansion on long annealing.** H. Sieglerschmidt (Metallwirts., 1938, **17**, 809—814).—Chill-cast Al–Zn alloys containing 20, 30, 40, and 50% Zn were investigated over long periods of annealing in a differential dilatometer (cf. B., 1938, 528). The displacement of the phase boundaries of the equilibrium diagram due to rapid cooling is shown. The results give the following points for the boundary of the Al-rich ($\gamma$) solid solution: 20% Zn, 160—200°; 30% Zn, 240—285°; 40% Zn, 270—290°; 50% Zn, 295—300°. C. E. H.

**Strain figures on aluminium alloys.** M. Bosshard and H. Hug (Metallwirts., 1938, **17**, 708—710).—By suitable etching, strain lines analogous to those observed on steel may be revealed on Al alloys subjected to cold-work followed by annealing at a certain temp. The phenomenon has been examined in the case of Al–Mg, Al–Cu–Mg, and Al–Cu–Ni alloys, and typical structures are illustrated. In some of the alloys the effect was not observed. C. E. H.

**Coating aluminium with lead.** O. Scarpa (Alluminio, 1936, **5**, 1—5; Chem. Zentr., 1936, ii, 369).—Spray-coating with Pb affords no protection against corrosion by $H_2SO_4$. Al may be protected by cleaning, and coating electrolytically with Ni and Pb in turn. The electrical resistance properties of Pb-coated Al resemble those of Pb-coated Cu. H. J. E.

**Electrolytic polishing of aluminium: application to microscopical study of aluminium and its alloys.** P. A. Jacquet and J. Calvet (Mét. et Corros., 1938, **13**, 86—91, 121—126).—The technique of electrolytic polishing is described and its advantages are discussed. The method was applied to study the distribution of impurities or constituents in various grades of Al and its alloys with Cu, Mg, Fe, or Be and the effect of working and annealing on the structure. Micrographs are given. R. B. C.

**Strength of test-bars of light-metal piston alloys in the cast, hot-pressed, and heat-treated conditions.** M. Ensslin (Metallwirts., 1938, **17**, 831—839).—A comprehensive investigation of the hardness and the tensile, compression, torsion, bending, and alternating-bending strength of 7 Al-base piston alloys in different conditions has been carried out. C. E. H.

***X*-Ray investigation of light metals.** F. Regler (Mitt. techn. Versuchsamtes, 1935, **24**, 20—28; Chem. Zentr., 1936, ii, 688—689).—A discussion of the detection of structural defects. H. J. E.

**Identification and sorting of light metal scrap.** E. R. Thews (Metallurgist, 1937—8, **11**, 114—116).—A drop test for distinguishing between the principal groups of Al alloys is described. Four aq. solutions containing $HNO_3$ 30, NaOH 20, HCl 5, and $CdSO_4$ 5%, respectively, are applied to the alloy, which is identified by the colour produced. C. E. H.

**Detection of faults in zinc coatings on iron.** G. Garre (Chem.-Ztg., 1938, **62**, 759—761).—Modifications of the ferroxyl reagent can be used, with or without an applied e.m.f., for rapid detection of pinholes etc. in coatings of Zn, Cd, etc. which are anodic to Fe. A. R. Pe.

**Progress in zinc coating and electrogalvanising of [steel] sheet and wire.** W. M. Peirce (Met. Progr., 1938, **34**, 53—55).—The advantages and disadvantages of electrogalvanising in comparison with the hot-dip process are discussed. R. B. C.

**Adherence of thick silver-plate on steel.** F. C. Mathers and L. I. Gilbertson (Trans. Electrochem. Soc., 1938, **74**, Preprint 30, 453—467).—Ag-plate up to 0·07 in. in thickness can be deposited on mild steel (C $\ngtr$0·1%). The plate is strongly adherent, although true cryst. continuity between deposit and basis metal is absent. Annealing, by causing diffusion of the Ag into the Fe, increases adherence. The uses of heavy Ag deposits include bearing surfaces and linings for industrial vessels. J. W. C.

**Electrodeposition of silver alloys from aqueous solutions.** F. C. Mathers and A. D. Johnson (Trans. Electrochem. Soc., 1938, **74**, Preprint 27, 399—420).—Data are recorded on the deposition from complex salt solutions of alloys of Ag with Ni, Co, Cd, Cu, Fe, Zn, and Pb, respectively. The properties of the alloys are discussed. J. W. C.

**Iron in the chromium[-plating] bath and its deposition.** E. Raub (Mitt. Forsch.-Inst. Probieramt. Schwäb. Gmünd, 1936, **10**, 1—7; Chem. Zentr., 1936, ii, 538).—Plating is possible with $\ngtr$10% of Fe present, reckoned on the $CrO_3$ content of the bath, but $>$5% exerts an adverse effect. Fe may be pptd. as basic chromate. H. J. E.

**Bright, grey, and black chromium [plate].** A. Weiss (Oberflächentech., 1936, **13**, 101—102; Chem. Zentr., 1936, ii, 538—539).—Grey or black Cr deposits are probably due to fine subdivision of the Cr, but contain no oxide. Black Cr is obtained from baths containing AcOH or org. acids in place of $H_2SO_4$, at high c.d. and temp. $<$15°. H. J. E.

**Nickel and chromium coatings of greater thickness.** R. de Buyer (Métaux, 1935, **10**, 475—479; Chem. Zentr., 1936, ii, 538).—The plating of complicated and angular articles is discussed. H. J. E.

**Nickel- and chromium-plating of tinplate.** A. W. Hothersall and C. J. Leadbeater (J. Electrodep. Tech. Soc., 1937—1938, **14**, 207—228; Tech. Publ. Internat. Tin Res. and Dev. Counc., 1938, *A*, No. 79).—The adhesion of N deposits to Sn coatings has been investigated quantitatively. With suitable plating conditions tinplate coated with Ni and Cr may be fabricated satisfactorily. A film of Cu must be applied before plating with Ni and Cr, in order to prevent diffusion of $H_2$ to the Sn surface, and thus avoid bad adhesion and blistering. Charcoal tinplate is preferable to coke tinplate, as it enables better appearance, adhesion, and protection from rusting to be obtained. The thickness of the Ni deposit should be $<$0·0005 in. A soft and ductile Ni coating must be obtained, particularly if Cr is to be applied subsequently, and fabrication is intended. Certain bright Ni-plating baths give deposits which are too brittle. Tinplate may be Cr-plated without a Cu and Ni undercoat, and may afterwards be fabricated without flaking. The finish is inferior to that obtained with an undercoat, but on coke tinplate the protective val. after fabrication appears to be better. C. E. H.

**Physical properties and uses of heavy nickel [electro-]deposits.** W. A. Wesley (Metal Ind., N.Y., 1938, **36**, 385—388, 424—426).—Soft and hard Ni plating, and the structure and the mechanical properties of Ni deposits are described, and the theory of the hardness of electro-deposits is discussed. Old and new engineering uses for thick Ni deposits are reviewed and illustrated photographically. L. S. T.

**Volumetric determination of cobalt and nickel in presence of one another.** B. S. Evans (J. Electrodep. Tech. Soc., 1938, **14**, 141—148).—A method previously published by the author (A., 1937, I, 377) has been slightly modified in order to render it suitable for plating solutions. C. E. H.

**Electrodeposition of tin from acid sulphate solutions. II.** A. W. Hothersall and W. N. Bradshaw (J. Electrodep. Tech. Soc., 1938—9, **15**, 31—48; cf. B., 1937, 924).—Three acid $SnSO_4$ baths containing crude $OH\cdot C_6H_4Me\cdot SO_3H$ (I) were prepared, and additions were made of gelatin (II) + $\beta$-$C_{10}H_7\cdot OH$ (III), lysalbic acid (IV) + (III), and (IV) + resorcinol, respectively. The working properties of the baths were examined over a period of 6 months. It was found that consistently good results over the longest period were given by a solution containing (per l.) Sn (as $SnSO_4$) 30, free $H_2SO_4$ 60, (I) 100, (III) 1, and (II) 2 g. [or (IV) 1 g.]. Methods of preparing and controlling the solution are described, and the effects of different conditions on the porosity of Sn coatings on steel have been investigated. Other org. addition agents and colloids had no advantages over those mentioned above. C. E. H.

**Electrodeposition of tin from alkaline solutions.** S. Baier and R. M. Angles (J. Electrodep. Tech. Soc., 1938—9, **15**, 1—30).—Existing information on stannate and stannite baths is reviewed, and additional experimental work has been carried out on the effects of different plating conditions on the results obtained with the baths at present available. From the data obtained suitable working conditions are described, and for the stannate bath the relation between bath composition, c.d., and plating time is tabulated. Analytical methods of control and information on the effects of impurities on the behaviour of stannate solutions are given. C. E. H.

**Stannous ammonium oxalate electroplating bath.** A. W. Hothersall and W. N. Bradshaw (J. Electrodep. Tech Soc., 1938—9, **15**, 49—52).—Cu and Fe were plated from a bath containing $SnC_2O_4$, $(NH_4)_2C_2O_4$, $H_2C_2O_4$, and gelatin. Relatively protective coatings were obtained only over a narrow range of c.d., so that the bath is unsuitable in cases where considerable irregularity in c.d. is unavoidable. The cathode efficiency is 99·8% at 5 amp. per sq. ft. The throwing power is better than that of an acid Cu-plating bath, but inferior to that of an acid $SnSO_4$ bath. The solution is stable provided that the $p_H$ is maintained at $<$3·5. C. E. H.

**Electrodeposition of lead on base metals. I. Behaviour of alkaline baths with iron cathodes at low current densities.** S. S. Joshi and T. V. S. Rao (J. Indian Chem. Soc., 1938, **15**, 377—382).—The effects of c.d., temp., addition agents (gelatin, tartar emetic), and intermediate coating of metallic Sb on the electrodeposition of Pb on Fe cathodes from moderately conc. solutions of PbO in aq. alkali have been investigated. The firmest and thickest coating of Pb was obtained on an electrode (5 × 3 cm.), previously cleaned and coated electrolytically with Sb, having p.d. 0·25 v., c.d. 0·667 amp./sq. dm., interelectrode distance 2·5 cm., for 3 hr. at 60°. The use of small quantities of Tl carbonate solution was advantageous. F. H.

**Effect of solution concentration in electrodeposition of manganese.** S. M. Shelton and M. B. Royer (Trans. Electrochem. Soc., 1938, **74**, Preprint 33, 497—508).—The electrolyte contains $MnSO_4$ and $(NH_4)_2SO_4$ and is operated with Pb anodes. Provided the c.d. is $<$3·2 amp./sq. dm. and the $(NH_4)_2SO_4$ content $\not<$125 g./l., variation in the concn. of the latter has little effect on cell resistance. J. W. C.

**Magnetic tests for plating thickness.** C. E. Richards (J. Electrodep. Tech. Soc., 1938, **14**, 101—107).—The utility of magnetic tests is discussed with particular reference to the method developed by the author (B., 1937, 1348). C. E. H.

**Magnetic instrument for measuring the local thickness of [electrodeposited] coatings.** W. E. Hoare and B. Chalmers (J. Electrodep. Tech. Soc., 1938, **14**, 113—120).—The instrument (B., 1937, 1061) has been applied to the examination of the local variations of thickness in scratch-brushed and polished electrodeposited Sn and bronze coatings on steel. A parallel investigation using an optical-interference method (B., 1935, 954) has confirmed the results obtained. C. E. H.

**Two electromagnetic instruments for measuring coating thickness.** W. H. Tait (J. Electrodep. Tech. Soc., 1938, **14**, 108—112).—The application of apparatus described previously (B., 1937, 1359) to the measurement of the thickness of non-magnetic coatings on a magnetic base is discussed. Additional data on calibration are included. A modified instrument for measuring the thickness of magnetic coatings on a non-magnetic base has been developed, and a typical calibration curve for Ni on brass is shown. C. E. H.

**Detection of pores and mechanical defects in protective coatings on light metals by anodic deposition of organic dyes.** V. Duffek (Z. Metallk., 1938, 30, 265—267).—Pores, scratches, and similar defects in the protective film (Eloxal, lacquer, or Ni-, Cu-, or Cr-plate) on Al are revealed by the formation of coloured spots or lines when the metal is anodically treated in a solution of Na alizarinsulphonate, K azobenzylaniline- and Na azo-α-naphthylamine-*p*-benzenesulphonate, or Na triphenylrosanilinetrisulphonate. A. R. P.

**Crystal separation and flow of melts.—Flotation experiments. Vac. seal.**—See I. **Russian bauxite.**—See VII. **Enamelling [of sheet steel]. Ground-enamel for sheet Fe. Refractories. Chrome-magnesite bricks.**—See VIII. **Resistance materials. Radiomicrography [of alloys etc.]. *X*-Ray testing and densography. Measurements on permanent magnet materials.**—See XI. **Al in soap industry.**—See XII. **Metallising plastics. Corrosion-resistant paints. Durability of paint films.**—See XIII. **Tinplate containers. Determining small amounts of Hg.**—See XIX. **Analysis of dust and fumes for Pb and Zn. Effects of corrosive waters on Zn.**—See XXIII.

See also A., I, 568, **Ag–Zn alloys. Alloys of Mg with Ga, In, and Tl. Al–Mg alloys. Liquidus etc. curves of Mg alloys. Cd–Sn alloys. Ageing of Al–$MgZn_2$ alloys. Pb–Cd, Pb, and Mn–Cu alloys.** 569, **Resistance of Fe–Si alloys. Magnetic Fe–Ni–Al alloys. Ni–Al hardener for steel. γ–α transformation in Fe alloyed with Pd. Ir–Bi alloys.** 581, **Prep. of pure Pt.** III, 946, **Effect of Zn-plating on teeth.**

### Patents.

**Metal-heating furnaces.** H. C. Smith (B.P. 491,620, 21.7.37).—The metal articles are inserted through the roof at the back and withdrawn through a door in the front; over the latter is a fluid-fuel burner, and the hearth is perforated for exit of products of combustion. B. M. V.

**Furnace for heating steel ingots.** W. A. Morton and H. F. Spencer (B.P. 491,814, 22.3.37).—The ingots are arranged upright and spaced apart, and the flames supplied vertically upwards at the centre of a group are deflected by the roof and pass outwards and downwards to exhaust at or near the hearth at its periphery. B. M. V.

**Case-hardening iron and steel and salt baths therefor.** E. F. Houghton & Co. (B.P. 486,232, 3.3.37. U.S., 19.3.36).—The carburising bath comprises a salt or salt mixture which is molten at the carburising temp., *e.g.*, NaCl and/or KCl 15—71, NaCN 10—50 (15—45), $BaCO_3$ or BaO 15—60 (25—30), activated C of low combustibility 4—15, and $BaCl_2$ 15—30%. F. M. L.

**Hardening of copper and copper alloys.** C. H. Coleman (B.P. 486,121, 2.12.36).—The metal is cooled to −12·2°, then immersed successively in beef tallow at 115·6° for 20 sec. and in boiling soap solution to remove the tallow, and finally cooled to room temp. The process is repeated until the required hardness is attained; the temp. of the tallow bath for the second treatment is 138° and for subsequent treatments is raised by 5·6° each time. F. M. L.

**Plastic shaping of zinc alloys.** Nat. Smelting Co., Ltd. (B.P. 486,288, 20.11.37. Ger., 2.6.37).—Alloys containing 2—20% Al are rolled or shaped at 270—380° (340°). F. M. L.

**Production of metal sheets coated with tin or other metal or alloy.** (Sir) W. J. Firth (B.P. 486,219, 19.1.37).—Claim is made for a cold-rolling process in which the sheet is in tension during the operation. F. M. L.

**Wire-coating process and apparatus.** Met-Alloys Co. (B.P. 486,266, 30.7.37. U.S., 13.8.36).—A mechanism is described in which the wire to be coated, *e.g.*, Zn, Pb, Sn, Cd, or Al, is moved through a casting die, the air being removed from around the die and the molten coating metal drawn through around the wire; the coated wire is finally quenched. F. M. L.

**Protection of sheaths of electric cables, pipes, and other metal articles against corrosion.** W. T. Henley's Telegraph Works Co., Ltd., H. A. Tunstall, and F. G. R. Jesson (B.P. 486,300, 30.11.36).—Cables etc. are wound with strips of a fibrous material, *e.g.*, paper, impregnated with a 6 : 4 mixture comprising, *e.g.*, coal tar and petroleum pitch, then passed through sand (passing 30-mesh), coated with pitch, and again wrapped with the sanded paper. F. M. L.

**Making vacuum-tight connexions between metal and ceramic substances.** Brit. Thomson-Houston Co., Ltd. (B.P. 486,256, 10.5.37. Ger., 12.5.36).—The ceramic and metal parts are placed together with the solder, *e.g.*, Ag, between them and then heated in a vac. furnace until the solder melts, when $H_2$ under pressure is admitted. When the solder solidifies, the furnace is again evacuated; air is not admitted until the joint has cooled to $<100—200°$. F. M. L.

**Casting of ingots from alloys of aluminium.** W. Roth (B.P. 486,420, 28.3.38).—The construction of a chill-mould suitable for casting ingots of Cu–Al alloys is described. F. M. L.

**Tanks for containing liquids used in the quenching of heat-treated metal articles.** Serck Radiators, Ltd., and H. J. Zimmermann (B.P. 492,066, 27.5.37).

**$H_2SO_4$ from steel-pickling liquors. Alkali metals.**—See VII. **Light mineral material.**—See IX.

## XI.—ELECTROTECHNICS.

**Gases from carbon arcs: absence of ozone.** R. W. Coltman and H. G. MacPherson (J. Ind. Hyg., 1938, 20, 465—467).—Gases from arcs produced with Cu-coated " C " carbons, containing Fe, Al, and Ni, and from high-intensity carbons, containing compounds of rare earths of the Ce group, were passed through a liquid air trap. Spectroscopic examination of the gas evolved on warming the trap showed absence of $O_3$. I. C. R.

**Production of sodium hydroxide and sulphuric acid by the electrolytic decomposition of sodium sulphate.** G. Grube and S. Stainoff (Z. Elektrochem., 1938, **44**, 640—648).—Various types of cell are discussed. In cells containing horizontal or vertical filter diaphragms to prevent neutralisation of $H_2SO_4$ and NaOH, the yield of NaOH is reduced on account of the crystallisation of $Na_2SO_4$ in the cathode filter which occurs at high concns. of NaOH. A cell is described which can work continuously and employs a flowing Hg cathode. The Hg amalgamates with the Na formed by electrolysis and is regenerated by treatment with $H_2O$. C. R. H.

**Interpretation of the positive difference effect.** W. O. Kroenig and V. N. Uspenskaja (Korros. u. Metallschutz, 1936, **12**, 123—132; Chem. Zentr., 1936, ii, 2219).—Interpretations of the effect recorded by Thiel and Akimow (B., 1931, 298; 1933, 510) are criticised. The effect is caused by an increase of anode potential in the local cell, due to increased c.d. on provision of an additional cathode; this increased anode potential is produced by a higher concn. of ions at the anode, owing to more rapid dissolution of the metal. A. J. E. W.

**Combustion cells with solid conductors.** E. Baur and H. Preis (Z. Elektrochem., 1938, **44**, 695—698).—The work described previously (B., 1937, 1362) has been extended and the results obtained with various types of separator are summarised. An efficient separator can be made from a 2 : 3 : 1 mixture of clay, $WO_3$, and $CeO_2$. The economics of batteries of such cells are discussed. C. R. H.

**Choice of materials for electrical resistances.** R. Hanel (Metallwirts., 1938, **17**, 793—795).—A survey is made of the electrical properties of the resistance materials available, and the ranges of temp. over which they can be used. The data are discussed from the viewpoint of the possible increase in the use of metals available in Germany. C. E. H.

**Physical structure and dielectric losses of solid insulators.** P. Junius (Elektrotech. Z., 1936, **57**, 519—522; Chem. Zentr., 1936, ii, 589—590).—Losses in a high-frequency cable are controlled largely by the quantity and pressure of the enclosed air. In a dielectric containing much air the loss curves vary little with the temp. H. J. E.

**Determination of plastic yield of dielectrics at elevated temperatures.** W. D. Owen (Elect. Times, 1938, **93**, 931—932).—The standard 6-hr. plastic-deformation test developed by the Electrical Research Assoc. is superior to the more rapid test developed by Martin in Germany. Yield–time curves for different materials illustrate this conclusion. R. B. C.

**Electrodynamic volume and porosity of metallic particles.** H. Löwy (Phil. Mag., 1938, [vii], **26**, 453—457).—A mathematical discussion of the $\epsilon$ for a mixture consisting of metallic particles distributed throughout an insulator. Three special cases are considered in which the metallic particles are solid spheres, hollow spheres, and of sponge-like structure with the insulating substance partly or wholly outside the sponge. T. H. G.

**Electrostatic dust collection.** F. S. Wright (Chem. Met. Min. Rev., 1938, **30**, 267—272).—The principles of the Lodge–Cottrell process are outlined and a modern type of this plant recently erected in an Australian cement works is described and illustrated. A. R. P.

**Electrical precipitation [of dust from gases].** W. A. Schmidt and E. Anderson (Elect. Eng., 1938, **57**, 332—338).—An illustrated review. R. B. C.

**Magnetic measuring methods and testing apparatus for permanent magnet materials.** H. Neumann (Arch. Eisenhüttenw., 1937—8, **11**, 483—494).—Modern apparatus and methods for determining the remanence, coercivity, and val. of $(B\text{-}H)_{\text{max.}}$ are described. A. R. P.

***X*-Ray testing methods in industry.** H. Stintzing (Metallwirts., 1938, **17**, 761—771).—A review is given of the principles and applications of methods of testing based on *X*-rays, with particular reference to metals. C. E. H.

***X*-Ray and gamma-ray instruments.** O. Vaupel (Berg u. Hüttenm. Monatsh., 1938, **86**, 121—124).—Modern portable instruments and accessories are described. R. B. C.

**Photographic basis of testing materials by means of *X*-rays.** J. Eggert (Berg u. Hüttenm. Monatsh., 1938, **86**, 174—180).—Precautions necessary for obtaining good *X*-ray photographs are discussed. R. B. C.

**Comparison of the non-destructive testing of materials by *X*-ray and Magnaflux processes.** M. (Frh.) von Schwarz (Berg u. Hüttenm. Monatsh., 1938, **86**, 189—193). R. B. C.

***X*-Ray densography.** M. Schwarz (Berg. u. Hüttenm. Monatsh., 1938, **86**, 154—156).—The operation of the electrodensograph, which records light and dark areas on an *X*-ray photograph, and its application to detect flaws in metals, are described. R. B. C.

**Technique and possibilities of radiomicrography.** F. Fournier (Rev. Mét., 1938, **35**, 349—355).—Radiomicrographic examination of metallic alloys may be effected by exposing a thin leaf of the alloy pressed against a photographic emulsion to *X*-rays ($\lambda$ 1—3 A.) and examining the image under the microscope. A special emulsion must be used which does not show the grain when examined at high magnification. Radiomicrographs of Cu–Al and Cu–Pb alloys are reproduced and compared with photomicrographs of the same alloys. It is claimed that radio- give a more accurate rendering of the structure than do photo-micrographs. M. A.

**Photoelectric spectrophotometers.** R. Sewig (Arch. Tech. Mess., 1938, No. 83, 69—70T).—Various types of instrument are described and sources of error discussed. R. B. C.

**Making $CaC_2$ in electric furnace. Boiler operation. Vac. seal.**—See I. **Measuring gas temp. Spectrometry of arc-flame temp. Catho-**

dic protection of pipe-lines. Piezo-electric indicator for motor fuels.—See II. Phosphate furnace. Prep. of $H_2$.—See VII. Dielectric losses in glass.—See VIII. Permanent-magnet alloys. Recognising faults in steel structures. Determining Mo and Cu in steel. Corrosion of Pb by stray currents. Determining Fe in brass. Properties of manganin. Concentrating minerals. Metal surfaces. *X*-Ray analysis of metals. Oxide films on Al. Polishing Al. Detecting faults in Zn coatings on Fe. Galvanising steel wire. Plating Ag on steel. Electrodepositing Ag alloys. Ni- and Cr-plate. Electrodepositing Sn. Pb deposits on base metals. Mn-plate. Measuring plating thickness. Detecting defects in coatings on light metals.—See X. Metallising plastics. Polyvinyl plastics. Plastics and insulation. Electrical properties of lacs.—See XIII. Rubber cable mixings. Buna mixings. Dielectric properties of rubber.—See XIV. Electrodialysis of soils. Determining seed val. of potatoes.—See XVI. Irradiation in dairy industry.—See XIX. Densitometry of *X*-ray films.—See XXI.

See also A., I, 569, **Resistance of Fe–Si alloys. Magnetic Fe–Ni–Al alloys.** II, 428, **Electrolysis of mixtures of nitrates with $CHMeEt{\cdot}CO_2Na$.** III, 946, **Effect of Zn-plating on teeth.**

### Patents.

**Electrically heated salt-bath furnaces and method of melting the salts therein.** O. Uhlendorff (B.P. 483,179, 16.3.37).—Auxiliary electrodes bridged below by a heating resistance, for starting the melting process, are connected with the main electrodes and, like them, extend from the top almost to the bottom of the furnace. Granulated salt is added in small successive amounts, and melted by current between the auxiliary electrodes until finally current passes between the main electrodes; the auxiliary electrodes may then be put out of circuit.
J. S. G. T.

**Red fluorescent layers [for use as signalling means with metal vapour discharge lamps].** N. V. Philips' Gloeilampenfabr. (B.P. 483,662, 22.10.36. Ger., 25.10.35).—A layer containing a red fluorescent rhodamine dye (I) together with an overlying orange-coloured filter, *e.g.*, of methasolaurine A.S., which partly absorbs light corresponding to the (I) absorption band in the visible spectrum and transmits red light is claimed. J. S. G. T.

**Photo-electric cells.** Ferranti, Ltd., and J. A. Darbyshire (B.P. 491,326, 19.3.37).—In apparatus in which the cathode comprises a metal (or alloy) coated with its oxide and that in turn with alkali metal, the last (Cs) is deposited, after assembly within the bulb, by volatilisation from a store of compound ($Cs_2CrO_4$, $Cr_2O_3$, and Al powder; or Cs azide) placed in a ceramic container which is heated by an electric resister. The base-metal oxide may also be formed or activated *in situ* by a glow discharge in $O_2$. In operation the cathode is heated at 600—800° by a current passing through it. B. M. V.

**Luminescent compositions [for fluorescent screens for television].** A. Kutzelnigg (B.P. 483,877, 17.3.37. Ger., 11.3.36).—Metal (Cd) halides are activated by mixing them with other metal halides of stratified lattice structure, *e.g.*, $MnCl_2$ or $PbI_2$. W. J. W.

**Sealing-off [vitreous] vessels containing gases.** Egyesült Izzólámpa és Villamossági R.T. (B.P. 491,554, 21.6.37. Hung., 20.6.36).—Pinching is effected by a tool of Fe–Cr or other alloy of approx. the same expansion as that of the glass. This tool is preheated and then further heated while in contact with the glass. Sticking may be prevented by coating the jaws (which may be resilient) with graphite.
B. M. V.

**Electrical-resistance thermometers.** J. S. Pont, and Imperial Chem. Industries, Ltd. (B.P. 492,093, 3.1.38).—A resistance wire for prolonged use at 500—1000° is packed, without voids as far as possible, in a refractory sheath with refractory cement which does not attack it; *e.g.*, the cement contains an element of high at. wt. (Zr) or is composed of recryst. $Al_2O_3$ substantially free from $SiO_2$. B. M. V.

**Electric incandescence bodies for producing polarised light.** R. Bosch A.-G. (B.P. 492,286, 17.3.37. Ger., 19.3.36).

**Reactive H.**—See VII. **Melting [furnace for] glass etc.**—See VIII. **Metal–ceramic substance connexions. Protecting cables etc.**—See X. **Depositing resin films.**—See XIII. **Sterilising dressings etc.**—See XX.

## XII.—FATS; OILS; WAXES.

**Examination of foodstuff fats.** J. Grossfeld (Z. Unters. Lebensm., 1938, 76, 340—350).—Procedures are detailed for the determination of the $PrCO_2H$ val. (*B*), the total and residual lower fatty acids (*R*), and *iso*oleic acid. The following new formulæ are derived (cf. B., 1938, 432): butter fat $= 5{\cdot}09B - 0{\cdot}12R$; coconut oil $= 2{\cdot}76R - 2{\cdot}07B$. Simplification of the procedure is possible when either constituent is absent. The limits of accuracy allowed by the normal variation in composition of the natural fats are indicated. E. C. S.

**Fractional crystallisation of mixed fats.** T. Hinko (Öle, Fette, Wachse, 1938, **3**, No. 8, 1—3).—Theoretical and practical conditions for the proper crystallisation of premier jus prior to expression of the oleo oil are discussed. E. L.

**Latent heat and crystallisation of fatty acids: practical considerations in preparation of mixed fatty acids of tallow for pressing.** H. M. Abbott and A. P. Lee [with Thompson and Koenig] (Oil & Soap, 1938, **15**, 265—268).—Experimental determinations (B.Th.U./lb.) over a range of 4·5—54·5° of the total heat (80·5), sp. heat (average 0·56), and latent heat of crystallisation (30·1) of tallow fatty acids intended for the prep. of red oil have been made, and the use of these results as a basis for the calculation of the refrigeration equipment necessary for the artificial chilling of such fatty acids in warm climates is discussed. E. L.

**Working-up of residues from tallow-melting.** T. Hinko (Öle, Fette, Wachse, 1938, 3, No. 6, 3—6).—Methods and plant for recovering oil and meal from the greaves obtained from kettle- or wet-rendering of tallow are briefly described. E. L.

**M.-p. difference method for detection of tallow in lard.** A. Bömer and R. Hagemann (Fette u. Seifen, 1938, 45, 473—477).—The modified Vitoux–Muttelet test (B., 1921, 126a, 445a) is criticised on the ground that the margin allowed is too small and liable to cause unjustifiable condemnation of slightly abnormal but genuine lards. A series of tests on lards and mixtures of lard and tallow with stearic and palmitic acids or lard fatty acids showed that, contrary to the conclusions of Muschter and Smit (B., 1926, 637), the presence of free saturated acids does not impair the accuracy of the original Bömer test (B., 1914, 38), which consequently may be freely applied to unneutralised as well as to neutral samples. E. L.

**Fats. LXIV. Selective oxidation of unsaturated compounds. I. Detection of erucic acid in mixed fatty acids.** H. P. Kaufmann and H. Fiedler (Fette u. Seifen, 1938, 45, 465—473).—The alkaline permanganate oxidations of oleic acid (I) and erucic acid (II) to the $(OH)_2$-acid stage proceed at about the same rate, but the further oxidation, causing splitting at the site of the original double linking, proceeds much more rapidly in the case of (I) than of (II), and still more rapidly in the case of more unsaturated acids. These results have been applied to the detection of (II) in fatty oils by means of an oxidation test, the conditions being controlled so that (I) and linoleic acid are destructively oxidised, whilst (II) is recovered in high yield as dihydroxybehenic acid, which may be identified by its m.p. and mol. wt. In this way the presence of, *e.g.*, 2% of rape oil in admixture with soya-bean, olive, arachis, or linseed oils [which, like lupin-seed, whale, and shark oils, are free from (II)] can be detected qualitatively by using a 2—20-g. sample. About 0·5% of (II) was identified in one sample (? pure) of Italian grape-seed oil, but (II) was absent from other Italian and 4 laboratory-prepared samples of this oil. E. L.

**Spoilage of fats. III. Influence of minor constituents of fats.** F. Kiermeier and K. Täufel. **IV. Behaviour of the fatty fraction of barley- and malt-coffee [substitutes] on storage.** K. Täufel and J. Köchling (Fette u. Seifen, 1938, 45, 487—491, 491—496; cf. B., 1938, 294).—III. The rôle of natural impurities, *e.g.*, tissue remains, proteins, $H_2O$, enzymes, etc., is discussed in relation to the spoilage and storage of lard, tallow, butter, and margarine.

IV. The changes in the analytical characters of the fats extracted from roasted barley, barley-coffee substitute, and malt-coffee substitute after storage under various conditions have been followed (cf. Bengis, B., 1936, 714). The known keeping properties of these products, which are in the above increasing order, are reflected in the condition of the fat extracted from them, the good qualities of the last-named being related to the stability of its contained fat. Deterioration is evidently associated with oxidative changes, and is restrained by excluding air during storage. The peroxide val. was greater, however, in the fat from products stored in closed boxes than from those on open trays, possibly because secondary breakdown reactions had been prevented by the exclusion of light. E. L.

**Is diphenylcarbazide suitable for detection of rancid fats?** E. Glimm, L. Kludzinski, and H. Fleischhauer (Fette u. Seifen, 1938, 45, 496—503).—Diphenylcarbazide (I) (Stamm reagent; cf. B., 1928, 577) is intensely sensitive to oxidation, which may be induced by presence of traces of Fe, Cu, or Ni. Glycerides, solvents, ketones, aldehydes, AcOH, fatty acids, OH-acids, or $H_2O_2$ do not give any colour with (I) when fresh or pure, but give reddish-blue tints if impure or stale, and, in the case of $H_2O_2$, if traces of Cu, Fe, or Ni ions are present. The colour obtained with rancid fats etc. is intensified if AcOH is present, whilst ketones, which alone remain colourless, give a positive reaction if AcOH or fatty acids be added. The colour from rancid fats, however, appears to be due to the liberation of catalytically activated $O_2$, traces of metal ions, aldehydes, etc. acting as catalyst. The test is therefore only qual. and limited in scope, but is very useful for testing solvents for purity. E. L.

**Use of substituted salicylaldehyde for determination of ketone rancidity in fats.** E. Glimm and A. Semma (Fette u. Seifen, 1938, 45, 500—503).—Of a large no. of substituted salicylaldehydes, only the Ac derivative, *o*-homosalicylaldehyde, and *o*-vanillin give red colours with ketones and ketone-containing fats in HCl solution, while yielding no colour with ketone-free fats or acid; the tints are rather weaker than with salicylaldehyde itself (Täufel and Thaler's reagent), but suffice for the detection of 10 µg. of ketones in 1 g. of fat. E. L.

**Application of cold technique [storage] in the fat industry.** F. Kiermeier (Fette u. Seifen, 1938, 45, 477—479).—A lecture. E. L.

**Preparation of stearin without distillation.** I. O. Lariukov, V. F. Sokolov, and A. I. Nenaschkina (Maslob. Shir. Delo, 1938, No. 4, 23—25).—94—95% of the fatty acids of fat are liberated with the aid of Petrov's contact, and the acids are washed free of inorg. impurities. An equal vol. of 10% NaCl is added to the brown product so obtained, and air is bubbled into the suspension at $\not< 80°$ for 6 hr. The stearin fraction is collected and pressed, to afford light yellow products. Crude oleic acid is obtained as a by-product. R. T.

**Value of the refractive method for determination of the oil content of seeds, oilcakes, and extracted meals.** F. Wittka (Seifens.-Ztg., 1938, 65, 742—743, 762).—The usefulness of the rapid refractive method (cf. Leithe, B., 1935, 317; 1936, 461) in routine factory analyses is confirmed; $1\text{-}C_{10}H_7Cl$ is preferred as solvent. E. L.

**Extraction of [seed] oils with hot solvent.** A. A. Lesiuis (Maslob. Shir. Delo, 1938, No. 4, 5—7).—

The optimum temp. for benzine extraction of soya-bean, cottonseed, and sunflower-seed oils is 60°. R. T.

**Application of high-speed centrifugal separators in the oil and fat industry.** F. Deitmers (Fette u. Seifen, 1938, **45**, 514—517).—An illustrated account of the application of such centrifuges to the refining of expressed and extracted oils of various kinds is given. E. L.

**Composition of "boiled" linseed oil.** S. Chatterjee, A. Saha, and M. Goswami (J. Indian Chem. Soc., 1938, **15**, 433—437; cf. B., 1937, 696).—"Boiled" oil has a diene val. (maleic anhydride absorption val.) indicating the presence of a conjugated double linking. Hydrogenation (Ni) of the oil affords *iso*oleic acid, ascribed to the presence of finely-divided metals acting catalytically through the first creation of the conjugated state in the linoleic acid residue, and then to partial hydrogenation of the latter. A. T. P.

**Heat-treatment of tung oil.** D. Davidson (Paint, Oil, and Chem. Rev., 1938, **100**, No. 17, 11).—Methods of treating tung oil to eliminate wrinkling on drying are reviewed. Investigation of heat-treatment methods indicates that wrinkling cannot be reduced without partial loss of drying properties. The best compromise is obtained by heating at 120° for 60 hr. and adding driers (0·03% Co and 0·09% Pb, as naphthenates). D. R. D.

**Pressure cooking of cottonseed meats and its application to the expeller.** R. H. Pickard (Oil & Soap, 1938, **15**, 261—263).—A promising new type of pressure cooker, whereby cottonseed meats may be heated up to 238° at 15—18 lb. pressure in a closed, steam-jacketed vessel fitted with adjustable live-steam inlet and opposed helical scrapers to provide efficient agitation, is described. If rolled meats so cooked are expressed in an expeller, the oil obtained is atypical, in that it requires less, and less conc., alkali for refining than the usual type of expeller oil. In the case of whole meats, however, the new cooker acts only as a dryer, and the ordinary type of "expeller crude" oil is obtained. E. L.

**Invisible losses in [cottonseed] expeller operation.** R. H. Pickard (Oil & Soap, 1938, **15**, 259—261).—The material balance calc. from the data obtained from a 24-hr. test run of an Anderson Super Duo (oil-cooled) expeller on cottonseed (allowing for evaporated $H_2O$) indicated that "invisible" (*i.e.*, unaccountable) losses were negligible, and within the experimental error of sampling, analysis, etc. E. L.

**Behaviour of cottonseed oil during concentration [bodying] with superheated steam.** E. Pyhälä (Öle, Fette, Wachse, 1938, **3**, No. 7, 4—6).—In the case of refined cottonseed oil distillation began at 300° and yielded distillates containing (pale) solid cryst. fatty acids and oleic acid (I), and a residual viscous clear yellow oil ("concentrate") which may be mixed with mineral machine oil to prepare compound steam-cylinder oils (separation may occur after storage for a year or so). Crude oil, extracted from cottonseed press-cakes, however, distilled from 210° to 280° and hydrolysis occurred, so that the distillate contained dark solid acids, (I), and glycerol; a black, pitchy residue was left in the flask. E. L.

**Drying oils from castor oil.** A. Zinoviev (Maslob. Shir. Delo, 1938, No. 4, 32—34).—Castor oil is heated with 1—2% of ascanite at 220—230° for 1 hr., to yield an oil which dries more rapidly than does linseed oil; it yields, however, a slightly sticky film owing to traces of ricinoleic acid. R. T.

**Extraction of oil from olives.** C. Kerkhoven (Öle, Fette, Wachse, 1936, No. 9, 7—8; Chem. Zentr., 1936, ii, 2255).—Processes are discussed. An easily bleached product, of good quality, with low fatty acid content can be obtained by extraction of the olives with $C_6H_6$, $CS_2$, or $C_2HCl_3$, without preliminary drying. A. J. E. W.

**Fractional distillation of saturated acids of completely hydrogenated oils. V. Hardened olive and rapeseed oils.** S. Ueno and M. Iwai (J. Soc. Chem. Ind. Japan, 1938, **41**, 256—257B).—Fractional distillation of the fatty acids of completely hydrogenated olive oil yields palmitic (13), stearic (87%), and arachidic acid (trace). Similarly treated, hydrogenated rapeseed oil yields stearic (44), behenic (55), and lignoceric acid (1%). J. D. R.

**Preparation of unsaturated higher alcohols [from seed oil].** S. Komori (J. Soc. Chem. Ind. Japan, 1938, **41**, 219—220B).—The Et ester of *Thea sasanqua* seed oil may be hydrogenated to give $>90\%$ yield of the unsaturated alcohol with 20% of Zn–Cr oxide catalyst (cf. A., 1937, II, 82, but prepared by decomp. of $ZnCrO_4$ under reduced pressure) in $1\frac{1}{3}$ hr. at 330°, the initial pressure being 100 atm. Good yields are obtained also with 10% of catalyst at 60 atm. The oil had $n_D^{20}$ 1·4512, $d_4^{20}$ 0·8690, sap. val. 182·8, I val. 73·3. I. C. R.

**Industrial use of tobacco seeds.** V. Arghirescu and T. Vladescu (Bul. Cultiv. Ferment. Tutun., 1936, **25**, 3—48; Chem. Zentr., 1936, ii, 3735).—Rumanian tobacco (Molovata) seeds contain 43—44·4% of a yellow-brown oil [$d^{20}$ 0·9506—0·9647, $n^{20}$ 1·4750—1·4757, $[\alpha]_D^{20}$ +74·39° to +76·03°, acid val. 1·57—3·14, sap. val. 186—188, Hehner val. 94·35—94·73, Reichert–Meissl val. 0·43—0·77, Polenske val. 0·17—0·33, I val. (Hübl) 133·3—138·5, glycerol content 10·09—10·11%, unsaponifiable 0·45—0·62%], and yield an oil cake (17—23% of oil, 37% of protein) suitable for use as cattle feed. The yield of oil under local conditions is 20—30%. A. H. C.

**Argentine grape-seed oil.** R. Rouzaut (Rev. Fac. Quím. Ind. Agric., 1936, **3**, 192—196; Chem. Zentr., 1936, ii, 2255).—The oil had $d$ 0·9255; $n_D^{19}$ 1·47649, $n_D^{24}$ 1·46828, sap. val. 189·57, I val. 133·72, Reichert–Meissl val. 0·537, f.p. −10·5°. A. J. E. W.

**Determination of the degree of thermal denaturation of oil-seed proteins.** V. G. Leites (Maslob. Shir. Delo, 1938, No. 4, 15—17).—5 g. of finely-powdered material are soaked for 10 min. in 15 c.c. of $H_2O$, and 15 c.c. of 4% NaOH are added, followed after 1 hr. by $H_2O$ to 100 c.c. The solution is filtered and N determined in 10 c.c. of filtrate. The degree of denaturation of the proteins is expressed by the ratio filtrate-N/total N. R. T.

**Composition of a soya-bean oil of abnormally low iodine value.** F. G. Dollear, P. Krauczunas, and K. S. Markley (Oil & Soap, 1938, **15**, 263—264).—Dunfield soya beans harvested at Columbia, Missouri, in 1936 were similar in composition (% $H_2O$, oil, N, protein, ash, etc.) to beans derived from the same seed grown in the same location in 1937, except that the $n_D^{25}$ (1·4700) and I val. (101·6) of the oil were abnormally low (cf. $n_D^{25}$ 1·4722, 1·4723, and I vals. 123, 127·3, respectively, for the 1937 oil and for oil from Dunfield beans grown at Lafayette, Indiana). The SCN val. (78), unsaponifiable matter, and other ordinary analytical characteristics of the 1936 oil showed no abnormality. The fatty acids from the 1936 and 1937 Missouri oils and the 1937 Indiana oil showed the following respective % compositions: saturated acids (corr.) 12, 13·2, 13·1; oleic acid 60, 34, 34·8; linoleic acid 25, 49, 46; linolenic acid 2·9, 3·6, 6·0. The Dunfield variety of soya bean tends to yield oils of low I val., and the abnormality of the 1936 oil is attributed to a combination of unfavourable varietal, climatic (unusually hot dry summer), and pedological factors. The refined hydrogenated fat prepared from the abnormal oil showed no better stability than ordinary hardened soya-bean oils. E. L.

**Effect of hydroxyl groups and acetylation on apparent diene values of soya-bean and other vegetable oils.** W. G. Bickford, F. G. Dollear, and K. S. Markley (Oil & Soap, 1938, **15**, 256—259; cf. B., 1938, 294).—Details of the results reported previously (*loc. cit.*) are given. The presence of OH groups and peroxides, and possibly of other oxidation products, increases the apparent diene vals. (Kaufmann or Ellis methods); in the case of soya-bean oil heated in presence of $O_2$, the diene val. increased almost linearly with the OH and peroxide vals. Addition of but-, croton-, or oct-aldehyde did not affect the diene vals. The Ellis method yields higher diene vals. than the Kaufmann method in almost every case, and especially in the case of OH-compounds. E. L.

**[Preparation and uses of] stearates and oleates.** Anon. (Oil and Col. Tr. J., 1938, **94**, 447—449).—A review with special reference to the alkaline-earth and heavy-metal compounds. D. R. D.

**Myristic acid.** J. Schaal (Seifens.-Ztg., 1936, **63**, 695—696; Chem. Zentr., 1936, ii, 3220).—The prep. of myristic acid (I) from coconut oil fatty acid is described. Technical (80%) (I) contains 10% of lauric, 5% of palmitic and stearic, and 5% of oleic acid. It is suitable for the prep. of shampoos and, with oleic acid, toilet soaps. A. H. C.

**Utilisation of myrobalans [*Terminalia chebula*]. II. Myrobalan oil.** S. R. Sunthankar and S. K. K. Jatkar (J. Indian Inst. Sci., 1938, **21**, A, 149—152).—The oil is yellow and has $d_{25}^{25}$ 0·9132, sap. val. 190·2, I val. 105·1, unsaponifiables 1·15%, Hehner val. 96·0, $n_D^{25}$ 1·4700, acid val. 3·4, liquid unsaturated acids 78·77%, Ac val. 5·25, $[\alpha]_D^{25}$ +0·12°, olein 58·6%, linolein 23·3%, saturated glycerides 17·75%. Its composition is similar to that of arachis oil, but it is of little commercial val. owing to the low oil content of the myrobalans. D. W.

**Bleaching of [vegetable] oils with combined adsorbents.** M. Singer (Seifens.-Ztg., 1938, **65**, 701—702, 722—723).—The advantages and economies in using mixtures of bleaching earths and activated C for the purpose are briefly discussed. E. L.

**Syntheses of glycerides with the help of trityl compounds and applications of this new method.** P. E. Verkade (Fette u. Seifen, 1938, **45**, 457—465).—A co-ordinated discussion is given (with 42 references) of the work of Verkade and Helferich and their collaborators and others on (*a*) the prep. of monotritylglycerol (trityl = $CPh_3$) and its use in the synthesis of authentic αγ- and αβ-diglycerides (containing like or unlike acyl radicals), and of triglycerides (3 unlike acyl radicals) of desired configuration; (*b*) the use of ditritylglycerides for the synthesis of α- and β-monoglycerides; and (*c*) the application of de-acylation and detritylation of mixed acyltritylglycerides to determine the configuration of mono- and di-glycerides. In order to correct misconceptions in connexion with the use of trityl compounds in studying the structure of poly-OH-compounds, it is emphasised that *sec.*, as well as primary, OH groups may readily react to yield trityl derivatives. E. L.

**Whaling and whale utilisation.** R. Dietrich (Angew. Chem., 1938, **51**, 715—718).—The working-up of whales for oil and by-products, and the utilisation of these are described (cf. B., 1938, 546, 547, 584). E. L.

**Determination of unsaponifiable matter in whale oil by the draft method of the Norwegian Standards Association.** E. R. Bolton and K. A. Williams (Analyst, 1938, **63**, 652—654).—Comparison with the S.P.A. method (B., 1933, 434) shows that the N.S.A. method (Norsk Hvalfaugat Tidende, 1938, 111) is unsatisfactory since extraction of the unsaponifiable matter is incomplete and variable. E. L. S.

**Shark-fishing and utilisation of sharks, with special reference to the liver oils.** W. Schnakenbeck (Fette u. Seifen, 1938, **45**, 450—456).—An illustrated account is given of the characters and occurrence of those cartilaginous fishes which frequent European waters and might be of interest to German industry, and the utilisation of the flesh (for food), liver oils (a no. of analyses of oils of these and other species are quoted from the literature), and skin (for leather) is discussed. E. L.

**Deposit in cooled halibut-liver oil.** E. A. Lum (Pharm. J., 1938, **141**, 439).—Commercial samples of the oil fall into two classes: those which do and those which do not form a thick deposit on being kept at 4—5° for 24 hr. The latter have probably been cooled and filtered, and this procedure is recommended. P. G. M.

**Partial hydrogenation of fish oil. IX. Hydrogenation of herring oils (Ōnishin oil and konishin oil).** M. Takano and F. Kikuya (J. Soc. Chem. Ind. Japan, 1938, **41**, 238—240B; cf. A., 1937, II, 482).—Ōnishin oil (from adult herrings) and konishin oil (from young herrings) are hydrogenated to various degrees of I val. by $H_2$ at 200—210°/1 atm., using a Ni–kieselguhr catalyst, and the hydrogenated oils converted into the fatty acids; these are then separated into saturated and unsaturated acids with 1, 2, and 3 or more double linkings. In both cases the highly unsaturated acids are first hydrogenated, and only when these have disappeared is saturated acid formed in appreciable quantity. (Cf. B., 1935, 859.) J. D. R.

**Determination of acid, saponification, and iodine values of fats and oils.** K. Koch (Süddeuts. Apoth.-Ztg., 1938, 78, 603—604, 611—613).—Various pharmacopœial methods for these determinations are described and discussed. For the determination of acid val., PrOH+$Et_2O$ is recommended in place of EtOH+$Et_2O$, whilst in the cast of the sap. val. the use of MeOH in conjunction with saponification under pressure has advantages. For the Hanus I val. method a smaller tolerance in the wt. of the sample appears to be desirable. The prescribed limits for these analytical characters given in 7 European and the U.S. Pharmacopœias are listed for 12 oils and fats. E. L.

**Manufacture of soap from rape oil.** S. Z. Engel (Maslob. Shir. Delo, 1938, No. 4, 22—23).—Soft soap with good detergent properties is obtained from hardened rape oil. R. T.

**Use of aluminium in the soap industry.** H. Lichtenberg (Fette u. Seifen, 1938, 45, 518—521).—An illustrated survey of some of the applications of Al plant (for tanks, fittings, distillation columns, heat exchangers, presses, etc.) for fatty acid manufacture is given. E. L.

**Influence and elimination of free and hydrolytic alkali [in soap].** N. Welwart (Öle, Fette, Wachse, 1938, 3, No. 8, 3—6).—The presence of "free" and hydrolytic alkali in soap solutions is discussed in reference to the harmful effect of alkali on the skin, and the cosmetic advantages of soaps (composition not described) which show negligible hydrolytic alkalinity are stressed. E. L.

**Transparency of soap.** Anon. (Seifens.-Ztg., 1938, 65, 545—548).—A discussion, mainly extracted from the papers of Tiutiunnikov *et al.* (cf. B., 1938, 79) on the structure and methods of producing transparent soap, including mechanical methods, *e.g.*, by milling, of rendering opaque soaps transparent. E. L.

**Detergent power and disinfectant power of soaps.** J. Stockhausen (Fette u. Seifen, 1938, 45, 596—597).—A lecture. The parallel increase of disinfecting activity and detergent power of soap solution with increasing mol. wt. and mol. saturation of the soap is regarded as a consequence of the greater degree of hydrolysis of the high-mol. saturated soaps. E. L.

**Surface tension of soap solutions.** Lottermoser (Fette u. Seifen, 1938, 45, 595—596).—A lecture. The measurement of static $\gamma$ of soap solutions by the ring method is complicated by errors introduced by the reaction of the soap with atm. $CO_2$ (which can be eliminated) and by the more troublesome effect of the presence of imperfectly wetted surfaces (*e.g.*, walls of the vessel or the Pt ring itself), at which points local concn., and even crystallisation, of solute may occur, apparently as a consequence of hydrolysis of the soap in dil. solution. E. L.

**Examination of old soapstock.** F. Wittka (Seifens.-Ztg., 1936, 63, 774—796; Chem. Zentr., 1936, ii, 3859).—Changes in soapstock on keeping are noted. In particular, the increase in fatty acids by hydrolysis of neutral oil and its effect on the loss factor are considered. A. H. C.

**Report of Soap-Stock Committee: American Oil Chemists' Society, 1937—8.** (Oil & Soap, 1938, 15, 268—271).—Collaborate studies indicate that the existing A.O.C.S. official "dry extraction" (fatty acid cake) method and the "optional official" (wet extraction with light petroleum) method give satisfactory results for the determination of "total fatty acids of all soap stock and acidulated soap stock except those from copra or palm-kernel oils." Further studies (detailed), using minor modifications of these methods, however, have shown the need for more sp. and consistent directions, and the methods have been re-drafted accordingly. The solvent, to be known officially in the A.O.C.S. Methods as "petroleum ether," should be tested according to Rule 272, Sect. 3, of the Rules of the National Cottonseed Products Assoc. E. L.

**Measurement of dispersive power for calcium soap.** E. L. Lederer (Öle, Fette, Wachse, 1936, No. 10, 1—3; Chem. Zentr., 1936, ii, 2257).—Kuckertz' method of measurement is preferred. The degree of dispersion is not simply related to optical properties, and relationships are derived giving the light transmission in terms of the concn. of disperse medium. Three consts. must be specified to determine the dispersive power of a given medium. A. J. E. W.

**Accelerated method of determining fatty acids, kaolin, and protein in soap.** B. I. Soibelman (Maslob. Shir. Delo, 1938, No. 4, 12—14).—Excess of $H_2SO_4$ is added to 0·5—0·8 g. of soap in 3 ml. of $H_2O$, in a centrifuge tube, and the suspension is shaken with 8 ml. of $Et_2O$ and centrifuged. 4 ml. of the $Et_2O$ layer are evaporated and the residue is weighed; the fatty acid content is then $795a/A(4 - 0{\cdot}84a)$, where $a$ is the wt. of the residue, and $A$ the wt. of soap taken. 2 vols. of EtOH are added to 0·5—0·8 g. of soap in 3 ml. of $H_2O$, the mixture is centrifuged, the residue of kaolin boiled with 2 ml. of $H_2O$, EtOH again added, and the mixture again centrifuged (these washing processes being repeated 3 times); the final residue is dried and weighed. Excess of $H_2SO_4$ is added to the first centrifugate from kaolin determination, the solution extracted with $Et_2O$ to remove fatty acids, EtOH added, the suspension centrifuged, and the ppt. of protein washed with EtOH and $Et_2O$, dried, and weighed. R. T.

**Manufacture of detergents for domestic purposes from fatty alcohol sulphonates.** A. Bohanes (Chem. Obzor, 1938, 13, 70—73).—Aliphatic alcohol sulphonates (I) can be used as domestic detergents when mixed with suitable substances, *e.g.*, stearin and cetyl alcohol, which produce readily mouldable masses and form aq. emulsions easily. (I) may be used in hair washes when, *e.g.*, methylcellulose is added to decrease the drying effect on the hair. The preps. are neutral, produce abundant non-irritant lather, and do not reduce the natural fat content of the skin or hair. F. R.

**Granulation of powder-form detergents and the possibility of its control in the spray[-drying] process.** B. Thomas (Seifens.-Ztg., 1938, 65, 647—649, 680—681, 700—701).—Questions of the uniform admixing of liquoring agents (silicates, bleaching soda, etc.) to the soap and the effect of these and of the type of granulation on the bulking-vol. of soap powders are discussed and illustrated with 20 photomicrographs. E. L.

**Sodium perborate as a corrosion-inhibitor in washing powders.** L. L. Little (J. Dairy Sci., 1938, 21, 154—155).—5% solutions of $Na_2SiO_3$, $Na_3PO_4$, and $Na_2CO_3$ attack Al and Sn plating. 5% of borax in the $Na_2SiO_3$ solid prevented action on Sn and Al, but not with $Na_3PO_4$ and $Na_2CO_3$. Combinations of borax and $Na_2SiO_3$ prevented the action of $Na_3PO_4$ and $Na_2CO_3$. $Na_3PO_4$ required 10% of borax and 20% of $Na_2SiO_3$, and $Na_2CO_3$ required 5% of borax and 10% of $Na_2SiO_3$, to prevent the action on Sn and Al. W. L. D.

**Lanette wax.** L. Ivanovsky (Öle, Fette, Wachse, 1936, No. 10, 10—11; Chem. Zentr., 1936, ii, 2256).—Lanette wax (I) is a mixture of $n$-$C_{16}H_{33}\cdot OH$ and -$C_{18}H_{37}\cdot OH$; (I) *extra* also contains fatty acids. (I) *SK* and *K*, consisting of cetyl and myristyl alcohols, respectively, contain small quantities of a neutral emulsifying agent of the sulphonate type. (I) *U* contains larger amounts of a neutral S compound. The properties and uses of the waxes are described. A. J. E. W.

**Determination of free alkali in coloured wax emulsions.** K. S. Nitsche (Öle, Fette, Wachse, 1938, 3, No. 6, 1—3).—Soaps and wax are removed from the aq. medium by salting out with NaCl (in the hot if $NH_3$ is absent), and the free alkali in the aq. solution is determined by one of the following methods: (*a*) if carbonates are present, the liquid is acidified and the $CO_2$ determined gravimetrically (apparatus described); (*b*) in the case of hydroxides, these are converted into carbonates by the passage of $CO_2$, and after boiling off the excess of $CO_2$ are determined as in (*a*); (*c*) $NH_3$ is determined by distillation and titration, and borates through conversion into Me borate. E. L.

**Vegetable oils as Diesel fuels. *d* of lubricating oils.**—See II. **$NaPO_3$ in dish-washing.**—See VII. **Corrosion of metals by oils.**—See X. **Fatty alcohols for leather. Shoe creams.**—See XV. **Poppy- and safflower-seed oil.**—See XVI. **Determining acidity in butter fat. Spoilage of margarine. Bakery fats. Fat in solvent-extracted materials. Lecithin in soap. [Fat from] coffee grounds.**—See XIX. **Acetals in [soap] perfumery.**—See XX.

Errata :—On p. 1184, col. 1, line 8 from bottom, *for* preceding abstract, and line 4 from bottom, *for loc. cit.*, *read* B., 1938, 1065, in each case. On p. 936, col. 2, line 27 from bottom, *for* F. Legé *read* E. Legé.

See also A., II, 428, **Prep. of anhyd. Mg oleate.** 451, **Vitamin-*E*.** 465, **Determining glycerol in aq. solution.** 466, **Determining tocopherols.** III, 924—930, **Vitamins.** 943, **Tung oil and dermatitis.**

Patents.

**Manufacture of a colloidal product from wool fat.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 483,315, 15.10.36).—Wool grease, or a purified fraction therefrom, is treated with 1—5% of an alkali metal (*e.g.*, Na wire), either alone at 100—150° or in presence of an inert solvent (*e.g.*, light petroleum, $C_6H_6$), at the b.p. After filtering off the undissolved metal, the waxy product may be mixed with $H_2O$ (and neutralised, if desired) to yield a colloidal solution. Its use in textile treatment or for cosmetics is indicated. E. L.

**Continuous refining of vegetable and animal oils.** Aktieb. Separator (B.P. 485,975, 8.10.37. Swed., 8.10.36).—The oil is mixed with alkali and passed through a heater (*e.g.*, at 50° or 60°); the amount of soap in solution is then greatly reduced by passing the mixture through a cooler, *e.g.*, at 20° or 30°, before separating the soap in a centrifugal separator; if required, the oil may then be washed and recentrifuged. For oils not yielding difficult emulsions, *e.g.*, coconut oil, the oil-storage tank may be heated by steam coils, so that the mixing with alkali takes place in the warm and the subsequent heating unit may be omitted. E. L.

**Distillation of (A) linseed and similar oils, (B) natural glycerides and preparation of vitamin compositions.** Eastman Kodak Co., Assees. of K. C. D. Hickman (B.P. 485,614 and 485,549 [A, B] 18.8.36. U.S., 24.8.35).—(A) Unbroken linseed or other unsaturated oil is degassed, subjected to mol. distillation, and the neutral " late " distillate fractions (*e.g.*, third or fourth fractions), which have a higher I val. than the original oil, are collected. (B) The neutral, protein-free fraction rich in unsaturated glycerides obtained by mol. distillation of unsaturated oils (*e.g.*, linseed or cod-liver oil), as in (A), is incorporated with vitamin concentrates in order to prevent the allergic conditions resulting from ingestion of the latter. E. L.

**(A) Buoyant soap cake. (B) Manufacture of [hollow or cellular] soap cakes.** R. A. Jones (B.P. [A] 492,171 and [B] 493,699, 12.3.37).

**Regenerating bleaching clays etc. Degreasing articles by solvents.**—See I. **Substituted aliphatic acids. Sulphonation products.**—See III. **Shortening.**—See XIX. **Vitamin-*D*.**—See XX. **Solutions of $O_2$ in aliphatic compounds.**—See XXIII.

## XIII.—PLASTICS; RESINS; PAINTS; COATING COMPOSITIONS.

**Preparation of polyvinyl chloride plastics for electrical measurements.** R. M. Fuoss (Trans. Electrochem. Soc., 1938, 74, Preprint 28, 421—442).—The sources of error in electrical measurements and their prevention are discussed. Imperfect contact between the surfaces of the sample and the electrodes is prevented by coating the plastic with a conducting C film. Dimensional changes in the sample, due to the relaxation of elastic strains, must be carefully determined. The d.-c. conductance ($\kappa$) summarises the thermal history of polyvinyl chloride–tritolyl phosphate, since the amount of HCl liberated by this plastic, and hence the $\kappa$, increases with time and temp. K. W. P.

**Phenomena observed in a polystyrene film and deductions therefrom.** G. van Iterson, jun., and K. E. C. Buyn (Kolloid-Z., 1938, **85**, 60—70).—Strips of polystyrene film, cut parallel and perpendicular to the directions of rolling, when heated at 90° under tension or in the unloaded state, undergo dimensional changes. Specimens may exhibit contraction (" racking "), extension, or initial contraction followed by extension. These changes and observations on double refraction are discussed in relation to the structure of the film. E. S. H.

**Chemical examination of synthetic plastics made by condensation or polymerisation.** A. Bohanes (Chem. Obzor, 1936, **11**, 9—12; Chem. Zentr., 1936, ii, 2804).—In resins traces of $CH_2O$ are detected with Schiff's reagent, PhOH by the diazo reaction, and urea by the appearance of $NH_3$ in the distillate on boiling with NaOH (highly polymerised products may be distilled with aq. $H_2SO_4$, and $CH_2O$ and PhOH detected in the distillate). Vinyl resins are recognised by the formation of aldehydes and lower fatty acids on boiling with EtOH–KOH in $C_6H_6$ or $CHCl_3$, coumarone resins burn with a smoky luminous flame, cellulose products give no $CH_2O$ or PhOH on distilling with aq. $H_2SO_4$, and galalith gives a horn-like odour on heating and a red-violet colour on boiling with tryptophan. A. H. C.

**Soya-bean protein as a base for plastic material.** G. H. Brother and L. L. McKinney (Brit. Plastics, 1938, **10**, 248—251).—An account is given of earlier work and a new process is described in which commercial soya-bean protein is hardened by $CH_2O$ at $p_H$ 4·1—4·3. The product with a plasticiser may be moulded to give a translucent thermoplastic. K. W. P.

**Synthetic substances with rubber-like properties.** E. R. Bridgwater (Mech. Eng., 1938, **60**, 735—737).—The properties of synthetic rubber, alkylene sulphides, polyvinyl and glyptal resins, etc. are reviewed. R. B. C.

**Classification and chemical genetics of organic plastics.** G. M. Kline (Trans. Electrochem. Soc., 1938, **74**, Preprint 35, 535—557).—An account of the following groups is given: (1) synthetic resins, *e.g.*, phenolics, vinyls, etc.; (2) synthetio lastics, *i.e.*, rubber-like products excluding natural rubber; (3) natural resinous and bituminous plastics; (4) cellulose derivatives; (5) protein plastics. K. W. P.

**Removal of bubbles from plastics for moulding purposes.** Anon. (Rev. Gén. Mat. Plast., 1938, **14**, 177s).—A process for removing air from plastics in the course of moulding is described. F. McK.

**Injection moulding of shellac plastics.** S. Ranganathan and H. K. Sen (Proc. Inst. Chem. [India], Reprint, 1938, **10**, Pt. I, II; Res. Note 19, Indian Lac Res. Inst., 2 pp.).—A composition containing shellac (6 pts.), wood-flour (4), urea (0·2), Ca stearate (0·1 pt.), and pigment or dye is workable at 110°. S. M.

**Metallising plastic surfaces.** Anon. (Mod. Plastics, 1938, **16**, No. 1, 30—31, 68).—An American process for electroplating plastics is described. F. McK.

**Pipes made from plastics.** E. Pallas (Korros. u. Metallschutz, 1938, **14**, 282—285).—The properties and applications of pipes made from plastic materials are discussed and methods of joining described. C. E. H.

**Plastics and electrical insulation.** L. Hartshorn, N. J. L. Megson, and E. Rushton (J. Inst. Electr. Eng., 1938, **83**, 474—496).—An account is given of the essential dielectric properties in plastics. Vals. for the power factor and $\epsilon$ of dried and undried resins from $CH_2O$ with PhOH, *m*-cresol, and *m*-5-xylenol have been determined over a range of temp. and frequency. High $H_2O$ absorption and poor dielectric properties are correlated with the presence of polar groups in the resin mol. K. W. P.

**Origin and mechanism of adhesion in wood plastics.** A. J. Bailey (Mod. Plastics, 1938, **15**, No. 11, 39—40, 66).—Adhesion is attributed to the cellulose in wood. Increasing the bonding capacity of cellulose by mechanical comminution and chemical gelatinisation should, it is suggested, produce greater strength. F. McK.

**Impact-testing of plastics.** R. Burns and W. W. Werring (Mod. Plastics, 1938, **15**, No. 12, 37—41, 52, 54, 56).—Methods of impact-testing are reviewed and the influence of conditioning on test-pieces, as shown by tests on phenolic and methacrylic resins and cellulose acetate, is examined. F. McK.

**Manila resins and the properties of their alcohol solutions.** C. W. Kopf (Paint, Oil, Chem. Rev., 1938, **100**, No. 15, 12—14).—The $\eta$ and colour of 50 wt.-% solutions of 27 commercial grades of Manila resin in MeOH, EtOH (various grades), $Pr^{\beta}OH$, BuOH, $C_5H_{11}{\cdot}OH$, $OH{\cdot}[CH_2]_2{\cdot}OEt$, and diacetone alcohol have been measured. $\eta$ rises with increase in the mol. wt. of the alcohol. The solubility in $(CH_2{\cdot}OH)_2$ is, in general, <50 wt.-%. D. R. D.

**(A) Shellac esters. Esterification of hydroxyl groups of lac with acids. (B) Fractionation of lac.** (A) R. Bhattacharya and B. S. Gidvani. (B) R. Bhattacharya and G. D. Heath (London Shellac Res. Bur., 1938, Tech. Papers [A] 15, 14 pp.; [B] 16, 15 pp.).—(A) Prep. of esters by causing one or more of the five OH groups in the lac mol. to react with AcOH, $PrCO_2H$, octoic, lauric, stearic, oleic, and linseed oil fatty acids and with rosin is described. Three OH groups react more readily than the other two; under suitable conditions all may react. Excess of acid was necessary in each case; with lower fatty acids this was removable by steam-distillation or washing with light petroleum, but with the higher fatty acids excess had to be esterified with suitable alcohols. With unsaturated acids there was a tendency for gelation to occur; oleic acid, however, gave a smooth reaction. The solubilities of the products are stated and some possible uses indicated (cf. B., 1938, 1192).

(B) Extraction of 12—16% of the lac content with $Na_2CO_3$ leaves a residue which has higher m.p., increased $H_2O$-resistance, and lower acid val. The effect of varying the size of the particles, the concn. and temp. of the $Na_2CO_3$ solution, and the relative proportion of $Na_2CO_3$ has been investigated and optimum conditions are given. The product contains considerable amounts of $Et_2O$-sol. matter; hence insolubility in $Et_2O$ is not necessarily a criterion of the quality of lac. After repeated extractions the residue became insol. in EtOH and had high m.p. and reduced flow; it is suggested that this residue consists of the more highly polymerised lac components, the dispersion of which in solvents is assisted by the alkali-sol., less polymerised, and softer portion (cf. B., 1938, 1072). S. M.

(A) **Iodine absorption by lac and similar natural resins and a rapid method for its determination.** A. KARIM and D. E. COOK. (B) **Mechanical and electrical properties of some commercial standard lacs.** A. KARIM. (C) **Shellac plastics. I. Compositions containing urea.** S. RANGANATHAN (Indian Lac Res. Inst., [A] 1937, 10 pp.; [B] 1937, 21 pp.; [C] 1938, Bull. 30, 8 pp.).—(A) As I vals. by Wijs' method tend to be high in consequence of halogen substitution, the Hübl method has been modified so as to give rapid results. The resin (0·5 g.) is heated at 70° under reflux for 30 min. with $CHCl_3$ (10 c.c.) and Hübl reagent (25 c.c.); the determination is completed in the usual way. A sample of TN lac gave I val. 15·2 (usual Hübl val. 14·3, Wijs val. 22·6). Results for rosin and kauri gum are also given.

(B) The hardness of lac films can be determined with Shore, Vickers, or Brinell apparatus; four filler-free samples of varying analytical data gave approx. the same hardness. Lac films could not be examined by these methods. The tensile strength was satisfactorily determined in a Michaelis cement tester. Repeated determinations of the breakdown voltage of films deposited on paper or Cu differed so widely as to be valueless, but moulded discs (prep. described) gave concordant results which depended on the thickness of the specimen (data tabulated). The four lacs examined again gave approx. the same results and there was little loss on curing or heat-hardening. Lac wax has the same breakdown voltage as the whole lac.

(C) The (*a*) impact strength, (*b*) heat-resistance, and (*c*) Vicat-needle data of moulded shellac panels are increased and the (*d*) $H_2O$-absorption is decreased by incorporating $\not> 6\%$ of urea with lac; the lac is dissolved in EtOH and the product dried in a vac. at 55°. With increasing proportions of wood-flour (*b*), (*c*), and (*d*) gradually decreased, but (*a*) showed a max. with 55% addition. With kaolin, barytes, and asbestos as fillers, instead of wood-flour, the improvement in mechanical properties was less marked, but (*d*) was considerably reduced. Preheating the powder for 20 min. at 90—95° is advantageous. Although urea reduces the plasticity, flow is sufficient for moulding at 160° and 1—2 tons/sq. in. S. M.

**Plasticised hardenable phenol resins.** A. GRETH (Angew. Chem., 1938, 51, 719—721).—A lecture. E. L.

**Rôle of catalysts in formation of phenol-formaldehyde condensation products.** F. SEEBACH (Fette u. Seifen, 1938, 45, 509—511).—Crystals of *pp*- and *op*-$CH_2(C_6H_4{\cdot}OH)_2$ have been isolated as characteristic constituents of the vac.-distillate recoverable from Novolak which has been prepared by condensing PhOH and $CH_2O$ in presence of acid and basic catalysts, respectively (these can be obtained also by simple crystallisation from the Novolak stock before it has been heated). Mixtures of these are obtained in the case of resins prepared with catalysts (*e.g.*, $NH_4Cl$, aq. $NH_3$) of intermediate $p_H$. Photomicrographs of these products and of the corresponding $Me_2$ derivatives similarly recovered from *o*- and *m*-cresol-Novolaks are shown. With *p*-cresol-Novolaks, the *oo*-derivative (*i.e.*, 6 : 6'-dihydroxy-3 : 3'-dimethyldiphenylmethane) is obtained irrespective of the nature of the catalyst. The bearing of these results on the theory of the formation of such resins, and on their analysis, is discussed. E. L.

**Determining the analysis and structure of phenol-resin compressed materials.** W. ESCH and R. NITSCHE (Kunstharze, 1938, 8, 249—250, 252—253).—A weighed sample (containing org. filler) is treated in a small wire cage for 24 hr. at 160—180° with α- or β-$C_{10}H_7{\cdot}OH$, which loosens the pure resin. The cage and its contents are then heated, while still hot, with a boiling 1 : 3 mixture of EtOH and benzol, to remove adherent naphthol. The contents are then extracted with $Et_2O$ and dried in air. The filler remains in the cage, which is weighed. The difference between the two weighings gives the resin content. F. McK.

**New applications of synthetic resins.** O. JORDAN (Oil and Col. Tr. J., 1938, 94, 455—458).—A review. D. R. D.

**Substitution of natural by artificial iron oxides [as pigments].** ANON. (Farben-Ztg., 1938, 43, 1093).—The extended use of artificial Fe oxides is urged as they show marked superiority in staining power, light-, alkali-, and weather-resistance, and fineness of particle size, and are less liable to variation. Where extension with kaolin alone produces undesirable tone, a 1 : 1 mixture of kaolin and $CaCO_3$ can be used. In oil a mixture of $CaCO_3$ and $BaSO_4$ is recommended. Admixture of chrome-yellow is available only for oil paints. S. M.

**Utility of iron oxide pigments for protective paints.** E. STOCK (Korros. u. Metallschutz, 1938, 14, 265—269).—Paints containing $Fe_2O_3$, $Fe_3O_4$, and other pigments were prepared and then applied to wood, masonry, Fe, and Zn. The painted specimens were tested for elasticity of the coating and for resistance to $H_2O$, $CuSO_4$, HCl, $Na_2CO_3$, smoke, NaCl, and heat. The results indicated that Fe oxide pigments possess good properties, but have the disadvantage of retarding the drying of the paint. C. E. H.

**Development and progress in manufacture of titanium pigments.** R. STRAUSS (Paint Var. Prod. Man., 1938, 18, 292—295).—A review. D. R. D.

**Red lead problems.** H. Wagner (Korros. u. Metallschutz, 1938, **14**, 273—277).—In the author's accelerated weathering test (B., 1938, 83), Fe oxide paints give much poorer results and $Pb_3O_4$ better results than in normal weathering. The reasons for this are discussed. The transmission of white and ultra-violet light by paints prepared from $Pb_3O_4$–heavy spar mixtures has been studied. The transmission is greatly increased with increase of the spar content, but can be reduced by the use of finely-ground or calcined spar. The latter, however, necessitates a greater proportion of oil, leading to increased liability to peeling. C. E. H.

**Colour of lead chromate pigments.** R. C. Ernst, E. E. Liktenhous, and J. W. Spanyer (Paint Var. Prod. Man., 1938, **18**, 302—306).—Pb chromate pptd. from a solution having $p_H < 9$ consists of yellow monoclinic $PbCrO_4$. At $p_H > 9$ the orange ppt. obtained consists of a basic chromate, the red colour and basicity of which increase with the $p_H$. D. R. D.

**Preparation of molybdate-orange.** A. Linz (Amer. Ink Maker, 1938, **16**, No. 9, 51—53, 81).—The best conditions for the pptn. of a stable red pigment are investigated and the following procedure is recommended. 1 l. of a solution containing $Na_2Cr_2O_7$ 1·15, $Na_2SO_4$ 0·17, $Na_2MoO_4$ 0·28, and NaOH 0·32% is run into an equal vol. of 3·47% $Pb(NO_3)_2$ solution at 15—20°. $HNO_3$ is added to give $p_H$ 2·5—3·0. After stirring for 30 min., a solution containing 2·3 g. of $Al_2(SO_4)_3$ in 20 ml. of $H_2O$ is added and the whole exactly neutralised with NaOH. The ppt. is filtered off, washed, and dried at $\nless$ 100°. The film of $Al(OH)_3$ pptd. on the pigment serves to stabilise and increase the brilliance of the colour and decrease the oil absorption. Other salts [$K_3Fe(CN)_6$] may be employed instead of $Na_2SO_4$, but mixed $PbCrO_4$–$PbMoO_4$ crystals containing no $PbSO_4$ or other insol. Pb salt are less red in colour and the conditions of manufacture require to be controlled more exactly. Small variations in conditions (concn., $p_H$, temp. of pptn. and of drying, etc.) which lead to the formation of yellow, monoclinic $PbCrO_4$ instead of the desired red tetragonal form are discussed. D. R. D.

**Standard colour tests [of pigments].** Tech. Comm. of the Printing Ink Production Club (Amer. Ink Maker, 1938, **16**, No. 9, 55—58).—Tentative standard methods for determining oil absorption, light-fastness, bleeding tendencies, colour, and tinting strength of pigments are proposed. D. R. D.

**Testing of pigments for basic properties.** E. Rossmann [with R. Haug and A. Kiebitz] (Fette u. Seifen, 1938, **45**, 503—509).—Preliminary studies of the $p_H$ of suspensions of pigments in $H_2O$ and dil. solutions of acids ($HCO_2H$, AcOH, $EtCO_2H$, $H_2C_2O_4$) such as may be generated during the ageing of drying-oil films, and of suspensions of paint films, indicated the important influence of basic pigments on the $p_H$ of the absorbed moisture in a paint film; this was confirmed by measurements of the $p_H$ of the retained $H_2O$ in actual paint films, for which a new method comprising the use of a thin glass bulb electrode coated with the paint in question and immersed in $H_2O$ is described. Since corrosion of Fe decreases with increasing alkalinity of the contact liquor, selection of basic pigments so as to produce alkaline conditions in the moist paint film should assist in restraining corrosion of painted Fe surfaces. E. L.

**Spectrography and spectrophotometry in the examination of works of art.** M. Roulleau (Document. Sci., 1936, **5**, 161—167; Chem. Zentr., 1936, ii, 3151).—The recognition of homogeneity in ultra-violet light and electrolytic and spectroanalytical methods of examining pigments (*e.g.*, of paintings) is described. Hg (*e.g.*, in cinnabar) is detected by its spectral lines, and examination of reflected light of pigments is of val. A. H. C.

**Aniline inks—their manufacture and use.** J. J. Deeney (Amer. Ink Maker, 1938, **16**, No. 7, 25—26).—A review. The use of insol. pigments rather than dissolved dyes is advocated. D. R. D.

**Determination of the age of inks by the chloride method.** J. Finn, jun., and R. E. Cornish (Ind. Eng. Chem. [Anal.], 1938, **10**, 524—525).—The chloride test involves so many factors, *e.g.*, nature of the ink, added chloride, etc., that any conclusions drawn from this test regarding the age of writing should be accepted with reserve. L. S. T.

**Action of bleaching earths on turpentine. III.** E. Erdheim (Öle, Fette, Wachse, 1938, **3**, No. 6, 7—8; cf. B., 1938, 1327).—*d*-Pinene reacts less actively with bleaching earths than does *l*-pinene, and very much less energetically than either of the turpentines tested previously (*loc. cit.*), which latter also show more rapid reaction and higher max. temp. E. L.

**Sadkinsk asphaltites as materials for the enamel paint industry.** P. V. Serb-Serbin, V. I. Medvedeva, and V. P. Iliuchin (Prom. Org. Chim., 1938, **5**, 605—610).—Analytical data are recorded. The asphaltites are related to gilsonite, and may be used for the prep. of enamel paints. R. T.

**Foam prevention and preventers in the paint industry.** F. Cellin (Farbe u. Lack, 1938, 461—462, 473—474).—Some suggested theories to explain foaming and the action of various types of foam preventers are discussed. Although neutral glue foams more than strongly alkaline glue, non-foaming is not an indication of purity; 0·3—0·5% of neutral fat considerably reduces foaming. For casein dispersions a 1 : 1 : 1 mixture of EtOH, petroleum, and clove oil is suggested. Foaming of polyacrylates is due to presence of emulsifying and stabilising agents. S. M.

**Modern corrosion protection with particular reference to paint for use under water.** G. Schultze (Korros. u. Metallschutz, 1938, **14**, 270—273).—The application of paints prepared from new org. binders (*e.g.*, chlorinated rubber) is discussed with examples. C. E. H.

**Protection from corrosion by means of oil films.** J. Scheiber (Fette u. Seifen, 1938, **45**, 578—582).—The electrical resistance method for measuring the swelling (imbibition) and pore occurrence in supported paint films has been applied in conjunction with observations of the corrosion suffered by an Fe support, to study the effect of different pigments in supported paint films immersed in dil. KCl or $K_2SO_4$. The sp. protective action of red-Pb and ZnO is confirmed and the reason therefor (result of chemical, *i.e.*, basic, or electrochemical properties of the pigment?) is discussed. The anticorrosive effect of red-Pb, but not of ZnO, is greatly reduced by admixture of inert pigments. E. L.

**Pretreatment of metal surfaces for painting.** F. N. Speller (Ind. Eng. Chem., 1938, **30**, 1152—1156).—Factors which affect adhesion of paint films and the prep. of Fe surfaces are discussed with particular reference to removal of mill scale and the application of $H_2O$-sol. inhibitors. Photographs illustrate the improved corrosion-resistance of steel panels which had been treated with $H_3PO_4$–chromate solution or a Bakelite primer. S. M.

**Application of paint to cold-pressed sheet steel.** A. H. Stuart (Chem. and Ind., 1938, 961—963).—The use of graphited oils and soaps as lubricants has the disadvantage that the film of graphite retained by the pressed sheets contains oil which is not removed by common degreasers; subsequent painting is thus interfered with. With "Aquadag" (aq. colloidal graphite), however, no degreasing is necessary, the graphitic film formed does not prevent adhesion of the paint, and electrolytic measurements show that the rust-inhibitive action of $Pb_3O_4$ primers is not reduced. S. M.

**Corrosion-resistant paints for iron.** B. Scheifele (Korros. u. Metallschutz, 1938, **14**, 262—265).—Recent developments are reviewed. C. E. H.

**Fire- and water-resistant coatings for iron and [other] metals.** O. T. Koritnig (Korros. u. Metallschutz, 1938, **14**, 253—258).—The characteristics and application of non-inflammable and corrosion-resistant lacquers, paints, and varnishes are reviewed. C. E. H.

**Organic protective coatings for special conditions in the construction of [metallic] plant.** F. J. Peters (Korros. u. Metallschutz, 1938, **14**, 258—262).—A review. C. E. H.

**Rigidity of settled pigment layers in paints.** E. L. McMillen and D. W. Glaser (J. Appl. Physics, 1938, **9**, 502—507).—The final settling equilibrium in paints is reached when each pigment layer possesses sufficient rigidity to support the wt. of the pigment structure above it. Settling properties and ease of remixing can be predicted from the rigidity of milled samples of high pigment content. J. A. K.

**Effect of corrosion on durability of paint films.** V. M. Darsey (Ind. Eng. Chem., 1938, **30**, 1147—1152).—The useful life of paints of varying composition when spread on steel, Al, galvanised Fe, and stainless steel was determined by (*a*) salt-spray and (*b*) humidity tests, and by (*c*) outside exposure. (*a*) and (*c*) were fairly related. The results with bare steel and galvanised Fe show that on easily corrodible surfaces outside durability is inversely ∝ the degree of blistering (produced by $H_2O$-penetration of the film) in (*b*), but although Al and stainless steel blistered badly their durability was good. Corrosion is a result of blistering, not a cause. The better adhesion obtained by sand-blasting the surface did not materially improve the durability, but bonderising was advantageous. S. M.

**Determination of adhesion of paint films.** E. Rossmann (Farbe u. Lack, 1938, 485—486, 497—498).—Apparatus which determines the force required to remove a film from its base is defective if it does not take into account the duration of application of the force and the possibility of a mol. film being left. The anchoring action of the surface can be ascertained by separately measuring the detaching force from a perfectly smooth surface. True adhesion is recorded only when no bending moments are introduced, as detachment is thereby facilitated particularly with hard, thick films. Schmidt's apparatus (B., 1933, 836) gives an approx. measure of true adhesion. For practical purposes, however, internal stresses of the film must be included, and an apparatus is described in which the period of application can be varied. It is shown also that the scratch-resistance varies with the adhesion, whilst Erichsen-machine data indicate that adhesion is less on light alloys than on Fe. S. M.

**Modern plant equipment in boiled-oil and varnish factories.** E. Stock (Fette u. Seifen, 1938, **45**, 591—595).—An illustrated lecture referring specially to modern plant for large-scale gum-running (*e.g.*, >5000-kg. batches), stand-oil boiling, etc., for the cooking of perilla oil (with notes on the necessary technique), and for the cleaning of used cans etc. E. L.

**Factory testing of paint and varnish products.** E. W. Plowman (J. Oil Col. Chem. Assoc., 1938, **21**, 311—320).—Laboratory layout and tests for control of the quality of varnishes, paints, and stoving finishes are discussed. S. M.

**Action of solvents and impregnating varnishes on varnish films.** E. Greulich (Z. Elektrochem., 1938, **44**, 627—636).—The films swell slowly in mineral oil solvents and quickly in alcohols and $C_6H_6$. The influence of temp. is more pronounced for the former than for the latter class of solvents. Impregnating varnishes act similarly to the solvent they contain. Data have been obtained at various temp., and the influence of pretreatment of the films on the rate of swelling, on the interval which elapses before swelling begins (activation time), and on the heat changes during swelling has also been investigated. C. R. H.

**From earliest varnish to development of the linkage-interpolymerisation type.** H. Friedmann (Amer. Paint J., 1938, **22**, No. 46, 44—46).—A historical review. D. R. D.

**Strength of brittle materials.**—See I. **Tar.**—See II. **Ethylcellulose plastics. Ti-white pigments. Paper-sizing problems. Synthetic resin materials in Germany.**—See V. **Al plant for making products from coke-oven gas.**—See X. **Plastic yield of dielectrics.**—See XI. **Stearates and oleates.**—See XII. **Myrobalan extract for inks.**—See XV.

See also A., III., 943, **Tung oil and dermatitis.**

## Patents.

**Manufacture of artificial masses from polyvinyl halides.** I. G. Farbenind. A.-G. (B.P. 483,657, 22.10.36. Ger., 26.10.35).—Plastic and elastic mouldable products which are acid- and alkali-resistant are prepared by mixing (*e.g.*, kneading) polyvinyl halide at $>100°$ with at least one softener consisting of alkylated or aralkylated polynuclear aromatic hydrocarbons or their halogen derivatives. Examples of suitable softeners are propylated, butylated, chlorobenzylated, etc. derivatives of $C_{10}H_8$, anthracene, $Ph_2$, etc. J. W. Cr.

**Production of mouldable articles from lignin-derivative material and fibrous filler.** Mead Corp. (B.P. 482,894, 6.10.36. U.S., 25.10.35).—Fibrous material is agitated (*e.g.*, by circulating through a circulating pump) in $H_2O$ with finely-divided lignin-derivative material (preferably separated by controlled neutralisation of the black liquor obtained by the soda-pulp process), with addition, if desired, of a thermo-setting resin (*e.g.*, PhOH– or urea–$CH_2O$ resin), the resulting suspension flowed on to a forming wire, the $H_2O$ withdrawn (*e.g.*, by suction), the sheet preformed to the required shape and thickness, and the product dried at low temp. below the fusing temp. of the binder. Adhesion between the binder and filler may be assisted by adjusting the $p_H$ to $\sim$ 3·5 (*e.g.*, by addition of alum). Moulded articles are prepared by pressing the products at temp. (*e.g.*, 150—175°) above the fusing temp. of the binder, preferably with added surfacing layer including a thermo-setting synthetic resin. J. W. Cr.

**Compositions containing film-forming polymeric esters and ethers.** W. H. Moss (B.P. 491,792, 4.3.37).—The products obtained by chlorinating dihydroxydiphenylmethanes, $CRR'(C_6H_4{\cdot}OH\text{-}p)_2$ (where R and $R' = H$ or unsubstituted univalent hydrocarbon residues or together form an unsubstituted bivalent hydrocarbon residue), in the $C_6H_4{\cdot}OH$ nuclei only so as to introduce at least one Cl into each nucleus, are excellent plasticisers for cellulose esters or ethers or polyvinyl esters especially as regards $H_2O$-resistance and light-fastness. The use of ββ-di-4-hydroxy-3-chloro- or -3 : 5-dichlorophenylpropane and compositions containing cellulose acetate and products obtained by chlorinating di(hydroxyphenyl)propane under various specified conditions are claimed. The corresponding Br-compounds may also be used. R. G.

**Plastic [rubber–cement] compositions.** S. H. Colton and A. G. Rodwell (B.P. 485,204, 20.11.36).—Small pieces of wood ($\frac{1}{16}$—$\frac{1}{8}$ in. thick, $\frac{3}{16}$—$\frac{1}{2}$ in. long) are uniformly distributed in a composition comprising a rubber dispersion (*e.g.*, latex) and a hydraulic setting cement. The products are resilient and suitable for floor and wall coverings. J. W. Cr.

**Articles moulded from synthetic plastic.** W. Engel (B.P. 482,711, 1.8.36. Ger., 21.8.35, 2.10.35, and 15.6.36).—Porous articles suitable for use as bearings are moulded under heat and pressure from a mixture of synthetic plastic, particles of metal with or without graphite, and an additional ingredient which either contracts or disappears during the moulding or heating process or which (*e.g.*, NaCl) can be dissolved out subsequent to moulding, *e.g.*, after the surface skin has been removed, leaving a network of fine capillary canals. J. W. Cr.

**[Urea–formaldehyde] resinous condensation products.** E. I. Du Pont de Nemours & Co. (B.P. 483,399, 7.1.37. U.S., 7.1.36).—A urea (1 mol.), $CH_2O$ (in aq. solution or anhyd. polymeric form), and a primary aliphatic $C_4$ alcohol ($>1$ mol.), *e.g.*, *n*- or *iso*-BuOH, are heated, with distillation; the distillate after rejection of $H_2O$ is returned to the condensation product and the operation continued until substantially 2 mols. of $H_2O$ per mol. of urea are removed. Preferably the reaction mixture includes a volatile org. solvent (*e.g.*, $C_6H_6$, PhMe) in proportion to facilitate separation of $H_2O$ in the distillate. The resinous products obtained are flexible, tough, sol. in commercial solvents (*e.g.*, hydrocarbons), and suitable for forming decorative and protective coating compositions with or without film-forming substances, *e.g.*, vegetable oils, natural resins, plasticisers, etc. J. W. Cr.

**Nitrogenous synthetic resins.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 482,897, 8.10.36).—$CH_2O$ or similarly reacting substance or a reactive methylol compound (*e.g.*, of acid amides, phenols, etc.) is caused to interact (at $p_H$ 7—10) with acrylamide (or an interpolymerisation product with vinyl compound) before, during, or after polymerisation of the latter. The products are suitable for preparing coatings, films, and shaped articles which can be rendered $H_2O$-insol. by heating, *e.g.*, at 180°. J. W. Cr.

**Synthetic resins of the polymerisation type.** (Sir) G. T. Morgan and C. F. Griffith (B.P. 483,664, 23.10.36).—Aliphatic compounds (*e.g.*, Bu stearate and lævulate), having $\nless 5$ C in chain and containing at least one CO group preferably in the form of esters of the fatty or ketonic acids, are added to the monomeric non-cyclic ketone–$CH_2O$ products, *e.g.*, those made according to B.P. 404,317 (cf. B., 1934, 244), thus accelerating polymerisation and increasing the $H_2O$-resistance and surface hardness of the polymeride. J. W. Cr.

**Production of coating compound [containing phenol–formaldehyde resin].** F. B. Dehn. From Plastergon Wall Board Co. (B.P. 482,458, 23.10.36).—A thermo-setting resin (I) formed from a phenol and $CH_2O$, prior to becoming infusible and insol., is blended with a resin (*e.g.*, a fatty acid- or natural gum fossil resin-modified alkyd resin) having the property of adherence to metal in a common solvent containing $>5\%$ ($>10\%$), based on the (I), of a high-b.p. solvent (II), *e.g.*, cresol. The varnish is non-skinning and on application and hardening forms chemically-resistant and adherent films. (II) imparts free-flowing properties and retards hardening until eliminated, when hardening occurs rapidly. J. W. Cr.

**Manufacture of [phenol–aldehyde] moulding resins.** Bakelite, Ltd. (B.P. 482,943, 5.9.36. Ger., 14.10.35).—To a hardenable and fusible phenol–aldehyde resin [or a mixture of Novolak and $(CH_2)_6N_4$]

free from $H_2O$ resulting from the condensation reaction are added a small quantity (*e.g.*, 1—5%) of $NH_2Ph,HCl$ and sufficient $H_2O$ (*e.g.*, 10—30%) to moisten the resin. The mixture is subjected to controlled mixing and heating (*e.g.*, on rolls at 100°, followed by 2—4 hr. in a drying oven at 70—80°) until the resin while still plastic and sol. in EtOH and $COMe_2$ is no longer fusible (*i.e.*, closely approaches the resitol stage). High-melting resins having good flowability and moulding properties result.
J. W. Cr.

**Phenol–aldehyde [resinous] condensation products.** J. R. Geigy A.-G. (B.P. 485,230, 18.3.37. Ger., 19.3.36).—A dihydroxydialkylsulphone, made, *e.g.*, according to B.P. 471,010 (B., 1937, 1175), is treated with $CH_2O$ in presence of an alkali (*e.g.*, NaOH), the latter in amount $<$ equimol. proportions and the alkalinity between neutrality and the beginning of the phenolphthalein reaction. The products are hardenable, odourless, fast to light, and may be used with pulverulent fillers including those liable to attack by strong alkalis. Cold-moulding products can be made by addition of polyhydric alcohols (*e.g.*, glycerol). J. W. Cr.

**Potentially reactive [phenol–fatty oil] liquid coating compositions.** Birkbys, Ltd., and A. J. Buck (B.P. 485,384, 20.11.36).—The condensation products prepared from phenols and fatty drying oils in presence of Al (cf. B.P. 443,798; B., 1936, 560) are rendered faster-hardening at room temp. or above (*e.g.*, 100°) by addition (preferably, but not necessarily, after the condensation) of metallic driers (*e.g.*, resinates, linoleates, or naphthenates) in amount 0·01—20% of actual metal radical, based on the fatty oil present. Modifying agents (*e.g.*, natural or artificial resins, bituminous products, etc.) may be added and the final product further heated with a methylene-containing agent (*e.g.*, in presence of xylol). J. W. Cr.

**Manufacture of materials comprising artificial resins.** O. F. Wyss (B.P. 483,638, 20.7.36. Addn. to B.P. 443,890; B., 1936, 500).—The binder of the product described in the prior patent comprises a dispersion (preferably aq.) of (*a*) a material (*e.g.*, PhOH, cresol, $NH_2Ph$, urea, casein) which interacts with aldehydes to form artificial resins, and (*b*) a component [*e.g.*, $(CH_2)_6N_4$] having higher b.p. than that of the dispersing agent. Preferably the org. fibrous materials are mixed with the dispersion and the products are suitably shaped simultaneously with the removal of the dispersing agent (*e.g.*, by pressing, cataphoresis, etc.) and condensation and polymerisation of the resin. J. W. Cr.

**Manufacture of condensation products [synthetic resins].** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 492,776, 11.5.37).—Non-cyclic amidines having at least once, preferably twice, the group $N{:}C{\cdot}NH_2$ or $N{:}C{\cdot}NH{\cdot}NH_2$ are condensed with aldehydes ($CH_2O$). *E.g.*, a $H_2O$-resistant resin is obtained from $[{\cdot}C(NH_2){:}NPh]_2$ with $CH_2O$ in EtOH containing $C_5H_5N$, the product being heated for some hr. at 100—130°; thermoplastic resins are obtained from phenyl- and *p*-tolyl-benzamidine, and *p*-tolylacetamidine and $CH_2O$. H. A. P.

**Electric deposition of resin films.** Brit. Thomson–Houston Co., Ltd. (B.P. 482,548, 31.3.37. U.S., 1.4.36).—Decorative and protective (*e.g.*, chemically- and electrically-resistant) resin films are deposited on foundations (*e.g.*, base metal, fibrous sheets, etc.) by the electrodeposition of an alkaline solution of a natural resin (shellac). Non-conducting bases (*e.g.*, fabrics etc.) are first treated with a conductive material (*e.g.*, graphite, finely-divided metal, salts, etc.). If a.c. is used, one electrode must be of the "film-forming" type, *e.g.*, Al or Ta.
J. W. Cr.

**Preparation of suspensions of titanium pigments.** Brit. Titan Products Co., Ltd. (B.P. 483,694, 30.10.37. U.S., 5.11.36).—$TiO_2$ pigments are suspended in an aliphatic alcohol ($\ngtr C_5$) or ketone ($\ngtr C_7$) to which has been added 0·1—2 wt.-% of a tannic acid (I) composition. In examples, (I) or gallotannic acid is used. An org. dye may be included. S. M.

**Manufacture of lead chromate colours containing lead molybdate.** G. W. Johnson. From I. G. Farbenind. A.-G. (B.P. 483,765, 25.1.37).—Suspensions of PbO, $Pb(OH)_2$, or basic Pb carbonate are stirred into solutions of $CrO_3$ and $MoO_3$ (or molybdates); $H_2SO_4$ may also be added. The colour of the product is varied from orange to red by adjusting the $p_H$ of the solution from 2 to 6. S. M.

**Manufacture of manganese pigments.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 483,333, 20.10.36).—A 5—30% aq. solution of $MnCl_2$ or other $Mn^{II}$ salt is added to a 7—18% aq. suspension of $Ca(OH)_2$ etc. [1·2—3 mols. of $Ca(OH)_2$ are used per atom of Mn] while air is blown in. The product is calcined to yield green to black pigments according to the temp. S. M.

**Printing inks.** A. Marzio (B.P. 482,489, 28.6.37).—A conditioning medium for printing inks, which facilitates rapid printing, comprises a mixture of medium-soft resin (*e.g.*, Venetian turpentine), a drying oil (*e.g.*, linseed oil), a solvent (*e.g.*, turpentine) which permits drying, a non-drying oil (*e.g.*, a mineral oil), and a drier (*e.g.*, Pb resinate) in the preferred proportions of 1 : 3 : 2·5 : 3 : 0·5. J. W. Cr.

**Production of chemically-resistant oil-colour paints.** Elektroschmelzwerk Kempten A.-G. (B.P. 482,834, 5.10.36. Ger., 13.8.36. Addn. to B.P. 459,257; B., 1937, 263).—SiC in amount $>$30%, but not in the preponderating quantities claimed in B.P. 459,257 (*loc. cit.*), is incorporated in the pigment portion of paint. J. W. Cr.

**Manufacture of [non-aqueous rubber oil] paints.** T. Meyer (B.P. 483,867, 12.1.37).—Rubber, S, pigments, and fillers are worked up with turpentine, $C_6H_6$, etc. and the product is incorporated with an ordinary oil paint with addition of an accelerator, *e.g.*, piperidine–*cyclo*hexylamine, for the vulcanisation which ensues at room temp. Three examples are given. S. M.

**Metal pigment pastes and paints.** H. H. Mandle (B.P. 483,814, 22.7.36. Can., 25.7.35).—Paints containing leafing pigments, *e.g.*, Al, are stabilised by adding an anhyd. alkali or alkaline-

earth salt of an aliphatic acid, *e.g.*, AcOH, oleic, or a weak inorg. acid, *e.g.*, $H_3BO_3$, a relatively volatile or sublimable compound, *e.g.*, a terpene, $C_{10}H_8$ or derivative thereof, of an org. N compound or derivative having alkaline reaction, *e.g.*, urea, NHPhMe. The solvent should be free from N and S compounds.
S. M.

**Manufacture of paint removers.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 485,857, 20.11.36).—A pulverised mineral, *e.g.*, talc (as scales or leaves), is used as filler in paint removers which contain $CH_2Cl_2$, at least one other org. solvent, and a film-forming agent, *e.g.*, scrap nitrocellulose. 14 examples are given. S. M.

**Coating composition [containing cellulose derivative and vinyl compounds].** Carbide & Carbon Chemicals Corp., Assees. of A. K. Doolittle (B.P. 485,255, 13.8.37. U.S., 10.9.36).—Durable and $H_2O$-resistant coating compositions based on a mixture of cellulose derivative (I), *e.g.*, the nitrate, and the conjoint polymeride (II) of a vinyl halide ($>60\%$) and a vinyl ester (*e.g.*, vinyl acetate) of a lower aliphatic acid, include as essential solvent an aliphatic polyether compound [*e.g.*, a dialkyl ether of a (poly-) alkylene glycol] which will dissolve both (I) and (II) and in which the ratio of $C:O$ atoms is $<4:1$. Pigments, dyes, plasticisers, and/or thinners may be added. J. W. Cr.

**Spraying apparatus [for paint or the like].** R. Bosch A.-G. (B.P. 491,396, 6.5.37. Ger., 14.7.36).

**Acrylic esters. Polymerising apparatus.**—See III. **Tracing cloth. Cork composition.**—See V. **Increasing the affinity of polymerides for dyes.**—See VI. **Abrasive-coated articles.**—See VIII. **Adhesive layers.**—See XV. **Protein compositions.**—See XIX.

## XIV.—INDIA-RUBBER; GUTTA-PERCHA.

**Optical and dimensional changes which accompany the freezing and melting of *Hevea* rubber.** W. H. Smith and C. P. Saylor (J. Res. Nat. Bur. Stand., 1938, 21, 257—268).—The opacity of "frozen" rubber is due to crystallisation of the hydrocarbons. After rubber from *H. brasiliensis* has been kept unstrained at $-25$° for 2—13 weeks, microtome sections appear to consist entirely of crystals with no systematic orientation and of m.p. 5—16°. Crystals from widely separated parts of the same sample differ in m.p. When the rubber is frozen while strained, the crystals tend to be oriented with their high-*n* direction parallel to the axes of elongation. This orientation effect may cause stretched samples to elongate during freezing to a length $>$ that attained previously by stretching. When frozen under high pressure (1000 atm.) the m.p. of the crystals is higher than that of the crystals from rubber frozen at atm. pressure. Vulcanised rubber crystallises less readily than unvulcanised rubber. J. W. S.

**Construction of [rubber] cable mixings.** Anon. (Gummi-Ztg., 1938, 52, 1071—1073).—The composition of rubber mixtures for the cable industry is discussed from the viewpoint both of electrical insulation and of protection against mechanical damage and oils. The influence of the type of rubber selected and of the various vulcanisation accelerators, and other compounding ingredients, is indicated by examples. D. F. T.

**Carbonalpha and important specifications of lampblack for use in the rubber industry.** W. Oostveen (Ind. chim. Belge, 1936, [ii], 7, 323—327; Chem. Zentr., 1936, ii, 3212).—Carbonalpha, a new gas C suitable for use in rubber technology, is obtained according to the reaction $2CO \rightleftharpoons C + CO_2$ at relatively low temp., but contains 0·25% of ash.
A. H. C.

**Application of aluminium powder to preservation of vulcanised rubber.** T. R. Dawson (J. Rubber Res., 1938, 7, 95—108).—A vulcanised 95 : 5 mixture of rubber and S was treated with Al powder by compounding, dusting (before completion of vulcanisation), and painting with Al suspended in rubber solution. Compounding with Al led to inferior tensile properties and poor ageing at 70°, but the other two methods gave satisfactory reflecting coats without seriously impairing the initial properties or the ageing. Al powder, however, is not altogether the best agent for stopping the transmission of heat or for protecting rubber against tropical exposure. The physical and chemical characteristics of 4 specimens of Al powder are described. D. F. T.

**Effect of temperature on mechanism of oxidation of rubber.** J. H. Ingmanson and A. R. Kemp (Ind. Eng. Chem., 1938, 30, 1168—1173).—Using mixtures of rubber 100, ZnO 20, S 3, di-*o*-tolylguanidine $\frac{3}{4}$, with 0, 1, and 2%, respectively, of $\alpha$-$C_{10}H_7{\cdot}NHPh$, dumb-bell test-pieces were exposed for various periods to $O_2$ (2 atm.) at 60°, 70°, and 80°, the gradual decrease in pressure being recorded and also the eventual increase in wt. and the tensile properties of the treated specimens. The reduction in pressure was approx. $\propto$ time, the autocatalytic effect being negligible under the selected conditions. After an initial induction period the decreases in tensile strength and breaking elongation were linear functions of the $O_2$ absorbed. With the antioxidant the rate of $O_2$ absorption was decreased, the period for 1% absorption at 80° being, respectively, 30, 125, and 160 hr. for the three mixtures. A 50% decrease in tensile strength corresponded with an absorption of $\sim$ 1·2% of $O_2$ (rubber 100); with more highly vulcanised rubber the necessary absorption would probably be less. The temp. coeff. of oxidation or of physical deterioration was 2·38 for 10°. Any attempt to base an accelerated ageing test on the volumetric measurement of absorption of $O_2$ is complicated by the interference of oxidisable non-caoutchouc substances natural to rubber or introduced therein. D. F. T.

**Dielectric properties of rubber.** J. Granier (Publ. sci. tech. Ministère de l'Air, 1935, No. 80; Chem. Zentr., 1936, ii, 3211).—The electrical conductivity of rubber mixtures of high C content and the dielectric behaviour (d.c. and a.c.) of rubber and rubber mixtures and its variation with moisture, temp., pressure, ultra-violet light, chemical composition, thermal and mechanical properties are recorded. A. H. C.

**Copper content of rubberised material.** Kehren (Textilber., 1936, 17, 578—580; Chem. Zentr., 1936, ii, 2824).—A Cu content $<$0·005% does not necessarily influence vulcanisation unfavourably. Cu is introduced not only during purification but also perhaps by contaminating the latex by spraying the plantation. A. H. C.

**Nomogram for calculation of abrasion loss [of rubber].** E. C. Bott (Trans. Inst. Rubber Ind., 1938, 14, 144—148).—A nomogram is described, together with its method of construction, for calculation of the abrasion loss from the various factors involved in the Williams type of machine (cf. B., 1927, 635). D. F. T.

**Hard rubber.** T. L. Garner (Brit. Plastics, 1938, 10, 280—283).—The subject of ebonite is briefly reviewed with reference to compounding (particularly the use of ebonite dust, reclaimed rubber, and org. accelerators) and vulcanisation, and the chemical, physical, and electrical properties of the product. D. F. T.

**Relations between constitution and elastic properties of high polymerides.** W. Kuhn (Kautschuk, 1938, 14, 182—187).—A theoretical discussion is presented, based on the hypothesis that the thread mols. in rubber-like substances form a loose, tangled skein capable of showing macro-Brownian movement, in which the outward appearance of the system undergoes alteration, and micro-Brownian movement in which individual units of the threads undergo small oscillations without change in the external form of the thread mols. In solid rubber only the micro-movement is possible, and is responsible for the tendency of rubber when stretched to retract to the condition in which the thread mols. lie in their original and most favoured configuration. The hypothesis provides a simple explanation of the essential physical characteristics. D. F. T.

**Influence of rubber-like high polymerides on physical properties of Buna mixings.** P. Nowak and H. Hofmeier (Kautschuk, 1938, 14, 193—197).—Investigation is made of the effect of replacing one third (by vol.) of the Buna S (in a mixture for cable insulation) and the Perbunan (in a mixture for protective covering) by 4 " thermoplasts " (Oppanol B and C, Plexigum B and D). The original Buna S and Perbunan gave, respectively: $COMe_2$ extract 6·73% and $\sim$50%, EtOH extract 6—33% and 3·76%, $H_2O$ extract 0·56% ($p_H$ 6·7) and 0·64% ($p_H$ 8·45), ash 0·37% and 0·13%. The introduction of the thermoplasts caused generally a lowering in the mechanical qualities but an improvement in the processing behaviour and in the resistance to $O_3$. Other properties examined include accelerated ageing, resistance to heat and pressure concurrently and to oils, and the electrical qualities. For insulating purposes mixtures of Buna S and an Oppanol are relatively attractive, whilst for heat-resistant coverings a combination of Perbunan and Plexigum is indicated. The Buna S and Perbunan are described as mixed polymerisates of butadiene with styrene and $CH_2{:}CH{\cdot}CN$, respectively. D. F. T.

**More sensitive detection of bromine in organic compounds.** F. Kirchhof (Kautschuk, 1938, 14, 163).—The purple colour of a solution of $CuBr_2$ containing HBr can serve as the basis for a sensitive test for an alkali bromide. Surface-brominated rubber, *e.g.*, is treated with hot aq. KOH and to the filtered solution on a clock glass are added a drop of aq. $CuSO_4$ and 1—2 drops of conc. $H_2SO_4$; a violet colour is obtained the formation of which is not interfered with by $Cl_2$ from cold vulcanisation or white factice. The test can also be made conveniently by evaporating a few drops of the $CuSO_4$–KBr solution on filter-paper and touching with a glass rod wetted with 1 : 1 $H_2SO_4$. The coloration is perceptible with 0·5 mg. of Br/l. D. F. T.

**Rubber-like synthetics. Org. plastics.**—See XIII. **Rubber plant development.**—See XVI.

## Patents.

**Treatment of [rubber] latex.** W. W. Triggs. From Wingfoot Corp. (B.P. 484,659, 4.11.36).—Non-tacky rubber with low $H_2O$ absorption is obtained by treating (*Hevea*) latex (with caustic alkali for several days at $\sim$60°) to solubilise the nitrogenous constituents, removing the resulting aq. solution (by centrifuging or creaming) to leave a conc. latex, diluting the latter (to $\ngtr$5% rubber content) with $H_2O$, coagulating, washing, and drying. D. F. T.

**Rubber compound.** United States Rubber Products, Inc. (B.P. 483,786, 5.6.37. U.S., 10.6.36).—Vulcanisable and vulcanised mixtures of ebonite type are claimed, containing $\nless$30% of S (rubber 100) and 15—200 wt.-% of wood charcoal (particle size $\ngtr$260 mesh/sq. in.). D. F. T.

**Manufacture of rubber, rubber substitutes, and like elastic masses or intermediate products.** F. Rostler and V. Mehner (B.P. 483,006, 5.10.36. Austr., 4.10.35).—Slightly unsaturated hydrocarbons sol. in conc. $H_2SO_4$ and obtainable from the acid sludge of the mineral oil industry (by neutralisation and distillation in a vac.) are added as filler or plasticiser–filler. D. F. T.

**Compositions containing rubber, rubber substitutes, and synthetic rubbers.** Standard Oil Development Co. (B.P. 483,563, 17.10.36. Addn. to B.P. 479,478; B., 1938, 1202).—Rubber (or isomerised rubber) etc. is mixed with ($\ngtr$50% of) a polymerised *iso*olefine of average mol. wt. 800—30,000 [*e.g.*, polymerised *iso*butene (I) obtained at −10° by the action of $BF_3$ on (I) dissolved in $C_3H_8$]. The plasticised product obtained is applied to ordinary processes of rubber manufacture. D. F. T.

**Manufacture of rubber compositions and goods from aqueous dispersions of or containing rubber.** Internat. Latex Processes, Ltd., A. S. Carpenter, and D. F. Twiss (B.P. 485,321, 9.4.37).—Compounded rubber is obtained by forming a mixture of an aq. dispersion of rubber and a pptd. substance ($CaCO_3$, PbS, ZnS, etc.) with a $H_2O$ content so low as to form a viscous or gelatinous mass, which then passes into a finely-divided condition. The dried mass can be shaped, or used for mixing with other rubber. D. F. T.

**Manufacture of rubber-like materials.** Kabushiki Kaisha Sumitomo Densen Seizosho (Sumitomo Electric Wire & Cable Works, Ltd.) (B.P. 485,554, 16.10.36. Jap., 31.10.35).—A compound $(C_nH_{2n}\cdot OH)_2S_x$, where $x = 2$—4, and $n$ is an integer), *e.g.*, $(OH\cdot CH_2\cdot CH_2)_2S_3$ obtained from $CH_2Cl\cdot CH_2\cdot OH$ and $Na_2S_3$, is treated with $H_2SO_4$ (1 hr. at 150°), $H_3PO_4$, $H_3AsO_4$, $B_2O_3$, $KHSO_4$, or a metal halide. The product is elastic and oil-proof and has a less objectionable odour than that from $C_2H_4Cl_2$. D. F. T.

**Production of [stable] vulcanised rubber solutions.** V. Tanner (B.P. 483,421, 7.4.37).—Solutions containing $\not>$1 pt. of rubber to 200 pts. of solvent are vulcanised and (a solution of) unvulcanised or chlorinated rubber is added as protective colloid. D. F. T.

**[Accelerating the] vulcanisation of rubber.** Wingfoot Corp. (B.P. 484,299, 30.9.36. U.S., 12.10.35).—Liquid rubber dispersions (latex or solution) are vulcanised in presence of the additive product of an amine (*cyclo*hexylamine, piperidine) and the Zn salt of a dithiocarbamic acid derived from a *sec.* amine ($NHBu_2$). Numerous examples of suitable bases etc. are tabulated. D. F. T.

**Preservation of rubber.** Monsanto Chem. Co. (B.P. 483,605, 30.3.37. U.S., 3.4.36).—Rubber is treated with a substituted diarylarylenediamine, containing at least one alkyl group of $> C_3$ or an aralkyl group, which may be obtained, *e.g.*, by the action of $CH_2PhCl$, $C_5H_{11}Cl$, or BuCl on *p*-$C_6H_4(NHPh)_2$. D. F. T.

**Treatment of rubber.** T. A. Clayton (B.P. 492,803, 14.4.38).—Rubber is protected against oxidation by incorporation of a diarylnitrosoamine substituted once or twice by aralkoxy or alkoxy, especially phenyl-*p*-benzyloxy- or -*iso*propoxy-phenylnitrosoamine. K. H. S.

**Production of permeable [rubber] bodies.** A. H. Stevens. From Amer. Hard Rubber Co. (B.P. 491,243, 29.12.36).—Non-swelling $SiO_2$ gel is wetted with sufficient $H_2O$ to coat the particles after entering the pores and is then mixed with a hard rubber compound ($SiO_2$ gel 226, smoked sheet 100, S 50, stearic acid 5, porous rubber dust 24 pts. by wt.). After forming to the desired shape (for a sheet, by rolling on to a metal plate against which it remains during vulcanisation) the mass is sprayed with $H_2O$ (at 40—99°) to eliminate air and is vulcanised under $H_2O$ (at 150°/4 hr.). B. M. V.

**Preparation of rubber hydrohalides.** Reynolds Res. Corp. (B.P. 485,234, 9.4.37. U.S., 24.4.36).—Rubber is treated with a H halide (HCl) while dissolved in a solvent ($C_7H_{16}$ and/or $Pr^{\beta}{}_2O$) in which the rubber hydrohalide is substantially insol. D. F. T.

**Halogen derivatives of rubber.** R.P.R. Assoc., E. H. Farmer, and J. W. Barrett (B.P. 492,767, 12.4.37).—A cooled solution of rubber in an org. solvent is treated either (*a*) with a solution of a hypohalogenite of an org. carboxylic acid, or (*b*) by adding a halogen to a solution of rubber and the acid or a suspension of a salt of the acid. The hypohalogenite adds to the rubber forming a product different from that obtained by halogenation, but by using excess of halogen in process (*b*) a mixture of both products is made. Among examples, $Cl_2$ (58) is dissolved in $CCl_4$ (400) and added to a suspension of NaOAc (90) in $CCl_4$ (1800) at 0—5°; rubber (36·5) dissolved in $CCl_4$ (580) is added slowly, keeping the temp. below 15°. The purified solution when conc. in vac. affords a colourless, non-viscous solution from which EtOH ppts. a white powder. Further, $Cl_2$ is passed into a cold solution of rubber (20) and AcOH (50) in $CCl_4$ (1020 g.) and after 3 hr. the solution is boiled, saturated with $Cl_2$ for a further 3 hr., and the product (Cl content 59·5%) pptd. with MeOH; it is sol. in $C_6H_6$, PhMe, and $COMe_2$ and affords non-brittle films on evaporation. K. H. S.

**Modified halogen-containing rubber derivatives.** W. J. Tennant. From Marbon Corp. (B.P. 484,225, 29.12.36).—A (homogeneous) mixture of (compounded) rubber with a plasticiser (a chlorinated paraffin or polymerised chlorobutadiene) in quantity insufficient to cause disaggregation of the mass is subjected to the action of a (substantially dry) H halide, *e.g.*, liquefied HCl. D. F. T.

**Acrylic esters.**—See III. **Shrinking fabrics. Treating textiles with rubber.**—See VI. **Rubber-cement plastics. Rubber oil paints.**—See XIII.

## XV.—LEATHER; GLUE.

**Drying of [raw] hides in Colombia.** M. Bonfiglio (Boll. Staz. Sperim. Ind. Pelli, 1936, 14, 321—323; J. Soc. Leather Trades' Chem., 1937, 21, 43).—Damage is caused to raw hides by exposure to sun and rain for several days. Hides are preserved in Colombia by drying them flesh side up on a wooden framework and then dipping in or painting with an As solution. Good results have hitherto been obtained but better results are given by drying in shade. D. W.

**Wet work [on raw hides] without preliminary soaking.** V. Casaburi and I. C. Cantarella (Boll. Staz. Sperim. Ind. Pelli, 1937, 15, 317—324; J. Soc. Leather Trades' Chem., 1938, 22, 46).—Salted hide strips were immersed in aq. $Na_2S$ of *d* 1·007, 1·011, or 1·014 for 48 hr., unhaired, fleshed, placed in $H_2O$ for 48 hr., the $H_2O$ being changed every 2 hr., and the product was then tanned. Addition of various salts to the $Na_2S$ solution had no effect other than that of disinfection. Full analytical details are given. D. W.

**Use of fatty alcohols in the leather industry** G. Blancher (J. Soc. Leather Trades' Chem., 1938, 22, 425—431).—The methods of prep. and general properties of the suphonated fatty alcohols are outlined. By the use of such compounds in the various processes, the time required for soaking furs and skins is shortened, and no alkali or sulphide is required; the removal of petroleum solvents after degreasing pickled pelts is facilitated, the vegetable tannins are dispersed and penetration is facilitated, a lighter-coloured leather being produced, and a full, soft Cr leather which wets-back easily is obtained. Cr tanning is, however, retarded a little. Increased penetration of acid and direct dyes and more stable fat-liquor emulsions are obtained. D. P.

**Tanning materials in Italian East Africa.** E. Simoncini (Boll. Staz. Sperim. Ind. Pelli, 1938, **16**, 173—182).—The bark, leaves, or fruits of the following have been examined for type of tannin and % of tans: *Acacia bussei*, Harms, *A. adansoni*, *A. etbaica*, *A. seyal*, *A. stenocarpa*, *A. spidocarpa*, *Terminalia catappa*, L., *T. ghebula*, W., *T. policarpa*, *T. somalensis*, *Zizyphus spina Christi*, *Cassia goratensis*, Fres., *Osirys abissinica*, Hochs, sumac, *Eucalyptus globulus*. R. Ga.

**Raw materials for tannins in Manchoukuo.** M. Shikata and M. Chikasuye (J. Agric. Chem. Soc. Japan, 1938, **14**, 1027—1036).—Data are given for the ash contents, amounts extracted by cold and hot $H_2O$, 1% NaOH, and $EtOH-C_6H_6$, and the analyses of the tannins from 18 kinds of bark. The colours and reactions of the bark extracts with gelatin–NaCl, $FeCl_3$, $Br-H_2O$, lime-water, conc. $H_2SO_4$, dil. $H_2SO_4$ followed by EtOH, and $Pb(OAc)_2$ followed by AcOH are described. J. N. A.

**Utilisation of myrobalans [*Terminalia chebula*]. I. Preparation and purification of myrobalan extract. III. Utilisation of myrobalan extract for preparation of ink and for cotton dyeing.** S. R. Sunthankar and S. K. K. Jatkar (J. Indian Inst. Sci., 1938, **21**, A, 131—147, 153—158).—I. Optimal results are obtained by two leachings of the myrobalans for 90 min. at 50—60° followed by five leachings occupying 1 hr. at 80—90°. A turbid liquor is obtained by leaching at a higher initial temp. The amount of $H_2O$ should be 7 times that of the myrobalans. Much colloidal matter but practically no tannin is separated out on cooling the leach liquor to 15°. More tannin than non-tans is removed by treatment of the leach liquor with $Al_2O_3$. The tans/non-tans ratio is approx. unchanged except in the first ppt. when the leach liquor is fractionally pptd. with increasing amounts of 10% solution of $Pb(OAc)_2$ and the ppt. subsequently decomposed with $H_2SO_4$.

III. Inks prepared from myrobalan extract and purified myrobalan tannic acids, respectively, compare favourably with those prepared from gallotannic acid in corrosive effect, washing and fading tests. The yellow colour of myrobalans extract renders it unsuitable for mordanting cotton for bright shades, but it is suitable for other shades. D. W.

**Use of quebracho extract in vegetable tannage of sole leather.** B. Bocca (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 8—13; J. Soc. Leather Trades' Chem., 1937, **21**, 136).—A good sole leather was not obtained experimentally by means of chestnut extract alone and it was not found possible to reduce the % of quebracho extract used in the tannage below 35% without seriously impairing the quality of the leather produced. D. W.

**[Substitution of] quebracho extract [by mimosa bark extract].** G. Ferretti (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 43—44; J. Soc. Leather Trades' Chem., 1937, **21**, 242).—Quebracho extract can be replaced by mimosa bark extract for tanning purposes except for a slight difference in the colour of the finished leather. D. W.

**[Substitution of] quebracho extract [in sole leather tanning].** C. Schiaparelli (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 38—42; J. Soc. Leather Trades' Chem., 1937, **21**, 281).—The use of oakwood extract is suggested. D. W.

**Analysis of sumac.** E. Simoncini (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 372—380; J. Soc. Leather Trades' Chem., 1938, **22**, 47).—Sumac tannin is extracted by diffusion and not by dissolution, and the following method of extraction is therefore recommended as a result of comparative tests. The material should be extremely finely divided and extracted at 95—100° continuously for $\not< 8$ hr. until no reaction with gelatin is given. The later portions of the extract may be conc. over a direct flame. D. W.

**Chrome tanning in presence of citric acid.** V. Casaburi and I. C. Cantarella (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 176—186; J. Soc. Leather Trades' Chem., 1937, **21**, 359).—Lambskins were tanned with Cr alum masked to the extent of 33% or 66% with citric acid. A stronger leather was obtained. A 33% masked liquor produced leather of high basicity. Masking to $>66\%$ was of no advantage. D. W.

**Tanning [hides and skins] with polymerised anhydrous phosphates (Coriagen tanning).** K. Lindner (Collegium, 1938, 145—163),—Mainly a review. The tannage of chromed and unchromed hide powder with $(NaPO_3)_6$ (I) at different $p_H$ vals., and of unchromed hide powder with varying amounts of tanning agent, and with and without washing before drying out, respectively, are described, and the combined $P_2O_5$ has been determined. The max. absorption by unchromed hide powder of 6·4% of $P_2O_5$ at $p_H$ 2·4—2·5 is confirmed. Approx. half the amount of $P_2O_5$ fixed by unchromed hide powder is fixed by chromed hide powder, and the combination between phosphate and hide powder before drying out is reversible at $p_H$ vals. $>$ and $<2·5$. ·Bated samples of calf skin have been tanned with different amounts of Coriagen (II) [polymerised (I)] and complex Fe and Cr hexametaphosphates at final $p_H$ vals. of 2·5 and 4—4·2, respectively, and the amounts of combined $P_2O_5$, $Cr_2O_3$, and $Fe_2O_3$ determined. Fe and Cr salts are more powerful tanning agents than is (I); a white leather is produced by the Fe salt and a pale green one by the Cr salt. Samples of different animal skins have been tanned with (II) + water-glass and (II) followed by basic Cr salts, Al salts, vegetable and synthetic tanning materials, respectively. The chrome–phosphate-tanned leather contains more $Cr_2O_3$ than a normal chrome-tanned leather and has a very tight grain and an increased tensile strength. Tanning with (II) followed by a vegetable or synthetic tannage reduces the tendency to produce drawn grain on the resulting leather and gives a lighter-coloured leather and an increased leather yield and rate of penetration of tanning material. D. P.

**Analysis of synthetic tans.** G. A. Bravo (Boll. Staz. Sperim. Ind. Pelli, 1936, **14**, 28—42; J. Soc. Leather Trades' Chem., 1936, **20**, 198).—Potentiometric titrations of synthetic tans, using the Sb electrode, are recommended. The solution, in a large squat beaker with a cylindrical Sb rod as electrode, is connected with the $Hg_2Cl_2$ electrode by a KCl–agar U-tube. Equilibrium was facilitated by passing $CO_2$-free air through the solution at intervals. The solution was titrated with 0·5N-NaOH, the e.m.f. measured by the Lüers electro-ionometer, and a titration curve deduced therefrom. The ordinary method of tannin analysis is not applicable to synthetic tans, but if it must be used the residues should be dried in vac. and the solutions previously neutralised with standard alkali and suitable corrections made. Practical tanning tests of the material in combination with vegetable tans should be made, and the total acidity and $p_H$ val. determined. D. M.

**Collaboration between the tannery and the shoe factory.** V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1936, **14**, 214—218, 261—290; J. Soc. Leather Trades' Chem., 1936, **20**, 525, 556).—Only closely rounded butts are suitable for sole leather. The tannage requirements for the quality demanded in soles and insoles are quite different. Insoles should contain $<6—8\%$ of $H_2O$-sol. matter. Two types of sole leather are required with 12% and 20% of $H_2O$-sol. matter, respectively. Insole and sole leathers should be tanned separately. Hardness can be produced in oak-bark-tanned leather by hammering it in the wet condition but this is not possible with modern tannages. The effect of soaking sole leather on its physical properties should be known. The grain of some leathers which have been soaked and dried is often brittle whereas it was flexible in the original leather. Experiments on an oak-bark-tanned leather have shown that such cracking is due, not to differences in composition between the different layers of the leather, but to the physical effect of drying out at too high a temp. (40°). D. W.

**Alcohol extraction and degree of tanning.** J. N. Gerssen (Nederl. Leder-Ind., 1936, **48**, No. 21, Suppl., 1439—1442; No. 25, Suppl. 1445—1446; Chem. Zentr., 1936, ii, 3043, 3751).—Comparable degrees of tanning are obtained if the removal of excess of tanning agent with $H_2O$ is followed by two extractions with 45% EtOH. The process is described. No N compounds are extracted after 3 treatments with 45% EtOH. A. H. C.

**Comparison of slow and rapid [vegetable-] tanned sole leathers.** V. Casaburi, I. Criscuolo, and C. Corradini (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 381—394; 1938, **16**, 4—15; J. Soc. Leather Trades' Chem., 1938, **22**, 143).—A no. of leathers of different tannage were tested chemically and physically and as a result were placed in the following decreasing order of merit: French oak-bark-tannage of 14 months; Naples slow-bark tannage of 9 months; French tanned with oak bark and a little chestnut; Naples bark and extract; German rapid-tanned; synthetic tannin pretannage followed by a rapid tannage; Italian rapid tannages with quebracho and chestnut or chestnut only. D. W.

**Determination of "degree of stability" of [vegetable-tanned] sole leather.** (A) V. Casaburi and C. Corradini. (B) V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1936, **14**, 345—356; 1937, **15**, 33—37; J. Soc. Leather Trades' Chem., 1937, **21**, 81, 241—242).—(A) The shrinkage temp, $t_s$, is determined on the leather before and after each of four successive soakings in $H_2O$ and subsequent drying. All $H_2O$-sol. matter should be removed in the first soaking of a satisfactory leather and $t_s$ should not change for the leathers treated with further soakings. Figures are quoted showing (*a*) practically const. vals. of $t_s$ for leathers of best quality containing little $H_2O$-sol. matter, (*b*) higher vals. with successive washings for medium qualities containing appreciable amounts of $H_2O$-sol. matter, and (*c*) variable figures for unsatisfactory leathers.

(B) Shrinkage in leather may arise from incomplete tannage or from reversible decomp. of the leather into hide substance and tannin. No standard $t_s$ can be prescribed. Six types of leather can be distinguished by the authors' method: (*a*) const. $t_s$, indicating a stable leather; (*b*) constantly diminishing $t_s$, indicating progressive deterioration; (*c*) $t_s$ increasing after the first soaking and remaining higher, indicating a removal of $H_2O$-sol. matter, leaving a stable leather; (*d*) fall in $t_s$ followed by higher vals.; (*e*) increase in $t_s$ followed by a fall; (*f*) irregularity. D. W.

**White formaldehyde[-tanned] leather.** V. Casaburi and I. C. Cantarella (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 125—130; J. Soc. Leather Trades' Chem., 1937, **21**, 290).—The most efficient tannage as judged by the shrinkage temp. of the leather was produced by treating pickled lamb pelts with 5% NaCl and 2% $NaHCO_3$ to bring their $p_H$ val. to 6·1, then tanning with 1·5% each of $CH_2O$ and Na citrate, and on the following day washing for 2 hr. in distilled $H_2O$. D. W.

**White [silica-tanned] leather.** Anon. (Boll. Staz. Sperim. Ind. Pelli, 1936, **14**, 301—304; J. Soc. Leather Trades' Chem., 1937, **21**, 43).—In Bocciardo and Genova's method (G.P. 630,124) the pelt is pretanned with $CH_2O$ at $p_H$ 7·0—9·8, washed, and retanned with an acidified solution of $Na_2SiO_3$. By using more $Na_2SiO_3$, the process can be applied to sole leather tanning. The following data have been obtained on the sole leather: $H_2O$ 13·51, $H_2O$-sol. matter 0·84, fat 1·86, ash (less $SiO_2$) 0·87, hide substance 62·88, $SiO_2$ 20·28%. 32% stretch was given by a piece of leather 3·12 mm. thick. The temp. of gelatinisation was 86—87°. D. W.

**Manufacture of a readily wetted chrome-tanned leather.** V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1937, **15**, 147—149; J. Soc. Leather Trades' Chem., 1937, **21**, 290).—A readily wetted leather is obtained by tanning pelts with a Cr liquor of very high basicity containing OH-acids (tartaric, citric), their salts, or derivatives but not present as complex Cr salts. D. W.

**Conditioning of vegetable-tanned leather prior to physical tests.** V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1938, **16**, 115—118; J. Soc. Leather Trades' Chem., 1938, **22**, 327).—An apparatus is described for conditioning vegetable-tanned leather prior to testing and for bringing it to approx. 18% $H_2O$ content. D. W.

**Analysis of leather split into sections.** C. Corradini (Boll. Staz. Sperim. Ind. Pelli, 1938, **16**, 97—114; J. Soc. Leather Trades' Chem., 1938, **22**, 327).—Three French leathers were soaked in $H_2O$ for 2 hr. and dried at room temp. and duplicate samples soaked in the same way and dried at 42°. The dried leathers were split into grain, middle, and flesh and the different parts analysed. The results showed that one leather of rapid tannage should be dried in the cold to avoid the deleterious effects of warm drying. D. W.

**True specific gravity of leather.** V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1938, **16**, 149—172).—Apparatus hitherto suggested for determining true sp. gr. of leather, depending on the displacement of air, gives, not the true vol. of the leather, but the vol. of the leather and the air contained in the pores. A new apparatus, described and illustrated, makes use of the principle that a known vol. of air is twice allowed to enter an evacuated vessel of smaller content; the evacuated vessel on the second occasion contains the piece of leather. The difference in the vols. of air entering gives the true vol. of the leather. R. Ga.

**Determination of nitrogen [in leather] by Kjeldahl's method.** J. Jány and A. Morvay (Z. anal. Chem., 1938, **114**, 120—125).—Six different variations of the method, using Hg or Wieninger's Se–Cu catalyst (B., 1936, 903), have been compared for the determination of N in leather. With the Se–Cu catalyst the results obtained are in agreement, but are low compared with those obtained with Hg, indicating loss of $N_2$ with the former. In spite of a wider divergence among individual determinations, the method using Hg as catalyst, 30 instead of 7 c.c. of conc. $H_2SO_4$ in the decomp., and Zn dust in the distillation is preferred. L. S. T.

**Leather-shrinkage recorder.** W. J. Chater (J. Soc. Leather Trades' Chem., 1938, **22**, 432—435).—An autographic shrinkage recorder is described. Leather strips 8·5 × 1 cm. are used. Temp. changes are recorded by a pen attached to a vertical spindle, the latter being rotated by changes in a Cu-plated, bimetallic spiral immersed in the $H_2O$. The contractive force of the leather strip on shrinking is caused to rotate a drum which makes contact with the pen. Shrinkage curves of several different leathers are given. A different mode of shrinkage was obtained when leather was immersed in $H_2O$ at an initial temp. of 55° instead of at room temp. D. P.

**Accelerated ageing of leather in the oxygen bomb at 100°.** J. R. Kanagy (J. Res. Nat. Bur. Stand., 1938, **21**, 241—255; cf. B., 1937, 1095).—Ageing of dried leathers at 100° for 7 days in $O_2$ under pressure (initially 100 lb./sq. in.) in a bomb shows that the influence of the type of tannin material and changes in $p_H$ on the deterioration of the leathers is similar to that occurring under normal conditions. The $p_H$ vals. of the vegetable-tanned leathers in most cases fall and those of raw hide and sulphite-cellulose leather rise. The mechanism of deterioration is also similar to normal; degradation of hide and tannin appears to be due to hydrolysis and oxidation, respectively. The order of decreasing stability at $p_H$ 3 with tanning agents is: quebracho, sumac, cutch, chestnut, and sulphite-cellulose, and a blend of commercial chestnut and sulphite-cellulose. The rates of evolution of $CO_2$ and $H_2O$ from the vegetable-tanned leathers when heated in a stream of $O_2$ at 100° are related to their stability in the $O_2$ bomb. Sulphite-cellulose leather is comparatively stable in presence of $O_2$ at 100° and its instability in the $O_2$ bomb indicates that sulphite-cellulose extract has poor tanning properties. Evolution of $CO_2$ and $H_2O$ is increased in the case of chestnut or quebracho leathers by traces of Cu (as $CuSO_4$). Since raw hide under the conditions evolves little $CO_2$ and $H_2O$, the source of these is the tannins. A. T. P.

**Cracking of the grain of leather.** V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1936, **14**, 169—183; J. Soc. Leather Trades' Chem., 1936, **20**, 475).—A case of a leather in certain areas of which there was cracky grain is cited. The cracky portions contained more fatty matter and a fat of higher m.p. than the sound parts. The cause is attributed to the use of $\not<$10% too much tallow. D. W.

**Microscopical features associated with "crackiness" of the grain of glazed (chrome-tanned) kid leathers.** G. O. Conabere (J. Soc. Leather Trades' Chem., 1938, **22**, 436—451).—A machine, similar to the Muller paper tester, for measuring "cracking" and "bursting" strain is described. The leather is fixed over a rubber diaphragm to which pressure is applied by means of glycerin. The thickness of the sample and the pressures necessary to crack the grain and to burst the full thickness of 52 samples of glazed kid are recorded. Brown-dyed leathers were found to be more liable to crack than comparable black-dyed leathers; the latter contained the greater proportion of grease. 25 samples have been examined microscopically. Leathers with relatively thin grains (and in which the corium fibres were finely split and merged gradually into the grain fibres) were less liable to crack than those having relatively thick grains (and showing an obvious line of demarcation between the grain and the corium). The relative thinness of the grain is inherent in the skin itself, and the fine splitting of the corium fibres is produced by suitable liming and bating. D. P.

**Light leather industry.** V. Casaburi (Boll. Staz. Sperim. Ind. Pelli, 1938, **16**, 183—192).—Means for the better utilisation of the raw materials (skins) in the light leather industry are discussed, *e.g.*, (1) improvement in val. and quantity of wool; (2) sorting the skins for glove making at the earliest stage, viz., in the soaking process; (3) improving the method of removing hair from rabbit skins. For the hat industry, the usual method ruins the skin from a tanning viewpoint. R. Ga.

**Leather-dressing media. [Shoe creams.]** F. von Artus (Farben-Chem., 1938, 9, 333—340, 347).—

An account is given of the prep. of various kinds of shoe polishes and their possible defects, with about 50 recipes. The wax components are described and properties of commercial montan and synthetic waxes tabulated. S. M.

**Importance of liming in the conversion of collagen into gelatin.** A. Küntzel and H. Koepff (Collegium, 1938, 433—458).—Pieces of cattle hide have been limed with $Ca(OH)_2$ at different concns., temp., and times, with addition of NaCl, $CaCl_2$, $Na_2SO_3$, and $Na_2S$, respectively, and with $NaOH-Na_2SO_4$, delimed, and converted into gelatin by heating at 65°. Gelatin has also been prepared from hide pieces treated with HCl at $p_H$ 2 and then with $Ca(OH)_2$, and with varying $H_2SO_4$ and NaCl concns., respectively, and from hide pieces the structure of which has been destroyed by means of 5N-KCNS and by heating for 30 sec. at 90°, and then liming with $Ca(OH)_2$. The swelling and loss of hide substance during liming, the hide substance dissolved during heating at 65°, and the ash, m.p., $\eta$, mutarotation, and formol titrations of the resulting gelatins are recorded. The duration of liming can be shortened by raising the temp., or by adding NaCl, $Na_2SO_3$, or $Na_2S$ to the $Ca(OH)_2$, but the resulting gelatin is inferior. The duration of liming is shortened, and a better gelatin produced, by the use of $Ca(OH)_2 + CaCl_2$, by a pretreatment with HCl, or by the liming of shrunken collagen. During the conversion of collagen into gelatin hydrolysis of some of the peptide linkings results, with and without the production of sol. degradation products, and the breaking down of the residual valency linkings holding the main peptide chains together and the salt linkings between the side chains. Only the breaking down of the residual valency linkings and partial hydrolysis of the peptide linkings without the splitting off of degradation products are desirable. D. P.

**Solubility of "lyophile" gelatins.** L. F. Tice (J. Amer. Pharm. Assoc., 1938, 27, 755—758).—"Lyophile" gelatins, prepared by rapid freezing of gelatin sols followed by dehydration of the frozen materials in high vac., are rapidly and completely sol. in $H_2O$ at 25—28°. Variations in the solubility of such preps. and the physical state of their sols and gels are discussed. F. O. H.

**Micro-organisms causing the foaming of aqueous gelatin solutions.** M. Remenec (Chem. Obzor, 1938, 13, 73—76).—Of 17 pure cultures of micro-organisms isolated from gelatin or its solutions, the following are identified as causing increase of foaming, the foams produced having equal stability: *Bacillus globigii*, *B. megatherium*, *Pseudomonas aëruginosa*, *B. vulgatus*, *Oidium cycloidea*, and *Sarcina flava*. All but the last belong to the class of gelatin-liquefying aërobes. *Micrococcus aquatilis*, which decreases the foaming, does not liquefy gelatin as do not most of those without any effect on the foaming. F. R.

**Use of concentrated hydrogen peroxide in the glue industry.** Anon. (Kunstdünger u. Leim, 1936, 33, 108—111; Chem. Zentr., 1936, ii, 2276).—$H_2O_2$ may be used as a bleaching agent for gelatin and glue, and also has a preservative action. Fe-free $H_2O$ should be used, and the glue must not come in contact with Cu. Starch is hydrolysed by 0·5—2% of 40% $H_2O_2$. A. J. E. W.

**Analysis of powdered casein glue.** H. Pfanner (Gelatine, Leim, Klebstoffe, 1936, 4, 100—102; Chem. Zentr., 1936, ii, 2276).—Sawdust, starch, and gluten are detected by the texture and the I and biuret tests, respectively. The glues always contain Na or K, and often Ca; additions [*e.g.*, $CuCl_2$, $NH_4Cl$, $Al_2(SO_4)_3$] which affect the consistency also occur. Adulterants include chalk, $BaSO_4$, kaolin, and kieselguhr. A. J. E. W.

**Evaluation of gelatin by means of the AGS number.** A. Küntzel and H. Koepff (Collegium, 1938, 458—460).—Experimental results are recorded to show that the AGS no. (cf. B., 1936, 755) gives comparable results only if the temp. of pptn. and the time of washing are carefully controlled. There is no correlation between $\eta$ or m.p. respectively, and the AGS no. of high-grade experimental gelatins. D. P.

**Dyeing tannins.**—See VI. **Myrobalan oil. [Leather from] sharks.**—See XII. **Adhesion of wood plastics.**—See XIII.

## Patents.

**Manufacture of tanning materials.** A. Carpmael. From I. G. Farbenind. A.-G. (B.P. 483,560, 16.10.36. Addn. to B.P. 444,591; B., 1936, 609. Cf. B.P. 465,803; B., 1937, 1382).—Sulphite-cellulose waste liquor (*d* 1·21—1·32) or a solution of ligninsulphonic acid obtainable therefrom is incorporated with a $H_2O$-insol. non-tanning product obtained by condensing an unsulphonated monohydric aromatic OH-compound and a carbohydrate (containing $\nless 5$ C) in an acid medium. The carbohydrate is derived from cotton, wheat, soya-bean cake, glucose, beechwood, or pinewood. The product may be after-treated with $CH_2O$. D. W.

**Manufacture of synthetic tanning agents.** G. W. Johnson. From I. G. Farbenind A.-G. (B.P. 491,817, 20.4.37. Cf. B.P. 189,190 and 478,280; B., 1923, 109a; 1938, 418).—Tanning agents, adjustable to low $p_H$ and having low ash content and a desirable ratio of tanning to non-tanning substances, are obtained by subjecting $H_2O$-sol. sulphonated products, prepared by condensing phenols or naphthols or their sulphonic acids with $CH_2O$ (or substances yielding it) with subsequent sulphonation if necessary, to an after-treatment with unsulphonated phenols or naphthols and $CH_2O$ (or substances yielding it) and carrying out a condensation with sulphite-cellulose waste liquor, with or without an aldehyde, at one stage of the process. Urea may also be present to condense simultaneously with $CH_2O$. R. G.

**Tanning of hides and skins.** Chem. Fabr. J. A. Benckiser G.m.b.H. (B.P. 481,635 and Addn. B.P. 484,781, 28.1.37. Ger., [a] 23.9.36, [b] 29.10.36).—(a) For tanning purposes, polyphosphoric acids (various examples given) or their $H_2O$-sol. salts with uni- or multi-valent metals, $NH_3$, or org. bases are used alone or with other tanning agents. (Cf. B.P. 478,443; B., 1938, 1083.) (b) The hides etc. are tanned with polyphosphoric acids or their sol. salts of metals, $NH_3$, or org. bases, and sol. silicates. In an example, drenched and pickled goat skins or pelts are first tanned in a bath of $Na_{12}P_{10}O_{31}$ (I) at $p_H$ 4·5, and then fully tanned in a bath containing aq. (I) and waterglass, the $p_H$ being reduced to 2·5 by addition of acid. D. W.

**Tanning of skins and hides.** G. F. Lloyd (B.P. 482,286, 23.9.36).—Pickled hides and skins are treated first with a mixture of $H_2O$ (1½ gals.), EtOH (1½ gals.), and formalin (3 pints), to which a vegetable tanning extract (chestnut), a filler (*e.g.*, French chalk), and/or a sulphated or untreated oil may be added, and subsequently with an alkaline solution, *e.g.*, aq. $Na_2CO_3$. The two steps are carried out within the period of 1 hr. D. W.

**Production of full and tear-resistant leather.** Röhm & Haas A.-G. (B.P. 483,598, 16.2.37. Ger., 12.10.36).—Unhaired hides are tanned with a mixture of $CH_2O$ and one or more complex compounds of Al salts and $H_2C_2O_4$ or its salts. The use of Al oxalates is claimed. The hides may be subsequently treated with any other tanning or filling agent. Eight examples of suitable liquors are given. D. W.

**Deacidification [neutralisation] of chrome [-tanned] leather.** I. G. Farbenind. A.-G. (B.P. 485,254, 10.8.37. Ger., 31.10.36).—Chrome-tanned leather is treated with alkali, alkaline-earth, or quaternary $NH_4$ salts of aliphatic polycarboxylic acids or aromatic OH-acids (*e.g.*, Na salicylate, adipate, or triglycolamate or K malonate). D. W.

**Manufacture of respirable artificial leather.** Tufide Products Corp. (B.P. 484,007, 30.10.36. U.S., 30.10.35).—A fluffed, uniform layer of interlaced vegetable fibres is impregnated (by spraying) with a binding agent (*e.g.*, stabilised latex–glue mixture), and gradually compressed to give a sheet containing 35—80% of fibre and 65—20% of binder; the surface can be modified by application of a finely-divided surfacing agent, *e.g.*, wood, cotton, or hemp dust, to the partly compressed sheet. A suitable binder contains rubber 19·4, blood-albumin 5·7, $H_2O$ 64, EtOH 7·3, EtOAc 0·4, petrol 0·1, $CH_2O$ 0·1, and $NH_3$ 2·6%, the alcohol and $CH_2O$ coagulants being added immediately prior to spraying so that deposition on the fibre occurs without effecting precoagulation. Apparatus for the prep. and application of the binding agent and compression of the sheet is claimed. R. J. W. R.

**Production of a material resembling leather.** N. V. Koninkl. Pharmaceut. Fabrieken voorh. Brocades-Stheeman & Pharmacia (B.P. 482,687, 4.4.38. Holl., 29.2.36).—The fibres of animal sinews and/or hide or de-tanned leather, which have been swollen (cf. B.P. 422,990; B., 1935, 300) and in which a gas, *e.g.*, air, has been distributed, are passed on to a conveyor belt of sieve design, treated with a shrinking agent, and subsequently tanned. Textile fibres may be suitably incorporated. Apparatus is claimed. D. W.

**Manufacture of powdered glue.** H. Seabrook. From C. Schülein (B.P. 485,050, 26.4.37).—A mixture of powdered animal glue, a small amount of an alkali salt of $1-C_{10}H_7 \cdot SO_3H$, a large amount of an adsorbent, *e.g.*, dolomite powder and wood flour, and urea is claimed. D. W.

**Production of [phenol–aldehyde resin] adhesive layers.** H. Prüfer (B.P. 482,400, 8.2.37. Austr., 8.2. and 5.11.36).—Layers (including adhesive-coated thin sheets, *e.g.*, of wood veneer, metal, etc., which can be pressed together to form ply-boards, and also adhesive impregnated sheets of paper, fabric, etc., which can be inserted and pressed between two uncoated surfaces to secure adhesion) contain hardenable alkali-metal derivative of phenol–aldehyde condensation products, in admixture with natural resin soaps or pptn. products (for cheapening), if desired. Softeners (*e.g.*, glycerol, oils, fat, etc.) may be added and spreading properties improved by including carbohydrates (sucrose) and/or polymerisation products. Undue penetration of the more absorbent surfaces may be prevented by applying a precipitant (*e.g.*, alum, dil. acids, and solutions of resins which are not appreciably $H_2O$-sol.). Adhesion of the plies is secured by the action of heat and pressure, with or without prior drying of the treated layers. J. W. Cr.

**Protein compositions.**—See XIX.

## XVI.—AGRICULTURE.

**Soils of Great Britain.** S. G. Brade-Birks (J. South-East. Agric. Coll., Wye, 1938, No. 42, 154—188).—Profiles and formations of characteristic soil types are described. A. G. P.

**Soils of the teart land areas of Somerset. II.** D. A. Osmond (Ann. Rept. [1937] Agric. Hort. Res. Sta., Long Ashton, 1938, 250—257).—Description and classification of these soils are recorded. A. G. P.

**Soil profiles developed on limestone of (A) the Great Oolite around Bath, Somerset, (B) the Upper Inferior Oolite near Batcombe and near Milton Clevedon, Somerset.** A. J. Low (J. South-East. Agric. Coll., Wye, 1938, No. 42, 189—200, 201—213).—Descriptions and profile characteristics of the principal soil types are recorded. A. G. P.

**Ceylon soils. X. Further characteristic dry-zone soils.** A. W. R. Joachim and D. G. Pandittesekere (Trop. Agric., 1938, 90, 136—141).—Profile characteristics and mechanical and chemical analyses of 4 soils of the dry zone are given. The suitability of the soils for crops is discussed. A. W. M.

**Structure of the sorption complex of German soil types.** W. Laatsch (Angew. Chem., 1938, 51, 584—589).—The electrodialysable base content, degree of saturation with bases, and electrometric titrations of dialysed soils are recorded for several typical profiles. The nature of the absorption complex and the "weathering" of soils during electrodialysis are discussed. A. G. P.

**Soil types in the lower valley of the Rhône. II. Erosion soils on the Marnes Plaisanciennes.** J. Bordas, Joessel, and Mathieu (Ann. Agron., 1938, 8, 44—56; cf. B., 1938, 305).—The origin of these soils is described and analyses of four samples are given. A. W. M.

**Physical properties of virgin mineral soils of Quebec.** W. Rowles and H. L. Fletcher (Sci. Agric., 1937, **17**, 353).—Relationships between the org. C content and the max. $H_2O$ capacity, moisture absorption at 50% R.H., sticky point, pore space, heat of wetting, and vol. expansion of these soils are examined. A. G. P.

**Physical and chemical properties and kind of organic matter affecting colour in Randall clay and upland soils of the southern higher plains.** F. A. Daniel and W. H. Langham (Soil Sci., 1938, **45**, 369—385).—In the fine-textured soils examined, colour is influenced more by the character than the abs. amount of org. matter present or by the nature of the minerals (notably Fe and Mn) occurring in the parent material. A. G. P.

**Chemistry of the humus of uncultivated soils of west Norway.** T. Gaarder and E. Alvsaker (Medd. Vestl. Forst. Forsøks-Stat., 1938, **6**, 97 pp.).—Descriptions and fractional analyses (Waksman) of these soils are recorded. The characteristics of the several humus types are discussed. A. G. P.

**Soil survey of the horticultural portion of the Mypolonga irrigation area (South Australia).** R. L. Crocker and B. E. Butler (J. Counc. Sci. Ind. Res. Australia, 1938, **11**, 143—150).—Analyses and descriptions of the soils are recorded. Those in which the stony or hard-pan layer is covered by > 24 in. of sandy soil are suitable for all horticultural crops. Drainage, height of $H_2O$-table, and salinity are discussed. A. G. P.

**Survey of horticultural soils in the Murrumbidgee irrigation areas, New South Wales.** J. K. Taylor and P. D. Hooper (Bull. Counc. Sci. Ind. Res. Australia, 1938, No. 118, 7—84).—Analytical data and a classification of the soils are recorded. Soil structure is examined in relation to permeability to $H_2O$. No relation was apparent between soil texture and clay content. The exchangeable-base content per unit of clay was lower in hill-slope soils than in plains. Exchangeable Mg replaced Ca to an increasing extent with depth. A. G. P.

**Clay fraction of Annapolis valley soils.** L. C. Harlow (Sci. Agric., 1937, **17**, 325—328).—Determinations of the $SiO_2$/sesquioxide ratios and exchangeable-base contents of these soils are recorded and discussed in relation to the nature of the profile and other soil characteristics. A. G. P.

**Thermal phenomena in a selected Hawaiian soil.** H. A. Wadsworth (Soil Sci., 1938, **45**, 251—262).—The f.-p. depression of soils varies with their previous drying history. Heat evolution occurs when a relatively dry soil is mixed with a wetter sample. The heat of wetting is closely related to the moisture potential of the soil. A. G. P.

**Laterites of western Samoa.** F. T. Seelye, L. I. Grange, and L. H. Davis (Soil Sci., 1938, **46**, 23—31).—Descriptions and analyses of these soils are recorded and the process of laterisation is examined. The $SiO_2$ content is a reliable index for classification purposes. A. G. P.

**Manganese in soils and herbage at Wye.** R. L. Wain (J. South-East. Agric. Coll., Wye, 1938, No. 42, 146—153).—In the soils examined, the total Mn contents were normal but the amounts extracted by N-$NH_4OAc$ and those present in herbage were low. Such conditions are associated with alkaline reaction in soil. A. G. P.

**Ferromanganiferous concretions from podsolic soils.** E. Winters (Soil Sci., 1938, **46**, 33—40).—The concretions occur principally in the surface horizons of poorly-drained, light-coloured soils. The Mn and Fe contents are $\gg$, Al is slightly >, and $SiO_2$ and org. matter contents are <, those of the soils in which they are formed. They become magnetic on gentle ignition. A. G. P.

**Fixation of ferric hydroxide by soil clay.** G. Barbier (Ann. Agron., 1938, **8**, 34—43).—Fixation of colloidal $Fe(OH)_3$ by clay involves the partition of Fe between the solid and liquid phases only when (i) electropositive $Fe(OH)_3$ is in contact with clay which has already fixed enough $Fe(OH)_3$ to become electropositive, or (ii) when electronegative $Fe(OH)_3$ is in contact with electronegative clay. As soil clay is normally electronegative, only electronegative $Fe(OH)_3$ can migrate in soil clays. A high concn. of sol. Ca in the soil, but not soil alkalinity, impedes migration of electronegative $Fe(OH)_3$. In cases of chlorosis, sol. Fe should be added to the soil when the sol. Ca concn. is low in winter. Plants can assimilate Fe from the gel form as well as from solution. A. W. M.

**Colloidal complexes of iron and aluminium [in soils].** A. Demolon and E. M. Batisse (Ann. Agron., 1938, **8**, 6—33).—Conditions governing the formation, stability, and dispersion of colloidal complexes of sol. $Fe^{\cdot\cdot}$, $Fe^{\cdot\cdot\cdot}$, or $Al^{\cdot\cdot\cdot}$ with $H_3PO_4$, humic, or silicic acids are studied. Raising the $p_H$ caused greater flocculation with sol. Ca, but $CaCO_3$ had very little effect. The rôle of Fe and Al in soil-formation processes is discussed. The mol. ratio $SiO_2/Fe_2O_3$ in the coagulum, and the Fe remaining in solution after neutral salt flocculation, increased in the order Ca, K, Na. The action of sol. Fe in podsols and red earths is discussed. Analytical procedures for Fe or Al are suggested. A. W. M.

**Minerals from the valley brick- [red-]earth.** R. L. Bellhouse (J. South-East. Agric. Coll., Wye, 1938, No. 42, 216—218).—Relative proportions of 12 minerals found in this soil are recorded. A. G. P.

**"Single value" soil properties: sticky point, rolling-out limit, and total phosphorus content of some Maquiling area soils.** N. M. Alvaro (Philippine Agric., 1938, **27**, 70—80).—No parallelism was apparent between sticky points and rolling-out limits in these soils. A. G. P.

**Presence of titania in chemically unweathered soils.** A. Salminen (Soil Sci., 1938, **46**, 41—47).—Fine-textured soils have higher Ti contents than have coarser-grained soils. The Ti is probably associated with micas. A. G. P.

**Boron in soils.** J. A. NAFTEL (Amer. Fertiliser, 1938, **89**, No. 7, 5—8, 24—26).—A review.
A. W. M.

**Agricultural significance of the minor elements.** W. O. ROBINSON (Amer. Fertiliser, 1938, **89**, No. 8, 5—8, 24—26).—Al, As, Mn, Se, and rare-earth contents of some plants and soils are reported.
A. W. M.

**Composition and structure of soil organo-mineral gels and soil fertility.** A. T. TIULIN (Soil Sci., 1938, **45**, 343—357).—The significance of organo-mineral gels in soils is discussed. Such gels contain loosely held humus with P and N constituents. Means of differentiating types of colloids by peptisation and coagulation are described.
A. G. P.

**Presence of allantoin in soils.** E. C. SHOREY (Soil Sci., 1938, **45**, 177—183).—Allantoin (a few p.p.m.) has been isolated from aq. extracts of 4 different types of soil. A. G. P.

**Influence of weather and changes of temperature on content of water-soluble fertilisers in agricultural soils.** D. LEROUX (Compt. rend., 1938, **207**, 504—506; cf. B., 1927, 343; 1930, 580; 1936, 1059).—Samples of soil left to weather from November to July and in the laboratory at 17—18° show an increase in sol. material (larger in the latter group); also the electrolyte content at first diminishes and then remains steady, and the $NO_3'$-N increases at first and scarcely changes further in spring (it is unaffected at 17—18°). Sol. $P_2O_5$ and $K_2O$ are uninfluenced by temp. variations. J. L. D.

**Leaching action of rain water on dolomite and limestone separates incorporated with quartz in outdoor lysimeters.** W. H. McINTIRE, W. M. SHAW, and B. ROBINSON (Soil Sci., 1938, **46**, 9—19).—The Mg, Ca, and $CO_3''$ contents of leachates from sand–limestone and sand–dolomite mixtures are recorded. The total Ca + Mg leached was greater from limestone than from dolomite mixtures. In the case of dolomite the proportion of Ca in early leachates was > in that subsequently obtained. Particle size and rate of leaching are the important factors controlling the decomp. of the materials. A. G. P.

**Effects of lime on the soil.** L. A. WHELAN (Scot. J. Agric., 1937, **20**, 258—263).—Use of CaO in counteracting acidity and in improving permeability of soils to $H_2O$ is discussed. A. W. M.

**Nitrogenous fraction of soils.** A. W. J. DYCK and R. R. McKIBBIN (Sci. Agric., 1937, **17**, 318—322).—Determinations of the N of soils by Dumas' method gave results 6—30% > those by the Kjeldahl method, differences being apparent in the hydrolysable and non-hydrolysable N fractions. Distillation of soil in a vac. with NaOH yielded $NH_3$, amines, pyrrole, $C_5H_5N$, and quinoline, and the total N of the distillate calc. from titrations compared favourably with N vals. obtained by Dumas' method. The proportions of $NH_2$- and amide-N in hydrolysable N fractions vary considerably in different soils, and definite but rather wide ranges of vals. may be associated with individual soil types. A. G. P.

**Ignition at low temperatures of the organic matter in soils.** J. S. HOSKING (J. Agric. Sci., 1938, **28**, 393—400).—Loss of org. matter from soil heated to 100° is appreciable. From 100° to 200° volatile constituents are distilled. Destructive distillation is the principal process at 200—300°; at this stage 85% of the total org. matter is removed. Ignition of residual carbonaceous matter is completed at 300—500°. Heating for 2 hr. at 450° or for ½ hr. at 500° destroys 99% of the total org. matter.
A. G. P.

**Compressibility curves as a quantitative measure of soil tilth. II.** G. W. S. BLAIR and G. H. CASHEN (J. Agric. Sci., 1938, **28**, 367—378; cf. B., 1938, 200).—Determinations of the compressibility of soil at intervals after digging are recorded and discussed. A new method for measuring compressibility is based on the rate of flow of $H_2O$ through rubber tubes embedded in soil at the time of digging. A. G. P.

**Modern conception of soils, fertiliser action, and plant nutrition.** E. TRUOG (Fert. Feeding-Stuffs J., 1938, **23**, 407—410).—An address. A. W. M.

***Azotobacter* in Iowa soils.** W. P. MARTIN and P. E. BROWN (Soil Sci., 1938, **45**, 455—466).—In the soils tested, liming to produce $p_H$ approaching 7·0 was the only factor examined which was essential for development of *Azotobacter*. In presence of CaO other treatments, *e.g.*, incorporation of oat straw, have a beneficial action. The limiting $p_H$ for growth of *Azotobacter* varied with soil type. A. G. P.

**Identification of *Phytomonas*, *Azotobacter*, and *Rhizobium* or *Achromobacter* on initial isolation [from soil].** C. S. BRYAN (Soil Sci., 1938, **45**, 185—187).—Addition of Congo-red to plating media serves to distinguish the species by differences in coloration of colonies. A. G. P.

**Isolation of halophilic bacteria from soil, water, and dung.** L. S. STUART (Food Res., 1938, **3**, 417—420).—Provided sufficient time (90 days) is allowed for their exceedingly long lag period halophilic organisms can be cultivated from sources other than salt or conc. brines. Such sources are stagnant $H_2O$, S springs, freshly flayed calf skin, rat dung, and soils. The lag period found was $\simeq$ that elapsing before active bacterial growth appeared on freshly flayed skin salted with uncontaminated NaCl.
E. C. S.

**Microbial activities in soil. III. Activity of specific groups of microbes in different soils.** S. C. VANDECAVEYE and G. O. BAKER. **IV. Microflora of different zonal soil types developed under similar climatic conditions.** S. C. VANDECAVEYE and H. KATZNELSON (Soil Sci., 1938, **45**, 315—333; **46**, 57—74; cf. B., 1935, 1156).—III. In two soils examined addition of straw, clover hay, or other plant residues produced increased biological activity except among *Azotobacter* and the cellulose-decomp. organisms, the nos. of which were small. Although individual groups of organisms were differently affected in the two soils, the relative order of predominance was similar and was apparently controlled by soil characteristics rather than by the nature of the org. matter added. The increased growth of fungi was more persistent than that of bacteria. Max. $CO_2$ production was attained prior to the max. no. of organisms. A secondary peak in microbial population was reached when $CO_2$ production had fallen to a low level. Rates of decomp. of org. matter in the two soils were similar although the levels of microbial nos. were markedly different. Changes in $p_H$ of treated soils were roughly paralleled by accumulation of $NO_3'$.

IV. Variations in microflora with season, depth, and locality are examined in relation to $p_H$, oxidation–reduction potential, and org. matter contents. A. G. P.

**Soil sterilisation.** R. W. Shorrock (J. Bd. Greenkeeping Res., 1938, 5, 201—210).—Various methods of sterilisation by heat, steam, and chemicals are discussed. A. G. P.

**Cooling and freezing bath [for soil examination].** G. J. Bouyoucos (Soil Sci., 1938, 46, 21—22).—A lagged ice-pail is described. It is suitable for dilatometer measurements of soils. A. G. P.

**Preparation of soil samples for colorimetry.** W. O. Sharp (J. South-East Agric. Coll., Wye, 1938, No. 42, 114—118).—Methods of preparing samples by painting soil pastes on filter-paper discs or by moulding into blocks are discussed. A. G. P.

**Determination of water capacity of mineral soils.** A. von Nostitz (Bodenk. Pflanzenernähr., 1938, 8, 257—262).—Methods of determining the $H_2O$-retaining capacity of soil are compared. Those involving stirring the soil with excess of $H_2O$ before draining cause undesirable physical changes, especially in heavy soils. Better results are obtained by the cylinder method, using a layer of soil 1·0 cm. deep and immersing the cylinder to a depth of 1·5 cm. for 24 hr. before draining. The "ordinary" $H_2O$ capacity is best determined in a slightly conical vessel, 15 cm. high. A. G. P.

**Lysimeter experiments [on soils].** A. Demolon and E. Bastisse (Soil Sci., 1938, 46, 1—7).—Loss of Ca in drainage $H_2O$ was diminished by cropping and increased by applications of artificial manures. The MgO/CaO ratio in drainage $H_2O$ from uncropped soils was approx. const. and $<$ that from cropped soils. The smaller losses of $NO_3'$ from cropped soils are attributable to absorption by plants and to utilisation by soil microflora, which is intensified by growth of plants. The weathering of comminuted granite in lysimeters is examined over a 5-year period. The proportion of clay particles formed was the same at all depths. Chemical changes occurred only in particles having diameter $<200\ \mu$. With diminution of particle size $SiO_2$ diminished and sesquioxides and $H_2O$ of hydration increased. K is probably leached as silicate and other bases as nitrates or sulphates. In the formation of clay colloids hydration rather than dissolution and hydrolysis is the dominant process. A. G. P.

**Isohydric $p_H$ value of soils and its determination.** A. N. Puri and A. Sarup (Soil Sci., 1938, 46, 49—56).—The isohydric $p_H$ (*i.e.*, the $p_H$ of a buffer solution which undergoes no change in reaction when placed in contact with soil) is determined titrimetrically. Vals. obtained serve to establish the buffer capacity and CaO requirement of the soil. A. G. P.

**Titration curves and dissociation constants of soil acidoids.** A. N. Puri and A. G. Asghar (Soil Sci., 1938, 45, 359—367).—Titration curves of soil acidoids resemble those of weak dibasic acids, with points of inflexion at $p_H \sim 4$ units above the initial val. Dissociation consts. for acidoids are calc. The $p_K$ vals. of soils are characteristic of the activity of the acidoids, low $p_K$ corresponding with strong acidoids. The relation of these vals. to customary base-exchange vals. is discussed. A. G. P.

**Electrodialysis of soils. III. Speed of electrodialysis of various cations.** A. N. Puri and R. C. Hoon (Soil Sci., 1938, 45, 309—313; cf. B., 1938, 420).—Differences in rates of electrodialysis of cations from single-base soil colloids are related to the ionic activities of the cations rather than to the state of aggregation of the colloids. A. G. P.

**Use of selenium as a catalyst in the Kjeldahl method for determining nitrogen.** C. S. Piper (J. Proc. Austral. Chem. Inst., 1938, 5, 312—316).—In determining N in soils, cereals, and pasture samples, Se is more effective than $CuSO_4$ in the destruction of org. matter during the digestion with conc. $H_2SO_4 + K_2SO_4$. The amounts of N found were $=$ or slightly $>$ those obtained in presence of $CuSO_4$. Digestion after the solution becomes clear is still necessary. Under the conditions employed, no loss of N was detected when excessive amounts of Se (up to 0·8 g.) were used (cf. A., 1935, 596). The black and red forms of Se appear to be equally effective. L. S. T.

**Evaluation of the influence of nitrogenous fertilisers on the acid–base status of soils by lysimeter studies.** M. F. Morgan and E. M. Bailey (Soil Sci., 1938, 45, 387—401).—In soils highly saturated with bases, the amount of base leached after application of acid-reacting fertilisers approaches the theoretical val. With low-base soils loss of base under these conditions is $<$ theoretical, but soils become more acid. Removal of $HCO_3'$ in acid soils contributes towards maintaining the loss of base at $<$ the anticipated amount. In fallow soils addition of $CaCO_3$ equiv. to the theoretical acidity tends to stabilise soil-$p_H$. The action of $NaNO_3$ in increasing soil-$p_H$ is $>$ can be ascribed to the increase in base saturation which it produces. The intake of N by tobacco plants does not correspond with twice its base equiv. in all cases, especially when plants contain a high % of ash. A. G. P.

**Determination of available phosphoric acid in calcareous soils.** P. Boischot and G. Drouineau (Ann. Agron., 1938, 8, 57—67).—The Schloesing–de Sigmond method (A., 1907, ii, 717) is difficult to use when the soil-Ca is only slowly attacked by dil. acid. After acid has been added to the soil suspension, $P_2O_5$ is liberated and fixed simultaneously. Fixation of free $P_2O_5$ is least in the soils with most available $P_2O_5$. Methods of determining available $P_2O_5$ are compared. The Schloesing–de Sigmond method must be more standardised to give reliable results. A. W. M.

**Determination of the organic base-exchange capacity of soils.** L. C. Olson and R. H. Bray (Soil Sci., 1938, 45, 483—496).—The base-exchange capacity was eliminated by treatment with 15·0% $H_2O_2$ (40 c.c. per 5 g. of soil). $MnO_2$ and $CaCO_3$ interfere with the destruction of org. matter by this means; where these are present in considerable quantities a second treatment with $H_2O_2$ containing AcOH is necessary. For peat soils a similar proportion of 22·5% $H_2O_2$ is preferable. A. G. P.

**Use of hydrofluoric acid in soil analysis.** A. S. Hammond (Sci. Agric., 1937, 17, 323—324).—Decomp. of the ignited soil sample (1—2 g.) with HF (10 c.c.) and $H_2SO_4$ (0·5 c.c.) simplifies subsequent analysis. Determinations of Ca, Mg, Al, and Fe agree satisfactorily with those obtained by fusion with $Na_2CO_3$. A. G. P.

**Determination of limiting values in methods of soil investigation by the "row" method.** H. Niklas and M. Miller (Bodenk. Pflanzenernähr., 1938, 8, 262—266).—Mathematical. A. G. P.

**Manurial requirement determinations by the Mitscherlich pot method.** J. C. Baird and R. H. Common (J. Min. Agric. N. Ireland, 1937, 5, 52—64).—In approx. 65% of the soils examined, the Mitscherlich method gave results which were subsequently confirmed in field trials. A. G. P.

**Detection of minute quantities of chlorates [in soils and plant material].** I. V. Hunt (J. South-East. Agric. Coll., Wye, 1938, No. 42, 119—125).—Korenman's indigo-carmine test (A., 1936, 577) is more sensitive than are those using Me-orange or -red. Suitable technique for determining $ClO_3'$ in soil is described. A. G. P.

**Testing fertility of Alberta soils by the Neubauer and Lemmermann methods.** H. Kohnke (Sci. Agric., 1937, 17, 312—317).—General agreement was obtained between results of laboratory analyses, of Lemmermann tests, and of the majority of the Neubauer tests on a no. of soils. A. G. P.

**Triple-analysis method of testing soil fertility and probable crop reaction to fertilisation.** H. Lundegårdh (Soil Sci., 1938, 45, 447—454).—A method involving analyses of plant leaves and of citric acid extracts of surface and subsoil is discussed. H, K, Na, Ca, Mg, Mn, Fe, Cu, $PO_4$, and N are determined. A. G. P.

**Influence of distribution of rich and poor soils in a series on evaluation of the probable accuracy of methods of soil examination.** H. Niklas, M. Miller, and O. Toursel (Bodenk. Pflanzenernähr., 1938, 8, 266—271).—A basis of correlation between results of pot experiments and those of chemical methods for determining the nutrient status of soils is established. A. G. P.

**The "series" principle in field experiments. III.** O. de Vries (Bodenk. Pflanzenernähr., 1938, 8, 73—77; cf. B., 1937, 1250).—The "series" form of experiment design is further eleaborated. A. G. P.

**Methods of applying commercial fertilisers.** W. S. Blair (Sci. Agric., 1937, 17, 279—282).—Placement of fertilisers in narrow bands on either side of and 3 in. from the seed gave better results than other methods examined. A. G. P.

**Side-dressing application of fertiliser.** C. B. Sayre (Amer. Fertiliser, 1938, 89, No. 8, 12—13).—Sol. N fertilisers should be scattered between the rows on the surface of the soil, but K and P fertilisers should be applied 3—4 in. below the surface. A. W. M.

**Reversion of citrate-soluble phosphate in modern fertilisers.** M. Popp (Bodenk. Pflanzenernähr., 1938, 8, 383—386).—No reversion occurred in Nitrophoska or Rhenania phosphate during many months of storage. A. G. P.

**Nature of potassium fixation in soils.** G. W. Volk (Soil Sci., 1938, 45, 263—276).—With few exceptions (bentonites and one muscovite sample) minerals examined showed little ability to fix K. Treatment with aq. $CO_2$, but not with $Na_2CO_3$, increased the ability of sericite and muscovite to fix K. Addition of colloidal $SiO_2$ or $Al(OH)_3$ increased the fixing power of pyrophyllite, but not that of kaolinite. Fine grinding of sericite, kaolinite, or muscovite had no effect on the capacity for K fixation. Treatment of soil or of undecomposed granite with $Na_2CO_3$ increased, and that with dil. HCl diminished, fixation to extents which increased with the amount of Al removed. Such acid-treated materials regained fixative capacity on addition of $Al_2O_3$, but not of $SiO_2$. Clays fixed larger amounts of K than any of the minerals examined. A. G. P.

**Manurial trials with maize for grain.** W. Sauerlandt (Bodenk. Pflanzenernähr., 1938, 8, 55—72).—Maize yields were markedly increased by inorg. but much less if at all by org. N fertilisers. P fertilisers had little influence on yields. In mature plants K accumulated principally in stems and P in the grain. Following generous N manuring, the N content of grain was $>$ that in stems, but when little or no N was given the stems contained the larger proportion. N manuring diminished the no. of earless plants and increased the no. but not the wt. of individual grains in the cobs. The $H_2O$ content of whole heads and grain varied with the proportion of N and P fertilisers given. A. G. P.

**Potash fertilisers for cotton plants.** D. V. Charkov (Kalii, 1938, No. 2, 27—29).—Plot experiments over a 4-year period on the effect of fertilisers on cotton plants are described, the soil having been used previously for lucerne. P, N–P, and N–P–K fertilisers were used; the K was added only during the first and fourth years in the N–P–K trials. At all periods of plant growth the K extracted from soil treated with N and P was $\gg$ for unfertilised soil. The hypothesis that treatment with K probably has a favourable effect due to its increased removal by the cotton plant when fertilised with N and P is confirmed. D. G.

**Rôle of minor elements, other than nitrogen, phosphorus, and potassium, in crop production.** L. E. Wright (Sci. Agric., 1937, 17, 283—293).—A spectrographic method for determining sol. B in soils is described. Application of Mg and Mn tends to improve yields on unlimed but not on limed soils. Borax prevented crown rot in mangolds on limed or unlimed soils. In absence of B treatment the disease was more prevalent on limed soil. Zn salts depressed yields on unlimed soils. A. G. P.

**Minor elements affecting horticultural crops.** H. Hill (Sci. Agric., 1936, **17**, 148—153).—Effects of B, Cu, Mn, and Zn on a no. of crops are discussed. A. G. P.

**Horticultural significance of trace elements in bituminous coal ash.** H. Mönnig (Bergbau, 1938, **51**, 251—252).—A compost comprising peat and coal ash when allowed to weather derives valuable manurial properties from Mg, Ca, K, P, and other elements in the ash. Traces of rare elements in the ash appear to have a manurial effect out of all proportion to their quantity. R. B. C.

**Time of sowing sugar beet in relation to yields.** G. Wimmer and H. Lüdecke [with O. Unverdorben, K. Sammet, G. Storck, G. Spielmeyer, A. Bollmann, and W. Lesch] (Z. Wirts. Zuckerind., 1938, **88**, 87—106).—Effects on yields of roots, tops, and sugar of varying the time of sowing are recorded. With late sowing, generous applications of N cause no diminution in sugar yield. A. G. P.

**Pot experiments for evaluation of the phosphoric acid in Kalkammonphosphat.** W. Lehmann (Bodenk. Pflanzenernähr., 1938, **8**, 26—42).—The P of Kalkammonphosphat produced yields = those obtained with other P fertilisers on acid soils, but on limed soils its efficiency diminished with increase in $p_H$, as a result of fixation. A. G. P.

**Action of the phosphoric acid of Kalkammonphosphat.** L. Schmitt (Bodenk. Pflanzenernähr., 1938, **8**, 1—25).—On strongly acid or lightly limed soils the P of Kalkammonphosphat was as effective as that of the customary simple P fertilisers. It gave much less satisfactory results on heavily limed soils. A. G. P.

**Activity and evaluation of the phosphoric acid in Kalkammonphosphat.** M. Popp (Bodenk. Pflanzenernähr., 1938, **8**, 42—54).—On well-buffered soils of moderate Ca content the manurial action of the P in Kalkammonphosphat was similar to that of superphosphate and basic slag; on calcareous and light sandy soils or those poor in humus results were less satisfactory. The utilisable P in the fertiliser corresponded with that portion sol. in 2% aq. citric acid. In soils rich in Ca transition of utilisable into unavailable P was rapid. A. G. P.

**Basalt dust as fertiliser for poor sandy soils.** H. H. Hilf (Forstarchiv, 1937, **13**, 113—116).—Basalt dust improved the growth of forest seedlings especially if previously composted with farmyard manure or peat. A. G. P.

**Zinc as a nutrient for plants.** W. H. Chandler (Bot. Gaz., 1937, **98**, 625—646).—A crit. review. A. G. P.

**Molasses as fertiliser in the United Provinces [India].** H. N. Batham (Int. Sugar J., 1938, **40**, 398).—Applied at the rate of 12 tons per acre two months before planting, ordinary cane molasses compares favourably with commercial fertiliser of the same nutrient content. Usually it has no effect on the sugar content of plant canes, but it lowers somewhat that of ratoon canes, this, however, being more than compensated by the increased tonnage. After the crops had been harvested, the soils were found to be richer in N than either conventionally fertilised or unfertilised plots. Molasses also tends to correct the condition of high alkalinity of some tropical soils. J. P. O.

**Plant food value of nitrogen in filter-cake.** R. J. Borden (Hawaiian Planters' Rec., 1938, **42**, 111—117; Int. Sugar J., 1938, **40**, 399).—Results of tests carried out in Mitscherlich pots indicated that no tangible effect as a nitrogenous fertiliser resulted from the application of the filter-press cake of cane-sugar factories in Hawaii. J. P. O.

**Reaction between ammonia and soils.** A. N. Puri and A. G. Asghar (Soil Sci., 1938, **45**, 477—481).—The amount of $NH_3$ reacting with soil is a function of $p_H$ and represents the residual portion of titration curves of soils which are partly neutralised with other bases. The amount of $NH_3$ retained by base-free soil on boiling is equiv. to half the *T* val. of the soil. A. G. P.

**Effects of organic materials and fertiliser treatments on soluble nutrients in soils.** R. E. Stephenson (Soil Sci., 1938, **45**, 467—475).—Org. materials commonly added to soils contain considerable amounts of $H_2O$-sol. matter much of which is absorbed by soil colloids. The concn. of cations in $H_2O$ extracts of soils is paralleled by the amount of $NO_3'$ present. The solvent action of dil. aq. $CO_2$ is of some significance in neutral or alkaline but not in acid soils. The largest proportions of $H_2O$-sol. nutrients occur in surface soils in which org. matter is most abundant and biological processes are most active. A. G. P.

**Chemical equilibrium existing between soluble salts and base-exchange compounds [in soils].** J. D. Peterson and D. S. Jennings (Soil Sci., 1938, **45**, 277—292).—Replaceable Na in calcareous soils is completely removed by leaching with $H_2O$. Treatment of soil or bentonite with salt solutions results in entry of all types of cations present into the complex; the final proportion of bases in the solid phase is independent of the nature of the bases originally present. Replaceable $Ca^{\cdot\cdot}$ remained in soils and bentonite after treatment with Na and K salts. The exchange capacity of bentonite treated with K salts was < when treated with Ca or Na salts. The sum of the exchangeable bases in bentonite repeatedly leached with salt solutions was usually > the total exchange capacity indicated by the $NH_4^{\cdot}$ absorbed from $NH_4OAc$ solution. A. G. P.

**Goat manure.** M. L. M. Salgado (Trop. Agric., 1938, **90**, 30—33).—Analyses of 3 samples of goat manure and rates of application for coconut palms are given. A. W. M.

**Artificial farmyard manure.** W. Hesse and K. Schmalfuss (Bodenk. Pflanzenernähr., 1938, **8**, 355—373).—Losses of dry matter during fermentation of straw for artificial manure were min. when 0·14% of N was added and heaps were compacted, and max. in loosely stacked heaps when 0·7% of N was added. Losses of N were max. in loose stacks to which 1·4% of

N was added. The C/N ratio of the product approached the optimum, viz., 20 : 1 (*i.e.*, N = 2% of dry matter), when 1·4% of N was used, whether in loose or compacted heaps. With 0·7% of N the C/N ratio approached 30 : 1 in some cases. A. G. P.

**Manuring of forest soils. II.** H. Süchting, W. Jessen, and G. Maurmann (Bodenk. Pflanzenernähr., 1938, **8**, 272—335).—Manurial trials are recorded. Forest growth was usually favoured by acid conditions. CaO tended to restrict the intake of K, but its action was counteracted by application of K fertilisers at customary levels. Intake of Ca was low in acid soils and was increased under all conditions by liming. Intake of P was not greatly affected by manuring or by soil-$p_H$. Fixation of P by Al or Fe was indicated. Response to N fertilisers was small and variable. A. G. P.

**Effect of fertiliser treatments on nutrients produced by pastures.** K. A. Ackerman and H. O. Henderson (J. Dairy Sci., 1938, **21**, 100—101).—The produce of plots limed and variously treated with N, P, and K fertilisers was measured by live-wt. increases in heifers grazing the plots and no. of grazing days. Over a 5-year period, treatment with complete fertilisers more than doubled the produce over the control plots, and partial treatment also showed a great increase of yield. W. L. D.

**Improvement of poor grassland by poultry.** L. T. Lowe (J. Min. Agric., 1938, **45**, 580—585).—Regular liming of poultry-stocked grassland is necessary to prevent a low Ca/P ratio in the herbage. Ca supplied to chickens in herbage is preferable to $CaCO_3$ given as a dietary supplement. K fertilisers improved such herbage on light soils. Herbage from poultry runs has high protein, P, and vitamin-*A* and -*C* contents and can effect considerable saving in dietary protein concentrates. A. G. P.

**Yield and composition of a Mitchell grass pasture for a period of twelve months.** J. G. Davies, A. E. Scott, and J. F. Kennedy (J. Counc. Sci. Ind. Res. Australia, 1938, **11**, 127—139).—Analyses of the pasture at intervals over a year are recorded. The protein and P contents were adequate during only portions of the season, and the Ca content was low in all samples. A. G. P.

**Weed eradication in lawns by chemical treatment.** I. M. Robertson and A. B. Stewart (J. Bd. Greenkeeping Res., 1938, **5**, 213—216).—Treatment with $(NH_4)_2SO_4$ (I), $H_2SO_4$, or S produced similar changes in soil-$p_H$ but very different effects on weed flora. Customary dressings of (I) destroy rosette weeds but not mosses or clover. The latter are eradicated by (I)–$FeSO_4$ mixtures. Top dressings of leaf mould tend to increase weed populations. A. G. P.

**Control of dandelions in lawns.** W. E. Loomis (J. Agric. Res., 1938, **56**, 855—868).—Food reserves of the dandelion (lævulin and dextrin) are markedly low during early spring growth. Kerosene (boiling range 180—250° and $\ngtr 4\%$ of unsaturateds present) at the rate of 200 gals./acre gives effective control if applied late in the season but before growth of grass ceases. A. G. P.

**Use of sulphur in improving the physical condition of clay soils on golf courses.** R. B. Dawson and B. M. Boyns (J. Bd. Greenkeeping Res., 1938, **5**, 189—200).—On the soil examined, application of S (2—3 oz. per sq. yard) improved the condition of the turf by increasing acidity and consequently improving drainage of surface layers. Considerable destruction of weeds occurred and the action of subsequent dressings of $(NH_4)_2SO_4$–$FeSO_4$ was intensified. A. G. P.

**Control of rabbits and moles on golf courses.** R. W. Shorrock (J. Bd. Greenkeeping Res., 1937, **5**, 120—127).—Fumigation with CO, $CS_2$, and HCN is described. A. G. P.

**Clover sickness.** H. H. Mann (J. Agric. Sci., 1938, **28**, 437—455).—On the soil examined, clover sickness was not appreciably affected by N, P, or K fertilisers or by liming. Temporary improvement was effected by heating at 60—70° for 1—2 hr. Treatment of the sick soil with very heavy dressings of farmyard manure resulted in healthy clover crops. Clover sickness is distinguishable from attack by *Anguillulina dipsaci*. A. G. P.

**Flax-growing in Scotland.** J. Stirling (Scot. J. Agric., 1937, **20**, 150—160).—Cultivation and manuring are described. A. W. M.

**Sodium chlorate tested against the reed *Calamagrostis epigeios*.** E. Herrmann (Forstarchiv., 1937, **13**, 106—110).—Successful control of the reed in forests and forest nurseries by use of $NaClO_3$ is described. A. G. P.

**Manuring of *Juncus effusus*, L., var. *decipiens*, Buch. I. Manurial value of nitrogen compounds.** H. Sutoh (J. Agric. Chem. Soc. Japan, 1938, **14**, 1103—1112).—$NH_4$ salts are much more effective than nitrates, $(NH_4)_2SO_4$ being most effective in increasing the length of the stem. Fish meal is also a good fertiliser, and urea is more effective than $NaNO_3$. CN′ is detrimental unless very carefully applied. Hippuric acid is harmful to the vital functions, and whilst uric acid has no injurious effect on the physiological processes yet its fertilising action is < that of $NaNO_3$. J. N. A.

**Manuring forest nurseries with Nitrophoska.** W. Bujakowsky (Forstarchiv, 1937, **13**, 110—113).—The response of forest seedlings to the fertiliser was increased by a covering of leaf humus or humus compost. A. G. P.

**Potato fertiliser investigations, 1936.** O. Smith (Amer. Potato J., 1937, **14**, 245—253).—A résumé. A. G. P.

**Electrometric determination of seed value of potato tubers. IV. Redox potential of mashed tubers as an index of degeneration.** H. Wartenberg and A. Hey (Phytopath. Z., 1936, **9**, 531—569).—Variations in redox potential of potato pulps prior to and during dormancy are recorded. Vals. for degenerated tubers are more negative than those for sound tubers of the same stock. A. G. P.

**Magnesium in field crop production in New Brunswick.** E. M. Taylor and J. L. Howatt (Sci. Agric., 1937, **17**, 293—298).—Physiological disorders and poor cropping power of potatoes and oats were remedied by application of $MgSO_4$. A. G. P.

**Turnip brown heart.** R. R. Hurst and D. J. Macleod (Sci. Agric., 1936, 17, 208—214).—The disease (described) is prevented by application of borax to soil (15—20 lb. per acre). Heavy liming favours the occurrence of the disease and on naturally alkaline soils treatment with B is less effective. A. G. P.

**Brown heart of swede turnips.** J. G. Coulson and L. C. Raymond (Sci. Agric., 1937, 17, 299—301).—The incidence of brown heart varied with manurial treatment, in the order: fertilisers alone $>$ fertilisers + manure $>$ manure alone. Increase of soil-$p_H$ to 5·2 almost eliminated the disease and a marked diminution followed maintenance of high soil-$H_2O$ contents by irrigation. Pot and field trials of the beneficial effects of B are recorded. A. G. P.

**Influence of phosphatic fertilisers on yield of irrigated lucerne at Griffith, N.S.W.** E. S. West (J. Counc. Sci. Ind. Res. Australia, 1938, 11, 179—181).—Crop yields were mainly dependent on the amounts of P fertiliser applied. After-effects of rock phosphate persisted for approx. 7 years. A. G. P.

**Effect of manurial treatment on composition of lettuce.** O. Owen (Ann. Rept. [1937], Exp. Res. Sta., Cheshunt, 1938, 67—69).—Best crops were obtained by use of complete artificial fertilisers. Omission of K markedly lowers yields. In general, omission of one of the principal nutrients results in diminished intake of all three, although differences in some cases are small. Intake of N by N-deficient plants is $>$ that of P- or K-deficient plants. A. G. P.

**Magnesium deficiency in cabbage and cauliflower.** N. H. Parberry (Agric. Gaz. New South Wales, 1937, 48, 556—558, 577).—Chlorotic markings on leaves of plants grown in very acid soils ($p_H$ 4·4—4·8) are attributed to Mg deficiency. Affected leaves had high ash, sol. ash, and K, but low Ca and Mg contents. Applications of dolomitic limestone are recommended. A. G. P.

**Effect of fertilisers on peas affected with "pea sickness."** L. Ogilvie, C. J. Hickman, and C. L. Walton (Ann. Rept. [1937], Agric. Hort. Res. Sta., Long Ashton, 1938, 118—126).—Fertiliser treatments had no influence on eelworm populations in soil. In a heavily infested, K-deficient soil N fertilisers improved, but K fertilisers had no effect on, growth of peas. Following steam sterilisation, K fertilisers improved growth whereas N fertilisers were somewhat detrimental. Eelworm attack probably disturbs the N metabolism of plants. A. G. P.

**Treatment of "hard" seeds of sea pea to induce germination.** E. R. Dinnis (J. South-East. Agric. Coll., Wye, 1938, No. 42, 126—129).—Seeds were steeped in conc. $H_2SO_4$ for 45—90 min. and rapidly washed in $H_2O$. Germination was markedly increased. Treated seeds after drying were stored for 9 days before sowing, without loss of germinative power. A. G. P.

**Characteristics of soils used for cultivation of peanuts (*Arachis*) in northern territory of Australia.** J. A. Prescott (J. Counc. Sci. Ind. Res. Australia, 1938, 11, 261—265).—Brown, light-textured soils of reasonable fertility are the most suitable. Well-defined ranges of mechanical analysis (high fine-sand fraction) are characteristic of these soils. A. G. P.

**Determination of various nitrogen fractions in plants, especially α-amino-acids.** F. Alten, E. Rauterberg, and E. Knippenberg (Bodenk. Pflanzenernähr., 1938, 8, 335—355).—In the customary method of separating true protein in feeding-stuffs the $Cu(OH)_2$ ppt. contains a proportion of non-protein-N. In the method devised, protein is pptd. by $CCl_3{\cdot}CO_2H$ and α-$NH_2$-acids are determined in the filtrate by the Van Slyke method. To determine the α-$NH_2$-acid constituents of the protein, those present in the $CCl_3{\cdot}CO_2H$ ppt. or in the finely-ground material are first hydrolysed by pancreatin. A. G. P.

**Growth of plants in relation to cultivation.** M. A. H. Tincker (J. Soc. Arts, 1938, 86, 1065—1080, 1085—1102, 1105—1124).—Cantor Lectures.

**Influences of the development of higher plants on micro-organisms in the soil. VI. Microscopical examination of the rhizosphere.** R. L. Starkey (Soil Sci., 1938, 45, 207—249; cf. B., 1932, 74).—The nature of the increased microbial population in soil in the immediate neighbourhood of plant roots is examined. A. G. P.

**Stages of ripening of grain and albumin formation.** K. Schmorl (Allgem. Mühlen-Ztg., 1938, 41, 353—354).—The ripening of wheat is divided into 6 stages. The chemical changes in these and the external conditions necessary are described. The albumin content is complete at an early stage, but changes in quality; in the case of the starch this position is reversed. E. A. F.

**Interaction of factors in crop growth. II (*a*). Residual effects of nitrogenous manuring and spacing of the cotton crop on the following wheat crop. II (*b*). Interaction of nitrogenous manuring, variety, and spacing for the wheat crop. III. Effects of variety, spacing, nitrogen and water supply on development of the cotton plant: rate of its absorption of nitrogenous fertiliser.** F. Crowther. **IV. Nitrogenous and phosphatic manuring of cotton: relation to variety and spacing.** F. Crowther, A. Tomforde, and A. Mahmoud (Bull. Roy. Agric. Soc. Egypt, 1936, No. 24, 25 pp.; No. 25, 50 pp.; No. 26, 47 pp.; cf. B., 1938, 826, 958).—II (*a*). Application of Nitrochalk to the cotton crop, 6 months prior to sowing the subsequent wheat crop, produced notable increases in wheat yields, high yields being associated with wide spacing of the cotton and close spacing of the wheat.

II (*b*). Response to direct N manuring increased with the amount applied. Differences in yields due to spacing were not large, but favoured close spacing at all levels of N supply.

III. The increases in cotton yield due to N manuring were obtained only from the upper parts of the plants, whereas those resulting from wider spacing were from all parts of the plant. Intake of N by cotton is most rapid in June, and translocation of N from leaves to bolls in July–Aug. Intake of N is not paralleled by yield.

IV. Response to N manuring was more marked in closely spaced plants. Varietal differences in response to P are demonstrated. The order of these differences was not the same as that of the differential varietal response to N. Response to P was independent of the amount of N given. A. G. P.

**Nitrogen in relation to stubble-sown cereal crops.** D. C. Wark (J. Australian Inst. Agric. Sci., 1938, 4, 103—104).—A preliminary note. A. G. P.

**Effect of fertilisers on yield and malting quality of Manitoba barley.** J. W. Hopkins (Sci. Agric., 1936, 17, 250—259).—Application of N to barley after summer fallowing increases the N content of the grain and may cause lodging. K and P increase the size and wt. of the grains. Residual N from a previous crop increases the yield without affecting the N content of grain. A. G. P.

**Importance of silicon, aluminium, and chlorine for higher plants.** C. B. Lipman (Soil Sci., 1938, 45, 189—198).—Presence of Si in culture media for barley and sunflower, and of Al in those for sunflower and maize, improved seed production. $Cl'$ increases dry matter and seed production in buckwheat and seed production in peas. A. G. P.

**Nutrition of maize. II. Statistical interpretation of the relation between the ionic concentration of the culture solutions and the element content of tissues.** J. R. Beckenbach, W. R. Robbins, and J. W. Shive (Soil Sci., 1938, 45, 403—426; cf. B., 1936, 852).—The principal factor governing the intake and accumulation of individual nutrients by the plants is the abs. concn. in the medium. The content of any nutrient element in plant tissues may be directly or inversely $\propto$ the concn. of other elements in the nutrient solution. The Mg content of maize tissues was directly $\propto$ the $[NO_3']$ and $[Ca^{\cdot\cdot}]$, but was unrelated to the $[SO_4'']$ or $[PO_4''']$ in the nutrient medium. The Ca content of the tissue was directly related to the $[NO_3']$, but was uninfluenced by other ions in the substrate. The K content of the tissue varied inversely with the $[Ca^{\cdot\cdot}]$ and $[NO_3']$, but was unaffected by other constituents of the nutrient. The N content of the tissue was influenced only by the $[K^{\cdot}]$ and $[Ca^{\cdot\cdot}]$ of the nutrient solution, and to these it bore an inverse relationship. P in the plants was controlled entirely by the $[PO_4''']$ of the substrate. The S content of the tissues varied inversely with the $[Ca^{\cdot\cdot}]$ and $[NO_3']$ of the medium. A. G. P.

**Stimulation of kudzu cuttings.** M. C. Myers, R. A. Bowden, and F. E. Hardisty (Science, 1938, 88, 167).—Treatment of cuttings with three commercial synthetic hormones increased the no. of strikes, and markedly increased the size and no. of roots per cutting. $KMnO_4$ appears to be superior to these hormones in producing these effects. L. S. T.

**Rôle of "deflowering" in cotton production.** B. N. Singh and R. S. Choudhri (Empire Cotton Growing Rev., 1937, 14, 126—133).—Deflowering of cotton plants increased the resistance to shedding, the size and wt. of bolls, the wt. of the seeds, and the quality of the lint. By deflowering, the time of boll-ripening can be adjusted. A. W. M.

**Micro-climatology of an irrigated cotton field in Sind.** B. M. Dabral and S. S. Chiney (Indian J. Agric. Sci., 1938, 8, 161—184).—Seasonal changes in the temp. and R.H. of the atm. just above the ground surface and of temp. of soil are recorded. Effects of irrigation are examined. A. G. P.

**Qualitative changes in rubber and resins in kok-saghyz roots in the course of plant development.** S. M. Maschtakov (Compt. rend. Acad. Sci. U.R.S.S., 1938, 19, 307—309).—Analyses and $\eta$ data of rubber from kok-saghyz roots are recorded. The mol. wt. and degree of polymerisation of the rubber increase with plant development. The % of resin in (dry) roots changes little, but the proportion of free and combined acids and $\eta$ increase with advancing growth. A. G. P.

**Effects of certain environmental factors on development and composition of peanuts.** S. L. Jodidi (J. Agric. Res., 1938, 57, 301—311).—High soil-N (cottonseed-meal manuring) increased yields, decreased the $Et_2O$ extract of shells but not of kernels, and slightly decreased the total polysaccharides, total carbohydrate, and ash content of shells and kernels. The N, fibre, and reducing-sugar contents were not affected. Spraying with Bordeaux mixture markedly increased yields, decreased the ash, N, and $Et_2O$ extract, and increased the carbohydrate contents of shells and kernels. A. G. P.

**Effect of plant nutrition on properties of poppy-seed oil.** K. Schmalfuss (Angew. Bot., 1936, 18, 345—348).—Yields of seeds were highest when complete fertilisers with high proportions of K or with CaO were applied. The I val. of the oil was slightly lower from manured than from unmanured plants, but differences due to individual nutrient elements were not apparent. A. G. P.

**Safflower, a neglected protective coating vehicle.** L. L. Carrick and H. K. Nielsen (Amer. Paint J., 1938, 22, No. 44, 7—9, 18—26; No. 45, 13—21, 44—46; No. 47, 12—14, 43—48; No. 48, 20—29; No. 49, 52—60).—The cultivation of safflower and the properties and uses of the flower pigment and seed oil are discussed in detail. D. R. D.

**Soil temperature and autumn development of the sugar beet.** Godard (Compt. rend. Acad. Agric. France, 1938, 24, 357—364).—The sugar content of beets depends on climatic conditions and on the condition of the foliage (cf. B., 1938, 828), but the fresh wt. of the beet is governed by the soil temp. A. W. M.

**Comparative effects of ammonium sulphate and legumes on yield of sugar cane.** V. C. Calma (Philippine Agric., 1938, 27, 31—42).—Yields of cane were increased by $(NH_4)_2SO_4$ (I) and lowered by green manuring with legumes. The yield of sugar per ton of cane was lowered by (I) and unaffected by the green manuring. A. G. P.

**Absorption of plant food by [sugar] cane.** B. E. BEATER and J. L. DU TOIT (Internat. Sugar J., 1938, **40**, 396).—A comparison of the plant food uptake of 8 Coimbatore canes grown on fertilised and on unfertilised soils showed that no significant differences in their mineral compositions existed, except that Co 301 was noticeably lower in Ca in the stalks. A very high accumulation of K was found in the tops of all varieties. It is concluded that more than all of the fertiliser added to a crop of cane, with the exception only of superphosphate, is removed from the field in the stalks. Hence it follows that cane farmers are depleting the soil of mineral and nitrogenous constituents. J. P. O.

**Response of tobacco to fertilisers in South-western Ontario.** R. J. HASLAM and H. F. MURWIN (Sci. Agric., 1936, **17**, 137—143).—Excessive N manuring delayed maturity and produced thick leaves which presented difficulty in curing, especially in flue-cured varieties. Insufficient N lowered yields. Excessive P caused early maturing and formation of coarsely-grained leaves; the colour of dark tobacco was impaired. Excessive K delayed maturity whereas inadequate amounts adversely affected yield and quality. A. G. P.

**Effect of sodium nitrate [as fertiliser] on tobacco.** ARDITTI (Compt. rend. Acad. Agric. France, 1938, **24**, 352—356).—In trials conducted on Paraguay-variety tobacco, $NaNO_3$ increased the $NO_3'$ and nicotine contents of the plant. The increased $NO_3'$ content of the leaf after fermentation is probably due to nitrifying bacteria. A. W. M.

**Field trials on potash manuring [of tobacco].** C. COOLHAAS (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 53—54).—Comparative tests with $(NH_4)_2SO_4$, $KNO_3$, and $(NH_4)_2SO_4 + K_2SO_4$ show that manuring with K always improves the quality of the tobacco. S. C.

**Nitrogen balance and nitrogen manuring [of tobacco].** H. A. MIDDELBURG (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 40—49).—Pot trials show that a high $NO_3'$ content of the tobacco leaf results, not from a heavy N manuring, but from a high C/N ratio in the soil. A high ratio $>10$ conserves the N in the soil and also increases the $NO_3'$ content of the leaves to $>5\%$, which rapidly falls to $<5\%$ with a falling C/N ratio. Leaf growth is not adversely affected. Increased length of leaf is obtained by manuring with paddy straw containing $\nless 0.5\%$ N and a C/N ratio $<60$, but under certain soil conditions this manure has an adverse effect on the quality of the tobacco. Slow-acting N manures are more effective than rapid manures. $(NH_4)_2SO_4$, $NaNO_3$, Nitrolim, and urea are all equally rapid in the tropics. The $NO_3'$ content of the leaf falls during ripening and at harvest time determines the suppleness, which decreases, and the proportion of dry tobacco sorts, which increases, with age. Light is an important factor in controlling the N content of the leaf, and tobacco grown in rows in an east to west direction is of better quality than that grown north to south. Fermentation after harvesting has practically no effect on $NO_3'$ contents $<3\%$. Comparative field trials with $(NH_4)_2SO_4$, different grades of Chili $NaNO_3$ (I), $KNO_3$, and sardine meal show that cryst. (I) is best. S. C.

**Field tests on organic manuring [of tobacco].** H. A. MIDDELBURG (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 50—52).—The effect of manuring with stable manure, paddy straw, and ploughed-in *Crotalaria*, with and without addition of $(NH_4)_2SO_4$, K, and $PO_4'''$, on the quality of the tobacco is discussed. The best results are obtained by manuring in rows rather than broadcast. S. C.

**Experiments [on growth of tobacco] in water terraces.** C. COOLHAAS (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 62—64).—The effect of height above the ground-$H_2O$ level on the quality of tobacco is discussed. The best results are obtained on the middle terraces. S. C.

**"Marble" phenomenon [in tobacco].** H. A. MIDDELBURG (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 60—61).—Marble leaf is due to low root development and retarded growth. There are notable differences in chemical composition, particularly lower CaO and higher $NO_3'$ contents. S. C.

**Chemical examination [of tobacco].** C. COOLHAAS (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 75—83).—Tobacco is analysed for ash, total N, N as nicotine, albumin + peptides, $NH_2$-compounds, and total protein, Cl, $SO_3$, CaO, MgO, and $K_2O$. The Cl, CaO, MgO, total N, and protein contents of the leaves fall, whilst $SO_3$, $K_2O$, nicotine, and $NH_2$ increase, from the bottom to the top of the plant. Manuring with K increases the K content, and also the $SO_3$ content where $K_2SO_4$ is employed, of the lower and lower-middle leaves. The Cl content is lowest when the ground is manured with $KNO_3$ and highest with $(NH_4)_2SO_4$ and $K_2SO_4$. The whiteness of the ash depends on the Na content and, to a smaller extent, on Ca and Mg. Dark ashes are produced by K. The quality of the ash can be judged by the ratio $[Na_2O \times (CaO + MgO)]/K_2O$. Determinations of $H_2O$ after keeping overnight are not sufficiently accurate as a measure of hygroscopicity. The effect of different kinds of manuring on taste and odour is also discussed. S. C.

**Field trials on the burning properties [of tobacco].** C. COOLHAAS (Proefstat. Vorstenland. Tabak Med., 1938, **85**, 56—57).—The burning properties of tobacco are greatly affected by manuring. Comparative experiments are described, using stable manure, *Crotalaria*, and kapokboengkil, with and without $(NH_4)_2SO_4$, $KNO_3$, and $K_2CO_3$ as accessory fertilisers. S. C.

**Loss of nitrogen from tomato soil.** O. OWEN (Ann. Rept. [1937], Exp. Res. Sta., Cheshunt, 1938, 67).—The loss, especially after heavy watering, is partly attributable to evolution of $NH_3$. A. G. P.

**Tomatoes. Soil sterilisation and soil warming.** ANON. (Ann. Rept. [1937], Exp. Res. Sta., Cheshunt, 1938, 25—27).—Steam sterilisation of tomato soils infested with eelworm gave better results than treatment with cresylic acid or KI. A. G. P.

**Adaptation of apple orchards in Quebec to special soil types.** P. C. Stobbe (Sci. Agric., 1937, 17, 329—332).—Formation and character of typical orchard soils of various types are discussed.
A. G. P.

**Behaviour of certain cider apple varieties.** C. Savidge (J. Min. Agric., 1938, 45, 570—579).—Yields and susceptibility to disease and insect attack of 21 varieties are recorded. Winter and spring spraying markedly increased yields, improved the condition of the trees, and restricted the biennial cropping habit. For red spider mite annual spraying with tar oils should be followed by CaO–S as a post-blossom spray. A. G. P.

**Corky core of apples.** L. C. Young and C. F. Bailey (Sci. Agric., 1936, 17, 115—127).—The incidence of corky core is unrelated to the condition of the soil in which the trees grow. Injection or spraying with B controlled the disease in most cases. Treatment with Mg or Zn salts was not effective.
A. G. P.

**Physiological disorders of apples.** H. Hill and M. B. Davis (Sci. Agric., 1936, 17, 199—208).—Internal cork and other disorders of apples are associated with high $CaCO_3$, N, and org. matter contents of soils, excessive variations in $H_2O$ content, and deficiency of available K with a high K/P ratio, especially in the lower horizons. A. G. P.

**Sterilisation of fruit cases.** G. A. H. Helson and W. J. Bennett (J. Counc. Sci. Ind. Res. Australia, 1938, 11, 140—142).—The construction and operation of a suitable steriliser are described. A. G. P.

**Biology of the lemon and olive.** G. Ajon (Riv. ital. Essenze, 1936, 18, 127—131; Chem. Zentr., 1936, ii, 2396).—Chemical and physiological characteristics of suitable soils and of healthy and diseased plant tissues are given. A. H. C.

**Manuring of black currants.** T. Wallace (J. Pomology, 1938, 16, 127—147).—Crops were increased by applications of farmyard manure or complete fertilisers, but not by dressings in which N, P, or K was omitted. Pruning wts. were increased only by farmyard manure. K deficiency resulted in berries of poor quality. Susceptibility to leaf spot caused by *Pseudopeziza ribis* was increased by deficiency of N or P and diminished by deficiency of K or dressings of farmyard manure. Effects of the manurial treatments on the available nutrients in soil are recorded.
A. G. P.

**Manuring of strawberries.** T. Wallace and V. G. Vaidya (J. Pomology, 1938, 16, 148—166).—Application of farmyard manure, shoddy, or complete fertilisers increased the vigour of the plants and fruit yields. Dried blood (with or without K) had little effect and proved a poor source of N for the plants. Manuring did not influence the ripening season, the proportion of marketable fruit in the crop, or the incidence and effects of red plant and yellow-edge diseases or of attack by Tarsonemid mites.
A. G. P.

**Plant injury by smoke containing fluorine.** G. Bredeman and H. Radeloff (Angew. Bot., 1937, 19, 172—181).—Shoots of fruit trees etc. exposed to exhaust fumes containing F accumulate considerable amounts of F in the bark (rarely in the wood) in sol. and insol. forms. This occurs in summer or winter. The shooting and subsequent growth of shoots are not greatly affected by the stored F. New shoots from branches, bulbs, or tubers containing F are free from F unless further exposed to the fumes.
A. G. P.

**Method for studying decomposition of isolated lignin: influence of lignin on cellulose decomposition [by soil organisms].** S. A. Waksman and T. C. Cordon (Soil Sci., 1938, 45, 199—206).—Lignin (I) deposited on cellulose (II) fibres from EtOH solution is decomposed by various organisms more slowly than is the (II): the rate of decomp. of (II) is unaffected by the presence of (I). Retarded decomp. of (II) in plant tissues is due, not to (I) as such, but to the manner of its combination with (II).
A. G. P.

**Factors influencing rate of decomposition of different types of plant tissue in soil: effect of products on plant growth.** M. F. Spalding and W. S. Eisenmenger (Soil Sci., 1938, 45, 427—445).—Analyses of numerous plants are recorded. Dicotyledons usually have higher N and lower C contents than monocotyledons. The N and pentosan contents were inversely related. In dicotyledons the pentosan content increased with that of C. Rates of decomp. of the plant materials in soil increased with the proportion of C and pentosans and, in general, with the N content. Plants with C/N ratios of 1 : 25—30 decompose readily. With a wider ratio supplementary N is required from the soil. A. G. P.

**Rate of decomposition of fallen leaves and conifer needles and the disappearance of some of the constituent elements.** A. Nõmmik (Bodenk. Pflanzenernähr., 1938, 8, 77—120).—During the decomp. of fallen leaves the C : N ratio narrows and after 2 years attains vals. of 20—30. In alder leaves the initial ratio is narrow and falls to ~13. The % N in decomp. leaves increases, in most cases, by 25—35% in 2 years although the dry wt. decreases considerably. The % P in leaves of most species increases during decomp. The abs. amount of P declines slowly in the first and more rapidly in the second year. The % K diminishes during the decomp. at rates which vary considerably with the species and, in general, are higher in those of initially higher K content. In nearly all species examined decomp. is accompanied by increase in % Ca; the rate of decline in total Ca content differed widely with species. The % and total Mg contents diminished progressively as decomp. proceeded. A. G. P.

**Chemistry of pyrethrum, a commercial insecticide.** M. Margulis (Rev. Fac. Cien. Quím. La Plata, 1936, 11, 53—58).—The val. of pyrethrum preps. as insecticides is dependent on their contents of pyrethrin-I and -II, which are determined by Ripert's method (B., 1935, 332). F. R. G.

**Analysis of *Derris* and *Lonchocarpus* roots and the composition of their extracts.** P. A. Rowaan and A. J. van Duuren (Chem. Weekblad, 1938, 35, 755—756).—$Et_2O$ extraction can be replaced by simple extraction of 40 g. of powdered root with

400 c.c. of $CHCl_3$ at room temp. overnight. 250 c.c. of filtrate are taken for the rotenone (I) determination and 50 c.c. for that of the extract. The filtrate from the (I) determination is evaporated, freed from $CCl_4$, dissolved in 100 c.c. of hot EtOH (95%), and boiled with 10 c.c. of N-NaOH. On cooling, Na toxicarol separates and is washed with EtOH and dried at 100—105°. *Derris* extracts containing high (I) contents (40—50%) contain no toxicarol (II), but those with low contents may contain as much as 70%. (II) has never been found in extracts of *Lonchocarpus* root. (II) is optically inactive and is present in the extract as *protoxicarol* (III) (lævorotatory in $C_6H_6$; dextrorotatory, $[\alpha]_D$ +41° in $COMe_2$). The greater insecticidal activity of *Derris* root compared with *Lonchocarpus* root is probably due to the presence of (III). S. C.

**Rotenone dusts [as insecticides].** G. Chevalier and P. Laffond (Compt. rend. Acad. Agric. France, 1938, 24, 380—386).—Dusts containing $>$0·25% of rotenone (I) are effective against Coleoptera. The rapidity of action on the insect is almost independent of the method of application, but natural (I) dusts are more effective than is pure (I). Biological as well as chemical tests are necessary to determine the efficiency of (I) dusts. A. W. M.

**Combined [insecticidal] washes. Phytocidal properties of petroleum oil sprays alone and in combination with lime–sulphur.** H. G. H. Kearns, R. W. Marsh, and H. Martin (Ann. Rept. [1937], Agric. Hort. Res. Sta., Long Ashton, 1938, 65—77).—Acid- and solvent-refined oils having the same proportions of unsulphonatable matter exhibit the same phytocidal properties. Combined washes of petroleum–sulphite lye, CaO–S, and nicotine cause no foliage injury when applied at petal fall to apple varieties which are not sensitive to S. Incorporation of oil emulsion did not lower the efficiency of CaO–S against apple scab. Oil emulsion caused no appreciable injury to black currants at the tight-cluster stage or to plums at petal fall. A. G. P.

**Fungicides.** W. H. Read (Ann. Rept. [1937], Exp. Res. Sta., Cheshunt, 1938, 57—58).—CuO was not effective against tomato leaf mould, but its action was improved by incorporation with an oil emulsion. An $NH_4$ silicate prep. containing Cu and Zn gave promising results, which were further improved by combination with oil emulsion. A colloidal $Cu(OH)_2$–petroleum prep. controlled both the leaf mould and rose mildew. A. G. P.

**Toxicological problems in insect control.** F. Stellwaag (Angew. Chem., 1938, 51, 589—594).—Methods of determining toxicity and the interpretation of results are discussed. The need of extended biological investigations in insect toxicology is stressed. A. G. P.

**Factors affecting the symptoms of the psyllid yellows disease of potatoes.** L. A. Schaal (Amer. Potato J., 1938, 15, 193—206).—Plants growing in highly alkaline soil, or those infected with fungus diseases or having damaged tops or roots, developed symptons of yellows after a relatively small incidence of insects. Spraying with cold $H_2O$ under pressure twice daily for 14 days gave complete control. CaO–S (1 : 40) at 300—400 lb. pressure also gave good results. A. G. P.

**Does treatment of potato plants with arsenical insecticides lead to accumulation of arsenic in the tubers ?** J. Wühber (Z. Unters. Lebensm., 1938, 76, 338—340).—Any As found is present in soil adhering to the skins. Neither the skin nor the substance of the washed tubers contains appreciable amounts of As even after repeated treatment of the plants with 0·1% As as $Ca_3(AsO_4)_2$. E. C. S.

**Control of carrot fly (*Psila rosæ*) in Northern Ireland.** R. Chamberlain, E. E. Skillman, and J. H. Stewart (J. Min. Agric. N. Ireland, 1937, 5, 39—51).—Infestations of carrot fly are prevented by application of deterrent substances at the period of egg-laying. $C_{10}H_8$ applied at the rate of 1 cwt. per acre at weekly intervals before, during, and shortly after the egg-laying period materially increased the yield of carrots. A. G. P.

**[Control of] the lucerne flea.** J. W. Evans (Tasmanian J. Agric., 1937, 8, 93—98).—Adequate control can be secured with CaO–S spray. A. W. M.

**Effect of excessive soil salinity on incidence of cereal root rots.** J. E. Machacek (Sci. Agric., 1936, 17, 215—224).—Root rot caused by *Fusarium* and *Helminthosporium* is favoured by high salinity. Both organisms tolerate $MgSO_4$ concns. which retard growth of the plants or prevent germination of seeds. A. G. P.

**Downy mildew of the hop, 1937.** E. S. Salmon and W. M. Ware (J. South-East. Agric. Coll., Wye, 1938, No. 42, 42—46).—Cottonseed oil–Bordeaux emulsions gave satisfactory results in controlling mildew. Spraying with $Cu_2O$ when hops were in burr caused no injury and did not prevent formation of seed in the cone. A. G. P.

**Tests of ovicidal washes against *Tetranychus telarius*, L., on hops.** S. G. Jary and M. D. Austin (J. South-East. Agric. Coll., Wye, 1938, No. 42, 60—63).—At concns. of 1 in 250, $C_{12}H_{25}\cdot SCN$ (I)– and $C_{10}H_7Cl$–sulphite-lye emulsions were equally effective and superior to *sec.*-alkyl thiocyanate ($C_{10}$—$C_{11}$) and β-butoxy-β-thiocyanodiethyl ether emulsions. At all other concns. (I) gave best results. A. G. P.

**Effect of treatment of tau-saghyz seed with "Granosan."** A. N. Kletschetov (Compt. rend. Acad. Sci. U.R.S.S., 1938, 20, 195—198).—Seed-borne diseases are largely controlled by disinfection of seed with Granosan. A. G. P.

**Downy mildew (blue mould) of tobacco : control by benzene and other vapours in covered seedbeds. IV.** J. M. Allan, A. V. Hill, and H. R. Angell (J. Counc. Sci. Ind. Res., Australia, 1938, 11, 247—253; cf. B., 1938, 204).—Better control was obtained with $C_6H_6$ than with other hydrocarbons. Conditions of application are examined. Calico covers for seed beds are treated with suitable fungicides, *e.g.*, Shirlan, Cu preps. A. G. P.

**Two troublesome varieties of star-burs.** E. P. Phillips (Farming in S. Africa, 1938, **13**, No. 148, 56—57).—*Acanthospermum hispidum* and *A. australe* are controlled by spraying with $CuSO_4$ 4—15%, or $FeSO_4$ 7—20%, according to the age of the plants. A. G. P.

**Glasshouse leaf-hopper, *Erythroneura pallidifrons*, Edw.** G. F. Wilson (J. Roy. Hort. Soc., 1938, **63**, 481—484).—The hopper was best controlled by repeated spraying with nicotine (I)–soap, or, where suitable, by use of (I) dust. Fumigation with HCN or (I) was not effective. A. G. P.

**Control of big-bud mite, *Eriophyes ribis* (Westw.), Nal., by lime–sulphur.** S. G. Jary, M. D. Austin, and R. S. Pitcher (J. South-East. Agric. Coll., Wye, 1938, No. 42, 82—92).—The efficiency of CaO–S is directly related to the concn. used, a 1 : 12 prep. giving optimum results. Frost after spraying checks foliage development. Infestations are not completely eliminated in one season. The action of the spray depends on residual effects rather than on direct contact action. Refined oil emulsions (1·6%) applied at the customary periods were not effective. A. G. P.

**Green aphids on tomatoes.** W. L. Morgan (Agric. Gaz. New South Wales, 1937, **48**, 616).—Spraying with nicotine sulphate–Bordeaux mixture caused scorching of tender foliage and flower buds. Incorporation of white oil emulsion (1 in 150) increased the efficiency of the spray and prevented injury to the plants. A. G. P.

**Control of apple scab in 1935—6.** R. McKay (J. Dept. Agric. Éire, 1938, **35**, 42—57).—Results of trials with Bordeaux mixture and CaO–S sprays of varied composition are reported. Varietal differences in sensitivity to injury are examined. A. G. P.

**Control of apple scab : Allington pippin and Newton Wonder, 1937.** W. Goodwin, N. H. Pizer, E. S. Salmon, and W. M. Ware (J. South-East. Agric. Coll., Wye, 1938, No. 42, 37—41).—Effects of 4 applications of cottonseed oil–Bordeaux mixture are recorded. Satisfactory results were obtained. A. G. P.

**Mottle-leaf of citrus trees.** R. J. Benton (Agric. Gaz. New South Wales, 1937, **48**, 571—572).—Successful control by spraying with $ZnSO_4$–$Ca(OH)_2$ (10 : 5 : 100) is recorded. A. G. P.

**Zinc-cured mottle leaf in citrus induced by excess phosphate.** E. S. West (J. Counc. Sci. Ind. Res., Australia, 1938, **11**, 182—184).—Applications of P fertiliser increased the incidence of Zn-cured mottle leaf, probably through immobilisation of Zn within the plant by pptn. as phosphate. A. G. P.

**Inflorescence rot of date palms caused by *Mauginiella scaettæ*, Cav.** G. Goidànich (Agric. colon., 1937, **31**, 424—430).—Promising results against the fungus are obtained with CaO–S and $CuSO_4$–CaO sprays. A. W. M.

**Control of plum sawfly (*Hoplocampa flava*, L.).** H. G. H. Kearns and H. Martin (Ann. Rept. [1937], Agric. Hort. Res. Sta., Long Ashton, 1938, 78—84).—A combined wash of refined petroleum oil emulsion and a rotenone prep. gave good control, the oil serving as a more efficient spreader than the customary $H_2O$-sol. wetting agents. An extract of *Lonchocarpus nicou* was more effective than the powdered root for this purpose. A. G. P.

**Fruit nibbler [*Odontionopa sericea*, Gyll]; biology and control.** C. J. Joubert (Farming in S. Africa, 1938, **13**, No. 148, 261—263).—Use of Pb arsenate sprays is recommended. A. G. P.

**Warble fly control in Canada.** A. Gibson and C. R. Twinn (Sci. Agric., 1936, **17**, 179—198).—Numerous control experiments are recorded. Satisfactory use of derris–soap preps. is demonstrated. A. G. P.

**Control of the sheep maggot fly (*Lucilia sericata*, Meigen).** W. Moore (Scot. J. Agric., 1937, **20**, 227—240).—A suitable dip contains white mineral oil, cresylic acid, $p$-$C_6H_4Cl_2$, wool grease, and oleum picis, diluted with $H_2O$ for use. The same materials were used as a blowfly dressing. In combating foot-rot a 4% fuel oil solution of creosote proved to be a good foot-bath. A. W. M.

**Does grasshopper and cricket control work involve hazards to livestock ?** F. T. Donaldson and H. Welch (Montana Agric. Exp. Stat. Bull., 1938, No. 351, 7 pp.).—Dusting fields with $Na_3AsO_3$–diatomaceous earth (1 : 3) or $Na_3AsO_3$–$Ca(OH)_2$ (1 : 4) at the rate of 5—10 lb. of mixture per acre or baiting with bran–$As_2O_3$, uniformly applied at the rate of 0·5 lb. of $As_2O_3$ per acre, involved no risk of injury to stock. A. G. P.

**Factors affecting earthworm activity in turf.** R. B. Ferro (J. Bd. Greenkeeping Res., 1937, **5**, 86—98).—Applications of CaO, nitrochalk, or $NaNO_3$ tended to increase, and of $(NH_4)_2SO_4$, $NH_4$ phosphate, and calcined $FeSO_4$ to diminish, earthworm activity. Urea and dried blood had little effect. A. G. P.

**Comparison of powdered and colloidal lead arsenate for earthworm control.** R. B. Dawson and R. B. Ferro (J. Bd. Greenkeeping Res., 1938, **5**, 184—188).—Control of earthworms depends more on the amount of Pb arsenate applied than on its physical form. A. G. P.

**Poison bait for slugs and snails.** H. C. F. Newton (J. Bd. Greenkeeping Res., 1937, **5**, 113—115).—Satisfactory use of "Meta" fuel is described. A. G. P.

**Machinery used in spraying.**—See I. **Debased peat [for insecticides].**—See II. **Complex silicates [in soils].**—See VII. **Artificial drying of agricultural products.**—See XIX. **$Et_2O$ extract of *Derris* root. Pyrethrum flowers.**—See XX. **Growth-promoting substances in sewage.**—See XXIII.

See also A., III, 970, **Effects of B in control of "hard fruit" in citrus.**

## Patents.

**Manufacture of cupriferous zeolitic fungicides.** Permutit Co. (B.P. 484,115, 2.11.36. U.S., 19.11.35).—A zeolitic fungicide, which will adhere to but not injure leaves and may contain at least 25% of Cu, is prepared by adding a Cu salt, *e.g.*, $CuSO_4$, to a

gelling mixture of $Na_2SiO_3$ and $NaAlO_2$ [or $Al_2(SO_4)_3$], the ratio Cu : Al being >1 : 1. The product is separated, *e.g.*, in a filter-press, partly dried, granulated, washed, dried, and powdered to <300-mesh.
I. C. R.

**Basic Hg Me nitrate.**—See III. **Paris-green.**—See VII. **Pyrethrum extract.**—See XX.

## XVII.—SUGARS; STARCHES; GUMS.

**Activity of micro-orgamisms in the diffusion [of sugar beets] and in raw juice.** H. Claassen (Deut. Zuckerind., 1938, 63, 234—236).—The occurrence of micro-organisms in beet juice, mentioned by Mezzadroli (cf. B., 1937, 483) as a possible cause of sugar losses, was studied many years ago by the author (*ibid.*, 1912, 14), who showed that under factory conditions no detectable loss of sugar could be caused thereby. A point of more importance is the occasional occurrence of $H_2$ and $CH_4$ in diffusion vessels, in sufficient quantity to impede circulation of the juice. This is probably due to anaërobic organisms the nature of which is at present unknown.
J. H. L.

**Reducing the sieve height of base-emptying diffusers [in sugar factories].** F. Zatloukal (Deuts. Zuckerind., 1938, 63, 852, 854, 871—872).—Diffuser construction is discussed from practical experience, attention being paid to the arrangement of screening sieves and the influence of this on extraction efficiency.
I. A. P.

**Preservation of extracted beet slices, with special reference to the chemical processes involved.** E. Roboz (Mezög. Kutat., 1936, 9, 156—169; Chem. Zentr., 1936, ii, 2252—2253).—Wastage of extracted beet slices on keeping is considerably reduced by addition of 0·5—1% of molasses and treatment with 0·25—0·30% HCl. When the slices are well packed loss is chiefly due to decomp. of sugars; otherwise decomp. of cellulose may occur. The increase of protein content on keeping is much reduced by preserving. In unpreserved specimens acid is eliminated chiefly as $PrCO_2H$ and AcOH, preserved specimens giving chiefly lactic acid. Twice-pressed beet is most suitable for preservation owing to its greater absorbing power for the preservative. Preserved beet retains its colour and firmness.
A. J. E. W.

**Purification of sugar juices and effective separation of sugar.** W. Paar (Deuts. Zuckerind., 1938, 63, 473—476).—The degree of separation of sugar and non-sugars achieved during beet diffusion, treatment of the diffusion juice, and crystallisation, and calculation of the purification at various stages, are discussed. The purity of the conc. juice has a considerable influence on the efficiency of crystallisation.
I. A. P.

**[Beet] molasses.** F. Morizot (Bull. Assoc. Chim. Sucr., 1938, 55, 772—788).—Opinions relating to molasses constituents and their effects on immobilising sugar are critically discussed, the val. of conclusions based on the % of ash and the ratio org. substances/ash being doubted when sulphated ash is determined, using the factor 0·9. The real ash figure might be more valuable. The sugar immobilisation is governed by the sugar content of the juice (calc. on the wt. of beet), the purity of the syrup, and that of the molasses. Physico-chemical methods of juice refining do not necessarily increase the purity of the molasses.
I. A. P.

**Absorptive power of sugar-beet marc.** L. Naudet (Bull. Assoc. Chim. Sucr., 1938, 55, 796—798).—A comment arising out of Martraire's paper (B., 1938, 963).
I. A. P.

**Active charcoal [for sugar decolorisation].** H. David (Deuts. Zuckerind., 1938, 63, 769—772, 791—793).—Comparison of the decolorising efficiencies of samples of active C by determining (*a*) decolorisation with equal amounts, (*b*) amounts for equal decolorisation, and (*c*) behaviour on prolonged contact with the solution, is discussed; a consideration of the results of the three methods is of val. for assessing the suitabilities of the samples for sugar factories, molasses solution being used for the tests. Determination of $H_2O$ in active C is discussed. Drying (110°) and xylol and $C_2Cl_4$ distillation methods give results showing reasonable concordance, but the cryohydrate method (described) in general gives results which are somewhat variably > those of other methods.
I. A. P.

**Effective utilisation of carbon dioxide in saturation [of sugar juices].** W. Paar (Deuts. Zuckerind., 1938, 63, 707—709).—Calculation of the efficiency of $CO_2$ utilisation in the saturation of sugar juices is described, and a table given relating this utilisation with the $CO_2$ content of the saturation gas and that of the escaping gas.
I. A. P.

**Action of carbon dioxide on calcium saccharate solutions.** G. Dorfmüller (Deuts. Zuckerind., 1938, 63, 891).—The mechanism of the pptn. of $CaCO_3$ is discussed (cf. B., 1937, 1110).
I. A. P.

**Optimal point of second saturation [of sugar juices], buffering alkalinity, and the solubility product of calcium carbonate.** F. Wenz (Deuts. Zuckerind., 1938, 63, 748—750).—With normally purified sugar juices, the $BaCl_2$ method does not give the optimal point correctly, though the method may be used in practice if a correction factor (determined by the Me-red or decarbonation method) is applied. At the optimal point, the whole of the hydroxide is not, apparently, converted into carbonate, but max. $[CO_3'']$ is shown. The solubility product of $CaCO_3$ is provisionally given as $8{\cdot}2 \times 10^{-8}$.
I. A. P.

**Optimal conditions for sulphitation [in beet-sugar manufacture].** J. B. Minz, N. P. Bolotov, and J. E. Gluchovsky (Deuts. Zuckerind., 1938, 63, 330—332).—For most favourable results, second-saturation juice is treated with $SO_2$ to attain $p_H$ 8·0. This yields the greatest decolorisation effect with economy of $SO_2$, and plant remains clean. Further sulphitation leads to danger of inversion.
I. A. P.

**[Sugar-]boiling fundamentals.** E. Horn (Deuts. Zuckerind., 1938, 63, 271—273).—Inter-relationships of factors concerned in the concn. of sugar liquors, notably boiling duration and temp., vac., crystallisation velocity, vol. of liquor, and colour, are critically considered, in part graphically and mathematically. I. A. P.

**Influence of the form of boiling plant on sugar colour.** E. Troje and G. Puschmann (Deuts. Zuckerind., 1938, **63**, 471—472).—Appreciable differences in colour could not be detected in sugars from 3 different types of vac. pan. Very great caution is necessary in attempting to use massecuite photographs for the assessment of sugar quality. I. A. P.

**Influence of new knowledge concerning the raising of the b.p. in sugar solutions, and the results of evaporation and boiling tests.** H. Claassen (Deuts. Zuckerind., 1938, **63**, 727—728).—The raising of the b.p. is influenced by the pressure imposed on the boiling juice, and the older tables give less accurate results for b.p. at different sugar concns. than the new quoted tables of Spengler, which take pressure into account (2·0—0·25 atm.) for solutions of different concn. and 93—95 purity. However, the differences are such that use of the new figures in calculations gives results but slightly different from the old. With reduced-pressure working (0·25 atm.), the older figures are higher than figures recently determined, the difference increasing with the concn. of the syrup. However, the older figures are better in accord with practical conditions in evaporators of the normal type than the new, theoretically more accurate, vals. I. A. P.

**Pre- and main liming [of beet sugar juices] and its automatic performance.** J. Eisner (Deut. Zuckerind., 1938, **63**, 169—170, 189—190, 209—211, 231—232, 252—256).—The conditions necessary for effective preliming as recommended by Spengler *et al.* (B., 1933, 363, 1311) and for progressive preliming as recommended by Dědek and Vašátko (B., 1936, 165) are discussed. The difficulty, in large-scale preliming, of avoiding local or temporary over-alkalisation beyond the optimum point is overcome in the apparatus described and illustrated. As raw juice enters (or leaves) a vessel described, the rise or fall of its surface actuates by air pressure (or suction) a proportional displacement of milk of CaO from a receptacle above the juice vessel, and the displaced milk of CaO mixes with the juice entering (or leaving) the juice vessel. The apparatus can be adapted to different conditions of preliming and to the subsequent main liming, and the latter may, if desired, be carried out in more than one stage. J. H. L.

**Statistical investigations on influence of lime salts and other factors on form of sugar crystals.** G. Vavrinecz (Deut. Zuckerind., 1937, 62, 1153—1154; 1938, 63, 87—88, 107—108).—In two Hungarian beet-sugar factories, *A* (1931 and 1933) and *B* (1934), 116 first-product massecuites were analysed and examined to determine the relative nos. and wts. of single crystals, twins, and clusters (consisting of 3 or more ill-formed crystals); the morphological development of the crystals was also studied. Few pronounced correlations between composition and crystal growth were found, possibly owing to the multiplicity of factors influencing growth; the most marked was that with different average sizes of grain the formation of clusters was a min. when the grain size was $\sim$ 2·5 mg. In slenderness (length/breadth) of crystals decided differences were found in the average vals. for the three main series of tests, viz., 2·0, 1·5, and 1·3, respectively, for *A* 1931, *A* 1933, and *B* 1934, but they could not be clearly related to type of vac. pan, personnel of boilers, purity (92—96%), $p_H$ val., or Ca content; possibly some particular non-sugar constituent was responsible. A table given shows the average relative development of the crystal faces in single crystals and twins. J. H. L.

**Lime separation [in sugar manufacture] by different methods.** K. Smolenski (Prace centr. Lab. cukrownicz., 1936, **1935**, 93—109; Chem. Zentr., 1936, ii, 2811).—A study of the separation on the laboratory scale during the last 3 seasons, using the same diffusion juice, is described. A. H. C.

**Application of trisodium phosphate in a [beet] sugar-factory refinery.** M. Borghi (Ind. Sacc. Ital., 1938, **31**, 165—170; Int. Sugar J., 1938, **40**, 400).—$Na_3PO_4$ added to a beet juice is hydrolysed according to : $Na_3PO_4 + H_2O = Na_2HPO_4 + NaOH$, the $Na_2HPO_4$ reacting with the Ca salt of any acid to produce $CaHPO_4$. By adding $NH_3$ this is converted into tertiary Ca phosphate, which is practically insol., leaving in solution some free NaOH. The most favourable proportions are : 0·045 g. of $Na_3PO_4$ and 0·002 g. of $NH_3$ per 0·01 g. of CaO in the juice or syrup. In this way practically 100% of the Ca in the thin juice and 95% of that in the syrups can be pptd. J. P. O.

**Circulation [of massecuites] in calandria vacuum pans.** E. R. Behne (Int. Sugar J., 1938, **40**, 382—386).—Figures for the velocity of the circulation were determined for four different types of calandria vac. pans, the results obtained placing them in the following (decreasing) order of merit : (1) the Webre design, using a mechanical stirrer; (2) the " Centre Flow " with the bottom stream-lined, and a large centre well; (3) a typical fixed calandria; and (4) a typical " floating " calandria vac. pan. The " Centre Flow " pan gave excellent results, suggesting that the incorporation of both forced circulation and stream-lining combined with a large centre well should result in the best performance, especially for low-grade massecuites. J. P. O.

**Treatment of low-grade massecuites.** C. W. Waddell (Int. Sugar J., 1938, **40**, 377—379).—Experiments carried out in a factory in the Philippines demonstrated the importance of effectively and rapidly mixing the dilution $H_2O$ with the low-grade massecuite. This should be combined with rapid cooling, using 150 sq. ft. of piping per 400 cu. ft. of massecuite, and subsequently with reheating with live steam in the same piping. Better boiling-house recovery and a greater capacity at the low-grade centrifugals are claimed. J. P. O.

**Tons of [sugar-factory] maceration water.** J. G. Davies (Int. Sugar J., 1938, **40**, 380—381).—A comparison between the vals. for the calc. and the weighed maceration $H_2O$ as obtained in factory runs show marked differences, depending on the maceration factor assumed in the calculation. For reliable chemical control in the sugar factory a scale for weighing the maceration $H_2O$, and also the mixed juice, must be used. The collated figures show that the common mill-control figure, viz., the polarisation in juice % polarisation in cane, is one of the figures showing the widest variations, which emphasises the greater reliability of the figure expressing the normal juice lost % fibre. J. P. O.

**Relationship between polarisation and sucrose in pure solutions and in cane juice.** C. R. von Stieglitz and L. C. Home (Int. Sugar J., 1938, **40**, 393—395).—A comparison of polarisation and sucrose (as determined by double polarisation, using the Jackson and Gillis no. IV method) was made with (1) pure sucrose solutions containing known amounts of glucose (I) and fructose (II); and (2) juices containing added amounts of (I) and (II). Results obtained in the case of one of the juices, containing 0·98% of reducing sugars per 100 c.c., showed the sucrose to exceed the polarisation by + 0·29. The same juice in presence of 1 g. of (I) and of (II) per 100 c.c. gave −0·40 and +1·58, respectively. J. P. O.

**Determination of the apparent purity of various sugar-factory products with maximum precision.** J. Zamaron (Bull. Assoc. Chim. Sucr., 1938, **55**, 789—795).—For accurate analytical control of sugar products, use of carefully standardised instruments (specially graduated saccharometers, Zeiss refractometer) is necessary, and attention must be paid to the temp. at which solutions are taken and readings made. A table is given for Brix correction at various temp. when using a described set of saccharometers. I. A. P.

**Evaluation of quality of beet granulated sugar.** J. C. Keane (Int. Sugar J., 1938, **40**, 400).—A photoelectric apparatus which measures the amount of light reflected, using directional illumination, is used for the evaluation of the appearance of the sugar. These reflectance figures are reported in their relationship to MgO, and are lowered by slight yellowness or greyness or by large or uneven grain size. Apparent colour and turbidity are estimated with the same instrument by measuring the transmittency of the sugar for red and green light. Ash is determined electrometrically, and the usual tests demanded by the candy and canning trades are applied. J. P. O.

**Determination of potassium carbonate in [sugar factory] distillation liquors.** R. Pajetta (Congr. int. Quim. pura apl., 1934, **9**, VI, 247—249; Chem. Zentr., 1936, ii, 3605—3606).—Determination of total $K_2O$, total Cl after converting sol. salts into chlorides, and total $CO_3$ after converting bi- into normal carbonates and removing $NH_4$ salts, gives the $K_2CO_3$ content. A. H. C.

**Sugar determination in defecation slime with 1% zinc salt solution.** O. Breyer (Deuts. Zucker-ind., 1938, **63**, 772).—Use of $NH_4NO_3$ in the determination yields towards the end of the campaign, dark-coloured solutions which may need further treatment, with $Al(NO_3)_3$ or by the AcOH method, before polarimetric readings are possible, due to the dark colour of the $NH_4$-pigment salt. $Zn(NO_3)_2$ (I) gives, on the contrary, clear solutions, since the Zn-pigment salt is colourless, but slight coloration of solution has been noted using frosted and rethawed beets, due to sugar decomp. Thus, two types of colouring matter are met with in the sugar factory, derived, respectively, from the beet (removed by first saturation) and from sugar decomp. (I) is useless for treatment of sugar juices and molasses. I. A. P.

**Biochemical sugar determinations. II. Starch syrup and massé.** F. T. van Voorst (Chem. Weekblad, 1938, **35**, 677—678; cf. A., 1938, III, 545).—Starch syrups and massé can be analysed satisfactorily by fermentation of sucrose (I), glucose (II), fructose (III), and maltose (IV) with *Sacch. cerevisiæ*, and (I), (II), (III), and lactose with *Sacch. fragilis*, Joergensen, or *Torula cremoris*, followed by determinations of the reducing powers before and after inversion. There is sufficient difference in the chemical compositions of starch syrups [(II) 22·5, (IV) 20, unfermentable 9·5%] and massé [(II) 63, (IV) 4, unfermentable 5%], to permit their recognition in mixtures. S. C.

**Fires and explosions in drying plants [for sugar-beet products].** A. Wegner (Deut. Zucker-ind., 1938, **63**, 211—214).—Replies from more than 200 sugar factories and 21 refineries in Germany to a questionnaire inquiring about dryers in use and occurrence of fires and explosions are summarised. In most of the factories rotary drum dryers are employed for beet pulp or "sugar slices," and fires have occurred in 91 of these dryers. The main causes, in diminishing order of frequency, were: errors of personnel, obstruction of feed causing overheating of the material in the drum, stoppage of the drum or running it empty, feeding the moist material too rapidly, caking of burnt sugar or flying of sparks, and mechanical breakdowns. Fires in stores for dried pulp or slices numbered 43, of which 26 were attributed to the material being insufficiently dried when stored and, in consequence, igniting spontaneously. Explosions in stores or drum dryers were rare, but 16 occurred in mills for dried slices and most of these were attributed to fragments of Fe which the magnets installed failed to retain. Numerous precautionary measures are recommended. J. H. L.

**Hydrolysis of potato and malt starches by malt amylase. II. Maltodextrin.** J. L. Baker and H. F. E. Hulton (J. Inst. Brew., 1938, **44**, 514—519; cf. B., 1937, 965).—From both potato and malt starches by malt diastatic action, maltodextrins have been prepared having similar $[\alpha]_D$, reducing power, solubility in $H_2O$ and in EtOH, and yielding $Ac_3$ derivatives of similar m.p. and $[\alpha]_D$. Both maltodextrins dialyse unchanged, cannot be fractionated with EtOH, are unfermentable, and yield maltose with malt diastase. The homogeneity and identity of the starch and malt products are therefore assumed. An EtOH-sol. product is also described, having $[\alpha]_D$ 135—142°, reducing power 36—45%, and mol. wt. <300. I. A. P.

**New iodine method for determination of starch. IV. Determination of dextrin in presence of starch and sugars.** F. W. Edwards, H. R. Nanji, and W. R. Chanmugam (Analyst, 1938, **63**, 697—702; cf. B., 1938, 1493).—Dextrin (I) is determined in presence of starch by pptn. of the latter, after treatment with boiling $H_2O$, with I, EtOH, and KOAc, and pptn. of the (I) with 95% EtOH. Starch is determined in presence of (I) by gelatinising with 0·7% aq. KOH and proceeding as described previously (*loc. cit.*). Sugars are determined in presence of (I) by the I–chloramine-T method. Commercial (I) samples contained 4—7% of reducing sugar (as glucose). E. C. S.

**Determination of water uptake of swelling starch.** W. Kröner (Z. Spiritusind., 1938, **61**, 335).—After grinding the starchy material with $H_2O$ in a mortar, the mixture is centrifuged and the increase in vol. over that of the original meal is noted, whence a figure for swelling is deduced. Results are reproducible. Disadvantages of the method include the possible effects on swelling of $H_2O$-sol. material from the meal, and the inability to follow changes in swelling during the course of the determination. I. A. P.

**Robert evaporators [for syrups].**—See I. **[Uses of] seed husk of *Plantago ovata*.**—See VI. **Plant food val. of N in filter-cake. Molasses as fertiliser. Beet leaves as fodder.**—See XIX. **Sugar beet and cane.**—See XVI. **Rum. Ferments from sugar canes. Fermentation of, and $CO_2$ from, molasses.**—See XVIII. **Determining sugar in flour. Sugars in bread. Honey. Whey solids in candy.**—See XIX. **I method for determining starch.**—See XIX.

See also A., I, 465, **Determining sugar by Cu reduction methods.**

### Patents.

**Clarification of molasses.** Ramesohl & Schmidt A.-G. (B.P. 492,255, 20.4.38. Ger., 30.4.37).—Centrifuging is effected in two stages, before and after dilution, the concn. being $\nless 40°$ and $\ngtr 25°$ Balling, respectively. The first stage is effected at a lower speed and with larger provision for sludge. B. M. V.

**Apparatus for clarifying liquors containing suspended and flocculent matter, such as sugar juices and similar liquors.** Mirrlees Watson Co., Ltd., and N. B. Bach (B.P. 491,343—6, 14.7.37).—In apparatus comprising a no. of superposed, obtusely conical decks in a cylindrical tank having an inverted conical bottom: (a) the scrapers for the decks and bottom comprise chains loosely suspended from rotating arms; (b) to eliminate gas from the settled mud, steam is admitted to the apex of the tank in puffs, these being produced by a valve rotating with the rake shaft; (c) a "flash tank" which not only maintains a const. level (by means of an overflow) but also removes some scum is provided in the feed conduit; (d) decantation pipes for clear liquid are provided at each deck. B. M. V.

**Sugar-denaturing agent.**—See XIX.

## XVIII.—FERMENTATION INDUSTRIES.

**Fast and slow types of [beer] yeast.** B. Dixon (J. Inst. Brew., 1938, **44**, 470—472).—The characters of fermentations brought about by, and of the beers resulting from, strongly attenuative (*e.g.*, Burton Union-type, *B*) and weakly attenuative (*e.g.*, Yorkshire stone square-type, *Y*) yeasts are described and discussed. Fermentations with *Y* are more troublesome and wasteful, and the beers, whilst usually of greater instability, are less suitable for pasteurisation. With *B* the lower final gravity is of great significance. The influence of environment on yeast is of great importance, and the alterations in characters of mixed yeasts with changing environment are noted. With strongly attenuative yeasts pure culture methods should be unnecessary if the wort is maintained as far as possible at a consistent standard. I. A. P.

**Simple staining method for detection of ascospores in yeasts.** J. L. Shimwell (J. Inst. Brew., 1938, **44**, 474).—A fixed, dry film is stained with warm 5% aq. malachite-green for 1—3 min., rinsed with $H_2O$, washed with EtOH for 30 sec., and again rinsed with $H_2O$. Counterstaining with 0·5% aq. safranine may be used. I. A. P.

**Grading of brewing barley.** E. Rothenbach (Woch. Brau., 1938, **55**, 225—228).—The necessity for using standardised apparatus and procedure for the determination of corn size and uniformity of barleys is stressed. Recommendations for rocking procedure are detailed, as are also the specifications of a recommended set of standard sieves. I. A. P.

**Evaluation of brewing barley.** F. Kutter (Woch. Brau., 1938, **55**, 347—350).—A points system in use in Switzerland is described, individual properties being taken separately; points in some cases are allotted by assessment and in others by calculation by given formulae from the results of mechanical, chemical, or biological analyses carried out in prescribed ways. I. A. P.

**Varietal differences in malting quality of barley. II.** J. A. Anderson and H. R. Sallans. **III.** J. A. Anderson and W. O. S. Meredith (Canad. J. Res., 1938, **16**, **C**, 234—240, 248—252; cf. B., 1938, 212).—II. In respect of diastatic power, permanently sol. N, and extract val. two varieties of barley responded similarly to changes in moisture and temp. during germination, but a consistent varietal difference in malting quality is indicated.

III. Comparison of 8 varieties grown in different localities shows that the differential effect of malting method is a source of error in interpreting routine tests, but the limiting factor in comparisons of varieties is the differential effect of environment. A. G. P.

**Respiration of malt during germination.** J. De Clerck (Bull. Assoc. Anc. Etud. Louvain, 1938, No. 3; Woch. Brau., 1938, **55**, 341—344).—Barley respiration during germination is increased by aëration during the steep, this also improving the modification of the resultant drum malt and the brightness of the resultant wort therefrom. A floor malt showed greater respiration and better ultimate properties than a well-steep-aërated drum malt, lack of air in the steep being less important than the effect of thickness of the piece. Sprinkling has a temporary stimulating effect on respiration, but the stimulation

of higher working temp. is partly due to increased aëration resulting from the necessary thinner working. The max. respiration attained is very important in determining ultimate modification, and measurement of respiration may be employed to determine whether sufficient steep- and drum-aëration has been applied.
I. A. P.

**Determination of the extract of barley and of the corresponding malt.** C. Plevoets and N. Znamensky (Ann. Ferm., 1938, **4**, 295—302).—The method for the determination of barley extract described involves the use of a standard enzyme prep. (diastase Merck) in the proportion found in a normal pale malt. After a preliminary protracted digestion at 18—20°, the temp. is raised to 70° under prescribed conditions. The method of calculation is described, and subtraction of 2 from the result gives a figure in very close agreement with the extract of the malt prepared from that barley. Figures for four seasons and numerous barley varieties are quoted.
I. A. P.

**Determination of the diastatic power of malt.** W. Salač (Böhm. Bierbrau., 1938, No. 41; Woch. Brau., 1938, **55**, 355—356).—The diastatic power of 13 malt samples has been determined by the following methods: Windisch–Kolbach, Lintner–Wirth, Pollack–Egloffstein (original and modified by present author), and Ducháček–Žila. The results have been compared with those of the first-named method, and conversion factors of fair constancy for each method can be deduced when the Windisch–Kolbach result is 350—450 units.
I. A. P.

**Process of malt economy [in the potato distillery].** B. Lampe and E. Roehrich (Z. Spiritusind., 1938, **61**, 333—334).—The malt used must be carefully grown and highly diastatic, and mashing at a temp. approx. 3° below the usual val. is necessary, $CH_2O$ treatment being applied in order to avoid undesirable organisms. Extraction of the ground kilned or green malt with $H_2O$ prior to addition to potato-flake mash gives increased corr. yields of EtOH when 6% or 4% of malt (calc. on flakes) is used, but not with 12%. The corr. yields in all cases using 6% or 4% are somewhat $<$ those obtained with 12%. Warm $H_2O$ or 1·5% aq. NaCl extraction shows no advantage over the use of cold $H_2O$.
I. A. P.

**Twenty-first report on the trial of new varieties of hops.** E. S. Salmon (J. Inst. Brew., 1938, **44**, 457—464).—Cultural and analytical data and disease incidence are discussed for numerous of the new varieties. Certain of these are equal or superior to imported American hops in flavour and preservative val.
I. A. P.

**Hops.** E. S. Salmon (J. South-East. Agric. Coll., Wye, 1938, No. 42, 47—59).—Preservative vals. of several varieties are recorded.
A. G. P.

**Influence of degree of ripeness on brewing value of hops.** P. Kolbach, R. Rehberg, and G. Wilharm (Woch. Brau., 1938, **55**, 321—323).—Hallertau hop samples picked (*a*) normally ripe, (*b*) 14 days prior to this, and (*c*) 14 days after were examined after normal drying etc. Hand evaluation placed them in the order (*a*), (*b*), (*c*). $\alpha$-Acid (abs. and relative to total resins) and bitter val. $(\alpha + \beta/9)$ were max. in (*a*) and hard resin was min. In experimental brews, the differences of the 3 samples influenced only the bitter principles (*B*) of wort, the concn. of *B* falling in the order (*a*), (*c*), (*b*); these concns. calc. to 12% wort were, however, in agreement with vals. calc. from the Wöllmer formula. The *B* of the beer were related similarly to those of wort, though (*a*) and (*c*) were closer. Foaming properties followed the concn. of *B*, except that (*c*) gave rather better results than those expected. Small differences only of chill haze were noted, whilst bitterness (taste) was in agreement with chemical analysis. Possibly hop oil becomes less volatile with increasing maturity.
I. A. P.

**Nitrogen [determination] problem in the brewery.** G. L. Chabot (Petit. J. Brass., 1938, No. 1987, 713; Woch. Brau., 1938, **55**, 323—326).—The importance and difficulty of obtaining reliable results from Kjeldahl N determinations in barley, malt, and wort are shown. A sufficiency of $H_2SO_4$ is necessary, difficulty here being most likely to arise with wort. The use of a reducing agent ($NaH_2PO_2$) is recommended, as giving the highest val. for N.
I. A. P.

**Sterilising filters [for beer].** (A) A. J. C. Cosbie. (B) H. R. Lyell (J. Inst. Brew., 1938, **44**, 465—467, 467—469).—(A) The characters and use of the sheet-filter (asbestos-cotton) are discussed. In effective filtration, bacteria should be removed with the min. of change of the colloidal character of the beer, and the work must not be spoilt by subsequent use of unsterile bottling plant. The possibility of obviating the need for pasteurisation by using a suitable filter and conveniently arranged sterile bottling plant is discussed.

(B) The essentials of good beer filtration and the advantages of the sheet-filter over the pulp-filter are discussed, manipulative details for the successful use of the former being given. A preliminary centrifugal treatment for removal of the coarser sediment prior to filtration does not appear to cause any deterioration of beer quality.
I. A. P.

**Rapid determination of attenuation limit of beer.** K. Silbereisen (Woch. Brau., 1938, **55**, 217—221).—In a simplification of Schild's method (B., 1938, 572), the beer treated with 16% of unbroken yeast is stirred (not shaken) for 2 hr. at 20°. The product is filtered and the *d* determined. Use of higher temp. or addition of Biospäne is without apparent advantage. The final *d* is usually slightly $>$ by the Schild procedure, but this probably does not represent a disadvantage in the new method.
I. A. P.

**Ludwig beer.** H. Haehn (Woch. Brau., 1938, **55**, 334—336).—Ludwig beer contains the bulk of the constituents of the original wort, since the specialised fermentation described, brought about, *e.g.*, by *Saccharomycodes Ludwigii*, removes sugars present in small concn. (sucrose, invert sugar) without attacking maltose. The product is of low [EtOH] (0·4—0·7%), but of beer character and with good foaming properties. The dietetic and physiological properties of this beer are discussed. The [EtOH] can be augmented, if desired, by addition of fermentable sugar to the wort. I. A. P.

**Pure culture of beer *Pediococcus*.** R. Koch (Woch. Brau., 1938, 55, 329—334).—Preliminary physiological culture of beer *Pediococcus* from bottle sediment etc. is carried out in unhopped wort–yeast–$H_2O$ under anaërobic conditions in presence of yeast, giving cultures of prolonged viability. Subsequent pure culture is on yeast–$H_2O$–wort–agar under conditions (as described) excluding $O_2$ entirely or substantially. Selected colonies may then be further developed on unhopped wort–yeast–$H_2O$. I. A. P.

**Beer *Pediococcus* (Sarcina).** R. Koch (Woch. Brau., 1938, 55, 345—347, 353—355).—A lecture. I. A. P.

**Experiences in process revision [in breweries].** J. Ambrosius (Woch. Brau., 1938, 55, 337—341).—A lecture, relating practical experiences in the detection and correction of faults in brewing processes and materials. I. A. P.

**De-acidification and start of fermentation in sulphited grape musts.** D. Collier (Ann. Ferm., 1938, 4, 167—181).—Other factors being equal, the period (*P*) before the onset of yeast fermentation increases with [$SO_2$] up to the [$SO_2$] which prevents the start of fermentation ("antiseptic dose", *A*). Increasing the seeding rate (*S*) reduces the effect of $SO_2$ and increases the val. of *A*. *P* increases as *S* is reduced. With *S* const., *P* is min. at $p_H$ 5—6; changes in $p_H$ over a wide range (~3—8) cause slow increase in *P* with very rapid increase outside these limits, growth thus soon becoming impossible. Increase in *S* reduces the min. val. of *P* and broadens somewhat the $p_H$ zone of possible growth. Decrease in [$SO_2$] broadens the acid zone of growth, but appears to narrow the alkaline zone. The practical implications of these results are discussed. I. A. P.

**Practical calculations relating to columns for direct distillation and rectification [of wines].** J. Perard (Bull. Assoc. Chim. Sucr., 1938, 55, 737—771).—Factors affecting suitable apparatus are considered by means of calculations, special attention being given to the purifying column. Points dealt with include: removal of EtOAc and the effect of plate no. on steam consumption; the relative effects of variations in head extraction and in heating on purification; pasteurisation; and elimination of esters, *e.g.*, Et *iso*butyrate. I. A. P.

**Lactic acid in Argentine wines.** E. Velazquez (Rev. Fac. Cienc. Quím. La Plata, 1936, 11, 65—68).—From determinations of lactic acid (I) in samples of wine from four districts of Argentina it is concluded that the $SO_2$ content places a limit on the activity of the bacteria by which it is generated. The (I) content is held to indicate the quality and genuineness of wines. The official Argentine method of Moslinger, Bonifazi, and Ferré is employed. F. R. G.

**Rapid determination of total acids in wine and fruit products by "dry titration."** F. Holzbach (Sborn. ceskoslov. Akad. Zemĕd., 1936, 11, 271—276; Chem. Zentr., 1936, ii, 3853).—Titration is effected with a no. of strips of filter-paper impregnated with alkali, each corresponding with 0·5 or 1% of acid in 1 l. of liquid, using bromocresol-purple paper as indicator. The colour change yellow–blue–violet ($p_H$ 6·8) may be observed with dark liquids. A. H. C.

**Colour in Californian wines. I. Methods of measurement of colour. II. Preliminary comparisons of certain factors influencing colour.** A. J. Winkler and M. A. Amerine (Food Res., 1938, 3, 429—438, 439—447).—I. Spectrophotometric data may be calc. in terms which give a complete colour specification of a wine. The colour comparator is a more reliable means of measuring the brightness of wines than the Salleron–Dujardin vinocolorimeter, brightness being defined as the transmission of light in contradistinction to brilliance, which is restricted to freedom from suspended matter. The Lovibond slides are useful only for measuring changes in wines.

II. The primary sources of variation in colour val., especially of red wines, viz., variety, maturity of fruit, regional conditions, and season temp., are discussed. E. C. S.

**Oxidation processes in wines.** S. M. Manskaja (Compt. rend. Acad. Sci. U.R.S.S., 1938, 20, 159—162).—New wine rapidly acquires the characteristics of aged wine (colour, flavour, bouquet) after addition of peroxidase. Addition of $H_2O_2$ yields an inferior product. A. G. P.

**Cider-making practices in Europe, 1925—37.** V. L. S. Charley (Ann. Rept. [1937] Agric. Hort. Res. Sta., Long Ashton, 1938, 160—169).—A crit. review. A. G. P.

**Manufacture of rum.** R. Arroyo (Ann. Rept. Rio Piedras Expt. Sta., Puerto Rico, 1936—7, 75—76; Int. Sugar J., 1938, 40, 399).—The "Pombe" yeast fermenting cane molasses in symbiosis with *Clostridium saccharo-butyricum* (Arroyo) produces a rum which has a uniformly higher ester content, a lower aldehyde content, and a higher acid content than have rums resulting from fermentation without symbiosis. Moreover, such rums age much more rapidly than they do ordinarily. The author claims to have been able to produce by symbiosis a rum indistinguishable from the Jamaican product in flavour and chemical analysis, and with a fraction only of the ageing time used heretofore. J. P. O.

***Hyochi* bacilli in saké.** Y. Otani (J. Fac. Agric. Hokkaido Univ., 1936, 39, [2], 49—142).—Characteristics of 4 species of *Lactobacillus* from saké are examined. In purified saké *L. hyochi* predominates. Ch. Abs. (*p*)

**Varieties of *Aspergillus oryzæ* employed in manufacture of Shōyu. II. Effect of temperature and $p_H$ on growth etc.** M. Kibi (J. Agric. Chem. Soc. Japan, 1938, 14, 1094—1102; cf., B., 1937, 77).—The optimum temp. for growth on Czapek medium for all varieties was 33—37°, and at 25° growth occurred at all $p_H$ vals. from 2·5 to 9·5. A comparison was made of various carbohydrates as sources of C, and of the utilisation of various N compounds. J. N. A.

**Denatured spirit in vinegar factories.** R. Sigmund (Chem. Obzor, 1938, 13, 116—118; cf. B., 1937, 1395).—Determination of the % EtOH by measurement of electrical conductivity ($\kappa$) of the EtOH solution is not practicable. More reliable results are obtained by the measurement of $\kappa$ for solutions of electrolytes in the distillate from the test material, but this presents no advantage over the usual alcoholometric or pyknometric determinations. Curves for $\kappa$ for K H tartrate, $CaSO_4$, and $Na_2C_2O_4$ in various EtOH solutions are given. Spirit denatured with AcOH forms appreciable quantities of EtOAc during storage. F. R.

**Alcoholic fermentation of beet and beet molasses. I.** A. Amati (Annali Chim. Appl., 1938, **28**, 289—297).—The commercial production of EtOH from sugar-beet extraction liquors or molasses is described; 100 kg. of beet containing 14% of sucrose yield $\sim$ 8 l. of EtOH. F. O. H.

**Alcoholic ferments from POJ 2714 and 2878 [sugar canes].** S. Lebedeff (Arch. Inst. Pesquizas Agron., Pernambuco, 1938, **1**, 74—81; Int. Sugar J., 1938, **40**, 399).—Juice from ripe POJ 2714 and 2878 canes was allowed to ferment spontaneously (in presence of small amounts of NaF), and the sediment resulting used to ferment fresh sterilised juice, this process being repeated until the bacteria had disappeared. Yeast thus separated was found to be exceptionally vigorous, and could be used in the distillery for 25 days without change, giving high (9·5%) EtOH yields from molasses of 21—22 Brix. It was probably a mixture of races, which fermenting together had a more favourable effect than the single yeasts composing it. J. P. O.

**Industrial carbon dioxide from fermentation of cane molasses.** N. Sreenivasan (Current Sci., 1938, **7**, 132—133).—Processes for deodorisation, purification, and drying of fermentation $CO_2$ for subsequent liquefaction and production of Dryice are outlined. The possible utilisation of Dryice for preservation of perishable goods in India, and the costs of its production, are discussed. I. A. P.

**Alcohol and fodder yeast from wood.** H. Scholler (Z. Spiritusind., 1938, **61**, 307—308).—A reply to criticism (cf. *ibid.*, 192, 277). I. A. P.

**Manufacture of alcohol from potatoes. VIII, IX. Alcoholic fermentation of acid-saccharified potato mash.** H. Okada. **X. Seed cultures.** T. Yosimachi. **XI. Manufacture of absolute alcohol on semi-industrial scale.** H. Okada (J. Agric. Chem. Soc. Japan, 1938, **14**, 1037—1060, 1061—1071, 1147—1163; cf. B., 1938, 1216).—VIII, IX. Addition of peptone or $PO_4'''$ to the mash has no appreciable effect on yield of EtOH. With const. pressure and amount of acid used, the longer is the time of saccharification, the slower is the fermentation, and the yield of EtOH is somewhat decreased. Brennerreihefe Rasse XII, *Sacch. formosensis*, and *Sacch. thermantitonum* give the best results with the mash. No differences in fermentation can be seen between acid-saccharified fresh potato-pulp mash and dried pulp mash. Fresh potato, merely crushed, requires more acid for saccharification than fresh pulp, and the yield on fermentation is lower. Small amounts of unsaccharified carbohydrate in fermented mash can be converted into fermentable sugar by the saccharolytic enzyme of takadiastase. Pressed juice from crushed potato contains nutritive substances of yeast and when added to fresh or dried potato-pulp mash facilitates the fermentation. The acclimatisation of the yeast to the mash is the most important factor in maintaining max. yield of EtOH.

X. The mother-yeast, acclimatised *Sacch. thermantitonum*, is cultivated successively in Pasteur flasks, Carlsberg fermenters, and seed-culture tanks. Acid sugar mash ($p_H$ 4·6—5·3 and glucose 8·1—11·5%) alone resulted in good seed cultures. The time of fermentation is about 40 hr.

XI. 2000—3000 kg. of fresh and 500 kg. of rotary kiln-dried potatoes were used to prepare 3600 l. of mash. This was saccharified with 20—23 kg. of $H_2SO_4$ (*d* 1·81) at 3·5 atm. for 45—100 min., whereby 95·5% of the starch was converted into reducing sugars (I). 10,800 l. of this mash were fermented in 65 hr., using 9% of seed culture of acclimatised *Sacch. thermantitonum*, when 87% of the (I) was converted into EtOH. Abs. EtOH (99·8%) was distilled by continuous rectification (using $CHCl_3$). J. N. A.

**Manufacture of alcohol from Jerusalem artichokes. V—VII.** T. Asai and T. Yukinoura (J. Agric. Chem. Soc. Japan, 1938, **14**, 1085—1093; cf. B., 1937, 964).—The constituents of the artichoke have been examined and the optimum conditions for direct alcoholic fermentation of the fresh tuber have been determined. The fermentation ratio is $\sim$ 95% of the total sugar in the mash. J. N. A.

**Irregularities in fermentation.** L. M. Baeta Neves (Rev. Chim. Ind., 1938, **7**, No. 77, 27—29).—A summary of the bacteria producing side reactions in alcoholic fermentation. To minimise loss of EtOH, the temp. should be $<30°$, the vessels sterilised with steam, castor oil added to prevent frothing, and $H_2SO_4$ added to inhibit the action of the bacteria. Addition of an emulsion of colophony effects a 50% economy in yeast by pptn. on the bacteria. F. R. G.

**Catalase content of extractum secalis cornuti fluidum.** E. Richter (Süddeut. Apoth.-Ztg., 1936, **76**, 400—401; Chem. Zentr., 1936, ii, 3146).—Catalase is determined by allowing it to decompose $H_2O_2$ for 1 hr., reducing excess of $H_2O_2$ with HI, and titrating the liberated I against $Na_2S_2O_3$. A. H. C.

**Manitoba barley. Hops.**—See XVI. **Hydrolysis of starches.**—See XVII. **Yeast cell–starch grain differentiation. Cereal amylases. Potato wash-flakes.**—See XIX.

See also A., III, 951, **Prep. of cocarboxylase. Catalase from horse liver.** 953, **Purification of papain by taka-amylase.** 954, **Separation of amylases in rice.** 955, **Phosphatases.** 956, **Yeasts in "miso." Removing factor Z and bios from beer wort.** 958, **Sulphurase.**

## Patents.

**Manufacture of yeast.** A. Pollak (B.P. 483,774, 8.3.37).—In the growth of yeast on mashes made from waste sugar materials, *e.g.*, molasses or sulphite liquor, phytin (I) or its components, or material containing (I), is (are) added (2—20% of mash material) in one quantity or discontinuously at suitable stage(s) during the yeast prep. The (I) content of the mash should be $\nless$ that of a normal grain mash, fermenting enzymes of the yeast being thus increased without increases in proteases. Ca and Mg compounds may also be added if desired. I. A. P.

**Production of malt enzymes.** PROTEX GES. M.B.H. (B.P. 486,468, 24.2.37. Switz., 4.3.36).—Malt wort is filtered through a bed of a suitably granulated adsorbing agent which is used in the crude state or after activation by treatment with mineral acid and/or electrical or heat (500—800°) treatment. The filter is then washed with a relatively small vol. of, *e.g.*, aq. $NH_3$ to yield a solution which on evaporation provides a highly active enzyme concentrate free from excess of malt extractives. Suitable adsorbing agents include Al silicates of the montmorillonite type. The treated wort, thus freed from the bulk of its enzymes and from certain materials detrimental to beer quality, is used for the prep. of beer. I. A. P.

**Continuous fermentation of solutions for obtaining fermentation products or propagating micro-organisms.** H. SCHOLLER (B.P. 486,481, 4.5.37. Ger., 4.5.36).—Fermentation is carried out in plant so designed that the fermenting liquid passes forward with successive upward and downward motions to a final zone ($F$) in which upward motion is retarded to allow partial sedimentation of the organisms. The liquid rich in organisms at the base of $F$ passes back in the system by a path in communication with all the earlier ascending columns, whilst that poor in organisms is run off from the top of $F$, the organisms being then separated. Organisms may also be separated from the sediment from $F$, sedimentation being assisted, if desired, by suitable chemical treatment of the liquid therein. Upward motion, except in $F$, is assured by, *e.g.*, aëration at the base of the ascending columns. Fresh nutrient liquid is supplied continuously to the apparatus, and fresh organisms as required are supplied either continuously or intermittently. I. A. P.

**Production of special beer with low percentage of sugar.** P. J. WINTER (B.P. 492,496, 13.1.38. Ger., 22.1. and 10.7.37).—Highly diastatic, low-dried malt, after predigestion for proteolysis, is so mashed as to yield the max. of maltose, biological acidification to $p_H$ 5·4 being applied if desired. Mash and sparge temp. are never $>$64—66°. Hop boiling (comminuted hops or hop extract may be used) is carried out under reduced pressure at 64—66° to avoid destruction of diastase, which thus remains active and produces further maltose during the fermentation stage. After described top- or bottom-fermentation procedures, a beer of abnormally low carbohydrate content results. I. A. P.

**Treatment of distillery slop.** A. H. STEVENS. From SHARPLES SPECIALTY CO. (B.P. 486,163, 6.4.37).—Spent slop from a maize mash is heated under pressure at 121—153° until it is converted into a condition in which it may be continuously filtered through cloth. After screening to remove coarse impurities, the liquid is filtered (or centrifuged); the filter-cake obtained is rich in maize oil, which may be recovered after drying the cake. The filtrate may be treated for recovery of lactic acid, and may be passed for sewage disposal or dried for cattle food after previous multiple-stage evaporation to 70—80% concn. of solids. I. A. P.

**Manufacture of fruit vinegar.** H. MOSTNY (B.P. 493,224, 11.6.37. Austr., 20.6.36).—Fruit juices of low sugar content are conc. to yield on fermentation an [EtOH] $>$ that usual to the juice. This is achieved by evaporation in a vac., by freezing out part of the $H_2O$ before pressing or before or after fermentation, by adding concentrates before or during fermentation to the dil. juice, or by mashing dried fruits with dil. juice. Alternatively, dried fruit may be mashed with $H_2O$ and the extract conc. as before. Fruit wine, sterilised if desired, may be refermented after addition of concentrates. The increased [EtOH] eliminates acetification difficulties, and the product, containing preferably $\gg$5 wt.-% of AcOH, is of increased stability. I. A. P.

**Foodstuffs containing yeast etc.**—See XIX.

## XIX.—FOODS.

**Analysis of Ceylon foodstuffs. I. General.** A. W. R. JOACHIM. **II. Some important cereals, pulses, oilseeds, and roots.** A. W. R. JOACHIM and D. G. PANDITTESEKERE. **III. Some leafy and non-leafy vegetables.** S. KANDIAH and D. E. V. KOCH. **IV. Vitamin-*C* contents of some Ceylon fruits and vegetables.** A. W. R. JOACHIM and C. CHARAVANAPAVAN. **V. Palm saps (toddy) and jaggery.** A. W. R. JOACHIM and S. KANDIAH (Trop. Agric., 1938, 90, 3—6, 7—10, 11—16, 17—21, 22—29).—Chemical analyses of 60 local foodstuffs, ascorbic acid contents of 55 fruits and vegetables, and the sugar, AcOH, and EtOH contents of 27 toddy samples are reported. A. W. M.

**Effect of carbon disulphide on baking quality of wheat.** L. S. CAYZER (J. Australian Inst. Agric. Sci., 1938, 4, 99—102).—Fumigation of wheat samples with $CS_2$ lowers the baking quality of the flour, probably by reversing the maturation process of gluten through formation of small amounts of $SO_2$. $C_2H_4Cl_2$–$CCl_4$ (3 : 1) has no ill effects. A. G. P.

**Effect on wheat quality of long exposure to carbon tetrachloride.** R. K. LARMOUR and H. N. BERGSTEINSSON (Canad. J. Res., 1938, 16, C, 241—247).—Wheat containing 12% of $H_2O$ was unaffected in baking quality by storage or exposure to $CCl_4$. With 18% of $H_2O$ damage by large doses of $CCl_4$ appeared after a period. With 24% of $H_2O$ storage and/or treatment with $CCl_4$ caused rapid deterioration. A. G. P.

**Can the use of carbon disulphide be avoided in the disinfection of stored grain?** A. CHIAROMONTE (Agric. colon., 1937, 31, 530—539).—The use of $CCl_4$, $(CH_2)_2O$, or $C_2H_4Cl_2$ as diluents or substitutes for $CS_2$ is discussed. A. W. M.

**Effect of home preservation on quality and vitamin content of sweet maize.** J. E. RICHARDSON, H. L. MAYFIELD, and R. J. DAVIS (Montana

Agric. Exp. Stat. Bull., 1937, No. 347, 22 pp.).—Canning processes are examined. Maize conserved by drying or in salt has, when cooked, the same vitamin-*A* content as a raw frozen maize. Cooked fermented maize has a higher, and canned maize a lower, -*A* potency than the fresh material. Maize loses approx. 75% of its -*B* on drying, salting, or canning and still larger amounts on fermentation in brine. Canning results in larger losses of -*C* than do other methods of conservation. A. G. P.

**Toxicity of mercurial preparations for disinfecting grain. Determination of small amounts of mercury.** H. Kluge, H. Tschubel, and A. Zitek (Z. Unters. Lebensm., 1938, 76, 321—337).—The treated grain, fed to rabbits, guinea-pigs, and hens, produced disturbances to health only after long periods. Small doses $\equiv$ 1% of the fatal dose caused no harmful effects. Hg in the organs etc. is determined by combustion in a Dennstedt tube, the Hg which distils being trapped in $HNO_3$ and pptd. as HgS in presence of Cu. The sulphides are dried, mixed with Ag and $Na_2CO_3$, and reheated; the Hg is collected in a capillary, dissolved in $HNO_3$, and after purification by electrolysis again collected in a capillary and centrifuged in presence of EtOH. The diameter of the resulting drop is measured. E. C. S.

**Use of a purifier in experimental [flour] milling.** E. Ziegler (Cereal Chem., 1938, 15, 663—671).—The Buhler experimental mill, using 3 break and 3 reduction rolls, is described. By suitable choice of roll surface, flour similar to commercial flour in diastatic activity can be produced. The insertion of a purifier did not give any improvement commensurate with the extra complication involved. E. A. F.

**Removal of bran from cereals.** R. H. Carr (Cereal Chem., 1938, 15, 658—662).—Grain is stirred with conc. $H_2SO_4$ until blackened, nitrated for 2—3 min., and washed free from acid. The bran floats off, leaving the endosperm and germ untouched. The proportion of bran thus found in various wheats varied from 11·75% to 15·06%; in rye the differences were greater. E. A. F.

**Fractionation of wheat-flour protein in the light of colloid chemistry.** C. E. Rich (Cereal Chem., 1938, 15, 596—621).—The "dissolving" of wheat-flour proteins in solutions of electrolytes is a process of hydration, giving a typical peptisation curve. The degree of peptisation depends on the nature as well as the concn. of the ions, $H^{\cdot}$ and $OH'$ being the most effective, and is influenced by temp. The size of the dispersed particles also varies with the conditions. The salting-out curves are regular, without breaks. The fractions obtained by various investigators are probably not chemical individuals, but colloidal modifications of the same substance or mixture of substances. E. A. F.

**Occurrence of vitamin-*B* in cereals and its significance in nutrition.** H. Kühl (Mühlenlab., 1938, 8, 141—144).—A report of a paper by H. Schroeder and a discussion thereon. Cereal germ is one of the most important sources of vitamin-*B*, and $\frac{1}{3}$ of the bread consumed should therefore be wholemeal. The germ removed in making white flour should be added to bakery products for direct human consumption. Attempts to raise the -*B* content of plants by manuring gave inconclusive results. E. A. F.

**Acid content of flour and causes of acid formation.** H. Kühl (Mehl u. Brot, 1938, 38, No. 29, 1).—The acidity of flour is related to its degree of extraction, but depends also on other factors, particularly the age of the flour. It does not as a rule depend on bacterial action. E. A. F.

**Acidity in cereals and cereal products, its determination and significance.** L. Zeleny and D. A. Coleman (Cereal Chem., 1938, 15, 580—595).—Various methods of determining acidity in cereals and cereal products are examined. Their results are very discordant, because they actually determine different factors. The acid substances present fall into three classes: free fatty acids, acid phosphates, and $NH_2$-acids; none of the methods proposed determines all of these. Only fat acidity increases significantly in the early stages of spoilage, and it is therefore this factor which should be measured to give an index of soundness. E. A. F.

**[Changes in wheat after long immersion in water.]** E. A. Schmidt (Z. ges. Getreidew., 1938, 25, 153—160).—Karachi wheat which had lain for several days under $H_2O$ in a wrecked barge was dried in vac. from 23% or 42% to 17·5% of $H_2O$, and subjected to physical, chemical, and baking tests. Both milling and baking properties were improved. It is suggested that the effect of this type of conditioning on other wheat varieties should be investigated. E. A. F.

**Colorimetric sugar determination [in flour].** E. A. Schmidt (Mühlenlab., 1938, 8, 121—132).—The depth of colour produced by caramelisation with NaOH is used as a measure of the maltose content of flour. The effects of temp., [NaOH], etc. on the colour are investigated, and the most suitable conditions described in detail. The results are valuable for determining flour quality, and as a means of milling control. E. A. F.

**Effect of proteoclastic enzymes on wheat-gluten solubility in sodium salicylate solutions.** R. H. Harris (Cereal Chem., 1938, 15, 690—707).—A change in aggregation of gluten, brought about by enzymes and indicated by the rate of dispersion in Na salicylate, would give a means of studying proteolysis and the effect of $BrO_3'$ thereon. Of a no. of enzymes tested, the majority, especially bromelin and pancreatin, hastened dispersion. The effect of $KBrO_3$ varied with the concn. and with the enzyme concerned; in some cases activation occurred at low concn. E. A. F.

**Determination of extensibility and tensile strength of gluten.** K. Mohs and E. A. Schmidt (Z. ges. Getreidew., 1938, 25, 125—130).—The application of the Schopper apparatus to the measurement of dough extensibility and tensile strength is described. The qualities measured are not exactly the same as in the Kosmin-Kranz method, since elasticity is also involved. The Schopper method is much quicker, and gives reliable results, especially if measurements are made both before and after the dough has been kept for 1 hr. E. A. F.

**Cereal amylases with reference to flour and malt behaviour.** M. J. Blish, R. M. Sandstedt, and E. Kneen (Cereal Chem., 1938, **15**, 629—657).—Existing data on the behaviour of $\alpha$- and $\beta$-amylase and the enzyme attacking raw starch are reviewed and further experiments on conversion rates recorded. The factor attacking raw starch is generally associated with, but apparently distinct from, $\alpha$-amylase; its relatively high initial rate of action does not support the theory that it makes starch available by destroying the cellulose walls. The Lintner val. measures $\alpha$- as well as $\beta$-amylase action, and refers primarily to the earlier stages of fermentation. The yeast manometric method of Sandstedt and Blish is likely to be suitable for the diastatic differentiation of malts. E. A. F.

**Microscopical distinction between yeast cells and starch grains by differential staining.** E. Schmidt (Mühlenlab., 1938, **8**, 137—142).—Yeast cells in presence of excess of starch are easily detected by staining red with carbolic fuchsin, the starch having been stained blue with I. The method is useful for detecting bakery or brewery products in feeding-stuffs etc. E. A. F.

**Bacteriological problems connected with potato flour and its manufacture.** V. Aschehoug and J. Lyng (Tids. Hermetikind., 1935, **21**, 367—371; Chem. Zentr., 1936, ii, 2251).—Potato flour may form a source of infection in certain fish preps. Gram-negative bacteria, which are the chief source of danger, are rendered inactive in the drying process. Normal samples were free from strictly anaërobic putrefactive bacteria. A. J. E. W.

**Colloidal behaviour of flour doughs. IV. Causes of the increase in mobility of doughs on prolonged mixing.** M. C. Markley and C. H. Bailey (Cereal Chem., 1938, **15**, 708—711; cf. B., 1938, 1219).—The rate of increase in mobility of flour doughs on overmixing is a function of many factors, and is therefore unsuitable for use as a measure of flour strength. The starch plays an important part. E. A. F.

**Preservation of bread.** H. Kühl (Chem.-Ztg., 1938, **62**, 778—780).—Staling of bread is due to retrogradation of starch, which is reversible by heat in presence of sufficient $H_2O$. The only practicable means of keeping bread fresh is by cold, canning being too costly and chemicals harmful. Moulds and bacteria can be checked by chemicals, but the best protection is cool, dry storage. An acid dough prevents rope development. The effects of these micro-organisms are not reversible. E. A. F.

**Sugars in bread.** W. Rice (Cereal Chem., 1938, **15**, 672—677).—Analysis of bread and of the ingredients used shows that glucose (I) is utilised by yeast more readily than fructose (II) or maltose (III). (II) has the best effect on flavour, moisture retention, and browning. Hence, addition of sucrose to the dough is advisable. When (I) only is added, there is an unexplained decrease in the (III) remaining in the bread. E. A. F.

**Odour and taste as indications of quality in grain, flour, and bread.** G. Brückner and E. A. Schmidt (Allgem. Mühlen-Ztg., 1938, **41**, 407—408).—Each grain, and each sound product prepared from it, has its characteristic odour. Staleness, contamination, etc. can be detected by odour or taste; examples are given. E. A. F.

**Bakery fats and economy thereof.** W. Hofmann (Angew. Chem., 1938, **51**, 721—724).—A lecture. Considerable economy of fats may be achieved by the use of new recipes (involving an increased proportion of sugar) developed for all types of cakes. E. L.

**Dispersing agents as stabilising media in baking powders.** S. Mendelsohn (Food Manuf., 1938, **13**, 333—336).—Maize is superior to potato starch, and rice starch must have $<12\%$ of $H_2O$ to be effective. $MgCO_3$ is bulky and evolves $CO_2$ too slowly. $CaSO_4$ is used as 25—30% of the powder. From 40—50% of casein may be used with 25—30% each of $NaH_2PO_4$ and $NaHCO_3$. Acid milk powders contribute free lactic acid and also act as stabilising media. Addition of $CaCO_3$ and Ca lactate or Ca or Mg pyrophosphate is also recommended with sweet and sour milk powders. W. L. D.

**Chemical composition and properties of normal and rancid Jersey milk. II. Fat, total solids, and protein content. III. Titratable acidity, hydrogen-ion concentration, and lipase content.** R. Reder (J. Dairy Sci., 1938, **21**, 249—260, 369—377; cf. B., 1938, 969).—II. Milk from cows susceptible to the development of rancidity contained a higher % of fat, total solids, and protein than did normal milk from cows fed on the same ration under the same environmental conditions. Casein and lactalbumin contribute to the higher protein content.

III. Rancid milk given by cows fed on the same ration as cows giving normal milk showed a higher titratable acidity and a lower $p_H$, and contained more lipase, than did normal milk. All milks contained a small amount of lipolytically-active substance. W. L. D.

**Variation in the composition of milk and the effect on solids-not-fat.** H. A. Herman (J. Dairy Sci., 1938, **21**, 146—147).—Season and temp. together account for decline in solids-not-fat % in milk during the summer months. The range for milk from mixed breeds over 12 months was 8·0—9·7%, and for July—Sept., 8·1—8·7 (mean 8·45)%. Lactose and total N were lower, and Cl was higher, in summer milk. For individual cows, solids-not-fat were high immediately after calving, but decreased at high milk yield. Cl and total N increased and lactose decreased at end of lactation. W. L. D.

**Kefir buttermilk.** L. A. Burney (J. Dairy Sci., 1938, **21**, 155—156).—Kefir grains in a muslin bag are suspended near the surface of milk at 18—21°. By varying the temp., the flavour can be varied from alcoholic to mildly or strongly acid. W. L. D.

**Soft curd milk produced with pancreatic concentrate.** V. Conquest, A. W. Turner, and H. J. Reynolds (J. Dairy Sci., 1938, **21**, 361—367).—The pancreatic prep. is added to milk at 43° (ratio 1 : 10,000), the milk is incubated for 15 min., and is then submitted to the usual pasteurisation process. The curd tension was lowered thereby from 60 g. to 20—30 g. (Hill method). Such milk shows only slight changes in P, Ca, Mg, and protein content and in $CH_2O$-titration vals. Calves fed such milk retain the curd in their stomachs for a shorter time and the curd is softer than that from normal pasteurised milk.
W. L. D.

**Sonic soft-curd milk.** L. A. Chambers (J. Dairy Sci., 1938, **21**, 162—163).—Homogenisation of milk with a 360-cycle sonic oscillator reduced the fat-globule size sufficiently to prevent creaming, reduced curd tension at least 50%, and decreased the residual bacterial count after pasteurisation by 50%. A sediment of leucocytes does not occur in sonised milk and a partial or total inactivation of phosphatase by homogenisation invalidates that test for the pasteurisation of homogenised milk. W. L. D.

**Digestibility of natural and processed soft curd milks.** C. C. Flora and F. J. Doan (J. Dairy Sci., 1938, **21**, 163—164).—Methods measuring the peptic followed by the tryptic breakdown of soft curd produced by natural means or by boiling, homogenisation, base exchange, and enzymic digestion showed that natural soft curd digested considerably faster than natural hard curd. Boiling of milk retards the action of pepsin, but the mechanism of physical breakdown in the stomach is more rapid and complete. Tryptic action is accelerated by the boiling of milk. W. L. D.

**Detecting thermophilic contamination in skim-milk powder.** C. M. Sorensen (Food Res., 1938, **3**, 421—427).—Dilutions may be made with N/60-NaOH or -LiOH in place of $H_2O$, the spore counts being slightly greater and difficulties due to the presence of undissolved specks being eliminated. The slight degree of alkalinity is an advantage when plating on glucose–tryptone agar containing bromocresol-purple, as the $p_H$ of milk powder is usually low enough to impair the usefulness of this indicator.
E. C. S.

**Homogenisation [of milk products].** P. H. Tracy (Dairy Ind., 1938, **3**, 374—375).—Comparisons were made of milk and ice-cream mix homogenised either by the high-pressure valve or the low-pressure rotary disc machine. With the latter, milk showed slight creaming and higher curd tension than with the former. Ice-cream mix from the low-pressure machine contained larger fat globules, was slower in whipping, and gave a smaller max. overrun. Valve-homogenisation at 1200—1500 lb./sq. in. is comparable with rotary homogenisation at 700 lb./sq. in. W. L. D.

**Cause and prevention of decrease in fat test of composite samples [of milk].** R. F. Holland (J. Dairy Sci., 1938, **21**, 141).—The % of fat of composite samples is 0·1% < the calc. average for daily tests, due mainly to factors associated with oiling off, churning, and packing of the fat globules. This can be prevented by addition of 0·2% of saponin.
W. L. D.

**Methylene-blue reduction test and the keeping quality of milk.** C. H. Chalmers (J. Dairy Res., 1938, 9, 351—355).—The application of the test to high-quality, tuberculin-tested milk is described, especially with respect to the time that samples have to be held before carrying out the test. Samples which are kept 15—24 hr. at 15° give a better correlation between reduction time at 37° and keeping quality than if they are examined immediately after production. W. L. D.

**Bactericidal action of milk fats in relation to improvement of the quality of milk.** M. Török (Mezög. Kutat., 1936, 9, 151—155; Chem. Zentr., 1936, ii, 2252).—The two fats studied, containing PhOH, are almost odourless and remain sterile even after infection. The disinfecting action is dependent on the dispersion of the PhOH as well as on its concn.
A. J. E. W.

**Lipase action in milk.** V. N. Krukovsky and B. L. Herrington (J. Dairy Sci., 1938, **21**, 142—143).—The extent of lipolysis was determined by titration of the butter fat isolated from the milk. Practically all milk samples from individual cows contain lipase, but there is much variation. Lipolysis is increased by warming milk to 30° and then cooling slowly. Milk contains $\nless$ 2 lipases, one being sensitive to $CH_2O$ and the other resistant.
W. L. D.

**Lipase activity in cow's milk.** J. C. Pfeffer, H. C. Jackson, and K. G. Weckel (J. Dairy Sci., 1938, **21**, 143).—Lipase (I) activity varies little from day to day, and no direct correlation exists between it and late lactation. A low yield at milking gives a low % of (I), and vice versa. A temporary decrease in (I) content is observed when cows are brought in for winter feeding. The (I) is carried in milk-serum ; when the % of fat increases (I) decreases. Rise of temp. of cream separation reduces the amount of (I), and separator slime is a rich source of (I). NaCl and heat have inhibiting effects on lipolytic activity.
W. L. D.

**Taints and off-flavours of milk. I.** H. Barkworth (Dairy Ind., 1938, **3**, 367—370, 377).—A review. W. L. D.

**Activated flavour of milk.** J. C. Flake, H. C. Jackson, and K. G. Weckel (J. Dairy Sci., 1938, **21**, 145—146).—A flavour characteristic of burnt protein or feathers, intensified by heating milk to 82°, develops in over-irradiated vitamin-*D* milk. Preheating of milk to 55—60°, cooling, and irradiation intensifies flavour development. Correcting the salt balance had no effect in preventing the flavour from developing. The flavour can be removed by oxidation such as by addition of small amounts of $H_2O_2$ or $CaO_2$, or 2—3 p.p.m. of Cu and bubbling air through at a milk temp. of 63°. Oxidised flavour develops later. For homogenised milk, irradiation should precede homogenisation. W. L. D.

**Relation of titratable acidity to metal-developed oxidised flavour in milk.** W. C. Brown and R. B. Dustman (J. Dairy Sci., 1938, **21**, 144—145).—No correlation was found between the titratable acidity (220 samples) of pasteurised milk and the tendency to develop the flavour in presence of 1·3 p.p.m. of added

Cu. The findings of other workers that reduction of acidity to 0·13% eliminates the tendency to flavour development could not be substantiated.
W. L. D.

**Relation of oxidation–reduction potential to oxidised flavour in milk.** G. R. Greenbank (J. Dairy Sci., 1938, **21**, 144).—As a result of the examination of 3000 samples, it was deduced that inhibition of the development of the flavour by heat was due to lowering the redox potential, and by green feeding due to this and an increased poising action. The effect of metallic contamination depends on the metal and its physico-chemical state, and the effect of light depends on metallic contamination and intensity of irradiation. W. L. D.

**Detecting milk that may become oxidised.** G. R. Greenbank (J. Dairy Sci., 1938, **21**, 143—144). —The increase in redox potential on adding a trace of $CuSO_4$ to milk is determined. Large increases indicate samples which might become oxidised. W. L. D.

**Modification of the Bloom gelometer for use in determination of curd tension of milk.** R. E. L. Berggren (J. Dairy Sci., 1938, **21**, 353—359).—An adaptation of the gelometer has been used for curd-tension measurements and was specially useful for low vals. Using the pepsin–$CaCl_2$ coagulant, the results agree with those of the Hill apparatus, but erroneous results are given when using pepsin–0·09N-HCl owing to retraction of the curd. W. L. D.

**Colorimetric determination of $p_H$ in milk and whey by means of the "Wulff" $p_H$ tester.** R. Aschaffenburg (J. Dairy Res., 1938, **9**, 336—338).— Membranes containing $p_H$ indicators are allowed to imbibe $H_2O$ from the liquid to be tested and the colour is compared with standards of known $p_H$ val. Milk and whey tested by this method gave results agreeing closely with those obtained by electrometric methods and the method is suggested for use with milk and whey in cheesemaking. W. L. D.

**Factors affecting the determination of fat in milk by the Babcock method.** W. A. Caldwell and E. O. Herreid (J. Dairy Sci., 1938, **21**, 140—141).—The difference in carrying out the test at 60° instead of at 5° was a 0·08% lower fat content. There was very little difference with a centrifuge temp. of 24°, 60°, and 82° and a speed of centrifuge of 850—1400 r.p.m. The temp. of the water-bath was important. The Babcock gave higher readings than the Mojonnier method, but this was overcome by overlaying the fat column with coloured liquid paraffin. W. L. D.

**Citric acid determinations in milk and milk products.** P. S. Arup (Analyst, 1938, **63**, 635—640).—In determining citric acid (I) by the pentabromoacetone method, the $KMnO_4$ should be added gradually, to avoid formation of volatile substances which interfere with drying to const. wt. The (I) content of 25 samples of retail milk varied from 0·0150 to 0·206%; that of 31 samples of condensed milk, tinned cream, and milk powder was ≡ 0·151—0·205% of the reconstituted milk. A procedure is outlined for the determination of (I) in sweetened condensed milk, chocolate, and malted milk. E. C. S.

**By-products of milk. II.** L. V. Burton (Dairy Ind., 1938, **3**, 371—373).—Lactic acid is manufactured from Ca lactate formed by the lactic fermentation of whey in presence of $CaCO_3$. The prep. and purification of these commercial grades are described. Whey powder is prepared by evaporation of whey after treatment with 0·08% of $Ca(OH)_2$ to a paste (*d* 1·70), mixing with a small quantity of direct whey powder to facilitate crystallisation, and then oven-drying.
W. L. D.

**Damaged and defective milk bottles.** C. T. Roland and H. A. Trebler (J. Dairy Sci., 1938, **21**, 275—281).—Various defects are noted. W. L. D.

**Specific heat and physical state of fat in cream.** A. H. Rishoi and P. F. Sharp (J. Dairy Sci., 1938, **21**, 399—405).—The method of mixtures was used to determine the sp. heat of cream within the range in which a change in the relative amounts of cryst. and liquid fat occurs. Within the range 0—20°, sp. heat data show that it requires a min. of 4 hr. for complete phase adjustment. For autumn-produced fat, the sp. heat for the range 0—5° is 0·89, for 10—15° is 1·43, for 15—20° is 1·85, and for 25—40° is 0·48. The sp. heat of the fat varies with the food of the cow and the time of year. W. L. D.

**Resazurin test for cream.** H. Jenkins (J. Dairy Sci., 1938, **21**, 141—142).—0·1 ml. of a 0·05% solution of resazurin (I) is added to 10 ml. of cream and the reduction time is taken when the grey colour becomes pink. Creams reducing in $<1$ hr. had bacterial counts of $3 \times 10^5$. Pasteurised cream of good quality does not reduce in $<3$ hr. A 2-hr. incubation test gives results comparable with a 5-hr. test with methylene-blue, and cream which takes 1—1·5 hr. to reduce the latter takes only 5—15 min. to reduce (I).
W. L. D.

**Neutralisation of cream for buttermaking.** R. C. Townley and I. A. Gould (J. Dairy Sci., 1938, **21**, 150).—The effect of $Na_2CO_3$, $NaHCO_3$, $Na_2CO_3$–$NaHCO_3$, $Na_2CO_3$–$K_2CO_3$, NaOH, CaO–MgO, and $Ca(OH)_2$ was studied. Using aq. solutions to neutralise partly the acidity of cream of 0·5% titratable acidity, the limes gave the most accurate reductions for reduction to 0·15—0·25%, but higher vals. than theoretical for acidities $<0·1$%. The carbonates reduced acidity quantitatively to 0·25% acidity, but failed to make cream reach lower acidities on adding the calc. amounts. Their behaviour was reflected also in the lower $p_H$ reached than when the limes were used. W. L. D.

**Improvement of the quality of butter. I. Effect of re-pasteurisation of dairy-farm cream on keeping quality of butter.** B. Platon and T. Olsson (Kung. Landtbruks-Akad. Handl. Tids., 1936, **74**, 538—554; Chem. Zentr., 1936, ii, 2252).—Twice-pasteurised cream gives better-quality butter than cream pasteurised once, which gives an oily product.
A. J. E. W.

**Re-pasteurisation of cream to prevent oiliness in butter.** B. Platon and T. Olsson (Medd. Centralanst. Försöksväs. Jordbruksområdet, 1936, No. 50, 22 pp.; Chem. Zentr., 1936, ii, 3607).— Repasteurisation is recommended (cf. preceding abstract). A. H. C.

**Burri-smear culture technique for examination of butter.** H. F. LONG and B. W. HAMMER (J. Dairy Sci., 1938, 21, 148—149).—Portions are picked out by a Pt needle and cultured on a dry agar slope on which the colonies are counted and the types studied. Colonies should be $\not>100$. The wt. of butter picked up for testing weighs approx. 0·05 mg. The distribution of count and type in butter is irregular. This technique gives lower counts than the plate method, owing to failure to break up clumps and overcrowding on slopes. W. L. D.

**Effect of temperature on score value and physical structure of butter.** W. H. E. REID and W. S. ARBUCKLE (J. Dairy Sci., 1938, 21, 148).—In testing butter for flavour, low temp. gives submerged flavours and high temp. pronounced flavours; tasting at 10° may give a lower score than at 21°. The rise in temp. of cold-stored butter exposed to room temp. is slow and $\propto$ the area of butter exposed. Microscopical examination reveals the structure of butter held at different temp. W. L. D.

**Texture in butter.** W. J. DAVIES (Canad. Dairy & Ice Cream J., 1938, 17, No. 10, 57—59).—Texture is closely associated with flavour, and is mainly influenced by the method of holding cream after pasteurisation, which defines the plastic condition of the butter when churned. Quick cooling after pasteurisation, holding for $\not<12$ hr., and the proper temp. of the butter wash-$H_2O$ are needed to ensure good texture. W. L. D.

**Consistency of butter.** C. I. KRUISHEER and P. C. DEN HERDER [with B. M. KROL and E. M. J. MULDERS] (Chem. Weekblad, 1938, 35, 719—733).—Several pieces of apparatus for studying butter consistency and the factors which affect it are described. Butter undergoes permanent deformation only under pressures > a definite limit termed the "yield val." A study of the plastic behaviour of butter with a simple type of plastometer gives a curve showing the velocity with which a stamp of fixed diameter sinks down into the surface as a function of the applied pressure, from which the upper "yield val." can be derived graphically. This val. is closely parallel with the points for "firmness" of a particular butter as determined by experienced graders. A strict relationship between these two quantities cannot be formulated because butter is highly thixotropic. A simple, hand-operated apparatus is described to determine the pressure needed to force a stamp 4 cm. in diameter to a depth of 1 cm. in 30 sec. The val. so obtained is 1·4 × the "yield val." measured graphically. A more elaborate, mechanically operated apparatus which eliminates the personal factor is also described. The vals. obtained with both machines are in excellent agreement with the points adjudged in practical grading. The connexion between firmness and temp. has been determined for winter and summer butters. The temp. coeff. is very high, the firmness becoming 0 at 25—30°, and the temp.–firmness curves are not similar in character for all butters, so that corrections due to temp. differences may be applied only over very small temp. ranges. Provisional tables of corrections and graphs are given. The results are discussed in relation to the modern ideas on the structure of butter, that the butter fat is partly composed of the original fat globules together with cryst. fat and fat in the form of a continuous phase. S. C.

**Keeping quality of butters. I. Rates of deterioration of butters made from creams of different acidities and stored at various temperatures.** G. E. HOLM, P. A. WRIGHT, W. WHITE, and E. F. DEYSHER (J. Dairy Sci., 1938, 21, 385—398).—Butters made from creams of different acidities grouped themselves similarly when judged by quality score, peroxide val., time of bleaching at 42°, and two dye-bleaching tests. The rates of deterioration of butter made from creams of an acidity up to 0·20% were identical, whilst samples from cream of $>0·30\%$ acidity were inferior in keeping quality to those made from sweet cream (acidity $<0·20\%$). There is a direct relation between loss of score and gain in peroxide val., and the latter is a direct measure of the rate of deterioration. The development of fishiness is promoted by free acidity and factors which encourage spontaneous oxidation. There is little difference in rate of deterioration when butter is stored at —10° or at —17°. W. L. D.

**Mould mycelia content of sour-cream butter.** J. ADAMS and E. H. PARFITT (J. Dairy Sci., 1938, 21, 147—148).—Mould content was highest in summer and lowest in winter. The method of determination was the microscopical method of determining the % no. of positive fields. Washing, working, and the $p_H$ of the butter-serum had no effect on the amount of mycelia retained by butter, but age, incubation temp., exposed surface, and agitation of cream influenced the mould content. W. L. D.

**[Comparison of] methods for determination of acidity in butter fat.** D. F. BREAZEALE and E. W. BIRD (J. Dairy Sci., 1938, 21, 335—344).—Of four methods, viz., titrating the EtOH suspension of the fat with 0·1N-NaOH, in $C_6H_6$ with 0·05N-NaOEt in EtOH, and with 0·05N-KOH in EtOH either direct or after separation of fatty acids prepared from soaps extracted from the fat, the best end-points (to phenolphthalein, used in all methods) were given by the KOH–EtOH, and the most difficult by the aq. NaOH, method. The NaOEt method gave higher results. From 95 to 99% of the acids were recovered in the acid-separation method. Commercial butter contained free acids $\equiv$ 0·4—1·3 ml. of 0·1N-alkali per 10 g. of fat. W. L. D.

**$p_H$ of New South Wales butter: relationship to bacterial and yeast counts.** E. G. PONT and W. S. SUTTON (J. Australian Inst. Agric. Sci., 1938, 4, 96—99).—No relationship was apparent. Neutralisation of cream prior to churning is discussed. Development of proteolytic organisms in cream is not favoured by increased alkalinity. A. G. P.

**Application of phosphatase test to the butter industry.** W. H. BROWN and E. H. PARFITT (J. Dairy Sci., 1938, 21, 149).—1 ml. of butter-serum is used instead of milk to determine whether cream has been properly pasteurised before churning. Of 372 samples, 31% gave positive phosphatase tests and these, when subjected to a keeping-quality test for 10 days at 15°, decreased in score more than others. Butter-serum tends to give a more positive reaction than the corresponding cream. W. L. D.

**Determination of the value of annatto seed.** A. J. van Duuren and P. A. Rowaan (Chem. Weekblad, 1938, **35**, 756—758).—Two constituents of the seeds of *Bixa orellana* are important, viz., bixin (I) for colouring butter and orellin (norbixin?) (II) for colouring cheese. 5 g. of seed are extracted twice for 15 min. with 50 and 30 c.c., respectively, of $CHCl_3$ and the filtered solution is made up to 100 c.c. (I) is determined colorimetrically in a Lovibond Tintometer at two dilutions and the results are extrapolated to 20 red units [$\equiv$ 263 mg. of (I)]. Yellow units are not satisfactory since the ratio is not directly proportional. 5 g. of seed are extracted with 2 × 50 c.c. of N-KOH and the (II) content is determined as for (I); 20 red units $\equiv$ 309 mg. of (II). Seeds of various origins contain 1·8—3% of (I) and 3·2—6·6% of (II), Jamaica seed giving the highest results in both cases. S. C.

**Spoilage of margarine. I. Effect of milk and salt. Iodometric determination of acid value.** Hans and Helene Schmalfuss [with A. Gehrke] (Fette u. Seifen, 1938, **45**, 479—487).—Quant. tests for the determination of various types of rancidity characterised by the formation, of epihydrinaldehyde, free aldehydes, free acids, and ketones, together with the Lea peroxide test, are described and have been applied to study the effect of the individual constituents of margarine on its keeping properties. The presence of (commercial) milk (without NaCl) is the most harmful, causing aldehydic and ketonic rancidity and imparting a soapy flavour; NaCl (with or without milk) also favours rancidification and is unsuitable as a preservative for milk-margarines. The plain margarine–fat mixture, without milk or NaCl, keeps most satisfactorily in storage. Kaufmann's iodometric method for the determination of the acid val. is accurate and superior to the ordinary alkalimetric method in cases where azo dyes (*e.g.*, "butter colours") may interfere with the colour change of the phenolphthalein indicator. E. L.

**Cheese manufacture with milk from herds fed with ensilage.** B. Platon and P. Hermansson (Kung. Landtbruks-Akad. Handl. Tids., 1936, **75**, 151—219; Chem. Zentr., 1936, ii, 2252). A. J. E. W.

**Retaining fat in American Cheddar cheese made at high temperatures.** H. L. Wilson (J. Dairy Sci., 1938, **21**, 160—161).—The cream is separated from the milk and then homogenised at 62°/500—2000 lb. per sq. in., held for ½ hr. at that temp., and added to the separated milk to give standard fat content. The curd will not show leakage of fat when heated to 30°. W. L. D.

**Solubility of Cheddar cheese curd in sodium chloride solutions.** F. H. McDowall and L. A. Whelan (J. Dairy Res., 1938, **9**, 339—341).—Cheese curd after 7 days of storage dissolves completely in 3—10% aq. NaCl. Normal and high-rennet cheese behaved identically and the solubility remained const. for $\not<$ 8 months. The [NaCl] in the $H_2O$ of cheese is $\sim$ 4·8%, and since cheese proteins are equally sol. in NaCl of this concn. it is suggested that the effect of NaCl on cheese quality is not due to the solubility of protein in brine. W. L. D.

**Comparison of methods for determining moisture content of Cheddar cheese. II. Steam-oven method at high pressure and olive oil methods.** I. A. Gould (J. Dairy Sci., 1938, **21**, 379—383).—$H_2O$ was driven off either in an oven heated by steam at 85 lb. per sq. in., over a flame after adding olive oil, or after addition of NaCl to the cheese–oil mixture to prevent loss by spattering. All methods give results which are close, and sufficiently accurate for practical use. With the oil method the determination takes $<\frac{1}{2}$ hr., whilst the oven method takes 2·5 hr. The oil method is preferred, but for cheese with a high $H_2O$ content loss through spattering occurs. An oil of higher volatilisation point is suggested, but the slight decomp. of olive oil has no effect on the accuracy of the results. W. L. D.

***X*-Ray diffraction analysis of white specks in Cheddar cheese.** S. L. Tuckey, H. A. Ruehe, and G. L. Clark (J. Dairy Sci., 1938, **21**, 161).—The specks consisted of Ca lactate (I) which were almost identical in *d* spacings with pure (I). The particles are not specks of Ca soaps. W. L. D.

**Canadian "blue" cheese.** O. R. Irvine (Canad. Dairy & Ice Cream J., 1938, **17**, No. 10, 19—22).—Cheeses of the Roquefort type weighing 3·5—5 lb. are made from cow's milk (3·8—4·0% of fat) ripened with starter to an acidity of 0·20% and renneted with 0·002% of rennet. The curd after 1·5 hr. is warmed to 31° by stirring in hot whey, drained and broken, salted, inoculated with mould powder, and hooped. The cheese is pricked with stainless-Fe needles and ripened at 11° at R.H. 90. The rind of the ripe cheese is pared off and the edible portion wrapped in Sn foil. Homogenising the milk and adding the lipase of raw milk hastened ripening and gave a whiter cheese. W. L. D.

**$p_{\rm H}$ of blue or American Roquefort cheese.** S. T. Coulter, W. B. Combs, and J. S. George (J. Dairy Sci., 1938, **21**, 273—274).—Cheese reached a min. $p_{\rm H}$ of 4·7 within 24 hr. after manufacture, which decreased gradually in acidity to $p_{\rm H}$ 6·5 in 3 months, and then increased to $p_{\rm H}$ 5·7 at the end of the 9th month. W. L. D.

**Ripening of blue cheese.** C. B. Lane and B. W. Hammer (J. Dairy Sci., 1938, **21**, 161—162).—Cheese from homogenised raw milk developed a satisfactory flavour in 3 months and showed fatty acid and Me ketone flavours due to mould action much sooner than cheese from pasturised homogenised milk, which took 6 months to ripen. Addition of 2% of NaCl to the curd gave more rapid and uniform mould growth than in unsalted cheese. Cheese made from milk of cows fed on soya beans was less coloured than that made from ordinary milk. W. L. D.

**Clarification of milk for manufacture of Swiss cheese with special reference to mastitis milk.** K. J. Matheson, G. P. Sanders, L. A. Burkey, and

J. F. Cone (J. Dairy Sci., 1938, 21, 151—152).—Clarified milk contains more $O_2$ in solution. Clarification promotes the efficiency of cultures, causes the cheese to hold less $H_2O$, and gives it a firmer texture, whilst the set of cheese is improved by the breaking up of fat clusters. On clarifying mastitis milk, the leucocyte content is reduced to $\frac{1}{3}$, and the rate of acid production is more rapid. Better-grading cheese is made from clarified mastitis milk. W. L. D.

**Methylene-blue reduction time as an indication of suitability of milk for manufacture of Swiss cheese.** A. B. Erekson, C. A. Eckburg, and E. Lee (J. Dairy Sci., 1938, 21, 172).—A 2 years' study on 2463 cheeses showed that the products from milks with a reduction time of nearly 6 hr. had the better quality. Those from milk having a reduction time $<3$ hr. were mostly third grade. W. L. D.

**Relationship of mastitis milk and soft curd milk to manufacture of Swiss cheese.** K. J. Matheson, L. A. Burkey, G. P. Sanders, and R. R. Farrar (J. Dairy Sci., 1938, 21, 173).—Mastitis milk has an inhibitory effect on the development of lactobacilli, causes the cheese to overset more than normal milk, gives a cheese of higher $H_2O$ content, gives a longer coagulation period, and generally yields better cheese. Cheese from milk giving a rennet curd of low tension contained more $H_2O$, and was poorer in texture and quality, than that from rennet curd of high tension. W. L. D.

**Relation of milk quality to grade of Swiss cheese.** L. A. Rogers, R. E. Hardell, and F. Feutz (J. Dairy Sci., 1938, 21, 151).—The no. of first-grade cheeses out of 400 varied directly with the quality of milk as measured by the methylene-blue (I) test. Cheese was of poor grade if the milk reduced (I) in $<3$ hr. and the $p_H$ at dipping was $<6{\cdot}4$. W. L. D.

**Vitamin-*A* content of cheese.** I. L. Hathaway and H. P. Davis (J. Dairy Sci., 1938, 21, 162).—The -*A* contents of 22 varieties of cheese were determined by feeding experiments on rats. From the data obtained, all cheeses were found not to possess the same -*A* val., some being rich and others poor sources. The -*A* content bears a relation to the fat content. W. L. D.

**Quality variations in summer- and winter-made cheese.** J. C. Marquardt (J. Dairy Sci., 1938, 21, 159—160).—Winter cheese is of inferior quality even when ripened under summer conditions. The development of flavour is more rapid in summer cheese. Addition of extra $Ca^{\cdot\cdot}$ to the milk causes deterioration of texture in both types of cheese. W. L. D.

**Apparatus for measurng elastic and plastic properties of cheese curd.** G. W. S. Blair (J. Dairy Res., 1938, 9, 347—350).—A simple apparatus for measuring the elastic and plastic deformation of cheese curd under a compressive load is described. A val. inversely $\propto$ to shear modulus is obtained and this is claimed to be the best simple criterion of the firmness of curd and in deciding the optimum time for cutting the curd. W. L. D.

**Different caseinogens in the curds obtained in cheese manufacture, and their relations to the maturing of the cheese.** P. Mazé and P. J. Mazé (Compt. rend. Soc. Biol., 1938, 128, 859—861).—The acidity of the caseinogen (I) is increased by lactic fermentation and that obtained differs from the (I) prepared by enzymic coagulation. H. G. R.

**Composition of cheese rinds.** W. L. Davies (J. Dairy Res., 1938, 9, 342—346).—Rinds from Cheddar cheese intended for making processed cheese contained $H_2O$ 15—20, fat 43—54, crude protein 37—45, true protein 29—42, NaCl 1·3—2·8, ash 3·5—6·1, Ca 0·97—1·54, and P 0·76—0·89%. $H_2O$ and fat are lower, whilst protein, ash, Ca, and P are higher, in rind than in the body of cheese, but protein is broken down less. NaCl diffuses from the rind into the interior of cheese when the rind dries during storage, and P compounds diffuse inwards at a greater rate than Ca compounds, which makes the Ca/P ratio higher. The fibre content is low and can be gauged by inspection of rinds for particles of bandage. W. L. D.

**Judging the freshness of hen's eggs by the fluorescence of the eggshell and the phosphate content of the egg-white.** J. Straub and W. J. Kabos (Chem. Weekblad, 1938, 35, 739—741).—From an examination of eggs from individual hens (white Leghorns and crossed Minorcas) over $\sim$ 2 months, it is concluded that on storage the fluorescence of the eggshell gradually changes from red to colourless and then to blue. The intensity of the original fluorescence varies considerably and eggs from the same hen also show comparatively large variations. The rate of changes depends on the intensity of the original fluorescence. An appreciable % of eggs giving a blue fluorescence in a lot of equal age shows that they are at least a month old. The $P_2O_5$ content of the white increases regularly for all eggs although the individual rates vary; $>5 \times 10^{-6}$ g. of $P_2O_5$ per c.c. of egg-white proves that the egg is at least a month old. S. C.

**Keeping quality of hen eggs.** (A) W. H. Dryden and R. W. Hale. (B) W. H. Dryden (J. Min. Agric. N. Ireland, 1937, 5, 70—112, 113—131).—(A) Keeping quality was not significantly affected by differences in customary feeding practices or management, or by the rate of production. Season, storage, and transport conditions were the primary factors involved.

(B) Effects of methods of packing and of storage temp. and R.H. are examined. A. G. P.

**Refrigerated gas storage of eggs.** W. Rudolph (Chem.-Ztg., 1938, 62, 641—642).—The effect of $CO_2$ in retarding bacterial attack and minimising physical changes in eggs stored for 7—8 months is reviewed. E. C. S.

**Influence of certain mix components on rate at which freezing occurs in ice cream as measured by the dilatometer method.** W. C. Cole and J. H. Boulware (J. Dairy Sci., 1938, 21, 159).—By cooling to 2·5° below the f.p. of the mix, it was found that milk solids-not-fat were more effective than was fat in retarding freezing. Using the size of ice crystal as the basis of evaluating smoothness, milk solids-not-fat again were more responsible for fine texture than was fat. W. L. D.

**Effect of temperature and composition on physical properties and dipping qualities of ice cream.** W. H. E. Reid, R. J. Drew, and W. S. Arbuckle (J. Dairy Sci., 1938, 21, 170—171).—Of ice creams having fat 12—16, serum solids 9—15·5, sugar 12—18, and gelatin 0·2—0·5% served at −14°, −12°, −10°, and −8°, that containing fat 14, solids 13, and sugar 14% served at −12° was preferred. Increase in % of all constituents decreased the size of ice crystals, whilst increased fat and gelatin increased stability. Serving temp. and composition of mix affected the no. of scoops per gal., the greatest no. of scoops being given at −14°. The best keeping quality was given by holding at −14° and cream containing 15% of serum solids had to be held for 21 days before sandiness was observed. W. L. D.

**Application of the phosphatase test to determine the efficiency of pasteurisation of ice-cream mix.** A. J. Hahn and P. H. Tracy (J. Dairy Sci., 1938, 21, 158).—The test is applicable within certain limitations and the use of raw non-milk ingredients before pasteurisation had no appreciable effect on the phosphatase content of the final product. Pure vanilla extracts had no effects, but imitation or artificial vanilla increased the phenol val. ($P$). Coumarin increased $P$ by $>10$ times that of the control sample. 6 kinds of fruits and 3 of cold-packed fruits increased $P$. Underpasteurised mixes stored before and after freezing showed slight decreases in $P$. W. L. D.

**Comparison of tryptone–glucose–skim milk and standard nutrient agars as media for determining bacterial count in ice cream.** V. D. Foltz and W. H. Martin (J. Dairy Sci., 1938, 21, 289—294).—Using nutrient agar at 37° and tryptone agar at both 32° and 37° for comparison, the latter gave logarithmic mean counts on 279 samples of 137% and 192%, respectively, of the former counts. The arithmetic means were 132% and 156%, respectively. W. L. D.

**Bound water and its relation to some dairy products. II. Factors affecting bound water content of some dairy products.** C. D. Dahle and H. Pyenson (J. Dairy Sci., 1938, 21, 407—420; cf. B., 1938, 969).—The max. content of bound $H_2O$ (I) in casein sols is at $p_H$ 6·6—6·7 and that of conc. milk-plasma at $p_H$ 6·2—6·4. Increasing the casein concn. diminishes the (I) per unit wt. of casein. Rise of temp. of heating lowers the (I) of milk-plasma, and high pasteurisation temp. decreases the (I) of the fat-globule membrane and of milk phospholipins. (I) is decreased slightly with pasteurisation of milk at 62° for ½ hr. and homogenisation decreases it still further, as it does also in ice-cream mix, the reduction in (I) being ∝ the pressure of homogenisation. Dual homogenisation destroys fat clumps and increases both protein stability and (I). Freezing of milk over long periods decreases protein stability and (I). Na phosphates and citrates increase protein stability and (I), whilst Ca lactate and phosphate have the reverse effect. W. L. D.

**Sterilisation by irradiation. A possible new tool for the dairy industry.** O. F. Garrett and R. B. Arnold (J. Dairy Sci., 1938, 21, 155).—Utensils were seeded with bacteria and subjected to ultra-violet irradiation. Small utensils were sterile in 3 min. and a 95% kill of bacteria on large utensils was obtained. Exposure of seeded vat pasteurisers also caused a high bactericidal action. W. L. D.

**Testing the sterility of dairy utensils.** H. Barkworth and S. J. Travers (J. South-East. Agric. Coll., Wye, 1938, No. 42, 105—106).—Utensils are washed with 0·9% sterile NaCl solution and washings are plated for bacterial counts. Effective sterilisation is shown by counts of $\not>$10—12 colonies per c.c. and absence of *B. coli* in 10 c.c. A. G. P.

**Effect of winter storage on palatability and vitamin content of potatoes grown in Montana.** H. L. Mayfield, J. E. Richardson, R. J. Davis, and E. J. Andes (Montana Agric. Exp. Stat. Bull., 1937, No. 346, 23 pp.).—Changes in $H_2O$, vitamin-*B* and -*C* contents, and palatability of two varieties of potatoes under different storage conditions are recorded. Qual. and wide quant. differences between varieties are shown. A. G. P.

**Changes in pectic substances and sugars in celery during cold storage.** R. H. White-Stevens (Sci. Agric., 1936, 17, 128—136).—The $H_2O$-sol. pectin content of stored celery remains low until soft-rot becomes active. The sucrose content increases rapidly in the early stages of storage and subsequently declines, with a simultaneous increase in hexose. The latter increases to a max. and, in turn, disappears. The storage life of celery at 0° is 60—100 days. A. G. P.

**Losses of vitamin-*C* during boiling and steaming of carrots.** F. Fenton, D. K. Tressler, S. C. Camp, and C. G. King (Food Res., 1938, 3, 403—408).—Fresh raw carrots (Chantenay) contain 0·044—0·069 mg. of vitamin-*C* per g. Boiled sliced carrots contain only 56% of their original -*C*, 11% being destroyed and the remainder dissolved in the $H_2O$. Steamed carrots retain 86% of their -*C*. E. C. S.

**Losses of vitamin-*C* during commercial freezing, defrosting, and cooking of frosted peas.** F. Fenton and D. K. Tressler (Food Res., 1938, 3, 409—416).—The vitamin-*C* content of peas (Thomas Laxton) was reduced from 0·25 to 0·18 mg. per g. during packaging and marketing in the frosted form. Defrosting at 4·4° or room temp. involved no further loss. Cooked frosted peas retained 56—59% of their -*C*, 36—39% remaining in the cooking-$H_2O$. E. C. S.

**Composition and texture of dried peas. II.** W. B. Adam (Ann. Rept. Fruit Veg. Pres. Res. Stat., Campden, 1936—7, 41—50; cf. B., 1937, 1125).—The texture of harvested peas is scarcely affected by artificial fertilisers, although these alter their mineral composition. Early cutting and rapid drying tend to give peas of firm texture and low swelling properties. E. C. S.

**Preparation of sprouts of different kinds of field beans; possible use for culinary purposes.**

A. M. Capinpin (Philippine Agric., 1938, 27, 96—111).—Analyses of sprouts of mungo bean, cowpea, patani (*Phaseolus lunatus*), tapilan (*P. calcaratus*), soya bean, and the winged bean (*Psophocarpus tetragonolobus*) at various stages of growth are recorded. Their culinary use is indicated. A. G. P.

**Losses of soluble solids in blanching of vegetables.** G. Horner (Ann. Rept. Fruit Veg. Pres. Res. Stat., Campden, 1936—7, 37—40).—The loss in wt. and of sugars and N during the blanching of peas, beans, and carrots is recorded. In each case the loss is less with steam- than with $H_2O$-blanching. E. C. S.

**Mineral content of canned vegetables. II.** G. Horner (Ann. Rept. Fruit Veg. Pres. Res. Stat., Campden, 1936—7, 51—56; cf. B., 1937, 1125).—During blanching of peas, beans, carrots, and potatoes considerable loss of K and some loss of $PO_4'''$ occur, and further losses of all constituents occur when the covering liquid is discarded. E. C. S.

**$p_H$ values of preserved fungi.** W. Friese (Pharm. Zentr., 1938, 79, 617—620; cf. A., 1938, III, 631).—The $p_H$ vals. of 8 kinds of preserved fungi (5·33—6·72) are always $>$ those of the corresponding fresh fungi, and slightly $<$ those of the dried fungi. An exception is the spring edible fungus, the $p_H$ of the preserved being $>$ that of the dried fungus. J. N. A.

**Copper in tomato products.** C. E. Sage and S. G. E. Stevens (Analyst, 1938, 63, 719).—In applying Cockburn and Herd's method (B., 1938, 1224), the substance yielding a yellow or brown colour on the final addition of aq. $NH_3$ may be removed by boiling, immediately prior to dilution and addition of aq. $NH_3$, with 10 ml. of saturated aq. $(NH_4)_2C_2O_4$. E. C. S.

**Tomato purée.** E. L. K. Dagneaux (Chem. Weekblad, 1938, 35, 703—707).—Details are given on 25 samples, mainly of Dutch and Italian origin, as regards taste, presence of moulds, starch, and artificial dyes, $n^{20}$, ash, NaCl, total solids, *d* of solution, invert sugar, total acids [as citric acid (I)], and volatile acids contents. It is concluded that in a satisfactory product, obtained by concentrating tomato pulp with small additions of NaCl, meal, and spices, the dry solids should be $\not<$ 16% (28 and 36% in doubly- and triply-conc. purées), which should contain $>$50% of invert sugar and 7—11% of (I). S. C.

**Cold storage of apples.** M. B. Davis and D. S. Blair (Sci. Agric., 1936, 17, 105—114).—The influence of storage temp. on the severity of losses by fungal attack, physiological breakdown, and shrinkage is examined. Storage at 5° in an atm. containing 7½% of $CO_2$ minimises the appearance of scald. The safe period of storage under these conditions differs with variety. The maintenance of suitable balance of N and P in the nutrition of the trees is an important factor in inducing good keeping quality of fruit. A. G. P.

**Determination of small amounts of nicotine on apples.** W. Ralston (Ind. Eng. Chem. [Anal.], 1938, 10, 533—534).—8—12 apples are shaken during 1 min. with two lots of a mixture of 175 c.c. of $C_2H_4Cl_2$ and 25 c.c. of 1% aq. NaOH, and finally with 40 c.c. of $C_2H_4Cl_2$. The combined wash liquors are extracted with 5 c.c. of conc. HCl and with 25—30 c.c. of 0·5% aq. HCl and the acid extracts conc. by distilling off 50—75 c.c. of $H_2O$. After cooling, 20 c.c. of aq. NaOH (*d* 1·35) are added, and the nicotine (I) is distilled by boiling nearly to dryness followed by steam-distillation until 300 c.c. of distillate are collected in a beaker containing 10 c.c. of conc. HCl. The (I) in the distillate is pptd. in the usual manner, and the ppt. weighed after ignition at 900° during 10 min. The method is accurate to 1 mg. over the range 0—12 mg. of (I) on a 1-kg. sample. F. N. W.

**Storage of oranges with special reference to locality, maturity, respiration, and chemical composition.** S. A. Trout, G. B. Tindale, and F. E. Huelin (Counc. Sci. Ind. Res., Australia, 1938, Pamph. 80, 59 pp.).—"Sweating" (keeping for a short period at $\sim$ 34°) is ineffective in preventing mould infection in oranges inoculated before the treatment, but is effective in controlling infection incurred subsequently. As judged by loss of palatability, sweated fruit has a slightly shorter storage life than unsweated. The temp. coeff. ($Q_{10}$) of respiration of Washington Navel oranges is $\sim$ 4·0 from 2° to 15°, 1·5 from 15° to 25°, and 1·0 from 25° to 32·5°. The effects of maturity at picking on respiration, duration of life, and chemical composition are extensively investigated. Colour bears more relation to the process of senescence than to ripening. Standards for overseas export are discussed. E. C. S.

**Foods of Hunan. I. Composition and vitamin-*C* content of citrus fruits.** T. F. Su and D. Y. Liu. **II. Antiscorbutic activity of the Hunan Kwang Chü.** T. F. Su and T. P. Tu (Chinese Med. J., 1938, 54, 40—44, 44—50).—I. Various species of Hunan oranges contain, on the average, 62·3—73·4% of edible material and 18·2—27·8% of juice, the corresponding vals. for pumeloes being 58·8—62·6% and 17·1—23·2%, respectively. The juices consist of moisture and volatile matter 89·00—89·75, ash 0·33—0·52, total sugar 7·03—8·92, reducing sugar 2·61—5·56, N 0·073—0·125, and protein 0·465—0·780%, and contain 0·091—0·779 mg. of ascorbic acid (I) per c.c.

II. The (I) content of the juice of this orange changes from 0·53 mg. per c.c. in December (harvest period) to 0·45 mg. in April and 0·47 mg. in July, the corresponding vals. for the juice of the Sunkist orange (American) being 0·38, 0·50, and 0·45 mg. per c.c. Biological tests with guinea-pigs yield results in agreement with those of chemical analyses. W. Mc.C.

**Analyses of "Saydi" dates from the oases at Gialo and Gicherra.** S. Copertini (Agric. colon., 1937, 31, 422—423).—The dimensions of fruit and stones and the composition of pulp are reported on six samples. A. W. M.

**Fruit products. XI. Fruit syrup production. (A) Extraction and preservation of fruit juices for syrup-making. (B) Effect of sugar concentration on retention of flavour in syrups. (C) Preservation of syrups by heat and chemical treatments.** V. L. S. Charley. **XII. Constituents of fresh juices from single varieties of**

**soft fruits: suitability of the juices for syrup manufacture.** V. L. S. Charley, R. C. Curtis, and V. E. Sills. **XIII. Commercial production of fruit syrups, 1937. XIV. Production of unfermented apple juice 1934—8.** V. L. S. Charley (Ann. Rept. [1937], Agric. Hort. Res. Sta., Long Ashton, 1938, 170—185, 186—190, 191—194, 195—230; cf. B., 1937, 1126).—XI. Syrup production from strawberry, cherry, raspberry, and loganberry by 4 methods is examined. Enzyme treatment was the most satisfactory for obtaining the juice. High sugar concns. ($>50\%$) are necessary for the retention of flavour by cherry, raspberry, and loganberry syrups. Loss of flavour was more rapid in the strawberry and cherry juices. $SO_2$ was superior to BzOH as a preservative for syrups. Hydroxybenzoic acids (10 p.p.m.) were inefficient. Pasteurisation (74°, 30 min.) prevented fermentation in syrups, but modified their flavour.

XII. Analyses are recorded and discussed.

XIII. Fermentation in soft fruits during transit modifies the flavour of syrups made therefrom. Fermentation of strawberries is prevented by 120 p.p.m. of $SO_2$ and of raspberries by 600 p.p.m.

XIV. Various processing methods are examined and a satisfactory technique is developed. A. G. P.

**Preparation of raspberry juice with filtration enzyme.** Zimmermann and Malsch (Destillateur u. Likörfabr., 1936, **49**, 448—450; Chem. Zentr., 1936, ii, 3734).—The juice may be easily pressed and filtered by adding Filtragol to the unfermented fruit mash. A. H. C.

**Fruit juices and preservatives.** N. Levin and R. Steenhoff (Svenska Bryggarefören. Månadsbl., 1936, **51**, 185—195; Chem. Zentr., 1936, ii, 2251).—The medicinal properties of fruit juices are discussed. The juices usually have a lower vitamin content than fresh fruit. The use of $H_3BO_3$, $o$-OH·$C_6H_4$·$CO_2H$, $PhCO_2H$, and $HCO_2H$ in the customary concns. as preservatives is not harmful. A. J. E. W.

**Preservation of fruits, berries, and vegetables.** G. Lunde (Oslo Hjemmenes Vels Medlemsblad, 1935, **4**, 55—64; Chem. Zentr., 1936, ii, 3606).—Normal processes for fruits and vegetables are described and the vitamin-*C* content of strawberries, cauliflower, etc. is determined. A. H. C.

**Origin of pectin–sugar jellies.** A. Herzer (Kolloid-Z., 1938, **85**, 56—60).—The formation of these jellies requires (1) the presence of invert sugar, the ease of jelly formation increasing with concn. of invert sugar, and (2) an optimum $p_H$ val. E. S. H.

**Canning equipment [in England].** H. D. Gregson (Food Manuf., 1938, **13**, 327—329).—Machinery used in processing fruit, namely, picking trays, washers, plant for syruping, exhausting, and cooking, is described. W. L. D.

**Fruit and vegetable canning [in Canada].** E. J. Thomas (Food Manuf., 1938, **13**, 330—332).—Canning procedure is described. W. L. D.

**Presence of tin in canned fruits and vegetables.** W. B. Adam and G. Horner (Ann. Rept. Fruit Veg. Pres. Res. Stat., Campden, 1936—7, 24—36).—A summary of work already noted (cf. B., 1937, 1402). E. C. S.

**Black coloration and rusting through of tinplate [food] containers.** von Morgenstern (Braunschweig. Kons.-Ztg., 1936, No. 22, 12—13; Chem. Zentr., 1936, ii, 715).—The brown colour of the Sn coating is caused by S compounds in the conserve. In presence of $O_2$, $H_2SO_4$ may be produced and eat through the container. The presence of pores has little influence. The difficulty may be eliminated by rapid handling of the material to be preserved and by vac.-packing. H. J. E.

**Preservation of perishable foodstuffs.** J. O. C. Vick and D. V. Howells (Scot. J. Agric., 1937, **20**, 135—149).—The use of solid $CO_2$ in preserving fruit, flowers, vegetables, meat, and fish is reported. A. W. M.

**Problems in the preserving industry.** S. Schmidt-Njelsen (Kung. Landtbruks-Akad. Handl. Tids., 1936, **74**, 465—478; Chem. Zentr., 1936, ii, 2251).—A lecture. Preserving scarcely affects the vitamin-*A* content of fish, and does not unduly reduce the -*C* content of vegetables and fruit. Cu salts added for colouring purposes may completely destroy -*C* owing to catalytic oxidation. A. J. E. W.

**Composition of Chile bees' and palm honey.** H. Schmidt-Hebbel and E. Toledo A. (Pharm. Zentr., 1938, **79**, 633—636).—From analyses of a no. of representative samples it is proposed that the products should conform to the following requirements: bees' honey: $H_2O \ngtr 20$, free acid $\ngtr 0{\cdot}25$ (as $HCO_2H$), reducing sugar 70—80, sucrose $\ngtr 8$, ash $\ngtr 0{\cdot}5\%$, protein (Lund's test) 0·6—1·0 c.c., insol. residue $\ngtr 1\%$, diastase val. (Gothe) $\nless 8{\cdot}3$; palm honey (conc. sap of *Jubœa spectabilis*): $H_2O \ngtr 38$, ash $\ngtr 0{\cdot}8$, insol. residue $\ngtr 1\%$, $d^{15} \nless 1{\cdot}33$, sucrose/(glucose + fructose) ratio $\nless 4$. E. C. S.

**Lowering of sucrose content of natural honey.** R. F. Kardos (Z. Unters. Lebensm., 1938, **76**, 354—357).—During the first 10—12 days' keeping at 40° the sucrose content falls rapidly, and thereafter more slowly. The effect is due to invertase. The diastase suffers slight inactivation when kept at this temp. E. C. S.

**Sulphate content of honey from conifers.** G. Büttner (Z. Unters. Lebensm., 1938, **76**, 351—353; cf. B., 1936, 346).—All specimens of coniferous honey examined contained $SO_4''$ in amounts varying from 1·3 to 73·5 mg.-% ($H_2SO_4$). Its presence in ordinary honey may be detected not only by the characteristic flavour, but also by Griebel's test (B., 1938, 843). E. C. S.

**Whey solids in candy.** B. H. Webb (J. Dairy Sci., 1938, **21**, 156).—Whey-protein improves body and flavour, and where whipped condensed whey is used the protein is an important factor in foam production. Lactose decreases the sweetness due to sucrose. Sweetened condensed whey can be used as the major constituent of fondants, but may be limited only to coloured products owing to the greenish-yellow tint and its tendency to darken with age. W. L. D.

**Effect of heating or dehydration during manufacture of fish meal on its digestibility.** T. Tomiyama and S. Ishikawa (J. Agric. Chem. Soc. Japan, 1938, **14**, 998—1000).—The digestibility of carp meal is not altered whether the muscle is dried at room temp. or 100°, or whether the muscle is fresh or coagulated at temp. ranging from 70° to 100°.
J. N. A.

***In vitro*** **determination of digestibility of fish meal.** T. Tomiyama and S. Ishikawa (J. Agric. Chem. Soc. Japan, 1938, **14**, 989—997).—1 g. of meal (without previous grinding and defatting) is kept for ½ hr. at room temp. with 20 c.c. of 0·1n-NaOH, and is then incubated at 40° for 24 hr. with 50 c.c. of 0·1n-HCl and 0·8 g. of pepsin in 20 c.c. of 0·1n-HCl. After addition of 10 c.c. of 30% $CCl_3\cdot CO_2H$ and filtration, total N is determined in 25 c.c. of filtrate. Digestibility $= (n - n')4000/N$, where $n$ is the wt. of N in 25 c.c. of filtrate, $n'$ the N in 5 c.c. of pepsin solution, and $N$ the N in 1 g. of fish meal.
J. N. A.

**Fish spoilage. II. Origin of trimethylamine produced during spoilage of cod muscle press-juice.** S. A. Beatty (J. Fish. Res. Bd. Canada, 1938, **4**, 63—68; cf. B., 1937, 613).—The volatile base used by Beatty and Gibbons as a measure of fish spoilage was found to be $\nless 93\%$ $NMe_3$. Even in advanced spoilage of the press-juice, $NMe_3$ was derived almost entirely from its oxide. R. L. N.

**Iodine method for determining starch. III. Determination of farinaceous matter in sausages, meat pastes, and fish pastes.** F. W. Edwards, H. R. Nanji, and W. R. Chanmugam (Analyst, 1938, **63**, 641—645).—A procedure based on the original method (B., 1935, 40) is detailed. For the routine analysis of these products $H_2O$, starch, and fat are determined. The % total solids, fat, starch, ash, and protein of representative samples of pork (some of known composition) and beef sausages, and bloater, wild duck, and chicken and ham pastes are tabulated. E. C. S.

**Stability of vitamin-$B_1$ of vacuum-dried animal tissues during storage.** A. Arnold and C. A. Elvehjem (Food Res., 1938, **3**, 367—372).—Vac.-dried beef kidney had 5·0, spleen 2·0, lung 2·0, and hog brains 1·6 I.U. of vitamin-$B_1$ per g. During storage for 2 years in vac.-packed cans the spleen lost little activity, but the other preps. lost $\ngtr 20\%$.
E. C. S.

**Growth of micro-organisms on ox muscle. III. Influence of 10% carbon dioxide on rates of growth at −1°.** W. J. Scott (J. Counc. Sci. Ind. Res., Australia, 1938, **11**, 266—277; cf. B., 1938, 222).—Growth of *Achromobacter* and *Pseudomonas* was greatly reduced by storage of meat in an atm. containing 10% of $CO_2$. The crit. $H_2O$ content of the muscle for growth of micro-organisms was somewhat higher in presence of 10% of $CO_2$ than in air. A. G. P.

**Effect of precooling and rate of freezing on quality of dressed poultry.** L. Sair and W. H. Cook (Canad. J. Res., 1938, **16**, D, 139—152).—Effects of methods of freezing on bacterial nos., development of visceral taint on thawing, and amount of fluid exuded from the carcases are examined.
A. G. P.

**Serological differentiation of preserved meats.** B. Rosa and V. Mazzaracchio (R. Ist. San. Pubbl., 1938, **1**, 269—298).—Precipitin reactions with meat extracts and sp. sera are given. S. O.

**Mixing in food industry.** W. C. Peck (Food Manuf., 1938, **13**, 337—342, 354).—Paddle, propeller, or helical, turbine or centrifugal, and miscellaneous types of mixing machines are described.
W. L. D.

**Coffee. II. New method of determining trigonelline.** K. H. Slotta and K. Niesser (Ber., 1938, **71**, [*B*], 1987—1990; cf. B., 1938, 1359).—For the determination of trigonelline (I) in fresh and roasted coffee and in coffee beverages the combined liquids from the pptn. of chlorogenic acid as the Pb salt are treated with $H_2S$ and filtered. An aliquot portion of the filtrate is acidified with 2n-$H_2SO_4$ and phosphotungstic acid is added. The cloudy solution is heated just to boiling and slowly cooled, finally in ice. The ppt. is filtered off, washed with 0·5n-$H_2SO_4$, and dissolved in n-NaOH. After addition of 0·05n-I solution, the mixture is kept in the dark for 1 hr., after which it is acidified with 2n-$H_2SO_4$ and the liberated (I) titrated with 0·05n-$Na_2S_2O_3$ in presence of starch. 1 mol. of (I) requires exactly 10 atoms of I. A correction for the amount of (I) phosphotungstate which remains in solution is necessary. H. W.

**Coffee substitute from cottonseed?** H. Trillich (Deut. Lebensmittel-Runds., 1936, 180—181; Chem. Zentr., 1936, ii, 3855).—Cottonseed meal is not suitable as a coffee substitute since an infusion did not resemble coffee in odour or taste and was not free from irritants (gossypol?). A. H. C.

**Utilisation of coffee grounds.** R. Intonti (R. Ist. San. Pubbl., 1938, **1**, 47—52).—20% of fat was extracted from the grounds; the remainder (containing ash 2·35, volatile substances 76%) can be used as fuel (4478 g.-cal./g.). S. O.

**Fermentation process in tea manufacture. I. Rôle of peroxidase.** E. A. H. Roberts and S. N. Sarma (Biochem. J., 1938, **32**, 1819—1828).—Fermentation of the tea leaf will not take place in vac. but starts when $O_2$ is admitted, the optimum $p_H$ being 5—6; it is inhibited by preliminary steaming, by acidification, or by small amounts of KCN. The first stage is an uptake of $O_2$ which results in the oxidation of some unidentified substance and the production of $H_2O_2$. Peroxidase (I) then catalyses the oxidation of tannin by $H_2O_2$, which results in the production of brown pigments which are responsible for the colour of a tea infusion. The determination of (I) in the leaf is described. (I) is inhibited by tannin, although protective substances are also present. P. G. M.

**Cacao and its products.** A. di Baja (Rev. Fac. Cienc. Quím. La Plata, 1936, **11**, 37—42).—A list of the contents of the author's thesis dealing with the technology of cacao. F. R. G.

**Residual fat in solvent-extracted materials [especially cacao products].** H. C. Lockwood

(Analyst, 1938, 63, 705—710). The fat remaining after thorough extraction with hot petroleum is liberated by treatment with hot aq. HCl. The amount of residual fat $\propto$ the particle size of the material. It differs in composition and m.p. from the main bulk of the fat. It is unsatisfactory to apply the HCl treatment to the original material (cf. Fincke, B., 1935, 122). E. C. S.

**Determination of sugar in chocolate.** R. Vivario and A. Fouassin (Bull. off. Office int. Cacao, 1936, 6, 181—202; Chem. Zentr., 1936, ii, 716—717).—Sugar in ordinary chocolate is determined polarimetrically, without hydrolysis, after clarification with $Pb(OAc)_2$. Alternatively the Auerbach–Borries iodometric method is applied, using a hydrolysing agent (0·02$N$-HCl or invertase), and clarifying with $K_4Fe(CN)_6$. Sucrose and lactose in milk chocolate are determined either polarimetrically or iodometrically. H. J. E.

**Lecithin and its applications in chocolate, soap, and cosmetic manufacture.** G. G. Valdivia (Bol. Soc. Quím. Peru, 1938, 4, 103—107).—The cultivation of the soya bean (var. *Amarilla gigante*) in Peru is recommended because of the advantages of the presence of lecithin (I) in fatty products, owing to its stabilisation of oil in $H_2O$ emulsions and prevention of oxidation. It improves the digestibility and manipulation of chocolate, the detergent properties and the stability of the lather of soap, and the tonic properties of cosmetics. The properties are recorded of a commercial sample of vitamin-*F* which is employed in conjunction with (I) and cholesterol in the treatment of dandruff. F. R. G.

**Feeding-tests on bran from rye subjected to whole grain treatment.** G. Frolich and H. Löwe (Z. ges. Getreidew., 1938, 25, 131—133).—Feeding-tests were carried out on bran from rye which had been treated with aq. $Na_2S_2O_5$ to facilitate milling. No considerable difference in digestibility or food val. was found between this and bran from untreated rye. E. A. F.

**Carotene content of market hays and maize silage as determined by a quantitative adsorption procedure.** L. A. Shinn, H. G. Wiseman, E. A. Kane, and C. A. Cary (J. Dairy Sci., 1938, 21, 113—114).—The carotene (I) contents averaged: lucerne hay (good) 43 and (poor) 4·5, timothy hay (good) 2 and (poor) 5·5, maize silage 13·7 p.p.m. The carotenes thus extracted did not give absorption curves corresponding with β-(I). By adsorption of the pigments without colour destruction, two fractions were obtained, one being β-(I) and the other a mixture, the former being isolated in amounts corresponding with that calc. from absorption curves. The true β-(I) contents of the above grasses were 18—40% $<$ the above vals., the non-(I) pigment being greatest in foods of low total carotenoid content. W. L. D.

**Ensilage of partly cured lucerne, the methods used, losses sustained, and feeding value.** J. B. Shepherd and T. E. Woodward (J. Dairy Sci., 1938, 21, 104—105).—Finely-chopped lucerne of 44% $H_2O$ content was ensiled under pressure. The max. temp. reached was 43°. Spoilage at the top amounted to 5·5% of the green material. The average loss throughout the silo was 3·1% of dry matter. The $p_H$ was 4·6—4·8 and the carotene content had decreased from 66 p.p.m. in the green to 48 p.p.m. in the silage. With feeding-trials on cows, 7·6% more dry matter was consumed as silage than as lucerne hay, and silage-fed cows declined 16% in milk yield in 60 days, as against a 25% decrease in the cows fed on hay. W. L. D.

**Methods of making and feeding lucerne–molasses silage.** B. R. Churchill and R. E. Horwood (J. Dairy Sci., 1938, 21, 105—106).—Lucerne silage was made satisfactorily from wet green material with addition of 1·5% of molasses. Some carotene loss occurred, due to presence of $O_2$ in the silage. Feeding-trials proved the palatability of the product, and silage could replace the dry matter of 15—20 lb. of hay daily per head. The $H_2O$ content of silage varied from 40 to 80% and the protein content from 13·6 to 16·9%. W. L. D.

**Method of studying deficiencies of lucerne hay and feeding value of various feeds as supplements to lucerne hay.** C. F. Hoffman (J. Dairy Sci., 1938, 21, 101—102).—The total digestible nutrients of lucerne show a low feeding val. for milk production even when supplemented with cereal grains. Methods of feeding were used in which feeding on lucerne was carried out until there was a sharp fall in milk yield. Part of the lucerne was then replaced by the mixture to be tested. Soya-bean oil and maize oil did not influence milk production, and further evidence that oil was not the deficiency in lucerne was obtained when increased milk yields were obtained by feeding beet pulp and fat-free soya-bean meal. Maize, cottonseed meal, and maize-gluten meal also gave increased milk production. W. L. D.

**Comparative nutritive value of sun-dried pea haulms, artificially-dried pea haulms, and pea-haulm silage.** J. C. Knott, R. E. Hodgson, and E. V. Ellington (J. Dairy Sci., 1938, 21, 104).—A high-quality roughage feed is obtained by preserving pea haulms in the above three ways. W. L. D.

**Losses in preparation of beet leaves [for fodder purposes].** J. Meyer and G. Aumüller [with P. Rieper] (Deuts. Zuckerind., 1938, 63, 463—467).—Using several modifications of a prep. method involving washing, pressing, and disintegration of the beet crowns and leaves, the losses in $SiO_2$-free dry substance, sugar, and raw protein were, respectively, 11·9, 31·0, and 22·1%. These losses are considerably $<$ those hitherto reported, smaller pressure being used; washing loss is $>$ pressing loss. When stored in protected earth silos, the product gave very good foddering results after 5 months. I. A. P.

**Spent-wash drying: [potato] wash-flakes.** B. Lampe (Z. Spiritusind., 1938, 61, 324).—On the laboratory scale, it is possible to mix fresh spent wash (without separation into liquid and residue fractions) (100 pts.) with potato flakes (6 pts.) for drying to wash-flakes with 7% of $H_2O$, and 15% of protein on dry substance. I. A. P.

**Artificial drying of agricultural products.** E. Rammler (Braunkohle, 1938, 37, 677—682).—

The artificial drying of green fodder is discussed from the economic aspect and details of two tests with a Büttner dryer, in which the $H_2O$ contents of lucerne and beet leaves, respectively, were reduced from 72—84% to 5—8% are tabulated. In this plant the material passes once through a preliminary drying stage and is then continuously recirculated in a second stage until the required degree of drying is reached; combustion gases from a furnace burning brown coal form the drying agent. The heat consumption amounted to 800—935 kg.-cal. per kg. of $H_2O$ evaporated. A. B. M.

**Drying green fodder.** K. Adloff (Wärme, 1938, **61**, 627—630).—Drying conditions for fodder in England and Germany are compared. Drying costs are discussed and various types of dryer described. R. B. C.

**Drying and thermal tests with a suspension dryer [for green fodder].** E. Rammler, K. Breitling, J. Gall, von Sybel, Poggensee, W. Klar, and Weise (Feuerungstech., 1938, **26**, 241—253).—A Rema-Rosin gas-circulation dryer for green fodder (lucerne and beet tops) is diagrammatically described. Experimental data including power requirements and drying costs are tabulated. One ton of protein in the fodder is obtained in exchange for 1·95 tons of bituminous or 5·85 tons of brown coal. R. B. C.

**Digestibility and nutritive value of Karroo pasture plants. VI. Groot gansie. VII. Berg gansie.** J. P. Botha (Farming in S. Africa, 1938, **13**, 305—306, 358, 369; cf. B., 1938, 1226).—VI. Analyses and digestibility data are recorded. The digestible protein content of *Pentzia nicana* is only slightly <, and the digestible N-free extract and starch equiv. are considerably >, those of lucerne hay.

VII. *P. sphaerocephala* is deficient in protein but rich in digestible carbohydrates. Feeding-trials with sheep are recorded. A. G. P.

**Sudan grass hay versus clover hay for dairy cows.** C. E. Wylie and S. A. Hinton (J. Dairy Sci., 1938, **21**, 167).—Sudan grass was worth $\frac{5}{6}$ as much as clover hay as a feed for dairy cows. Cows on Sudan hay kept their body wt., were never off feed, and bred and calved normally. W. L. D.

**Preventing Sudan grass poisoning.** F. Boyd, O. S. Aamodt, G. Bohstedt, and E. Truog (J. Dairy Sci., 1938, **21**, 125—126).—Short, dark, green grass, especially aftermath, is too high in HCN content for pasture, but grass >1½ ft. high or short or tall grass of a pale or yellow-green colour is low in HCN content and safe for pasture. A high HCN content is favoured by high available N and low available P in the soil, and vice versa. Drought increases, whilst hay-making has no effect on, HCN content, but tall hay is safe for feeding. Cattle should be fed previous to turning out to grass in order to avoid voracious eating and thus consuming a fatal dose. W. L. D.

**Influence of quality of protein in the concentrate mixture on production of dairy cows fed on mixed hay and maize silage.** G. W. Salisbury and F. B. Morrison (J. Dairy Sci., 1938, **21**, 106—107).—Groups of 9 cows were fed on low-quality protein from cereal meals and high-quality protein mostly from oil meals. Some cows on low-quality protein refused food in the 13th week, but such cows had produced 96% as much milk as other cows in this period. Changing over from low- to high-quality protein improved appetite immediately. About 13 weeks are needed for the nutritive deficiency in the low-protein ration to become apparent. Addition of mixed hay containing some clover in a later experiment caused the low-quality protein group to give 107% as much milk as the other group on high-quality protein. W. L. D.

**Higher-producing cows make larger returns for roughages.** W. T. Crandall (J. Dairy Sci., 1938, **21**, 134—135).—Based on yearly fat and milk yields of groups of cows of different performances, it is calc. that the return obtained for hay on a butter fat-yield basis increases uniformly from zero for a fat yield of 210 lb. to positive returns for higher yields. W. L. D.

**Physico-chemical effects of [feeding] soya beans on fat in cow's milk.** R. W. Barton, W. F. Epple, J. W. Wilbur, and J. H. Hilton (J. Dairy Sci., 1938, **21**, 109—110).—Temporary replacement of 25% of a grain ration with raw soya beans increases the fat content of milk but has no effect on the no. or size-frequency of milk-fat globules. Feeding of soya oil and of raw and roasted beans raised the I val., SCN val., and oleic and linoleic acid contents of the ensuing butter fat. With rise in I val. the Reichert val. decreased. The results indicate that the oil of the beans is mainly responsible. W. L. D.

**Feeding value of dried grass and sprouted maize for dairy cows.** N. L. Tinley and D. M. Bryant (J. South-East. Agric. Coll., Wye, 1938, No. 42, 135—145).—Neither feed significantly affected the milk yield or live wt. of cows. A. G. P.

**Iodine test for toxicity in sorghum.** R. R. Briese and J. F. Couch (Amer. J. Pharm., 1938, **110**, 356—361).—There is no correlation between the quantity of starch and of HCN in sorghum, so that Acharya's procedure (A., 1934, 710), in which the starch-I coloration in sections of the plant is taken as a measure of the HCN content, is valueless in this case. T. F. D.

**Relation of certain succulent roughages to colour and flavour of milk.** H. H. Tucker, O. F. Garrett, and C. B. Bender (J. Dairy Sci., 1938, **21**, 108—109).—A high correlation occurs between high yellow colour and good flavour. Molasses-grass silage is suitable for producing highly coloured milk, and fed with hay gave 8% extra colour over feeding with hay and maize silage and 9% when fed alone. A mixture of silage from maize and carrot tops gave 5·7% more yellow colour in milk than did beet pulp. W. L. D.

**Effect of feeding mangels or dried beet pulp to cows on development of oxidised flavour in milk.** J. C. Hening and A. C. Dahlberg (J. Dairy Sci., 1938, **21**, 345—352).—The feeding of either foodstuff did not prevent or increase the susceptibility of milk of 8 Holstein cows to the development of the taint. W. L. D.

**Effect of level of feeding dairy cows on flavour of milk.** J. C. Hening and A. C. Dahlberg (J. Dairy Sci., 1938, **21**, 109).—Groups of cows were fed, respectively, on the Morrison standard, 10 and 20% below, and 10, 20, and 30% above the standard. Milk from such cows was judged when raw, when pasteurised, and with added Cu. The flavour of the milk and the susceptibility to oxidised flavour were not affected by level of feeding. The occurrence of oxidised flavour was less in summer than in winter, but could not be directly correlated with the feeding of fresh green food. Milk from first calf heifers showed more cases of oxidised flavour than that from older cows. W. L. D.

**Value of dried molasses and yeast for calves.** O. L. Lepard, P. E. Newman, and E. S. Savage (J. Dairy Sci., 1938, **21**, 116—117).—Dried molasses and yeast were used to replace 25 and 50% of dried skim milk in 2 calf rations containing 20 and 10% of dried milk, respectively. Both groups showed superior gains in live wt., and in wt. per lb. of food fed, to those fed the dried-milk ration. The yeast–molasses mixture is hygroscopic and contains 32% of ash, which may raise difficulties when larger amounts are used in a ration. W. L. D.

**Air-dried hay for dairy heifers.** C. E. Wylie, S. A. Hinton, and J. W. Weaver (J. Dairy Sci., 1938, **21**, 102—103).—Hay dried on the field to 35—45% $H_2O$ content is further dried indoors in lofts provided with ducts for air-blowing. There was no significant difference in the feeding val. of hay made as above and that of field-dried hay. W. L. D.

**Influence of certain rations and management practices on rate of growth of Holstein Friesian heifers.** R. G. McCarty and A. C. Ragsdale (J. Dairy Sci., 1938, **21**, 103—104).—At 6 months, heifers fed on milk and lucerne hay were 17% below normal in live wt. and 4% below normal in height. Those on a balanced " rapid growth " ration at that age were 23% and 7% above normal, respectively, and 34% and 6% above normal at 1 year old. When the ration was modified to contain 10% of cereal hay the corresponding data were: 6 months, 20% and 6%; 1 year, 27% and 5%, respectively. W. L. D.

**Mineral supplements for cattle on phosphorus-deficient range.** J. H. Knox and P. E. Neale (New Mexico Agric. Exp. Stat. Bull., 1937, No. 249, 16 pp.).—Mixtures of bone 60, NaCl 40%, or $Ca(H_2PO_4)_2$ 40, NaCl 60%, or $CaHPO_4$ 40, NaCl 60% were equally effective sources of P for cattle feeding on high-Ca, low-P forage. Daily consumption of 0·134 oz. of P was adequate for the requirements of cattle. A. G. P.

**Nutritive value of vetch straw (*Lathyrus sativa*).** V. von Kurelec (Mezög. Kutat., 1938, **11**, 129—132).—Feeding-trials with sheep are recorded. A. G. P.

**Composition of Hungarian cacao products. V. Feeding value of cacao shell, with special reference to its vitamin-*D* content.** E. Becker and L. von T. Kováts (Mezög. Kutat., 1938, **11**, 122—129).—The vitamin-*D* content of sun-dried shell was 26 and of artificially dried material 2 international units. Ultra-violet irradiation of the sun-dried material increased its -*D* content to 36 units. A. G. P.

**Feeding value of extracted tobacco-seed meal.** V. von Kurelec (Mezög. Kutat., 1938, **11**, 168—172).—In feeding-trials with sheep, the meal showed digestible protein 26·0% (crude protein 27·5%) and starch equiv. 37·5. A. G. P.

**Utilisation of wheat and wheat by-products in feeding young chickens. I. Effect of fineness of grinding of wheat. II. Lucerne leaf meal as a vitamin-*A* supplement for ground wheat. III. Ground wheat bran and middlings as sources of antineuritic vitamin-*B*.** W. E. Poley (Poultry Sci., 1938, **17**, 331—334, 334—337, 338—344).—I. Very finely-ground wheat (modulus no. 1·74) comprising 75% of certain rations caused pressure necrosis, malformation of beaks, and retarded development.

II. A basal ration of ground wheat, meat and bone scraps, and dried skim milk requires $\not<$ 3% of lucerne leaf meal to maintain adequate vitamin-*A* supplies.

III. In rations examined, 30% of ground wheat, 20% of bran, or 10% of middlings as sole sources of antineuritic vitamin-*B* were adequate for chicks up to 10—12 weeks. For mature birds 45% of wheat fed with 55% of degerminated yellow maize did not prevent polyneuritis. A. G. P.

**Use of capra meal in duck rations for egg production.** F. M. Fronda and E. Basio (Philippine Agric., 1938, **27**, 173—176).—With increasing proportions of copra meal in the ration egg production steadily diminished, reaching a very low level (3·8% of optimum) when copra formed the sole source of protein. A. G. P.

**Fish meal in rations for growing ducklings.** J. V. Castillo (Philippine Agric., 1938, **27**, 18—30).—Increase in live wt. was max. and mortality min. when rations contained 30% of fish meal (65% of protein). A. G. P.

**Methods and rations for fattening poultry.** H. S. Gutteridge (Sci. Agric., 1937, **17**, 340—358).—*Ad lib* feeding of a fattening mash with skim milk to drink produced smaller gains in wt. than when the mash was mixed with skim milk and given twice daily. Supplementing mash–potato rations with skim milk was disadvantageous. The efficiency of yellow maize–skim milk was > that of ground wheat–skim milk or ground oats and barley (2 : 1)–skim milk. Addition of 10% of meat meal to a ground oats–barley mixture increased the gain in wt. Increases in wt. of dressed poultry are not satisfactory indices of feeding efficiency. Sampling of individual tissues and their analysis afford a better basis of comparison. A. G. P.

**Use of substitutes for Sussex-ground oats in the ration of the laying hen.** J. H. Prentice (J. Min. Agric. N. Ireland, 1937, **5**, 149—159).—Replacement of Sussex-ground by coarsely-ground oats or by bran or maize meal resulted in higher rates of egg production, increased food consumption, and economy of cost. A. G. P.

**Pig feeding. Comparison of wet feeding with unrestricted dry feeding.** R. G. Basket, R. W. Hale, and G. L. Gray (J. Min. Agric. N. Ireland, 1937, **5**, 1—8).—Unrestricted dry feeding produced slightly quicker growth than did restricted wet feeding, but this was mainly due to larger amounts of foodstuffs eaten. Increased wt. per unit food consumed was slightly lower with the dry ration. Grading of carcases was somewhat higher with wet feeding. No significant differences in food economy, growth rate, or carcase grade resulted from replacement of part of the pollard in the ration by an equiv. amount of ground wheat. A. G. P.

**Pig-feeding experiments.** Anon. (J. Dept. Agric. Éire, 1938, **35**, 58—66).—Trials with rations containing separated milk, potatoes, or sugar-beet pulp in partial replacement of constituents of customary rations are recorded. Effects on carcase quality are examined. A. G. P.

**Feeding-trials with pure-bred Chinese pigs.** T. D. Marsh and N. Kanagaratnam (Malay. Agric. J., 1938, **26**, 361—368).—On the same ration Chinese pigs reached slaughter wt. approx. 2 months later than Middle Whites. On a balanced ration the rate of increase in wt. was approx. double that obtained with the native small-holding ration which contained excessive succulent matter and a deficiency of minerals. A. G. P.

**Analysis of the ash constituents of Swedish feeding-stuffs.** S. Odén and T. Wijkström (Kung. Landtbruks-Akad. Handl. Tids., 1936, **74**, 479—537; Chem. Zentr., 1936, ii, 2252).—Determinations of the ash content, total N, and $H_2O$ in a no. of feeding-stuffs, and of Ca, K, Na, Mg, Fe, Mn, P, S, Cl, and Si in the ashes, are recorded. A. J. E. W.

**Erratum** :—On p. 725, col. 2, line 4, *for* **Karras**, and on p. 975, col. 1, line 13, *for* **karoo**, *read* **Karroo**.

**Moisture control [of grain]. Emulsions [in foods].**—See I. **Nutrition and wool growth.**—See V. **Casein–clay slips.**—See VIII. **Examining foodstuff fats. Cold storage in fat industry. Spoilage of fats. Detecting, and determining, rancidity in fats. Detecting tallow in lard. Sharks [for food]. Determining oil content of oil cake etc. Tobacco seeds.**—See XII. **[Protein] plastics.**—See XIII. **Pastures. Kjeldahl determination of N.**—See XVI. **Brewing barley. Total acids in fruit products. EtOH from potatoes.**—See XVIII. **Packing-house waste.**—See XXIII.

See also A., II, 449, **Isolation of cafesterol etc. from unsaponifiables of coffee oil.** 451, **Vitamin-*E*.** 465, **Colorimetric micro-determination of $Ac_2$. Determination of lactic acid.** III, 922, **Determining Cl in milk.** 924—930, **Vitamins.** 954, **Separating amylases in rice.**

## Patents.

**Means for testing dough.** Brabender Ges. m.b.h. (B.P. 483,573, 21.10.36. Ger., 10.2.36).—A cylinder of dough, fixed at each end, is stretched by the passage of a hooked, metal arm through the unsupported centre portion, and the resistance of the cylinder to extension is recorded graphically. The cylinder is formed by passing dough between a motor-driven roller and a cylindrical outer casing, and means are provided for measuring its length while being formed, and again after release, giving a measure of its elasticity. E. B. H.

**Improvement [stabilisation] of shortening.** Industrial Patents Corp. (B.P. 484,477, 31.10.36. U.S., 12.8.36).—0·001—0·05 wt.-% of a monobasic hydroxyaliphatic acid is added to shortening as an antioxidant. The OH must occupy the α- and/or β-position; lactic, glycollic, and gluconic acids are given as examples. E. B. H.

**Manufacture of bread.** H. C. Brinkers (B.P. 484,015, 10.12.36. Holl., 11.12.35).—Bread of improved appearance, flavour, and keeping quality is obtained by adding to the dough 5 wt.-% of a product produced from skim milk by pptg. the casein with HCl, and concentrating the remaining liquid to a paste. E. B. H.

**Manufacture of leavened baked goods.** Standard Brands, Inc. (B.P. 484,616, 21.1.37. U.S., 21.1.36).—Baked products are leavened with a mixture of 0·4—0·8% of 30% $H_2O_2$, 0·25—1% of yeast, and 0·035—0·28% of alkali (*e.g.*, $NaHCO_3$, $Na_2CO_3$, etc.). Complete decomp. of the $H_2O_2$ must occur before the goods are baked. E. B. H.

**Apparatus for drying and cooling, or heating and drying, flaked or cereal or other products.** D. Farrell and J. Healy (B.P. 492,231, 3.12.37).—Treatment is effected on a foraminous conveyor belt and levelling near the feed end by a transverse helical conveyor. B. M. V.

**Manufacture of a frothed, cellular, or sponge-like [food] product of colloidal origin.** T. L. Shepherd, and Shepherd's Industries, Ltd. (B.P. 484,468, 30.7.36).—A thick paste containing cassava flour, wheat flour, a material containing a hydrophilic colloid (*e.g.*, egg-white, cheese, etc.), and $H_2O$ is gelatinised by heating in steam in shallow pans, and the gelatinised material is cut into thin flakes and finally dried to 8—12% $H_2O$ content. The dried flakes are " frothed " by immersion in hot oil at 210—240°, when they swell to several times their original size, and the final product may be sprinkled with NaCl, cheese, etc. E. B. H.

**Preparation of soft curd milk.** Armour & Co. (B.P. 484,453, 5.10.37. U.S., 1.4.37).—Whole milk is treated with 0·0025—0·02% of pancreatic enzyme at 4·5—40·5° for ¼—24 hr., whereby no appreciable protein digestion is caused, and is then pasteurised. E. B. H.

**Manufacture of vegetable milk.** H. W. Miller (B.P. 485,331, 26.4.37).—Soya beans, after soaking for 6—10 hr. in 8 pts. by wt. of $H_2O$ at 15·5—24°, are ground with $H_2O$ in a burr mill and the pulp is boiled and strained or centrifuged. Sugars, vegetable fat, and NaCl are added to produce a balanced milk, which is boiled with agitation for ½—1 hr., homogenised, and either dried or cooled and bottled. E. B. H.

**Concentrated casein solutions having an acid reaction.** E. Schueller (B.P. 485,805, 16.4.37).—Casein is treated with very dil. alkali in amount about 2500 times $<$ that required to produce a sol. caseinate (*e.g.*, 1 kg. with 200 c.c. of 0·01% aq. NaOH). The mass after malaxating and dispersion in $H_2O$ gives a solution having $p_H$ 5. E. B. H.

**Production of albuminous solutions resembling white of egg.** H. Fischer (B.P. 483,430, 4.6.37. Ger., 26.9.36).—A heat-coagulable material, capable of being whipped, is obtained by addition of 0·3% of a $H_2O$-sol. salt of Ca or Mg with a strong acid to a conc. casein solution (*e.g.*, separated milk condensed to ⅓ of its vol.) or conc. extract of defatted soya beans. E. B. H.

**Production of dried potatoes.** W. Koeniger (B.P. 482,997, 5.8.36).—After removal of the skin and eyes, the potatoes are heated in boiling $H_2O$ in order to destroy ferments, washed or sprayed with cold $H_2O$ (the $H_2O$ used in one of these treatments containing NaCl), and dried in a current of hot air at $\ngtr$90°, the temp. being lowered progressively as the $H_2O$ is removed. The juice is expressed from the skins, eyes, etc. and the pressed waste is dried. E. B. H.

**Preparation of precooked leguminous seed products.** W. J. Robinson, L. J. and U. J. Archambeau (B.P. 484,279, 9.10.37).—The shrivelling, discoloration, and cracking of processed beans etc. are prevented by soaking the raw dried beans for 10—12 hr. in cold, softened $H_2O$ and then cooking them in $H_2O$ at 79—93° for 1½—2 hr., up to 1% of caramel being added to the cooking-$H_2O$ as a "conditioning" agent. The cooked beans are dried in vac. at 37—43° and may be stored whole, or ground for use in soups etc. E. B. H.

**Preservation of vegetable products.** G. Pollacci, R. Ciferri, and M. Gallotti (B.P. 483,309, 14.10.36. It., 15.10.35).—Ripening, germination, and deterioration are retarded by storage of vegetable products alternately in atm. of $N_2$ and of air cooled to 10°. E. B. H.

**Preparation of food products from papaya fruit.** T. A. de Neve (B.P. 482,846, 21.4.37).—Over-ripening of papaya is prevented, the natural flavour and colour are destroyed, and the flesh is rendered suitable for use as a basis for food products (jams, jellies, candied fruit, etc.) by treatment of the peeled ripe fruit with a Ca-containing liquid (*e.g.*, lime-water), the fruit then being rinsed with $H_2O$ and treated with a solution of sugar, colour, and flavouring. E. B. H.

**[Preparation of] foodstuffs [containing yeast and fruits].** C. Weizmann (B.P. 483,587, 28.10.36).—Fruits rich in sugar (dates, raisins, bananas, etc.) are plasmolysed by addition of ∼50 wt.-% of pressed yeast under anaërobic conditions. Liquefaction takes place and after 1 hr. the skins etc. are screened off. The product is heated gradually up to 90° during 6 hr. with stirring to remove the yeast flavour. The material is used in cakes, confectionery, etc. E. B. H.

**Manufacture of sausages and sausage-filling composition.** H. E. Allen and A. G. McCaleb (B.P. 483,925, 4.11.36).—Addition of 0·25—1% of agar-agar to processed sausages (frankfurters etc.) during the chopping stage retards the loss of $H_2O$ during subsequent smoking and cooking, and yields an unwrinkled, plump, and firm product. E. B. H.

**Treatment of fresh whale-meat and similar foodstuffs containing fish oil.** D. Hildisch (B.P. 486,032, 28.11.36. Ger., 29.11.35. Addn. to B.P. 446,065; B., 1936, 619).—Addition of 10% of an emulsified animal or vegetable oil or egg yolk to the glycerin solution enhances its preservative action on whale flesh. E. B. H.

**Treatment of liquid or semi-solid foodstuffs for preserving them.** H. E. Potts. From A. Tietz and F. Unterberg (B.P. 484,195, 1.9.36).—Dairy products, meat broth and pastes, oil emulsions, etc. are freed from dissolved gases, enclosed and kept in an atm. of $O_2$ at 8—12 atm., heated to 50—80° for some hr., and then cooled. E. B. H.

**Refrigeration of victuals.** Ges. f. Patentverwertung m.b.H. (B.P. 491,060, 18.3.38. Ger., 19.3.37).—The food is conveyed between a pair of bands mostly vertically arranged, and the remote sides of the faces of the bands are sprayed with cold brine. B. M. V.

**Manufacture of cocoa and chocolate compounds.** J. E. Pollak. From Internat. Patents Development Co. (B.P. 483,523, 1.3.37).—A powdered cocoa product is prepared by heating together cocoa powder, sugar (cerelose), and lecithin, and by pulverising the mixture when cryst. with (1% of) $Ca_3(PO_4)_2$, added to prevent caking. E. B. H.

**Fodder and sugar-denaturing agent.** B. Robicek (B.P. 484,258, 19.6.37).—By hydrolysing hardened casein substances (galalith, erinoid, etc.) a product suitable as fodder and for sugar-denaturing purposes is obtained. E. B. H.

**Vitamin compositions.**—See XII. **Treating distillery slop.**—See XVIII. **Vitamin-*D*.**—See XX.

## XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

**Discoloration of aromatic spirit of ammonia.** C. C. Reed, P. L. Burrin, and F. E. Bibbins (J. Amer. Pharm. Assoc., 1938, 27, 783—785).—Discoloration is decreased by substituting an equiv. amount of terpeneless, in place of normal, lemon oil and using the distillation method of prep. F. O. H.

**Aromatic waters. Their bacteriology and the modifications they undergo in presence of micro-organisms.** J. G. Marchal (Bull. Sci. Pharmacol., 1938, 40, 59—65, 123—132).—Slow passage through a Chamberland filter L3 at low pressure and aseptic collection in vessels of resistant glass previously sterilised appears to have a favourable influence on the preservation of distilled aromatic waters. After a year the $p_H$ vals. of waters thus treated are $>$ those of waters preserved without special precautions or intentionally contaminated after filtration. The

fluorescence of orange-flower water thus treated is more permanent. This water contaminated with bacteria and fungi loses its fluorescence when preserved more rapidly than that contaminated solely with bacteria. The $MnO_4'$ index of waters preserved without special care is diminished after a year, whereas that of waters preserved aseptically is increased. The nature of the contamination influences the amount of $MnO_4'$ fixed. The I index diminishes with time.
H. W.

**Galenical preparations. IV. Orange-flower water.** L. Rosenthaler (Pharm. Acta Helv., 1936, **11**, 111—114; Chem. Zentr., 1936, ii, 3147; cf. B., 1936, 252).—Examination according to the Swiss and U.S. Pharmacopœias is insufficient. The determination of (*a*) free acid, (*b*) esters, and (*c*) Br addition is recommended. Alkaline, coloured, or synthetic products from Me anthranilate are of less val.
A. H. C.

**Cerimetric determination of ferrum oxalicum oxydulatum.** L. Szebellédy and S. Tanay (Pharm. Zentr., 1938, **79**, 683—686).—$FeC_2O_4$ can be accurately determined by titration with 0·1N-$Ce(SO_4)_2$, using Mn as catalyst. The Mn also acts as indicator (cf. A., 1938, II, 343).
E. H. S.

**Analysis of official lead acetates. Volumetric determination of lead and acetic acid in neutral and basic lead acetates.** M. François and (Mlle.) L. Seguin (J. Pharm. Chim., 1938, [viii], **28**, 193—199).—Pb is determined by titrating with $H_2SO_4$ to acidity towards gentian-violet; the indicator is destroyed by $CaOCl_2$ (prepared from $CaCO_3$), and the AcOH is then titrated by NaOH, using phenolphthalein.
R. S. C.

**Determination of inositol in medicinal calcium and magnesium inositol phosphate preparations.** (Mlle.) M. C. Bailly (J. Pharm. Chim., 1938, [viii], **28**, 199—208).—To distinguish them from salts of $(H_2PO_4\cdot CH_2)_2O$, inositol in these products should be determined by hydrolysis and subsequent titration with $HIO_4$. (Cf. Stainier *et al.*, B., 1936, 762.)
R. S. C.

**Genuine cardiac glucosides.** A. Stoll (J. Amer. Pharm. Assoc., 1938, **27**, 761—773).—A discussion of attempts to isolate the active principles of drugs in their initial, natural state, exemplified by the cardiac glucosides.
F. O. H.

**Detection of constituents extractable with ether (ether extract) in slices of dried *Derris* root.** A. Diakonoff and C. M. L. Smulders (Pharm. Weekblad, 1938, **75**, 1097—1107; cf. B., 1937, 979).—From a microscopical examination of 25 samples of *Derris* and 2 samples of *Lonchocarpus* roots it is concluded that there is direct proportionality between the $Et_2O$ extract content and the intensity of the colour reaction with $HNO_3$ and $NH_3$, the quantity of milky substance extracted by $H_2O$, and the surface of the fibres in a transverse section which become clear in Venetian turpentine, and an inverse relation to the starch content as measured by the KI–I reaction. None of the above reactions is directly ∝ the rotenone (I) content. Simple microscopical examination will not differentiate *D. elliptica* with a high (I) content from *D. malaccensis* with a high $Et_2O$ extract content. The *Lonchocarpus* root samples gave only weak reactions although they contained a high $Et_2O$ extract content.
S. C.

**Chemical evaluation of pyrethrum flowers (*Chrysanthemum cinerariæfolium*).** J. T. Martin (J. Agric. Sci., 1938, **28**, 456—471).—Five established methods for determining pyrethrin are compared. Discrepancies between vals. for pyrethrins I and II were notably > those for total pyrethrin content.
A. G. P.

**Premature fermentation of tobacco.** T. Andreadis (Mitt. Inst. Tabakforsch., 1936, No. 5, 22 pp.; Chem. Zentr., 1936, ii, 3855).—Greek cigarette tobacco was treated (*a*) at 20—35° for 45 days, (*b*) at 45°, and (*c*) according to ordinary practice. The quality of intermediate and inferior grades is improved by the rapid process (*b*), whilst finer grades are best treated under milder conditions.
A. H. C.

**Codex 1937. Volatility of ephedrine and ψ-ephedrine.** R. Monnet and P. Durand (J. Pharm. Chim., 1938, [viii], **28**, 145—151).—0·4 g. of ephedrine (I) or ψ-ephedrine (II) is completely volatilised at 100°, (I) more rapidly than (II), with considerable decomp. (methylamine). The loss is 10% in 10 min. Mixtures of (I) and (II) volatilise at first more rapidly and then less rapidly than does (I). At 60° both volatilise, but much more slowly than at 100°. At 30° the loss is small, and in vac. at room temp. is about 8—10% in 12 days. The procedure recommended in the Codex for determining the drugs should be amended so that drying is carried out over $CaCl_2$ and not at 100°.
J. L. D.

**Semen strychni.** E. le Coultre and P. van der Wielen (Pharm. Weekblad, 1938, **75**, 1329—1332).—The size of nux vomica seeds is not important. When graded the smallest (1·22—1·53 cm.) show the highest fat (6·66%), alkaloid (2·55—2·60%), and strychnine (I) (1·03—1·07%) contents. The alkaloid content [2·5% with 1·15—1·25% of (I)] given in most pharmacopœias is too high, the (I) content being usually ≯1%.
S. C.

**Indian hemp. [Hashish.]** J. Bouquet (Bull. Sci. Pharmacol., 1938, **40**, 107—122, 161—173).—The technique of Beam's alkaline reaction is somewhat modified and for the acid reaction the use of EtOH–$H_2SO_4$ in place of EtOH saturated with HCl (cf. B., 1936, 1127) is recommended. In a third process the sample is pulverised and the triturate of the powder with KOH or NaOH is treated with EtOH. The mixture is filtered and a portion of the filtrate diluted with $H_2O$ and shaken with $C_5H_{11}\cdot OH$ (I). In presence of *Cannabis* the latter acquires a more or less intense violet colour which persists for several days. The alkaline reaction allows the detection of the resin of Indian hemp in nearly every case if the technique is slightly modified according to the nature of the product under examination. The acid reaction is useful in many cases as a control. The (I) reaction is as simple as and more sensitive than Beam's processes. The process of extracting the crude resin is described. The use of animal charcoal appears

to improve Beam's reactions and has only a slight effect on the determination of crude resin in *C. indica*. Evaluation of *Cannabis* by experiments on dogs, rats, or guinea-pigs appears illusory. A possible colorimetric method is indicated. Questions of judicial procedure and of nomenclature are discussed.
H. W.

**Thalleioquin and erythroquin reaction.** L. Rosenthaler (Sci. pharm., 1936, 7, 59; Chem. Zentr., 1936, ii, 3333).—The tests are best carried out by removing excess of Br by dropwise addition of 0·1N-$NH_4CNS$ before adding $NH_3$. The coloured products may be extracted with $CHCl_3$ and transferred to AcOH. Quinine sulphate in concn. 1 : $10^5$ may be thus detected. A. H. C.

**Determination of heroin in mixtures of heroin hydrochloride and procaine.** C. M. Milos (Amer. J. Pharm., 1938, **110**, 362—364).—A method of determining heroin (I) is described, based on the fact that the morphine (II) resulting from the acid hydrolysis of (I) is extracted from an ammoniacal solution by $CHCl_3$ containing 10% of EtOH and is sol. in lime-water, whereas the hydrolysis of procaine produces $p$-$NH_2{\cdot}C_6H_4{\cdot}CO_2H$ and $NEt_2{\cdot}C_2H_4{\cdot}OH$, the former being insol. in $CHCl_3$ containing 10% EtOH and the latter being insol. in lime-water. The (II) is then dissolved in acid and back-titrated with alkali. Lactose, sucrose, and quinine do not interfere. The (II) can be isolated and thus serves as an added confirmatory test for (I). T. F. D.

**Evaluation of tinctures containing alkaloids. I, II.** A. Kuhn and G. Schäfer (Apoth.-Ztg., 1938, **53**, 968—970, 1006—1008).—Methods for determination of alkaloids in tinctures of *Calabar*, *Granatum*, *Lobelia infl.*, *Conium maculatum*, and *Cytisus lab.* are described. Errors caused by occlusion of $CHCl_3$ solutions of alkaloids by gum tragacanth and by incomplete removal of $NH_3$ from $Et_2O$ extracts of alkaloid mixtures are noted and eliminated.
E. H. S.

**Chemical differentiation of carijo and barbacuá maté.** A. Jacobacci (Ind. y Quím., 1938, **2**, 106—107).—The steam-distillation of maté dried by the primitive carijo method, importation of which is prohibited in Argentina, has a high ultra-violet fluorescence and contains phenols which give azo dyes and a positive Millon reaction. Some permitted samples of maté also give these reactions and the method is not recommended. F. R. G.

**Arbutin plants. I. Comparative pharmacological and chemical examinations of *Arctostaphylos Uva ursi* and *Bergenia* varieties.** O. Moritz (Apoth.-Ztg., 1938, **53**, 653—657).—Determinations of arbutin and tannin in numerous varieties of the two plants before and after drying indicate that the leaves of many varieties of *Bergenia* are efficient substitutes for those of *Arctostaphylos*. The physiological basis for the loss of arbutin under varying conditions of drying is discussed. E. H. S.

**Ionone and irone.** N. Sabbatini (Riv. ital. Essenze Prof., 1936, **18**, 135—137, 187—190; Chem. Zentr., 1936, ii, 3484).—Properties of the two ionones, their separation and use, with methylionone, in perfumery, the prep. of irone from the oil of the iris, and its conversion into irene, dehydroirene, dehydroirenehydroxylactone, iregenone-di- and -tricarboxylic acids, are described. A. H. C.

**Rectification of peppermint oil.** B. Lifschitz (Maslob. Shir. Delo, 1938, No. 4, 28—29).—Steam is passed at atm. pressure into the crude oil, the first 5—10% of the distillate is rejected, and distillation continued until 10—15% of tarry residue remains. The main distillate contains $\nless$70% of menthol, and may be marketed without further treatment. The fore-runnings and residues are mixed, and the mixtures further rectified as above. R. T.

**Essential oils of *Eucalyptus australiana* (Baker & Smith) and its physiological forms. II.** A. R. Penfold and F. R. Morrison (J. Proc. Roy. Soc. New South Wales, 1938, **71**, 357—361; cf. B., 1936, 429).—Seven samples of oil distilled from the foliage of *E. australiana* (yield 0·4—1·6%) collected in different districts in Victoria had $d_{15}^{15}$ 0·8713—0·9167, $\alpha_D^{20}$ +5·2° to −68·5°, $n_D^{20}$ 1·4653—1·4830, cineole nil to 50%, piperitone nil to 52%, phellandrene nil to abundance, thus indicating a no. of varieties giving oils different in chemical composition from the oil from *E. australiana* growing in New South Wales. Simplification in nomenclature is suggested by correlating all species of *E. australiana* and its varieties with *E. amygdalina* of Tasmania. At Lilydale and Healesville the oil from one tree contained 32—36% of piperitone, whilst from an adjoining tree in each locality this was replaced by piperitol when the yield of oil was doubled. T. F. W.

**Chemistry of Australian sandalwood oil.** A. R. Penfold (Australasian J. Pharm., Reprint, 1937, 154).—In 1928 this oil contained 94—95% of sesquiterpene alcohols ($C_{15}H_{24}O$) of which actual santalol (I) was $\ngtr$45%, but manufacturers' improvements have now increased the (I) content to 60—65%. The structure of the other primary and *sec.* alcohols is being investigated (cf. A., 1937, II, 26). A recent sample of the oil had $d_{15}^{15}$ 0·9789, $\alpha$ −4·2°, $n^{20}$ 1·5074, ester val. 13·4 (after acetylation 208·3), alcohols 96·8% [as (I)], and was sol. in 3 vols. of 70% EtOH.
T. F. W.

**Essential oil of Japanese *oranda-hakka* (crape mint). II. Carvone.** T. Nagasawa (J. Soc. Chem. Ind. Japan, 1938, **41**, 252B).—Reduction of *l*-carvone (derived from the oil) with Pt–$H_2$, Na–EtOH, Zn–KOH, and $Al(OPr^{\beta})_3$ yields *cis*- and *trans*-carvomenthones, and *l*-, *l*-neo-, *l*-*iso*, and *l*-neo*iso*-carvomenthols. The vals. of $[\alpha]_D$ are 10·5°, 43·9°, −26·5°, 41·3°, 20·2°, and −33·0°, respectively.
J. D. R.

**Essential oil of *Fagara Lemaerei*, de Wildeman.** M. Denis (Congr. Chim. ind. Bruxelles, 1935, **15**, I, 162—165; Chem. Zentr., 1936, ii, 3373).—Steam-distillation of the fruits gives 2·29% of a yellow oil ($d^{20}$ 0·8956, $n_D^{20}$ 1·4760, $\alpha_D$ +14° 23′, b.p. up to 190°, acid val. 2·01, sap. val. 82·65, ester val. 80·64, sol. in 6 vols. of 90% EtOH) of bitter taste and lemon odour, containing citral and citronellal (removal of which leaves an oil fluorescing blue-violet), esters, and alcohols. A. H. C.

***Ocimum canum* oil of North India.** J. N. RAKSHIT (Perf. & Essent. Oil Rec., 1938, **29**, 402).—Steam-distillation of the leaves, soft twigs, and flowering tops of *O. canum* growing wild in N. India yielded a pale yellow oil (0·38%) having $d_{20}^{20}$ 0·89142, $n_D^{20}$ 1·4842, $\alpha_D^{20}$ —2·66°, acid val. 3·4, ester val. 9·4, Me no. 2·0, phenols 1·2%, and aldehydes 60%. It contained citral 49·6, citronellal 15·7, *l*-linalool 15, and Me cinnamate 5·4%, with small quantities of AcOH and citronellic acid, eugenol, and unidentified phenols and terpenes. T. F. W.

**Application of the Raman effect to analysis of essential oils.** L. M. LABAUNE (Rev. Marques Parfum. Savonn., 1936, **14**, 145—146; Chem. Zentr., 1936, ii, 2810).—The identification of oils and study of their constitution (*e.g.*, the distinction between isomerides) with the use of Raman frequencies is suggested. A. H. C.

**Maleic anhydride as colour reagent in the chemistry of essential oils.** W. SANDERMANN (Seifens.-Ztg., 1938, **65**, 553—554).—Many pure compounds such as are found in ethereal oils, and the latter themselves, have been tested by treating a few drops with 1 c.c. of a saturated solution of $(:CH\cdot CO)_2O$ in $COMe_2$. All aliphatic and hydroaromatic compounds containing conjugated linkings gave a yellow colour (positive reaction), although conditions were too mild for an adduct to be formed. Abietic acid and commercial terpinolene (probably on account of α-terpinene present) give positive reactions, but pyroabietic acid gives a negative result, confirming Ruzicka's opinion that conjugation is absent. Most, though not all, phenolic compounds and aromatic amines gave a positive reaction, the intensity of which is a useful rapid test in the examination of essential oils. E. L.

**Antiseptic and bactericidal power of essential oils.** H. KLIEWE and C. K. HUTHMACHER (Apoth.-Ztg., 1938, **53**, 952—955).—Many oils had a strong bactericidal action (on staphylococci and typhus bacilli), but only 5 of a total of 38 had any marked antiseptic action. The bactericidal power was stronger under aërobic conditions and mixtures of oils were weaker than the single constituents. Decoctions of oil-bearing drugs were less powerful than infusions and the latter had little antiseptic action. E. H. S.

**Acetals in perfumery.** C. FUCHS (Fette u. Seifen, 1938, **45**, 511—513).—A no. of acetals of interest to the soap-perfumer, since they resemble the corresponding aldehydes in odour, but are stable to soap and alkalis, are enumerated and briefly described. E. L.

**Moisture control [of tobacco]. Emulsions [in pharmacy etc.].**—See I. **Halibut- and shark-liver oils.**—See XII. **Solubility of "lyophile" gelatins.**—See XV. **Tobacco. Analysis of *Derris* and *Lonchocarpus* roots.**—See XVI. **Catalase in extractum secalis cornuti.**—See XVIII.

See also A., II, 439, **Sulphanilamide derivatives.** 441, **Carboxylic esters of chaulmoogryl and hydnocarpyl alcohols.** 446, **Keto-phenols from Australian essential oils.** 450—1, **Lower homologues of α-tocopherol.** 452, **Prep. of flavones.** 458, **Prep. of 2 : 8-diaminoacridine. Acridine compounds related to the 5-aminoacridine therapeutics.** 459, **Prep. of triphenylmethylbarbituric acids.** 463, **Alkaloids.** 464, **Determining S in org. substances.** 465, **Detecting $CHCl_3$ in medicinals. Determination of alcohols in pharmaceuticals.** 466, **Determination of alkaloids.** III, 908, **Activation of female sex hormones.** 924—930, **Vitamins.**

## PATENTS.

**Manufacture of sulphonic acid amide compounds.** A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 491,925, 9.3.37).—4-Amino-3-alkoxy-(or -aralkoxy-)6-alkyl benzenesulphonamides, which may be wholly or partly substituted in the $\cdot SO_2\cdot NH_2$ group, are obtained by saponification of the corresponding 4-NHAc-compounds, by reduction of the corresponding 4-azo compounds, or by the action of $NH_3$ on the corresponding 4-halogeno-compounds. The manufacture of 4-amino-3-methoxy-6-methylbenzenesulphonamide is claimed, although any steps which form part of the process of B.P. 474,423 (B., 1938, 104) are disclaimed. The products are valuable in the treatment of ascarides infections of warm-blooded individuals. R. G.

**Preparation of hexamethylenetetramine salt of hexylresorcinolsulphonic acid.** H. LEGERLOTZ (B.P. 492,914, 9.4.37. Austr., 9.4.36).—Hexylresorcinol (I) is treated with $H_2SO_4$, excess of the latter is removed as $BaSO_4$, unchanged (I) is extracted with $Et_2O$, and the sulphonic acid of (I) is exactly neutralised with $(CH_2)_6N_4$; or hexoylresorcinol may be sulphonated and the product reduced before neutralisation. The salt so obtained has a much greater antiseptic action than (I) and has sp. therapeutic action in the case of paradentose and its auxiliary phenomena, gingivitides and stomatides. R. G.

**Manufacture of vermicidal compounds.** W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 493,465, 9.4.37).—The diethylcarbamates of resorcinol monoalkyl ethers are vermicides having action against ascarides and/or bothriocephalus. The vermicides are made (*a*) by interaction of $m$-$C_6H_4(OH)_2$ (I) with $COCl_2$ followed by treatment with $NHEt_2$; (*b*) from (I) and $ClCO\cdot NEt_2$ (II); (*c*) by alkylation of $m$-$OH\cdot C_6H_4\cdot O\cdot CO\cdot NEt_2$. Among examples, $m$-$OH\cdot C_6H_4\cdot OMe$ (26) and $C_5H_5N$ (18) are dissolved in PhMe (67) and treated while cooling with a 25% solution of $COCl_2$ in PhMe (200); after 2—3 hr. the solution is shaken with dil. HCl at 0°, washed, dried, treated with $NHEt_2$ (80) dissolved in $Et_2O$ (30), washed, and the solvents removed, leaving *resorcinol $Me_1$ ether diethylcarbamate* (III), an oil, b.p. 138—140°/2 mm. Further, (I) and (II) afford *resorcinol monodiethylcarbamate*, b.p. 177—179°/2 mm., m.p. 64—66°, converted into (III) by $Me_2SO_4$. Similarly there are obtained the *diethylcarbamates* of resorcinol $Et_1$, b.p.

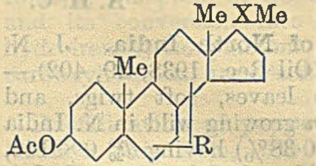
151°/3 mm., and $Bu_1$ ether, b.p. 155°/2 mm., and of 2-ethoxy-*p*-cresol, b.p. 152°/2 mm. [from (II) and 2-*ethoxy*-p-*cresol*, b.p. 119°/4 mm., m.p. 71—72°].

K. H. S.

**Separation of the antirachitically acting components of irradiated 7-dehydrocholesterol.** K., L., W., and F. MERCK (E. MERCK) (B.P. 491,653, 6.3.37. Ger., 6.3.36).—Irradiated 7-dehydrocholesterol (I) is esterified, the esters are separated, and the desired fraction is purified by chromatographic absorption. A preliminary purification may be effected by treatment in the cold with maleic anhydride or a homologue and removal of difficultly sol. additive compounds. *E.g.*, irradiated (I) is treated with citraconic anhydride in $C_6H_6$ (10 days at room temp.), the product is evaporated to dryness in a vac. and hydrolysed with KOH in MeOH at 50°, and pptd. cryst. solids are filtered off and washed with MeOH; the combined MeOH filtrates are diluted with $H_2O$, extracted with light petroleum (II), and the extracts washed with $H_2O$, dried, and evaporated. The residue is converted into 4 : 6-dinitro-*p*-toluates, which are dissolved in boiling $COMe_2$; on cooling the 4 : 6-*dinitro*-p-*toluate* of (I), m.p. 201°, separates, and the sol. fraction is submitted [in (II)] to chromatographic analysis, giving a highly antirachitic 4 : 6-*dinitro*-p-*toluate* of vitamin-$D_3$. The 3 : 5-*dinitrobenzoate*, m.p. 135—136°, $[\alpha]_D$ +97°, and *allophanate*, $C_{28}H_{46}O_3N_2$, m.p. 173—174°, of vitamin-$D_3$ are similarly prepared. H. A. P.

**Manufacture of medicaments [local anæsthetics].** CHEM. WERKE VORM. H. & E. ALBERT (B.P. 491,951, 7.12.36. Ger., 7.12.35 and 20.3., 9.6., and 5.11.36).—Aryl aminoalkyl ketones, $NR_2\cdot CR_2\cdot COX$ (I), in which R is H or alkyl and X is aryl, are treated with Mg aryl halides (II) (2 mols.); (I) may be formed *in situ* from arylaminoalkylamides (X is $NH_2$ or substituted $NH_2$) and (II) (1 mol.). *E.g.*, $NMe_2\cdot CH_2\cdot COPh$ [from $NMe_2\cdot CH_2\cdot CO\cdot NMe_2$ and MgPhBr in $Et_2O$] gives with MgPhBr in $Et_2O$ *diphenyldimethylaminomethylcarbinol*, m.p. 55° [*hydrochloride*, m.p. 230—232° (decomp.)]; with Mg 2-*p*-xylyl bromide (III) *phenyl*-2-p-*xylyldimethylaminomethylcarbinol* is formed. 2-*p*-Xylyl dimethylaminomethyl ketone and (III) give *di*-p-*xylyldimethylaminomethylcarbinol*. The compounds are claimed to have effects subsidiary to their local anæsthetic action, *e.g.*, pressor effects. H. A. P.

**Manufacture of (A) *cyclo*pentanopolyhydrophenanthrene ketones, (B) derivatives of *cyclo*pentanopolyhydrophenanthrene, (C) ketones of the sterol series, (D) carboxylic acids of the hydroaromatic series.** (A, B) W. W. GROVES. From I. G. FARBENIND. A.-G. (C, D) I. G. FARBENIND. A.-G. (B.P. 491,798—9, 492,729, and 493,055, [A, B] 8.3.37, [C] 24.3.37, [D] 30.3.37. Ger., [C, D] 28.3.36).—(A) *cyclo*Pentanopolyhydrophenanthrene-17-carboxyl chlorides are treated with Zn, Cd, or Mg alkyl compounds, or the corresponding disubstituted amides or nitriles are treated with Mg alkyl halides. *E.g.*, 3-acetoxyætiocholeno-17-nitrile with MgMeI in $Et_2O$ gives 3-*acetoxypregnen*-20-*one*, m.p. 146—147°, which is similarly obtained using 3-acetoxycholenyl-17-carboxyl-diethylamide or chloride (I), or from (I) and CdMeBr or $ZnMe_2$. (B) A compound of the general formula annexed in which R is acyloxy and X is CO, C:NH, ·C·OH, or ·C·$NH_2$ is partly hydrolysed (at 3), oxidised to the 3-ketone, which is then halogenated, and H halide removed from the product. *E.g.*, 3 : 12-*diacetoxypregnan*-20-*one* ($Ac_2O$–$C_5H_5N$) is hydrolysed (NaOH in aq. MeOH) to 3-*hydroxy*-12-*acetoxypregnanone*, m.p. 203°, which with $CrO_3$–AcOH gives 12-*acetoxypregnane*-3 : 20-*dione*, m.p. 132·5°; the 4-*Br*-derivative, m.p. 170° (decomp.), of this (Br–HBr–AcOH) gives with anhyd. $C_5H_5N$ at the b.p. the *Ac* derivative, m.p. 181°, of 12-*hydroxyprogesterone*, m.p. 195°. (C) 3-Acyloxy-17-carboxylic acids of the cholane series are subjected to the Curtius reaction, the acyl group is removed by hydrolysis, the product is oxidised to the 3-ketone after protection of the double linking, and the $NH_2$ is converted into OH. *E.g.*, 3-acetoxyætiocholenyl-17-carboxylic acid is converted through the acid azide and carbimide into 17-*amino*-3-*acetoxyætiocholane* (*hydrochloride*, decomp. 300°), which is dibrominated, oxidised ($CrO_3$–AcOH), and debrominated (Zn), and the product converted into testosterone, m.p. 154—155°, by $HNO_2$ in aq. EtOH. (D) The ketones of the sterol series are oxidised with a hypohalogenous acid (I and alkali), optionally after protection of the double linking in the case of unsaturated compounds. *E.g.*, $\Delta^5$-3-acetoxypregnenone is converted by I and NaOH in EtOH at room temp. into the 17-*carboxylic acid*, m.p. 201—202°; 3-acetoxypregnanone, similarly, gives 3-*acetoxyætiocholane*-17-*carboxylic acid*, decomp. 200—220°. H. A. P.



**Manufacture of αβ-unsaturated ketones of the *cyclo*pentanopolyhydrophenanthrene series.** SCHERING–KAHLBAUM A.-G. (B.P. 492,725, 25.3.37. Ger., 31.3.36).—βγ-Unsaturated ketones having CO at 3, and CO, CH·OH, CR·OH (or hydrolysable derivatives), or CHR (R is a substituted or unsubstituted hydrocarbon residue) at 17, are converted by standard means into the corresponding αβ-isomerides, which, in general, have greater physiological activity. *E.g.*, $\Delta^5$-cholesten-3-one is converted by acids, *e.g.*, $H_2SO_4$, HCl, HBr, or alkalis, *e.g.*, NaOH in MeOH or EtOH, or by reduction of its $Br_2$-derivative, m.p. 80°, with Zn, into $\Delta^4$-*cholesten*-3-*one*, m.p. 80°, $\Delta^5$-pregnene-3 : 20-dione is converted by heat or by $H_2SO_4$ in aq. EtOH into the $\Delta^4$-compound (progesterone), 3-acetoxy-$\Delta^5$-androsten-17-one gives with HCl in cold MeOH testosterone acetate, and 17-*ethyl*-$\Delta^4$-*androsten*-17-*ol*-3-*one*, m.p. 139° [*semicarbazone*, m.p. 230° (decomp.)], is prepared by heating the $\Delta^5$-compound with $H_2SO_4$ in EtOH. H. A. P.

**Manufacture of compounds [conjugated ketones] of the androstane and pregnane series.** A. G. BLOXAM. From SOC. CHEM. IND. IN BASLE (B.P. 492,377, 18.2.37).—$\Delta^{4:6}$-Doubly unsaturated 3-ketones of the androstane and pregnane series are prepared by removal of H halide from 6-halogeno-$\Delta^4$-unsaturated or 5 : 6-dihalogeno-saturated 3-keto-compounds. *E.g.*, 6-bromo-$\Delta^4$-androstene-3 : 17-dione, m.p. 171°, gives with $C_5H_5N$ at the b.p. (or

$NPhMe_2$ or quinoline) $\Delta^{4:6}$-*androstadiene*-3 : 7-*dione*, m.p. 173°; 6-bromotestosterone benzoate, m.p. 176°, similarly, gives $\Delta^6$-*dehydrotestosterone benzoate*, m.p. 236°. H. A. P.

**Preparation of nuclear alkylated, aralkylated, and arylated derivatives of alkaloids of the morphine series.** W. U. Dykes. From Research Corp., L. F. Small, and H. M. Fitch (B.P. 492,702, 5.5.37).—Dihydrothebaine (I) is caused to interact with organomagnesium halides in anhyd. $C_6H_6$, any free halogenohydrocarbon in solution being removed by addition of a *tert.* amine prior to the condensation. *E.g.*, MgMeI is prepared in $Et_2O$, the $Et_2O$ is removed by distillation, (I) in $C_6H_6$ is added, and the mixture is heated at the b.p. for 24 hr.; *methyl*-, m.p. 192—193°, $[\alpha]_D^{25}$ −20·5° in EtOH [*hydrochloride*, m.p. 283—285° (decomp.)], and iso*methyl-dihydrothebainone*, m.p. 168—168·5°, $[\alpha]_D^{24}$ − 57°, are formed. *Benzyl*-, m.p. 227—229°, and *phenyl-dihydrothebainone*, m.p. 213—214°, are similarly prepared. H. A. P.

**Manufacture of stable, liquid, vitamin-containing preparations.** E. Lilly & Co., H. W. Rhodehamel, and E. C. Kleiderer (B.P. 486,054—5, 9.4.37).—(a) One or more vitamins of the -*B* group is/are dissolved in one or more $C_3$ polyhydric alcohols the C atoms in which form part of an acyclic C⁚C chain, *e.g.*, glycerol, propylene glycol. (b) Vitamin-*C* is dissolved in a propanediol, *e.g.*, propane-αβ-diol. E. H. S.

**Production of compounds containing vitamin-*C* and other vitamins.** H. Lotze (B.P. 485,612, 10.12.37. Ger., 15.12.36).—Catalase (1 pt.) is added to vitamin-*C* (2 pts.), either before or after mixing with other vitamins, to protect it against destruction. E. H. S.

**Preparation of vitamin-*D* in high yields.** Kodak, Ltd. From Eastman Kodak Co. (B.P. 482,880, 6.7.36).—Oils containing fat-sol. vitamins are degassed in a centrifugal degasser (apparatus claimed) and then subjected to mol. distillation with a short heating period, *i.e.*, "flash" distillation, in a specified apparatus. Antioxidants may be added to the oil. Two fractions of vitamin-*D* may be obtained, having b.p. 142—144° and 210—260° under mol. conditions. A total recovery of 80—100% of the -*D* can be attained. E. H. S.

**Production of antirachitic substances.** W. W. Triggs. From E. I. Du Pont de Nemours & Co. (B.P. 485,452, 17.8.36).—Substances containing cholesterol (I) and substantially free from provitamin are treated with non-gaseous oxidising agents ($H_2O_2$, $Bz_2O_2$, eosin, $CrO_3$. *E.g.*, an EtOH solution containing ~2% of (I) and 4% of 30% $H_2O_2$ is boiled for 40 min. The solution is irradiated by ultra-violet light either during or after treatment. E. H. S.

**Manufacture of thrombin.** H. Dyckerhoff (B.P. 485,731, 25.11.37. Ger., 5.12.36).—A solution of animal fibrin prepared from dry, fresh fibrin, *e.g.*, dried by treatment with $COMe_2$–$Et_2O$, is mixed with a miscible org. solvent and the pptd. crude thrombin (I) is extracted with $H_2O$, preferably at $p_H$ 6·5—7·5. Purified (I) is obtained from the extract by pptn. with, *e.g.*, $COMe_2$. E. H. S.

**Manufacture of extracts of spleen or liver.** I. G. Farbenind. A.-G. (B.P. 482,826, 5.10.36. Ger., 5.10.35).—Spleen or liver, which has been autolysed in absence of acid, is extracted with $H_2O$ and/or a $H_2O$-sol. org. solvent at $p_H$ 4—6 and the extract is freed from ballast substances and proteins by the usual methods. E. H. S.

**Obtaining a substance [for] lowering the blood pressure.** E. Wollheim (B.P. 486,064, 22.6.37. Ger., 23.6.36).—An AcOH extract of pituitary glands, particularly the posterior lobes, is treated with $Et_2O$ and light petroleum. The clear liquid is removed and neutralised and the ppt. formed is isolated. It may be purified by first extracting with small quantities of $H_2O$ and finally with larger amounts to dissolve the active material. It may be further purified by deaminising. E. H. S.

**Treatment of antitoxins and the like.** Lederle Labs., Inc. (B.P. 493,101, 30.3.37. U.S., 23.10.36).—Solutions of toxins, antitoxins, etc., and the proteins with which they are associated, are digested with a proteolytic enzyme (pepsin, at $p_H \not> 4$) until the greater part (~70%) of the proteins have been destroyed or rendered non-coagulable by heat, and are then treated with a finely-divided alkaline-earth phosphate [$Ca_3(PO_4)_2$] to absorb lipins, enzymes, and other impurities. The initial solution may be heated prior to digestion to ppt. fibrin, and after digestion the coagulable proteins may be pptd., together with the toxins etc., with a neutral salt [$(NH_4)_2SO_4$, $Na_2SO_4$, NaCl], after previous concn. by ultrafiltration if desired, the ppt. being redissolved in $H_2O$ to a conc. solution which may be dialysed and then diluted and treated with phosphate. The solution after treatment with phosphate may be conc. by ultrafiltration. Sp. claim is made to the purification of diphtheria antitoxin. R. G.

**Manufacture of [pale-coloured] pyrethrum extract.** Stafford Allen & Sons, Ltd., and T. F. West (B.P. 493,074, 2.4.37).—Pyrethrum flowers are extracted with $COMe_2$ and after removal of the latter the highly-coloured impurities in the extract are removed by treatment with aq. MeOH, insol. matter being rejected, followed by removal of MeOH and treatment with a petroleum hydrocarbon (I) (substantially free from aromatic hydrocarbons), the insol. residue being rejected. Where (I) is kerosene the product may be marketed directly, but otherwise (I) is distilled off to give a conc. extract which may be dissolved in kerosene to form a pale-coloured spray. R. G.

**Production of a stable, water-soluble medicament from the latex of *Lactuca virosa*.** Knoll A.-G. Chem. Fabr. (B.P. 483,789, 21.6.37. Ger., 23.6.36).—The liquid portion of fresh latex is separated from the solid, preferably by mixing with $H_2O$, followed by filtration or centrifuging, and the product, to which reducing agents and/or preservatives may be added, and heated to ~ 80°, if desired, to destroy oxidases, is evaporated. E. H. S.

**Production of dry, stable, therapeutic preparation containing the volatile constituents of freshly-gathered plants.** G., F., and H. Madaus (Dr. Madaus & Co.) (B.P. 485,188, 13.8.36. Ger., 14.8.35).—Fresh, moist plants (*e.g.*, hemlock, garlic, thuja leaves, fennel) and coarsely granular $H_2O$-insol. adsorbents [*e.g.*, $SiO_2$, loam, kaolin, fuller's earth, $Al(OH)_3$] are ground together until a state of max. dispersion is reached; the mixture is then dried. E. H. S.

**Sterilisation of surgical dressings and instruments.** R. M. Savage, and S. Maw, Son & Sons, Ltd. (B.P. 483,147, 16.4.37).—The dressings etc. are heated by a high-frequency, oscillating electric field between electrodes in a closed vessel and are sterilised by steam generated from the hygroscopic moisture they contain. Apparatus is claimed. J. S. G. T.

**Vitamin compositions.**—See XII.

## XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

**Foreign nuclei in silver bromide.** Lüppo-Cramer (Kolloid-Z., 1938, **84**, 340—344).—An explanation of the Capri-blue effect (B., 1937, 89) is given. E. S. H.

**Washing of photographic emulsions. I, II.** T. Nakatogawa and S. Yoshikawa (J. Soc. Chem. Ind. Japan, 1938, **41**, 219B).—I. To study the effect of salts in the wash-$H_2O$, negative emulsions were soaked in salt solutions (0·0002—0·005N) for 2 hr. and washed in distilled $H_2O$ for 1 hr. Ca, Ba, Sr, and Mg salts increased the sensitivity ($S$), Cu, Fe, Pb, and Bi salts decreased $S$, and Al, Cr, Co, Mn, Ni, and Zn had little effect. Acids decreased $S$ and fog; alkalis slightly increased $S$ but caused much fog.

II. Prolonged washing of chloro-bromide paper emulsions slightly increased $S$ and contrast, but decreased durability. Replacement of the NaCl, $NaNO_3$, and $NH_4NO_3$ removed by washing had little effect, but addition of these salts singly, or of sol. chlorides, bromides, or iodides, increased durability but decreased $S$ and (except in the case of the chlorides and bromides) contrast. I. C. R.

**Stability of the viscose type of Ozaphane photographic film.** A. M. Sookne and C. G. Weber (J. Res. Nat. Bur. Stand., 1938, **21**, 347—353).—The retention of folding-endurance, loss in wt., change in acidity and in Cu no., and decrease in $\eta$ of viscose Ozaphane kinema film have been studied during accelerated ageing for 30 days at 100°, comparison being made with the change in properties of cellulose acetate and nitrate films during similar treatment. The Ozaphane film is less stable than are the other types, and hence is unsuitable for permanent records. J. W. S.

**Densitometry of *X*-ray films and its standardisation.** J. E. de Graaf (Z. wiss. Phot., 1938, **37**, 147—159).—Graphs are given showing the variations of transmission density using a small parallel beam of light and varying the angle of incidence of the film or the angle of collection (on a photoelectric cell), or turning the film in the straight path from light to cell, or with varying angle of cell opening using parallel or diffuse light. The $\lambda$ of the light has a small effect and a standard Na-vapour lamp is suggested; the spectral sensitivity of the cell must also be fixed. The densitometer should use diffuse light by means of an opal disc, preferably shaped around the lamp, and should have ½° angular opening of the cell, which must be highly sensitive to Na light. The use of a visual densitometer is discussed. J. L.

**[Use of] pyrogallol monomethyl ether as [photographic] developer.** C. Emmermann (Phot. Ind., 1938, **36**, 1085).—Pyrogallol Me ether (I) is not alone (15 g./l.) a developer. The formula: (I) 6, anhyd. $Na_2SO_3$ 20, anhyd. $Na_2CO_3$ 20 g., $H_2O$ to make 1 l., gives a developer very similar to ordinary metol–quinol developer, with a slightly smaller threshold sensitivity, a little longer life, and good stability; image tones were neutral above $\gamma$ 0·8 but brownish below that $\gamma$. The formula (I) 15, anhyd. $Na_2SO_3$ 100 g., $H_2O$ to 1 l., requiring double the development time, gave slightly finer grain (not comparable with fine-grain developers), as the brownish image, having better covering power, can be developed to lower $\gamma$. (I) is therefore not superior to metol–quinol. (I) has a marked odour which is disturbing in confined spaces and produces throat irritation and headaches after more prolonged use by workers. J. L.

**Proportional clearing of [photographic] prints on paper.** O. Schweitzer (Fotogr. Runds. Mitt., 1936, **73**, 279—280; Chem Zentr., 1936, ii, 3046).—The formula of a clearing solution (containing $K_2Cr_2O_7$, $K_2S_2O_8$, and $H_2SO_4$) which softens the high lights in AgBr prints is given. A. H. C.

**Selenium toning methods for prints.** E. Asloglou (Brit. J. Phot., 1938, **85**, 599—600, 613—614, 629—630, 643—644, 662—663).—Detailed practical tests are recorded of the various methods of Se toning, reduction, and intensification, toning into other metallic selenides, $Ag_2SeS$, etc., with explanations of the effects. A no. of new observations and recommendations are included. J. L.

**Grain size [in photography].** H. W. Greenwood (Brit. J. Phot., 1938, **85**, 666—667).—The influence of grain size on the tone of sulphide-toned prints is discussed. Recommendations are given for the production of colder or warmer tones by means of the type of developer used for the original print, variation of bromide content of the developer, or of the $Br'$–$[Fe(CN)_6]'''$ ratio in the bleacher. J. L.

**Grain size and [photographic] sensitisation.** Lüppo-Cramer (Phot. Ind., 1938, **36**, 985—986).—The Capri-blue effect is discussed. J. L.

**Production of fine-grain photographic negatives from large-grain emulsions or images.** A. Seyewetz (Bull. Soc. Franç. Phot., 1938, **25**, 145—150).—A previously developed large-grain image is treated with 10% $K_3Fe(CN)_6$ solution, with or without addition of 0·5 g. of $NH_4CNS$ per 100 c.c., and the insol. Ag salt produced is redeveloped with a developer of composition: $p$-$C_6H_4(NH_2)_2$ 10, anhyd. $Na_2SO_3$ 60 g., $H_2O$ to make 1 l. Contrast and speed are only slightly decreased, and prints from such negatives are indistinguishable in contrast from the originals. The grain size of the image is considerably reduced. Absence of Ag from the used solutions appears to show that the effect is not analogous to reduction, but is a concn. of Ag to form a smaller grain. J. L.

**Harmonisation of negatives.** Anon. (Corr. fotogr., 1936, **33**, 83—84; Chem. Zentr., 1936, ii, 2279).—Increase of grain size on over-development is remedied by reduction with a solution of $CuSO_4$ 100 g., NaCl 100 g., and $H_2SO_4$ 25 c.c. in $H_2O$ 1 l., followed by re-development with $p$-$C_6H_4(NH_2)_2$ (3 g. + 20 g. $Na_2SO_3$ in 1 l.), or with a commercial fine-grain developer. A. J. E. W.

**Chemistry of colour development.** A. G. Tull (Brit. J. Phot., 1938, **85**, 627—629, 647—648).—The history and theory of colour development are reviewed. It is pointed out that the oxidising agent effecting the coupling of the developer and coupler must be the exposed Ag halide; possible reactions in dye formation are discussed. A comprehensive classified list is given of patented colour-forming materials; suitable couplers to give desired colours are indicated. J. L.

***X*-Ray densography. Testing materials by *X*-ray. Radiomicrography.**—See XI.

## Patents.

**Manufacture of photographic silver halide emulsions.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 491,958—9, 8.1.37).—(a) The mol. of dye-forming components fast to diffusion in multi-layered films contains as substituents residues of hydroaromatic, mixed aromatic–hydroaromatic, or hydrogenated heterocyclic compounds, *e.g.*, 4-*amino*-(from $Ph_2O$ condensed with *cyclo*hexanol, nitration, and reduction), or 2 : 4-*diamino*-4′-cyclo*hexyldiphenyl ether* (by dinitration as above), 4-cyclo*hexylaniline* (I) [by nitration and reduction of *cyclo*hexylbenzene (II)], 4-*aminodi*cyclo*hexyl* (by reduction of $p$-$C_6H_4Ph\cdot NH_2$), 4-cyclo*hexylbenzoic acid* (III) [Sandmeyer, from (I)], 4-cyclo*hexylbenzaldehyde* [from (II), by Gattermann], 6-*amino*-1-*ethyl*-1 : 2 : 3 : 4-*tetrahydroquinoline* (IV) (from tetrahydroquinoline by interaction with EtI–$HNO_2$ and reduction), α- and β-amino-tetralin and -decalin. The dye components are *o*-hydroxycarboxylic acids, aldehydes, aminonaphthols, acylacetic arylamides, or pyrazolones, including those made from compounds such as (I). Condensations mentioned among examples are (I) with $CH_2Bz\cdot CO_2Et$ to form *benzolylacet*-p-cyclo*hexylanilide*, 1-*p*-aminophenyl-3-methyl-5-pyrazolone with the chloride of (III), 2 : 3-$OH\cdot C_{10}H_6\cdot COCl$ with 4 : 4′-*di*cyclo*hexylaniline* (from $C_6H_6$ and di*cyclo*hexanol by nitration and reduction), and 2-hydroxycarbazole-3-carboxylic acid with (IV). The condensation products are added to Ag halide emulsions at any stage in production, and after exposure may be developed by simple colour development or by reversal development to form various colours. (b) Fastness to diffusion is obtained by combining the dye-forming components with a cyclic menthane derivative containing OH, $NH_2$, CHO, or $CO_2H$ as means of attachment, *e.g.*, pinene glycol, borneol, 2-amino- (V) or 2 : 3-diamino-camphane (VI), 3-amino- or 3-carboxy-camphor, or ketopinic acid. In the examples, compounds added to the emulsion are *p*-camphorylaminobenzoylacetanilide-4-carboxylic acid, the condensation products of (V) with 2 : 3-$OH\cdot C_{10}H_6\cdot CO_2H$, and of (VI) with hydroxyanthracene-3-carboxylic acid. K. H. S.

**Photographic stripping film.** Kodak, Ltd., Assees. of G. F. Nadeau (B.P. 483,609, 18.5.37. U.S. 16.5.36).—To prevent lines and mottle in stripping films, due to non-uniformity of the adhesive layer and differential imbibition by the paper, a $H_2O$-insol. colloid layer is provided between the temporary support and the adhesive layer. The insol. layer consists preferably of a cellulose ester (nitrate, acetate, acetate–propionate, etc.) or a synthetic resin. A gelatin subbing layer may be coated on this before coating the adhesive layer; if a synthetic resin is used, a thin cellulose ester layer is preferably coated on top (before the subbing layer) to protect the resin from sticking in coating machines. Anti-halation, anti-curling, etc. layers may also be provided in the film. J. L.

**Colour photography.** I. G. Farbenind. A.-G. (B.P. 493,308, 8.4.37. Ger., 29.4.36).—Plates etc. for colour photography are rendered insensitive to ultra-violet light by the addition of a filter layer which absorbs light of $\lambda < 400$ mμ. without sensibly affecting visible light (*e.g.*, containing æsculin, quinine, primuline, or bis-*m*-aminobenzamidostilbenedisulphonic acid). H. A. P.

**Photographic material for colour photography.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 486,005, 26.10.36).—The film base carries three superimposed emulsion layers, the lowest layer being green-sensitive, the middle layer red-sensitive [the sensitiser giving high red sensitivity but having a pronounced gap in the blue-green (cf. B.P. 480,778 and 483,548; B., 1938, 734, 984)], and the top layer blue-sensitive. Colourless dye components fast to diffusion (cf. B.P. 483,000 and 484,698; B., 1938, 849, 984) are incorporated in the different layers to give red, blue, and yellow images, respectively. A yellow filter dye is incorporated in the top layer and/or in an intermediate layer between the top and middle emulsions. J. L.

**Production of photographic colour-picture films having a sound record.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 483,052, 8.10.36).—The sound track is coated in the course of manufacture with a varnish insol. in aq. solutions, *e.g.*, the polymerisation product of α-butyl-β-chlorobutadiene, this layer being removed by dissolution in $C_6H_6$ after the processing of the colour picture; alternatively, the layer may be stable in acid baths, but rendered sol. or permeable on treatment in alkaline baths, *e.g.*, a mixed polymeride of styrene and Bu acrylate, or the condensation product of maleic acid and colophony. The sound track is thereafter developable. J. L.

**[Photographic] filters which absorb ultra-violet light.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 490,516, 16.11.36).—The use is claimed as filter layers for photographic purposes of colloids containing a non-diffusible absorbent for ultra-violet light, viz., derivatives of appropriate aromatic compounds, *e.g.*, 2-hydroxychrysene and its 8-$CO_2H$-derivative, 3-hydroxy- and 3-amino-pyrene, umbelliferone and its derivatives, and fluorene and $C_{10}H_8$ derivatives, rendered non-diffusible by the presence of a *n*-alkyl of $\nless C_5$, or an albuminoid, carbohydrate, natural resin, or sterol group. Derivatives containing urea, benzamide, benzidine, stilbene, and heterocyclic groups are referred to but not claimed. H. A. P.

**Photographic treating solutions [developers].** I. G. Farbenind. A.-G. (B.P. 493,364, 6.4.37. Ger., 11.4.36).—The addition to photographic developers as antiseptics of *meso*-aminoacridines (5-aminoacridine) is claimed. H. A. P.

**Manufacture of kinematograph films.** J. J. V. Armstrong (B.P. 483,044, 7. and 29.10.36).—Film images and sound tracks are copied by printing from the original on to a light-sensitive surface, *e.g.*, dichromated gelatin, which is on, or is to be transferred on to, a metal (Cu, Zn) strip, without the interposition of any form of line screen. The metal strip is lightly etched in known manner, inked, and, after removal of excess of ink from unetched areas, printed on to a transparent strip of cellulose acetate. The ink preferably contains a solvent ($COMe_2$) For variable-density sound tracks the ink should be semi-transparent. J. L.

**Manufacture of colour prints and matrices therefor.** J. J. V. Armstrong (B.P. 483,059, 7.10., 17.10., and 18.11.36. Cf. B.P. 483,044; preceding abstract).—Three partial-colour records are printed from mosaic-screen, 3-colour original films on to light-sensitive layers, *e.g.*, dichromated gelatin or fish-glue and gelatin mixture, which are on, or are to be transferred on to, celluloid or metal strip capable of being etched. Single-colour records are obtained by the use of suitable coloured printing light, colour filters, or stop-out screens. The strip is etched, inked, and printed on to cellulose acetate strip, as in the prior patent, using suitably coloured inks. A method of attaining exact registration is claimed. J. L.

**Preparation of kinematograph colour films.** J. J. V. Armstrong (B.P. 484,096, 29.10.36).—Colour-separation images are printed on to sensitised Zn or Cu strip, without the use of any line screen, and the images are lightly etched in. These strips are then used for offset printing in the correct colours in register on to a single transparent flexible, *e.g.*, cellulose acetate. The image areas are sufficiently small and separated to be equiv. to areas produced under a line screen; a rigid doctor blade, preferably in tensional stress, is required. (Cf. B.P. 483,044 and 483,059; preceding.) J. L.

**Colour photography and kinematography.** Truecolour Film, Ltd., and E. Sanders-Dolgoruki (B.P. 480,251, 14.8.36).—Material comprising three emulsion layers sensitive to different primary colours, the layers being preferably superimposed on one base, is processed so that $\nless$ two images are obtained in colours non-complementary to the colour sensation recorded in the layers. The preferred method is to process the front blue-sensitive layer to minus-red (blue-green), the middle green-sensitive layer to minus-green (magenta), and the rear red-sensitive layer to minus-blue (yellow). A print is then made from this negative on to similar material, giving a picture in natural colours with the blue-green image on top to give the best definition. Other arrangements are described. J. L.

**Colour photography and kinematography.** Truecolour Film, Ltd., E. Sanders-Dolgoruki, and J. H. Reindorp (B.P. 480,287 and Addn. B.P. 480,291, [A] 9.10.36, [B] 14.4.37).—(A) Differently coloured images are obtained in two superimposed layers by developing both to Ag images, and converting the upper image only into AgI with KI + I solution, penetration being checked when sufficient by immersion in a bath of $Na_2SO_3$ solution. The Ag of the lower layer is then converted into $Ag_4Fe(CN)_6$ by treatment with a solution of $K_3Fe(CN)_6$ and $NH_3$. The lower image is now redeveloped with a suitable colour developer to Ag + dye, and the AgI image is mordanted with a suitable basic dye. Alternatively, a relief image may be formed from the upper image, according to B.P. 377,706, the AgI being developed to Ag with amidol–$Na_2CO_3$ developer, a dyed gelatin layer coated above and treated with a bleach-hardening bath, and unhardened parts dissolved away. Finally, Ag and Ag salts are removed with Farmer's reducer. Other variations are described. Three- and four-colour pictures may be obtained by using material with one or two extra layers coated on the other side of the base. (B) The process is modified by converting both images, after the first development, into $Ag_4Fe(CN)_6$, and then converting the upper image into AgI, the KI–I solution being loaded with glycerin to control penetration, the $Na_2SO_3$ stop-bath being used when required. J. L.

**Production of additive colour-kinematograph films.** A. H. Kämpfer (B.P. 482,624, 17.12.36. Ger., 31.10.36).—By means of a beam-splitting system, two images, each half the width and half the height of a normal frame, are photographed on to a bi-pack, each film of which has two different colour-sensitive emulsions disposed side by side lengthwise of the film, with suitable decolorisable filter layers; the front film has a colour-filter layer on the front and the emulsions on the rear of the support, and the rear film has the emulsions between the colour filter and the support. After development, these negatives are printed on to double-coated positive film so that the pair of images from the front negative film is printed on one side, and the pair from the rear film, staggered so as to be below the first two, on the other side, the four pictures thus occupying only one whole frame. The four-colour pictures which can then be projected give improved colour-rendering. J. L.

**Colour photography and colour kinematography.** B. Gaspar (B.P. 483,366, 16.7.36. Ger., 16.7.35).—The negative and positive films both consist of three emulsion layers on one or both sides of a single support. The top layer is uncoloured and sensitive to blue light, and the second layer is coloured yellow. In one film (*A*) this second layer is sensitive to green and the third (bottom) layer is coloured purple-red and sensitised to red; in the other film (*B*) the second layer is sensitised to red and the third layer is coloured blue-green and sensitised to green. After development, the top layer is diffusely dyed blue-green in *A*, or purple-red in *B*, and the dyes are selectively destroyed at the image or non-image points in all three layers; alternatively, the dyes are selectively destroyed first in the two lower layers only, and the top layer is then selectively toned and mordanted; the Ag is removed from all layers at a suitable point in the processing. Either film may then be used for making the negative if the other is used for making the positive, which then gives a true colour rendering of the original. (Cf. following abstracts.) J. L.

**Light-sensitive photographic material and production of multicolour images employing it.** B. Gaspar (B.P. 483,463, 16.7.36. Ger., 16.7.35).—Either of the films of B.P. 483,366 (cf. preceding abstract) is used to prepare a negative colour picture, from which a correctly coloured, positive, multicolour picture is prepared by any means other than that claimed in the prior patent, *e.g.*, by the use of intermediate individual colour-component images (black-and-white or coloured) from which the final positive is prepared. J. L.

**Production of multi-colour photographic prints.** B. Gaspar (B.P. 483,464, 16.7.36. Ger., 16.7.35).—Either of the multi-layer materials of B.P. 483,366 (cf. two preceding abstracts), with the layers all superimposed on one side of the support, is used as a printing material on which prints are made from any true or false multicolour master image or from coloured or black-and-white individual colour-selection images. The image recording the blue of the original subject is printed into the second layer of the printing material: if the *A* type of material of the prior patent is used, the image recording green is printed into the bottom layer, and the image recording red is printed into the top layer; if the *B* type is used, these last two printings are reversed. The choice of *A* or *B* will depend on the nature of false colouring of the images of the master picture. Processing of the prints is then the same as in the prior patent. J. L.

**Colour photography.** I. G. Farbenind. A.-G. (B.P. 485,862, 25.11.36. Ger., 7.12.35).—A three-layer film is provided with semipermeable intermediate layers between the emulsions. The top intermediate layer is impermeable to acid developers but permeable to alkaline developer; the lower intermediate layer is impermeable to alkaline developer but permeable to acid developer; the properties of permeability may be produced when required in known manner, *e.g.*, by saponification. The top emulsion is then developed with an acid developer, and a print made from the image by suitably coloured light; the image is then removed with hot $H_2O$ or a Ag solvent, and the next image developed with an alkaline developer and a print similarly made from it; the third image is then developable with an acid developer. Alternatively, the images need not be removed, but may be converted into suitable differently-coloured component pictures. The order of the intermediate layers may, of course, be reversed, or, in the case of a bi-pack, only one such layer may be required. J. L.

**Colour photography.** C. W. C. and C. C. H. Wheatley (B.P. 486,006, 27.10.36 and 8.3.37).—A mixture of normally light-fast (preferably acid) dyes, together forming an approx. black mixture, *e.g.*, Aurine (yellow), Brilliant Cresyl Blue, and Acid Fuchsine, is incorporated in an emulsion, preferably collodion, together with substances accelerating bleaching of the dyes under light not of their own colour. These accelerators comprise the oxides or salts of Mo, Cr, W, or U, especially $(NH_4)_2MoO_4$, in combination with $H_3BO_3$ or an org. acid (oxalic, tartaric, lactic, citric, or salicylic). Fully-coloured prints can then be rapidly prepared, and after washing out the accelerators (the dyes are preferably EtOH-sol.) with $H_2O$, and, if desired, $H_2C_2O_4$ or $H_2O_2$ solutions, and thereafter with $H_2O$ again, the dyes may be mordanted with, *e.g.*, tannic acid or chromates. The picture is then quite light-fast. J. L.

**Colour photography.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 486,043, 1.12.36).—In processes producing colour pictures formed of component colour images in different layers, wherein a second exposure and second development (*e.g.*, reversal development, or second development after initial development, fixing, and bleaching of the Ag image) are required, faulty colour reproduction is corr. by the use of controlled exposures of each image layer with suitably coloured light; these exposures may be made through colour filters of suitably adjusted absorption, this adjustment being made by addition of grey filters or masks, or the times of exposure may be controlled. J. L.

**Colour photography.** W. W. Groves. From I. G. Farbenind. A.-G. (B.P. 492,648, 20.1.37).—In making coloured photographs to be viewed by transmitted or reflected light, in addition to the usual three-colour layers containing dyes fast to diffusion, there is superimposed a panchromatically sensitised Ag halide emulsion for the production of a black-and-white picture. The latter may depend on org. dyes, *e.g.*, the usual three colours in admixture or a dye component fast to diffusion that produces a black on development, *e.g.*, 1 : 2-hydroxynaphthoyldodecylaminocarbazole, or on treatment with a metal salt. H. A. P.

**Production of colour films by the subtractive three-colour method.** C. Wille (B.P. 485,190, 16.9.36).—60-mm. wide kinema film is coated with blue-sensitive emulsion, the marginal thirds of the emulsion being, however, sensitised, one to green and one to red light. The film is exposed in a 3-colour camera so that partial colour images of slightly $<$ normal size are obtained side by side. These are printed (with slight enlargement) on to double-coated positive stock, the red image on one side and the green on the other. The images are developed and processed to blue-green and magenta, respectively. One side is then recoated with dichromated gelatin and the blue negative is printed on this in register; the resulting image is dyed yellow. J. L.

**Production of colour-selection pictures from multicolour master images.** B. Gaspar (B.P. 485,552, 20.8.36 and 19.4.37).—Colour-selection prints are made from the master, using for each image a printing light of spectral composition such that the ratio of the absorption of the part image to be printed to that of the part image not to be printed is a max.; where three colours are employed, the printing light should be at the max. of the smaller of the two ratios which can be then evaluated, and within the effective absorption range of the dye image to be printed. Better results are obtainable if the part images of the multicolour master are such that the combined images do not give neutral grey, but are on the yellow side, the yellow dye having a higher, and the other dyes a lower, absorption than usual. With three dye images it is preferable for at least two ratios of at least two dyes, determined at the most intensely coloured image points, to have practically equal max. vals. for at least two λλ, each selected within the main absorption range of one of the dyes. The partial prints are improved if developed to different degrees of contrast, determinable from the contrasts of the different master images. J. L.

**Production of photographic multi-colour pictures.** I. G. Farbenind. A.-G. (B.P. 485,861, 25.11.36. Ger., 6.12.35).—Colour-component negatives (*e.g.*, blue and green records) are printed on to the two sides of double-coated positive film, and the images are developed with a "residual image" developer. The whole film is then exposed to light, developed with an ordinary developer, and the Ag reconverted into a uniform layer of AgBr (by means of $NH_4Br$ + Br solution, cleared by 0·5% aq. sulphite), and the film is dried. The third (red record) image is printed in register on to one side, developed, and the whole fixed. The residual images are then dyed (yellow and purple) with basic dyes, mordanted with, *e.g.*, molybdic acid or its salts, and the third image toned blue. Alternatively, a residual image may be produced on one side only of the film, and the record on the other side colour-developed or formed by a Ag–dye-bleaching process. J. L.

**Devices and processes for development of light-sensitive materials.** S. Sokal. From Kalle & Co. A.-G. (B.P. 483,118, 23.6.37).—Prints to be developed with gases, *e.g.*, $NH_3$, are placed on edge (in unrolled condition) in a narrow container of suitable dimensions and $NH_3$ is blown through them from the bottom upwards, causing them to flutter in the gas stream; when development is complete, a warm, moist air stream is blown through. Suitable apparatus is claimed, with rotary valves admitting gas or air as desired. J. L.

**Production of fine-grain photographic pictures.** I. G. Farbenind. A.-G. (B.P. 492,518, 18.1.37. Ger., 18. and 29.1.36).—Single- or multi-layer Ag halide emulsion films containing two or more dye components afford fine-grain neutral-grey or black pictures either by colour development or by the Ag *iso*diazotate method (B.P. 387,197; B., 1933, 285); each emulsion layer has the same spectral sensitivity. In the examples, the colour developers are 1 : 2 : 6 : 4-$OH{\cdot}C_6H_2Br_2{\cdot}NH_2$ (2), $Na_2SO_3$ (2), NaOH (0·6), and $H_2O$ (200), or 1 : 2 : 6 : 4-$OH{\cdot}C_6H_2Cl_2{\cdot}NH_2$ (2), $Na_2SO_3$ (2), $K_2CO_3$ (6), KBr (0·5), and $H_2O$ (200 g.), which give with emulsions containing 4 : 4′-dipyrazolonyldiphenyl a red, with di-(1-hydroxynaphthamido)diphenyldicarboxylic acid a blue, and with terephthaloylbisacetanilide a yellow. Superposition of three such films affords a grey picture of grain size suitable for enlargement. K. H. S.

**Production of multi-coloured still or kinematographic projected images.** C. Bocca and L. Amati (B.P. 481,336, 9.4.37).

**Photographic printing of lenticular film.** Kodak, Ltd., Assees. of O. E. Miller (B.P. 483,319, 16.10.36. U.S., 31.10.35).

**Flexible films.**—See V.

## XXII.—EXPLOSIVES; MATCHES.

**Mining explosives and the mechanism of detonation.** W. Payman (Chim. et Ind., 1938, 40, 638—648).—A review, with special reference to researches carried out at Buxton (cf. B., 1935, 479; 1938, 108, 593, 747). A. R. Pe.

**Physicochemical study of smoke and artificial smoke.** L. M. Sandoz (Protar, 1936, 2, 112—114, 153—157; Chem. Zentr., 1936, ii, 3245).—A review of properties (chemical, physical, *e.g.*, screening power, etc.), literature, prep., and use of white and coloured artificial fogs. A. H. C.

**Mustard gas.** Anon. (Génie Civil, 1938, **113**, 203—205).—Its manufacture and properties are reviewed. R. B. C.

**Rate of evaporation of war gases.** Z. Blaszkowska (Przeglad Obrony Przeciw., 1936, 7, 188—192; Chem. Zentr., 1936, ii, 3750).—"Saturation concn." is suggested, to replace the normal term "volatility," the true volatility, $m$ (in g. of substance evaporated), being given by $m = C[(P - p)S/b]$, where $S$ = surface, $b$ = pressure, $P$ = pressure of saturated vapour, $C$ = a const. Typical vals. (g./sq. m./hr.) at 20° are: $H_2O$, 175; $CCl_3{\cdot}NO_2$ (I), 920; lewisite (II), 28·5; yperite (III), 3·1. Relative volatilities at 20° ($H_2O = 100$) are: $COCl_2$ (at 0°), 3400; (I) $\sim$ 530; PhMe, 350; diphosgene, 250; (II), 16; sternite α, 2·3; (III), 1·8; camite, 0·4; chloroacetophenone, 0·3. A. H. C.

**Why are chemical warfare materials irritant poisons?** F. Schwarz (Protar, 1936, 2, 107—110; Chem. Zentr., 1936, ii, 3245).—The action of irritant poisons $\propto$ the time and concn., but they are, unlike simple toxic or narcotic gases (*e.g.*, $CH_4$, $CHCl_3$, HCN), effective in low concn. A. H. C.

**Cellulose nitrates.**—See V.

### Patents.

**Priming compositions.** Deuts. Waffen- u. Munitions-Fabriken A.-G. (B.P. 493,385, 14.7.37. Ger., 4.6.37).—Non-rusting and non-corroding priming compositions, free from Hg fulminate, containing besides the usual constituents up to 10% of 5-diazo-1 : 2 : 4-triazole-3-carboxylic acid as initiator, are claimed. W. J. W.

**Manufacture of propellant explosives.** F. B. Dehn. From Western Cartridge Co. (B.P. 494,277, 23.7.37).—Grains of propellant explosives (produced as in B.P. 473,057; B., 1938, 735) in the condition of a slurry or suspension in a non-solvent liquid are treated at 40° with a solvent, *e.g.*, a $H_2O$ emulsion of $Pr^{\beta}OAc$ 60% and $C_6H_6$ 40%, to soften the surface They are then treated with a $H_2O$ emulsion of nitroglycerin 50% and PhMe 50% and kept at 65° for ½ hr. Deterrents may be added. W. J. W.

**Explosive charges.** W. Kessen, and Westfälisch-Anhaltische Sprengstoff-A.-G., Chem. Fabr. (B.P. 493,984, 11.11.37).—A borehole charge for fiery mines comprises one or more cartridges of a normal explosive with additional cartridges containing a mixture of nitroglycerin and/or nitroglycol, and a larger wt. of an alkali bicarbonate (I), the (I) being placed between, or at the end of, the nitro-compounds. Alternatively, the charge may consist of composite cartridges in which the normal composition is separated from the composition containing the (I). W. J. W.

**Mixing and kneading explosives etc.**—See I.

## XXIII.—SANITATION; WATER PURIFICATION.

**Reducing value of air.** E. Quitmann (Z. anal. Chem., 1938, **114**, 1—8).—The "reducing val." of air is determined by passing 1—50 l. of air, according to purity, through 2 or 3 c.c. of acid $K_2Cr_2O_7$ solution (0·25 g. of $K_2Cr_2O_7$ + 1 c.c. of $H_2O$, diluted to 100 c.c. with conc. $H_2SO_4$), warming to 100° for 30 min. to ensure complete reaction, diluting, and determining the unconsumed $Cr_2O_7''$ iodometrically (0·01N-$Na_2S_2O_3$). Reducing vals. (c.c. of 0·1N-$Na_2S_2O_3$ per cu. m. of air) for the air of numerous rooms, laboratories, etc. are tabulated and discussed. The reducing vals. of the open air fluctuate considerably, whilst those of inhabited rooms are markedly increased by the introduction of tobacco smoke, solvent vapours, $NH_3$, $H_2S$, etc. The method affords a measurement of the quality and condition of air in relation to substances that are overlooked by methods depending on a determination of $CO_2$ content. L. S. T.

**Analysis of dust and fumes for lead and zinc.** S. Moskowitz and W. J. Burke (J. Ind. Hyg., 1938, **20**, 457—464).—The dust sample is treated with hot conc. $HNO_3$ (10 c.c.) and, after evaporation to dryness, dissolved in aq. HCl (1 : 1, 15 c.c.). Aq. $NH_2OH$ (25%, 1 c.c.), phenol-red (indicator), and $NH_3$ to $p_H$ 8 are then added. To a portion (<0·05 mg. of Pb) are added 10% aq. KCN (0·5 c.c.), $CHCl_3$ (5 c.c.), and then, with shaking, small amounts of diphenylthiocarbazone (I) solution [40 mg. in $CHCl_3$ (400 c.c.) shaken with $H_2O$ (50 c.c.) and 25% $NH_2OH,HCl$ (2 c.c.)] until (I) is present in excess. The $CHCl_3$ solution is washed several times with 0·5% KCN (1·5 vol.) to remove excess of (I), the Pb–(I) complex is decomposed by aq. HCl (1%), and the (I), which remains in the $CHCl_3$, is titrated with standard aq. $Pb(NO_3)_2$. To another portion of the original solution (<0·025 mg. of Zn or its equiv. of Zn and Pb) are added $CHCl_3$ (5 c.c.) and excess of (I), but no KCN, excess of (I) being removed from $CHCl_3$ solution by washing with dil. aq. $NH_3$. The (I) complexes are decomposed by HCl and the solution of (I) in $CHCl_3$ is treated with 0·5% KCN (0·5 vol.) and titrated with standard Pb solution. Interference of Sn is prevented by oxidation to $Sn^{\cdot\cdot\cdot\cdot}$; Bi is pptd. in presence of KCN, but unless much is present, is removed by the KCN wash. The Cu–(I) complex is pptd. in absence of KCN, but is comparatively stable to HCl, and is eliminated by twice repptg. the Zn and Pb complexes. I. C. R.

**Behaviour of gas masks towards ammonia in Dräger's method of disinfection.** Hetzel (Draeger-H., 1936, 3133—3135; Chem. Zentr., 1936, ii, 3159).—Destruction of $CH_2O$ residues in gas masks used in the Dräger process is effected with 30—45% excess of $NH_3$. In this concn. moist $NH_3$ or $CH_2O$ is without harmful action on the metal apparatus. A. H. C.

**Synthetic insecticides: value of α-naphthyl *iso*thiocyanate [thiocarbimide] in fly-sprays.** N. Tischler and J. Stonis (Soap, 1938, **14**, No. 10, 97, 99; cf. B., 1938, 595).—Comparisons of the toxicity of sprays containing various concns. of pyrethrins alone, with others containing 1% of α-$C_{10}H_7\cdot NCS$ (I) as well as pyrethrins, show that the better is the insecticide, the greater is the proportion of pyrethrins that can be replaced by (I): it is suggested that 1% of (I) together with 37, 55, and 80 mg. of pyrethrins per 100 c.c. will make B-, A-, and AA-grade insecticides, respectively. E. L.

**Fly-spray analysis. Pyrethrin determination in insecticides.** Pacific Coast Insecticide Assoc. (Soap, 1938, **14**, No. 10, 91, 93, 95).—Collaborate analyses of (mixed) household insecticides show that the Seil method, as modified by the Calif. State Div. of Chemistry, is capable of yielding reasonably uniform figures for pyrethrins-I and -II; the original Seil method also yields fairly const. results, but the Ripert method (B., 1935, 332) was found to be unreliable. Rogers and Calameri's method for the determination of rotenone (B., 1936, 467) proved to be unsatisfactory, and even approx. estimation of thiocarbimide esters is scarcely possible unless the S content of the original ester is known. For mixed insecticides biological assay appears to be the most satisfactory way of testing for service val. E. L.

**Breeding houseflies.** E. G. Thomssen and M. H. Doner (Soap, 1938, **14**, No. 10, 89—90, 101).—A simple system of fly-breeding suitable for small factories is described. E. L.

**Effect of salts on germicidal action of phenol and *sec*.-amyltricresol.** H. W. Lundy (J. Bact., 1938, **35**, 633—639).—Addition of 2—10% of many salts increased the efficiency of the germicides, the effect increasing with the valency of the cations. HCl and $H_2SO_4$ produced similar effects, which were not entirely attributable to the resulting change in $p_H$. $E_h$ is probably a contributory factor. A. G. P.

**Activity of common disinfectants.** E. Maier and E. Müller (Fortschr. Ther., 1936, **12**, 204—211; Chem. Zentr., 1936, ii, 3144).—The following PhOH coeffs. were determined according to the U.S. Food and Drug Administration method (1) for typhus bacillus, (2) for *Staph. aureus*, (3) as in (2) with 10% of human serum: alka-lysol, 2·2, 1·0, 0·9; bacillol, 2·2, 1·8, 0·9; bactol, 3·6, 1·3, 0·7; cellocresol, 0·7, 0·3, 0·1; creolin, 4·3, 0·9, 0·4; herboform <0·1; cresol soap solution (30%), 1·0, 0·6, 0·2 (as in Deuts. Arzneibuch IV and IV, 1·6, 1·0, —); lavasteril, 6·0, 2·5, 1·0; lysoform, $<0·1$; lysol, 2·2, 1·8, 1·0; phobrol, 13·2, 8·0, —; sagrotan, 4·4, 2·2, 0·7; ufinol, 7·8, 5·0, —; zephirol, 20·1, 15·0, 4·2; caporite, 80·0, 40·0, 0·1; clorina, 40·0, 66·0, 10·0; mianin, 40·0, 70·0, 10·0 (the last three are Cl-compounds). A. H. C.

**Stream pollution. Natural stream purification as applied to practical measures of stream-pollution control.** H. W. Streeter (Sewage Works J., 1938, **10**, 747—753).—To decide the extent of sewage treatment required at various up-stream towns to reduce pollution effectively and at min. cost, the relative effect of these up-stream populations on pollution at the particular point of interest downstream (utilising the natural stream purification) rather than their immediate effects at their points of discharge should be considered (measured as bacterial-purification rate, biochemical $O_2$ demand, or as dissolved $O_2$ content). O. M.

**Sewage purification. VII. Biochemical oxidation by activated sludge.** C. C. Ruchhoft, P. D. McNamee, and C. T. Butterfield (Sewage Works J., 1938, **10**, 661—690; cf. B., 1937, 625).—Using natural activated sludge from sewage treatment, results were obtained similar to those given by sterile sewage (*loc. cit.*), showing that the oxidation rates in the activated-sludge process vary considerably, depending on the operating conditions, and are $\gg$ the natural biochemical oxidation rates of streams, due probably to the rapid propagation of bacteria by application of food and aërobic conditions. Observations on the quantities of $O_2$ required by fed and unfed portions of activated sludge give information on sludge condition and plant operation, as the quantity of $O_2$ used by the unfed sludge is a criterion of sludge condition, and with good activated sludge the fed portion consumes much more $O_2$ than the unfed portion. The quantity of $O_2$ utilised by addition of food is not $\propto$ the biochemical $O_2$ demand of the food, but depends on the biochemical character and activity of the sludge. The quantity of $O_2$ used when a known increment of food is given is an index of the oxidising activity of the sludge and is ascribed to the oxidation of the food, 40—50% of the 5-day biochemical $O_2$ demand of the food being oxidised in 5 hr. by good non-nitrifying activated sludge. It is concluded that the rapid reduction in $O_2$ demand of fed activated sludge due to the oxidation of added food supports the practice of tapered aëration in plant operation, and that there is no single optimum quantity of activated sludge for all plants, but each differs, depending on the character and strength of the sewage and cycle of operations. For economic operation no more sludge than is necessary to maintain satisfactory effluents should be carried. O. M.

**Chemical studies on activated sludge used for purification of sewage. IV. Theory and mechanism of the process. V. Essential factors in the mechanism of activated sludge. VI. Cause and control of bulking of activated sludge. VII. Bulking of activated sludge. VIII. Effects of trade wastes on the activated-sludge process.** S. Shibata (J. Soc. Chem. Ind. Japan, 1938, **41**, 229—230B, 231B, 232—233B, 233—235B, 235—236B; cf. B., 1938, 1106).—IV. In comparative tests on the purification of sewage by aëration with (*A*) 20% of activated sludge, (*B*) 20% of $Fe(OH)_3 + Al(OH)_3$, and (*C*) 20% of these hydroxides + 5% of water-moss, *B* and *C* were not inferior to *A* in purification, proving that the part played by bacteria is unimportant. The mechanism of the activated-sludge process for purification of sewage colloids and suspended matter is considered to be due to the physico- and electrochemical action of $Fe(OH)_3$, $Al(OH)_3$, and $Mg(OH)_2$, which are the main inorg. constituents of the sludge floc.

V. The various factors examined are: (i) the $p_H$: this is important as no good flocs are formed if the $p_H$ is $< 5·8$ or $> 7·5$; (ii) aëration: the supply of $O_2$ by aëration is essential in order to convert inorg. salts into carbonates, hydroxides, and oxides, to augment the positively-charged colloids, thus causing better electrical neutralisation with OH groups, and to maintain aërobic bacterial life; (iii) the settling period: this for activated sludge in Japan should be short ($\not> 2$ hr.) so as to avoid depletion of dissolved $O_2$. If it takes $> 2$ hr., "bulking" occurs, which is not curable by more lengthy settlement; (iv) denitrification: the effect of this process on activated sludge in tanks is to cause abnormal $NH_3$ content in the effluent; (v) the optimum aëration temp.: the optimum temp. is 25°; (vi) the quantity of return activated sludge required: this depends on the sewage concn. thus: $Q = p(k - x)/(g - k)$, where $Q$ and $m$ are the vols. of return sludge and sewage, respectively, and $x$, $g$, and $k$ are the no. of g./cu.m. of suspended solids in raw sewage, return sludge, and mixed liquor (*i.e.*, activated sludge and sewage), respectively.

VI. At Tokyo the same sewage is treated by the Sheffield diffused-air and Simplex processes, but bulking occurs only with the last-named. This is shown to be due not to filamentous growths, the agitation mechanism, or deficient dissolved $O_2$, but to the design of the Dortmund settling tanks, which allow heavy flocs rich in inorg. hydroxides to be settled and removed as surplus sludge, whilst the light flocs rich in org. matter are returned to the aëration tank.

VII. Tests show that bulking is due to shortage of metallic hydroxides in the sludge flocs, and may be cured by adding them (*i.e.*, Fe and Al salts) until the normal ash content is obtained in the flocs.

VIII. The effects of gas, dye waste, wool-scouring, tan-liquor, and slaughter-house wastes are discussed. O. M.

**Carbon dioxide production in activated-sludge process.** H. Wilson and J. A. McLachlan (Sewage Works J., 1938, **10**, 691—699).—The belief that the first stage in the activated-sludge process and biological filters is combustion of the org. C mainly to $CO_2$ is thought to be wrong, as in a C balance on a laboratory scale of the activated-sludge operation only about 10% of the transformation products of C was $CO_2$, and probably much of the C is used in building up the body substance of the sludge organisms. The rôle of $CO_2$ in the process, whether stimulative or inhibitory, is discussed and it is suggested that the purifying function of $O_2$ may be dehydrogenation of org. complex groups with formation of $H_2O$. O. M.

**Sludge drying on glass-covered beds [at Cleveland].** G. E. Flower. C. B. Budd, and C. Hauck (Sewage Works J., 1938, **10**, 714—721).—Substitution of cinder grit for sand, sand losses, and effects of temp., air movement, depth of sludge, etc. are discussed. O. M.

**Growth-promoting substances in sewage and [sewage] sludge. I. Review of the literature.** W. Rudolfs and B. Heinemann. **II. Indole and skatole.** W. Rudolfs and R. S. Ingols (Sewage Works J., 1938, **10**, 643—652, 653—660).—I. Plant growth-promoting substances appear in many cases to be decomp. products of org. matter (mostly protein) and to be present, or formed, or destroyed in modern sewage-treatment processes. The val. of sewage sludge cannot be accounted for solely on its mineral constituents (N, K, $PO_4'''$).

II. Indole and skatole are intermediate products of anaërobic decomp. of sewage, and therefore increase in amount with the staleness of the sewage; oxidised effluents contain least. The quantities of these products present in fresh and stale sewage and in digested, activated, chemically dewatered, and dried sludges have been determined. The compounds increase during anaërobic digestion, but are utilised by $CH_4$ organisms, so that ripe sludge contains less of them than do fresh solids. Chemicals added for dewatering the sludge fix these substances. Drying at atm. temp. has little effect on them, but heat destroys them. Digested sludge dried at low temp. contains relatively large amounts of these substances, making it a valuable base for complete fertilisers. O. M.

**Laboratory analyses and studies in [sewage-] plant operation.** E. Hurwitz (Sewage Works J., 1938, **10**, 722—730).—Routine sewage-analytical technique is discussed, in particular special tests for plant operation and control of sludge digestion and activated-sludge plants. O. M.

**Experimental high-rate trickling filters.** G. P. Edwards and G. O. Adams (Sewage Works J., 1938, **10**, 700—704).—From analytical figures and appearance the high-rate filter effluents [turbid, high residual biochemical $O_2$ demand (B.O.D.), and low $NO_3'$] are much inferior to low-rate filter effluents (clear, stable, and nitrated), but as the high-rate filter removes the greatest B.O.D. load in lb. B.O.D./acre/ft./day, the quality of the filter effluent must be considered with filter efficiency. Working at heavy loads in the filter, the most easily oxidisable substances are removed first, leaving the more stable though still putrescible substances. With heavy loading, high efficiencies of purification (lb. of B.O.D. removed per acre/ft./day) are obtained at the expense of quality. O. M.

**Design of high-rate trickling filters.** K. Imhoff (Sewage Works J., 1938, **10**, 705—711).—The important difference between high- and low-rate filters is not only the greater rate of application, but the smaller surface area, thus allowing the flushing effect of the applied sewage, this effect increasing as the area diminishes. The sludge from the high-rate filters is discharged continuously and is high in $H_2O$, easily putrescible, and bulky. In the low-rate filters the growth remains attached to the stones and accumulates in the lower layers, decomp. at the expense of $O_2$ and unloading at regular intervals as a dense non-putrescible humus. Thus as the high-rate filter is free from the function of stabilising the sludge (*i.e.*, it does not act as a digestion tank as well as a filter) it can treat 4—10 times that treated by the low-rate filter. Correct design is important. The stronger is the sewage, the deeper must be the filter to obtain a proper surface rate correlated with the amount applied per unit vol. If with strong sewages too great a filter depth is to be avoided, the necessary surface rate may be obtained by dilution of the influent by recirculation of the filter effluent etc. O. M.

**[Sewage] trickling filters with artificial aëration.** A. Heilmann (Gesundheits-Ing., 1938, **61**, 45—47).—Developments in design and methods of operation are discussed. R. B. C.

**Amount of film in [sewage] trickling filters.** R. Pönninger (Gesundheits-Ing., 1938, **61**, 34—39).—The amount of biological film forming on different kinds and sizes of filter medium is investigated. Data show that when the $O_2$ supply is sufficient the purifying effect of the filter is largely dependent on the amount of film and the diameter and depth of the filter. R. B. C.

**Hazards and safety measures at sewage works.** P. J. Houser (Sewage Works J., 1938, **10**, 731—737). Danger from infectious disease organisms (particularly typhoid), accidental injuries, and poisonous gases ($CH_4$, $CO_2$, $N_2$, $H_2S$, CO, $NH_3$, $SO_2$, $Cl_2$, petrol, solvents, etc), together with the necessary precautions, are discussed. O. M.

**Biology of iron bacteria for precipitating (A) iron, and (B) manganese [in waterworks' practice].** H. Beger (Gas- u. Wasserfach, 1937, **80**, 779—784; 1938, **81**, 35—39).—(A) Fe bacteria are defined as all those bacteria possessing the power of pptg. Fe when present in $H_2O$ as $Fe(HCO_3)_2$ or org. Fe compounds; they include *Gallionella*, *Leptothrix*, and *Crenothrix*. Winogradsky's theory of bacterial pptn. of Fe from $Fe(HCO_3)_2$ is preferred to Molisch's, as the better explanation of the life processes. The presence of Fe is not essential to their life. In $H_2O$ containing $H_2S$ the Fe is finally pptd. as $Fe_2S_3$, which is the probable cause of the pyrites deposits. The bacterial pptn. of Fe from $H_2O$ containing org. Fe compounds is discussed, and Aschan's theory is rejected. It is concluded that true Fe bacteria can utilise org. Fe compounds to obtain energy. There are 44 Fe-pptg. bacteria, but classification into natural orders is unsatisfactory. They occur in widely different spheres so long as air is available, in widely different forms (as muddy deposits, or as luxurious growths on fish gills etc. to " oily " skin on still $H_2O$). They are propagated by marsh birds, insects, and $H_2O$ currents, usually avoiding $H_2O$ rich in org. food. The presence of light is not essential, but the $p_H$ and temp. vary between wide limits (*e.g.*, 5·5—8·2; 1—3°, 37—74°).

(B) The biological conditions for Mn pptn. are the same as for Fe pptn. All the Fe-pptg. bacteria ppt. Mn as well as Fe, but some prefer Mn. They can be arranged spectrum-wise in order of Fe or Mn preference, which agrees with a curve of $KMnO_4$ demand showing that the Fe-pptg. bacteria have small $KMnO_4$ demand, whilst Mn-pptg. bacteria have an increased $KMnO_4$ demand : $MnCO_3 + 2H_2O + O = MnO(OH)_2 + H_2O + CO_2 + 54$ kg.-cal. As the energy gain shown is $< \frac{1}{3}$ that by Fe pptn. (189 kg.-cal.), to obtain an equal amount of energy from $MnCO_3$ as from $FeCO_3$ 3 times the amount of $MnCO_3$ must be used up, hence the much more abundant pptn. with Mn than with Fe. The various forms which the ppt. takes are discussed. The gelatinous, slimy mass is rich in silicic acid ($SiO_2 = 32\%$), yielding a turbid, musty-smelling $H_2O$. In certain reservoirs where deep $H_2O$ remains for long periods, Mn deposits increase in the autumn on account of the accumulations of org. matter from decaying vegetation which is washed into the subsoil, thereby increasing the Mn and Fe solubility in the feed $H_2O$, followed by increased Mn-pptg. bacterial activity. The mechanism of the pptn. is discussed. (Cf. A., 1936, 248; B., 1938, 232, 462.) O. M.

**Detection and determination of phenols in water.** L. Schumann and H. Thieberger (Chem. Obzor, 1938, **13**, 1—4).—Detection and determination of aq. solutions of phenols, using $Br–H_2O$, are discussed. A positive reaction is not given with very small quantities; in that case a colorimetric method must be used. The Fox–Gauge and the Folin–Denis methods of determination are recommended; these can be used without a special colorimeter with reasonable accuracy within the limits 3·0—0·1 mg. of phenol per l. F. R.

**Determination of phenol in effluent [and river] water.** H. A. J. Pieters, K. Penners, and J. Hovers (Chem. Weekblad, 1938, **35**, 686—692).—The sample is made alkaline with NaOH and then 200 c.c. are acidified with $H_2SO_4$, treated with $CuSO_4$, and 180 c.c. distilled off. The PhOH in the distillate is determined colorimetrically by coupling with diazotised $m$-$NO_2{\cdot}C_6H_4{\cdot}NH_2$ solution. If a preliminary determination shows $<0{\cdot}1$ mg./l., the sample is made strongly alkaline with NaOH and conc. before acidification and distillation. S. C.

**Deleterious effects of corrosive waters on metals. II. Zinc.** J. Koblic (Chem. Obzor, 1938, **13**, 91—95; cf. B., 1937, 1414).—$H_2O$ containing $CO_2$, free $O_2$, and $NO_3'$, after passage through Fe piping internally coated with Zn, contains $NO_2'$ by reduction of the $NO_3'$ and dissolved Zn by the action of $CO_2$. This $H_2O$ gives no separation of bubbles of $CO_2$ on boiling, but a dirty white ppt. Meat cooked in it has a red colour, and its taste is bad. F. R.

**Fundamental properties of textile-processing wastes. V. Flotation from ferric oxide sols.** B. R. Clanton (Text. Res., 1938, **8**, 301—304). **VI. Electrophoresis of platinum and gold hydrosols.** J. E. Magoffin and H. T. Hatch (*Ibid.*, 305—309). **VII. Electric charge on escaping bubbles.** P. H. Burdiett (*Ibid.*, 353—356). **VIII. Flotation of suspensions.** J. E. Magoffin and B. R. Clanton (*Ibid.*, 357—363).—V. In testing the possibility that particles of colloidal size could be removed from an aq. medium by flotation methods, use was made of colloidal $Fe_2O_3$; it was established that this could be floated completely with Na oleate, NaOBz, and Gardinol, which last-named acted both as frother and collector. The gas phase was found to be essential for flotation.

VI. The effect of variations in $p_H$ on the electrophoretic velocity and ζ-potential of Pt and Au hydrosols was measured by the method described previously (cf. Magoffin, B., 1938, 776), and it is shown that this method will be useful in determining the properties and reactions of the constituents of textile-works wastes (effluents).

VII. Contrary to previous general conclusions, no electric charge was found on a gas (air) after being bubbled through pure $H_2O$ or aq. solutions of NaCl and glycerol.

VIII. The results are given of cataphoretic studies on seven colloidal suspensions (of $Fe_2O_3$, $Al_2O_3$, $Cr_2O_3$, a basic brown dye, Congo-red, cotton, a S-black dye, and indigo) and on the effect of $p_H$ on the migration velocities, using named flotation agents suitable for negative and positive suspensions. In these instances the requirements of a good flotation agent were that it must have a large electric charge opposite to that on the particles to be floated and be capable of forming a $H_2O$-repellent film around the particles. A. J. H.

**Disposal of packing-house waste.** M. A. Milling and B. A. Poole (Sewage Works J., 1938, **10**, 738—746).—An activated-sludge plant has been designed in Indiana to give complete treatment to such wastes, in spite of their wide variations in concn. and rate of flow. O. M.

**Emulsions [in cosmetics etc.].**—See I. **Sanitary val. of $NaPO_3$.**—See VII. **Corrosion of steel water-pipes, and of Mn steel by sea-$H_2O$.**—See X. **Disinfectant power of soaps. Influence of alkalinity in soap [on skin]. Detergents.**—See XII. **Lecithin in cosmetics.**—See XIX.

See also A., III, 943, **Tung oil and dermatitis.** 946, **Teeth affections in Zn-plating works.**

### Patents.

**Decolorisation of sewage effluents, trade wastes, and the like.** R. Furness, H. J. Wheaton, and J. Crosfield & Sons, Ltd. (B.P. 484,669, 5.11.36).—Activated C for decolorisation purposes can economically be replaced by granular sulphonated coal (prepared as described in B.P. 455,374; B., 1937, 13) in the "spent" base-exchange condition, as the action is one of physical absorption. The degree of colour removed depends on the size of this coal product, the $p_H$ of the $H_2O$, etc. O. M.

**Recovery of carbon disulphide from industrial effluent waters.** Carbo-Norit-Union-Verwaltungs G.m.b.H. (B.P. 483,974, 4.11.37. Ger., 28.1.37).—Effluents, *e.g.*, $H_2O$, from the manufacture of viscose rayon are blown with air or other gases preferably in countercurrent flow; the $CS_2$ removed is extracted in known manner by treatment with wash oils or absorbent media (active C, $SiO_2$ gel), from which it may subsequently be recovered by steaming. O. M.

**Drying sludge.**—See I. **Toilet preps.**—See V. **Colloidal wool fat.**—See XII. **Treating distillery slop.**—See XVIII.