

# BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS

## B.—APPLIED CHEMISTRY.

JULY, 1938.

### I.—GENERAL; PLANT; MACHINERY.

Device for linear raising of the temperature of a furnace as a function of time. P. DUBOIS (Bull. Soc. chim., 1938, [v], 5, 344—346).—Apparatus is described. R. B. C.

Convection furnaces. ANON. (Ind. Heating, 1938, 5, 114—130).—The various types are described and their applications discussed. R. B. C.

Measurement of wall temperatures in copper and steel locomotive fireboxes. K. KOCH (Wärme, 1938, 61, 293—297).—The technique is described. R. B. C.

Heat conductivity of an aggregate of [steel] balls in a quiescent gas. G. KLING (Forsch. Geb. Ingenieurw., 1938, 9, 28—34).—Steel balls, 3.18 mm. in diameter, were packed as closely as possible into the space between a central, electrically-heated sphere and a surrounding hollow sphere. The conductivity was deduced from surface-temp. measurements of the spheres and the amount of heat supplied. Experiments were carried out with various gases, e.g.,  $H_2$ ,  $CH_4$ , air, and  $CO_2$ , the gas pressure on the balls being reduced progressively from 50 atm. to a few mm. of Hg. At high pressures the conductivity was practically independent of the pressure; with reduction of pressure, however, it fell at first gradually and then rapidly. This is attributed to a sudden change in temp. at the surface of contact of the gas with the balls. The possible application of the data in the study of the movement of gases through fuel beds etc. is discussed. R. B. C.

Heat control through proper insulation. R. C. PARLETT (Refiner, 1938, 17, 152—157).—The various types of insulating materials available and their applications are reviewed. R. B. C.

Use of thermo-elements at high temperatures. A. SCHULZE (Chem.-Ztg., 1938, 62, 285—288, 308—310).—A review. The use of various combinations of noble and base metals, their thermo-electric force and useful temp. range, are discussed. Ir—Rh, Ir (40% Ir) can be used up to 2000°, and W—W, Mo (25% Mo) up to 3000°. I. C. R.

Controlled protective atmospheres for furnace use. A. R. RYAN (Ind. Heating, 1935, 2, 633—640).—A review and discussion. CH. ABS. (e)

Model experiments on flow of furnace gases in combustion chambers and furnaces. F. SCHULTZ-GRUNOW (Forsch. Geb. Ingenieurw., 1938, 9, 41—48).—An attempt was made to trace the path of the flame in the combustion chamber of a boiler furnace fired with pulverised coal with the view of obtaining data on the probable localisation of the ash deposits.

A  $C_3H_8$  flame was employed in the model. Flame photographs, obtained under various operating conditions of the model, enable the full-scale behaviour to be deduced. R. B. C.

Calculation of temperature of flames at constant pressure by the  $\Delta T$  method. L. REINGOLD (Chaleur et Ind., 1938, 19, 69—75).—A review. R. B. C.

Boiler-furnace combustion chamber air-inlet nozzles. K. CLEVE (Feuerungstech., 1937, 25, 317—322).—The distribution of air in a chamber into which air was forced through nozzles of different sizes and shapes was investigated. For a given power expenditure large nozzles effected a greater degree of turbulence than small ones. The results are applied to determine the path of the secondary air in the combustion chamber of a  $H_2O$ -tube boiler with a travelling grate. R. B. C.

Changes of the form of flow in nozzles. F. KRETZSCHMER (Forsch. Geb. Ingenieurw., 1938, 9, 35—40).—Since periodic changes in the type of flow and in the effective discharge coeff. occur when using measuring nozzles with a cylindrical exit, the sharp-edged orifice method for metering air, in which the type of flow is more uniform, is recommended. R. B. C.

Pressure-regulating valves for steam and water. A. SCHAUMANN (Z. Ver. deut. Ing., 1938, 82, 251—257). R. B. C.

Electronic smoke indicator improves operation at the Hiram Walker [boiler] plant [Peoria, Illinois]. R. P. PFEIFFER (Power Plant Eng., 1938, 42, 268—269).—Combustion is controlled and smoke measured by placing a photoelectric cell opposite a source of light in the boiler flue. R. B. C.

Wood waste for steam generation. ANON. (Steam Eng., 1938, 7, 275, 301).—A Fraser  $H_2O$ -tube boiler fired with wood chips and sawdust is described. R. B. C.

Slag and deslagging of steam-generating equipment. A. D. BAILEY (Trans. Amer. Soc. Mech. Eng., 1938, 60, 209—211).—Clean coal appears to be the only solution of the problem of slag formation in boiler furnaces. Slag is not reduced to any marked extent by chemical treatment of the coal. R. B. C.

Estimation of radiant-heat exchange in boiler furnaces. G. A. ORROK and N. C. ARTSAY (Combustion, 1938, 9, No. 10, 37—42).—The practical limitations of various theoretical and mathematical analyses of heat exchange are discussed. Simplified empirical expressions for heat transfer based on operating experience are checked with the results of a no. of boiler tests. R. B. C.



Measurement of the total radiation of steam and carbon dioxide in mixtures with non-radiating gases at temperatures up to 1300°. E. ECKERT (Forsch. Geb. Ingenieurw. Forschungsh. 387, 1937, 20 pp.).—Determinations of the radiation from steam or CO<sub>2</sub> mixed with N<sub>2</sub> were made on gas-layer thicknesses ranging from 10 cm. to 3 m. Beer's law was confirmed for CO<sub>2</sub>, but not for steam. The experimental data are applied to calculate the radiant heat coeffs. in boiler furnaces and engine cylinders. In a normal H<sub>2</sub>O-tube boiler furnace the heat transfer by radiation is of the order of 15 kg.-cal./sq.m./hr./° c. At the beginning of the expansion stroke of the Otto engine, the heat lost by radiation amounts to 15–25% of the total heat loss. This val. is  $\gg$  has previously been assumed. R. B. C.

Heat transfer from steam and hot water to an external air flow by spirally-ribbed pipes. A. WATZINGER (Gesundheits-Ing., 1938, 61, 29–32, 47–52).—The influence of the rib dimensions (height and pitch) and the diameter, distance apart, and arrangement of the pipe elements in an air-heating battery in which air was propelled across the pipelines was investigated. The arrangement of several following elements, staggered to the extent of one half the rib-diameter space, gave the max. heat transfer. The space between successive elements should be as small as possible. Comparative tests showed that the heat transfer was slightly reduced when the steam pressure was increased from 1 to 4 atm. R. B. C.

Temperature gradients and heat flow in the combustion chamber of a water-tube sectional header boiler fired with natural gas. R. OREL (Wärme, 1938, 61, 231–234).—The temp. was measured at 80 different points in the combustion chamber. The isothermal curves given permit the paths of the gases to be traced under four conditions of load. From the data obtained the heat radiated to the heating surfaces is deduced. The temp. conditions in the chamber become more uniform with increasing load. R. B. C.

Improvement of heat transmission in the "compound evaporator." H. CLAASSEN (Centr. Zuckerind., 1938, 46, 15–17; Int. Sugar J., 1938, 40, 198).—In an improved arrangement of the author's recently invented "compound evaporator," the mixture of steam and air from the pre-evaporator is distributed equally under all tubes of the main evaporator by means of a circular distributing pipe with tangentially directed outlet nozzles. Baffles are also employed to promote a regulated circulation, and to assure that the upper parts of the tubes are always wet with juice. As the result of these improvements, heat transmissions of the order of 6310 kg.-cal./m.<sup>2</sup>/hr./° c. have been observed. (Cf. B., 1937, 1286.) J. P. O.

Filtering material for hot lime-soda [water] softeners. J. D. YODER (Power Plant Eng., 1938, 42, 134–135, 143).—Tests show that a bed of anthrafilrite (specially prepared anthracite) is more suitable than one of calcite for filtering boiler feed-H<sub>2</sub>O softened by the above process. Data on the

correct rate of flow at various temp. of the back-wash-H<sub>2</sub>O used for cleaning the filter bed are given. R. B. C.

Silica scale prevention [in boilers]. D. W. HAERING (Power Plant Eng., 1938, 42, 331–333, 336).— $\beta$ -Glucosides or their derivatives are added to the boiler-H<sub>2</sub>O. A system of control based on the SiO<sub>2</sub>:Cl' ratio in the H<sub>2</sub>O is adopted. R. B. C.

Calculation of specific volume of steam. G. FORNER (Arch. Wärmewirts., 1938, 19, 49–50).—Tables for this purpose based on the work of Koch are given. R. B. C.

Selection of water separators for steam pipelines. H. STRIEN (Arch. Wärmewirts., 1938, 19, 15–19).—Various types of H<sub>2</sub>O separator are diagrammatically described. The range of pressures in which they can be applied is indicated. R. B. C.

Determination of salt content [of steam condensate] by measurement of electrical conductivity. W. SCHUH (Arch. Wärmewirts., 1938, 19, 95–96).—The method is diagrammatically described. 0.25 mg. of salt per l. of H<sub>2</sub>O can be determined. R. B. C.

Measurement of temperature and pressure gradients in the surface layer between solid and liquid carbon dioxide in the manufacture of Dryice by the Agefko process. W. MEISSNER, E. MEYER, and S. HASINGER (Z. ges. Kälte-Ind., 1937, 44, 223–228).—The thickness of the surface layer according to temp. and pressure measurements was 0.52–0.57 mm. and 0.49 mm., respectively. Temp. and pressure gradients in the layer were approx. 170°/1 mm. and 25 atm./1 mm., respectively. The triple point has no special significance in the Agefko process. A large part of the ice is formed above the triple point at temp. on the m.-p. curve. R. B. C.

Refrigerator parts are hot-tinned in compact plant. ANON. (Steel, 1937, 101, No. 6, 51–52, 65).—The plant and technique are described. 75:25 Sn:Pb is employed. R. B. C.

Primary crushing. Progress report No. 3. M. SHEPPARD (U.S. Bur. Mines, 1938, Rept. Invest. 3390, 10 pp.).—The relationship between feed and product of 2 different limestones, as to size distribution and particle shape, when crushed in the same jaw crusher has been investigated. It was found that the sizes making up the larger portion of the product were at and immediately below the size of the crusher opening, and that these sizes were the most nearly cubical, thereby indicating that the major tendency of crushers that depend on pressure for comminution is to break through the particle in a direction normal to the crusher faces, forming nearly cubical fragments, and that the minor tendency is to break particles by radial fracture, forming slabs. H. C. M.

Pan grinding. J. W. MELLOR (Trans. Ceram. Soc., 1938, 37, 126–129).—A mathematical analysis shows that, for the optimum grinding efficiency, the speed of revolution of the runners varies inversely as the diameter of the pan. J. A. S.

Mechanical concentration methods. B. M. BIRD (Chem. Met. Eng., 1938, 45, 264–267, 284).—



Concn. by means of classifiers, jigs, tables, flotation, etc. as developed for the metallurgical industries is suggested as having possibilities in the prep. of raw materials for and the treatment of various wastes in the general chemical industry. F. J. B.

**Viscosimetry.** A. BONDI (Petroleum, 1938, 34, No. 6, 1—8).—After a brief reference to the Levin micro-viscosimeter (B., 1937, 408), the term viscosity pole height ( $V_p$ ) and its significance, as described by various authors, are discussed.  $V_p$  is not directly related to the elementary composition of oils, nor is any definite relation shown between  $V_p$  and the physical properties of oils generally. The possibility of determining the  $\eta$  of mixtures of oils from the proportions and  $\eta$  of the constituents is discussed, particularly the Arrhenius-Lederer formula.  $V_p$  is not accurately additive, but between 1.8 and 4.5 it is sufficiently additive for practical purposes. C. C.

**Measuring thermal conductivity of liquids.** H. PERIEM (Z. Ver. deut. Ing., 1938, 82, 71—72).—A method which avoids errors due to heat loss by convection currents is described. A very fine wire stretched vertically in the liquid is heated electrically. The form of the resultant variable cylindrical temp. field depends on the thermal characteristics of the liquid. The theory of the method, and formulae for calculating the result, are given. R. B. C.

**Technique for routine use of the konimeter.** J. B. LITTLEFIELD, C. E. BROWN, and H. H. SCHRENK (U.S. Bur. Mines, 1938, Inf. Circ. 6993, 6 pp.).—The konimeter is an instrument for collecting on a glass disc covered with an adhesive the dust in a small vol. (2.5—10 c.c.) of air. The particles on the slide are then counted under the microscope with light field illumination. D. K. M.

**Protection of chemical plant materials against corrosion.** W. WIEDERHOLT (Chem.-Ztg., 1938, 62, 325—328; cf. B., 1937, 1141).—A review. Protection by metal and alloy coatings, enamelling, surface treatments, etc. is discussed. I. C. R.

**Rust-protection of chemical and allied plants in difficult conditions.** W. JÄGER (Chem.-Ztg., 1938, 62, 333—334).—The suitability of chlorinated rubber, synthetic resin (glyptal), and bituminous paints for corrosive conditions, and precautions necessary for their successful application, are discussed with special reference to the potash industry. I. C. R.

**Sinterite jointing.** F. MILKOWSKI (Gas- u. Wasserfach, 1938, 81, 336—340).—Prior publications (B., 1936, 863; 1937, 1414; 1938, 596) have dealt with the material during its development stages, and the properties of its final form now in commercial production are summarised. Its basis is a specially prepared spongy Fe and it is giving satisfactory service to users. A. R. PE.

**Friction and heat-transfer coefficients.** W. F. CORE (Proc. Inst. Mech. Eng., 1937, 137, 165—194).—Friction-factor ( $f$ ) and heat-transfer ( $K$ ) measurements on horizontal Cu and brass pipes of various cross-sections showed that heat exchangers having pipes of irregular section can be designed by normal methods provided the hydraulic diameter is known,

but that calculation of  $K$  based on  $f$  may lead to errors as  $f$  does not necessarily increase as  $K$  increases. By using the  $\eta$  of the fluid at the wall temp. of the pipes,  $f$  was found to be the same as for isothermal conditions. A. K. G. T.

**Grindability of coal. Industrial flames. Fuel oil combustion in boiler furnaces.**—See II. **Turbidimeter.**—See IX. **Action of conc. NaOH on boiler steel. Furnace dust as insulator. Corrosion by a concn. cell.**—See X. **Electrostatic charges in flowing gases.**—See XI. **High-power emulsifier.**—See XII. **Rubber in factory plant.**—See XIV. **Determining  $PO_4'''$  in  $H_2O$ .**—See XXIII.

#### PATENTS.

**Furnaces.** BENNIS COMBUSTION, LTD., and A. W. BENNIS (B.P. 481,872, 14.8.36).—A furnace grate for effecting coking before the fuel enters the actual fire is described. [Stat. ref.] B. M. V.

**Furnaces.** J. MACDONALD (B.P. 483,206, 18.8.37).—In a heat-treatment furnace a circulating fan is in motion up to a temp. of 750° and stopped above that temp. by a thermostat which will also restart it when a fall of temp. occurs. B. M. V.

**Gas-fired [bakers'] ovens or furnaces.** GAS LIGHT & COKE Co., P. LLOYD, and A. W. DUMBRILL (B.P. 482,446, 29.9.36).—The sides and bottom of the oven proper are separated from the hot gases by air spaces, and the wall of the air space immediately over the burners is protected by refractory tiles. B. M. V.

**Walls for furnaces or other heating apparatus.** T. A. R. STRAND, U. O. BLOMQUIST, and H. F. ALBIHN (B.P. 482,143, 12.10.36. Swed., 16.10.35).—The tubes of  $H_2O$ -walls are provided with smaller tubes forming fin-like extensions which are connected to the main tubes only at the ends. B. M. V.

**Temperature control.** W. W. TRIGGS. From E. I. DU PONT DE NEMOURS & Co. (B.P. 481,586, 5.6.36).—A system utilising vaporised heat-transmitting medium, e.g.,  $Ph_2O$ , for separately melting Na and Pb and maintaining their mixing pot at correct temp. is described. B. M. V.

**Temperature-measuring plugs.** R. BOSCH A.-G. (B.P. 482,480, 13.12.37. Ger., 14.2.36).—A plug containing a thermocouple for insertion into the cylinder of an internal-combustion engine in place of an ignition or starting plug is described. B. M. V.

**Heat insulation.** G. RICHARDSON (B.P. 482,747, 1.10.36 and 3.9.37).—The insulation comprises sheets of refractory material (Al) 0.05—0.10 mm. thick spaced at  $\frac{3}{8}$ — $\frac{1}{2}$  in. by other sheets of similar thickness which are corrugated and formed also with smaller ribs transverse to the corrugations to afford only point contact and to stiffen, the whole being secured together by known means. B. M. V.

**Heat- and sound-insulating bodies of spun glass.** O. GOSSLER GLASGESPINST-FABR. G.M.B.H. (B.P. 482,809, 16.11.37. Ger., 11.12.36).—A mattress is made up of alternate layers of long-fibred spun glass and fine-fibred glass felt, impregnated, if desired,



to form a rigid body and enclosed in any suitable casing. B. M. V.

**Heat-transfer apparatus.** J. H. SHAFNER, Assr. to NAT. BRONZE & ALUMINUM FOUNDRY CO. (U.S.P. 2,072,652, 2.3.37. Appl., 28.12.31).—Apparatus comprising zigzag tubes with fins of metal of lower m.p. and "higher inherent heat-transfer capacity" cast thereon is described. B. M. V.

**Heat-transfer method and apparatus.** F. R. TATE. From KOLD-HOLD MANUFG. CO. (B.P. 482,742, 4.8.36).—Heat-storage units containing a substance of high latent heat are constructed of pipe coils (for the heating-cooling medium) surrounded by a sheet metal casing sealed up after reducing the internal pressure to <1 atm. (under all conditions of operation), so that the sheets are pressed against the pipe coils. B. M. V.

[Heat-resisting] embedding mass. W. MOOSDORF and P. WOLSKI, Assrs. to WINTHROP CHEM. CO., INC. (U.S.P. 2,072,212, 2.3.37. Appl., 26.7.35. Ger., 15.8.34).—The mass comprises a ceramic substance hardenable by burning (quartz flour and kaolin), a substance capable of hardening with  $\text{PO}_4$  ions [calcined  $\text{ZnO}$ ,  $\text{Al}(\text{OH})_3$ , other oxides, carbonates, and phosphates], and a substance that will yield  $\text{PO}_4^{3-}$  in presence of a solvent (primary Mg phosphate). B. M. V.

**Refrigeration and apparatus therefor.** F. LE G. BRYANT (B.P. 482,465, 19.11.36. U.S., 19.11.35).—In an adsorption-type refrigerator having no moving parts and only small pressure differences, the solution (dil.  $\text{H}_2\text{SO}_4$ ) is resolved by electrolysis, which is followed by synthesis of the components of the volatile liquid ( $\text{H}_2\text{O}$ ), absorption and electrolysis being effected at substantially the same temp. The liquor is electrolysed by itself forming a turn around the core of a transformer, and the energy of synthesis is recovered electrically. B. M. V.

**Softening of water.** G. W. KÜHL (B.P. 482,141, 7.10.36. Ger., 7.10.35, 22.4., 8.6., and 25.7.36).— $\text{H}_2\text{O}$  containing finely-divided ppts. (e.g., those produced by alkaline treatment of hard  $\text{H}_2\text{O}$ ) is passed through a "flaking chamber" containing numerous galvanic couples in the form of irregularly arranged pieces of opposite polarity. The flow through the flaking chamber is too turbulent to permit settlement, but sedimentation elsewhere is accelerated. One of the complementary electrodes is composed of Al 85—90 (88), Cu 5—10 (8), Zn 1.4—4.5 (2.5), and Pb 0.5—2.5 (1.0)%. A metal salt may be added with the alkali in the pretreatment. B. M. V.

**Boiler-water conditioning and blow-off systems.** J. E. POLLAK. From ELECTRO-CHEM. ENG. CORP. (B.P. 481,988, 16.11.36).—Foaming is controlled by withdrawal of  $\text{H}_2\text{O}$  expanded by steam from a fixed level above the normal level of compact  $\text{H}_2\text{O}$ , discharge of either excess of steam or of compact  $\text{H}_2\text{O}$  being avoided. B. M. V.

**Gyratory crusher.** I. G. FARBERIND. A.-G. (B.P. 482,825, 5.10.36. Ger., 5.10.35).—A freely swinging crusher head is flexibly suspended from the frame of a motor, and an unbalanced shaft within

the head is rotated by the motor and hung from it by a flexible coupling. B. M. V.

**Machine for breaking and granulating stone and like material.** F. PARKER, LTD., and F. W. PARKER (B.P. 482,144, 13.10.36).—A hammer crusher is described. B. M. V.

**Jet impact pulveriser.** P. ANGER (U.S.P. 2,072,492, 2.3.37. Appl., 18.7.34. Ger., 1.8.33).—The apparatus is similar to that described in B.P. 433,034 (B., 1936, 960), but is constructed so as to mingle the oversize with the new feed. B. M. V.

**Grinding machine.** H. G. DAY (U.S.P. 2,072,157, 2.3.37. Appl., 17.5.33).—A completely enclosed grinding and pneumatic delivery system suitable for grain and the like is described. Only a portion of the return air passes through the grinder. B. M. V.

**Colloidal mill.** F. G. CRANE, Assr. to F. G. CRANE, jun. (U.S.P. 2,072,710, 2.3.37. Appl., 24.7.35).—A no. of toothed discs are inclined to a shaft and rotated closely to the smooth bore of a drum, to which the feed is (at one end) at the top and from which the outlet is (at the other end) at the bottom and controlled by a valve. B. M. V.

**Vibrating granular and like materials.** G. SANDERS and F. SUREN (B.P. 483,292, 14.10.36).—Gearing and flexible drives for operating one or more vibrators of known type are described. B. M. V.

**Agitating apparatus.** L. P. SMITH, INC. (B.P. 483,141, 27.10.37. U.S., 16.11.36).—An apparatus for shaking a container with conoidal rotary motion, without opening it, is described. B. M. V.

**Mixing apparatus.** L. P. SMITH, INC. (B.P. 482,707, 19.11.37. U.S., 1.2.37).—An impeller on a long shaft, baffles on adjacent stationary shafts, and an electric motor are combined in one portable apparatus. B. M. V.

**Mixing and sifting machines.** C. E. GARDNER (B.P. 483,151, 12. and 19.10.36).—A perforated or imperforate drum or trough contains a helical rotor and the latter is provided with flexible cables or chains substantially parallel to the axis and slightly slack, which rub on the lower part of the drum. B. M. V.

**Oxidising of [molten] materials [molten lead].** J. MCCALLUM, Assr. to NAT. LEAD CO. (U.S.P. 2,072,375, 2.3.37. Appl., 26.6.31).—A nozzle for spreading molten material, e.g., Pb, in the form of a hollow conical sheet and oxidising it with preheated air is described. B. M. V.

**Centrifugal machine.** E. MORRISON (U.S.P. 2,072,377, 2.3.37. Appl., 6.2.34).—The apparatus is of the basket type with washing of collected solids. Means for separate collection of the two liquid effluents are claimed. B. M. V.

**Centrifugal separators.** H. W. FAWCETT (B.P. 483,239, 13.10.36).—The bowl is formed with a double taper and is provided with peripheral discharge openings hydraulically operated through screw threads of angle  $45^\circ$ , i.e., non-sticking. B. M. V.

**Centrifuges, particularly cream-separating centrifuges.** FUSION-MOTEURS (B.P. 481,930, 22.9.37. Fr., 6.10.36).—A construction in which the



bowl base and driver are welded to the bowl wall is described. B. M. V.

**Rotary filter.** H. D. GRANT, Assr. to SWENSON EVAPORATOR Co. (U.S.P. 2,072,586, 2.3.37. Appl., 24.9.34).—For an external-type, rotary-drum, vac. filter a doctor is constructed so that it can be retracted during building up of a layer of filter aid, held in one operative position during normal removal of filter cake, and, as the filter becomes choked, be caused to approach the drum gradually. B. M. V.

**Pressure filter.** S. W. BRIGGS (U.S.P. 2,072,393, 2.3.37. Appl., 5.2.34).—A filter mass is pressed down by a spring and perforated plate to prevent channelling by contraction. B. M. V.

**Continuous vacuum filters.** W. MAUSS (B.P. 481,815, 29.9.36).—The stream of feed (which may most conveniently be applied direct to the crown of the drum) is caused to stratify in the supply launder so that the cake forms with the coarsest particles nearest the filter. The cake is caused to adhere while passing through a bath of washing liquid into which the drum dips, and is discharged only after rising above the bath. B. M. V.

**Filter fabrics and media.** JOHNSON & JOHNSON (GT. BRITAIN), LTD., Assees. of R. P. HAYDEN (B.P. 482,343, 24.9.36. U.S., 25.10.35).—A no. of sheets of carded fibre are superposed, lightly sized, and passed through embossing rolls imparting a grid-like pattern of compressed and strong material along the lines and rapid-filtering zones between them. B. M. V.

**Manufacture of electropositive composition [for coating filter aid].** A. B. CUMMINS, Assr. to JOHNS-MANVILLE CORP. (U.S.P. 2,036,258, 7.4.36. Appl., 5.10.32).—Diatomaceous earth is coated with <3% of incompletely dehydrated electropositive material, e.g.,  $\text{Al}(\text{OH})_3$ , deposited at a temp. not  $\geq 100^\circ$ . B. M. V.

**Controlling the concentration or consistency of a liquid, particularly of a paper-pulp suspension.** A. J. LOGUIN (B.P. 481,904, 21.9.36. Swed., 21.9.35 and 8.9.36).—An impulse member (perforated paddle) in the pulp is oscillated by const. mechanical means through an elastic drive so that the amplitude of the oscillations depends on the consistency of the pulp and they are integrated by a pawl, and after a predetermined no. of cycles a diluting device is affected by the ratchet wheel. B. M. V.

**Regulating the density of fluids.** A. J. J. FIFER (B.P. 482,051, 10.10.36).—A sample of liquid from a conditioning tank is weighed in a balanced vessel which initiates electro-mechanical controls for dilution. B. M. V.

**Apparatus for measurement of viscosity and thixotropy.** C. F. GOODEVE (B.P. 482,950, 6.10.36).—A hollow body is rotated in the mass and the drag on another body suspended axially within is measured. Thixotropy is a measure of the difference between the initial torque and that obtainable later in a state of steady shearing. Both bodies are shaped as truncated cones; the distance between them is adjustable and a thermometer is suspended inside the inner body. B. M. V.

**Apparatus for determining gravity.** BOLIDENS GRUVAKTIEB. (B.P. 483,217, 22.11.37. Swed., 30.9.37).—Apparatus comprising a mass balanced by a spring is completely enclosed in a vessel having high thermal capacity and that vessel in a vac. flask; between the two is an electric heater controlled by the temp. or the inner vessel. B. M. V.

**Apparatus for atomising liquids, especially for spraying milk on to drying machines.** ESCHER WYSS MASCHINENFABRIK G.M.B.H. (B.P. 481,724, 29.10.37. Ger., 30.10.36).—The milk is picked up by collars on a rotating shaft and blown off them by air jets. B. M. V.

**Heating and vaporising liquids [e.g., butane].** C. H. FOLMSBEE, H. W. LE BOUTILLIER, and F. HESS (U.S.P. 2,072,713, 2.3.37. Appl., 2.1.34).—Apparatus suitable for withdrawing  $\text{C}_4\text{H}_{10}$  (atm. b.p.  $0^\circ$ ) from bulk storage in very cold weather is suspended in a manhole and is entirely removable. Only a non-freezing, heat-transmitting fluid ( $\text{C}_6\text{H}_{14}$ ) is used within the tank, all steam or other primary source of heat being outside; the  $\text{C}_6\text{H}_{14}$  is boiled outside the tank and condenses in the suspended apparatus with boiling of only a small portion of the  $\text{C}_4\text{H}_{10}$ . The supply of primary heat is regulated by the v.p. over the  $\text{C}_4\text{H}_{10}$  in the bulk part of the tank. B. M. V.

**Fractional distillation of liquids.** A. R. BLAKEY, Assr. to DOHERTY RES. Co. (U.S.P. 2,072,093 and 2,072,834, 2.3.37. Appl., [A] 1.6.29, [B] 10.4.35).—(A) Liquid deficient in constituents of intermediate b.p., e.g., crude petroleum, is introduced at an intermediate point into a vapour-rectifying zone and the liquid flows downward in countercurrent to vapours, of which, in the first still, pure lowest-boiling vapour is drawn off alone. The liquid passes from the first still to a second rectifier and still, and so on. Pure second-boiling vapour from the second rectifier is condensed and part added to the first still. (B) The feed (petroleum or the like) is heated in a conduit of restricted cross-section and passed to an intermediate point of a tower which is at lower pressure so as to effect partial vaporisation of the feed. The tower is steamed at the bottom, reflux is provided, and a no. of side streams of liquid are withdrawn, stripped by steam, and the vapours returned to a higher point of the tower at substantially the temp. of withdrawal. B. M. V.

**Dissolving apparatus.** S. B. SCHWARTZ, Assr. to MYLES SALT Co., LTD. (U.S.P. 2,072,385, 2.3.37. Appl., 18.11.35).—A vertical, cylindrical tank is provided with a feed hopper forming the top closure and a conical bottom containing gravel; beyond the latter in the outlet pipe is a fine screen, and that pipe is brought upwards to maintain a definite level of liquid in the tank. B. M. V.

**Countercurrent contactor.** J. ROBINSON, Assr. to STANDARD OIL Co. (U.S.P. 2,072,382, 2.3.37. Appl. 28.3.35).—A tower for two liquids of different  $d$  is claimed. Between the stories of filler material are free zones containing rotating distributors comprising horizontal discs under and over which the liquids collect in pools on the respective faces and overflow up



and down through a no. of devices spaced in a substantially even manner. B. M. V.

Apparatus for treatment of fluids, applicable, e.g., to the drying or moistening of air and the separation of water from oil. H. BEHRINGER (B.P. 483,076, 10.7.36. Holl., 26.2.36).—A disseminator or moisture eliminator comprises a pack of alternate flat and corrugated sheets the surface area of which is large compared with the vol. of fluid flowing through. B. M. V.

Dust collectors. J. HOWDEN & Co., LTD., and C. W. HUME (B.P. 482,594, 5.10.36).—A stationary, centrifugal type of separator embodying flushing of the collecting wall with  $H_2O$  is described. B. M. V.

Filters for gases. N. V. MAATS. TOT BEHEER EN EXPLOIT. VAN OCTROOEN (B.P. 482,543, 18.2.37. U.S., 19.2.36).—Filter-panels comprising two nested frames of L-section, two grids of expanded metal or the like, and a filling of glass or other fibres are described. B. M. V.

Filters for air and gases. C. G. VOKES (B.P. 483,022, 9.10.36).—Cylindrical filters are normally stationary with the lower half immersed in cleansing liquid, and a few at a time are quickly rotated through  $180^\circ$ , at intervals. B. M. V.

Purifier and pressure regulator for gas. M. O. M. SIMON (B.P. 482,263, 25.10.37. Belg., 23.10.36).—The gas, supplied under excess of pressure, is passed through a pair of fans rotated in opposite directions by the flow of gas only, and between them through filters of gauze or the like. B. M. V.

Apparatus for extracting or precipitating suspended particles from air or other gases. J. A. L. RUWOLDT (B.P. 481,802, 14.9.36).—The gases are put into whirling motion over  $H_2O$ , in the bath of which is a device (operated by a "hot pipe") for causing steam to enter the gases in a direction opposite to their general flow. B. M. V.

Air-extraction and condensation plants for exhausting acid vapours from pickling and brass-dipping plants or the like. F. BAUML (B.P. 483,138, 14.10.37).—Fumes are removed from treatment vats by air jets along one side pushing the gases into exhaust ports along the other side; both the plenum and exhaust currents are produced by  $H_2O$ -jets. The exhaust jets are placed in the downward limbs of a series of U- and  $\cap$ -pipes, and the  $H_2O$  is withdrawn from the lower return bends. B. M. V.

Contrivances for absorbing gases or vapours. E. ALTENKIRCH (B.P. 482,200, 22.9.36. Ger., 2.10.35).—The gases are passed in contact with coherent, tubular, absorbent elements, the other side of which is protected and the whole stiffened by metal foil or the like and is preferably in contact with cooling medium (e.g., air). B. M. V.

Vacuum gauges. GEN. ELECTRIC Co., LTD., and E. GALLIZIA (B.P. 482,466, 1.12.36).—A gauge of the Pirani (hot-filament) type for attaching to a metal-clad Hg-vapour converter is described. B. M. V.

[Attachment of] cloths for filter presses. J. S. and C. R. HEATH (G. H. HEATH & SON) (B.P. 482,612, 28.11.36).

Lubricated rubber joint.—See XIV. Pasteurising.—See XIX.

## II.—FUEL; GAS; TAR; MINERAL OILS.

Cumberland coalfield. Little Main seam. ANON. (Dept. Sci. Ind. Res., Fuel Res. Surv. Paper 42, 1938, 59 pp.).—Results of a detailed examination, from floor to roof, of 9 complete samples drawn from the western part of the field are given. The seam varies in thickness from 21 to 28 in. and normally produces good-quality coal with a low S but a variable P content. It has strong coking properties, but is mainly used as a general-purpose coal. In properties the coal varies over the following ranges: ash 3.6—5.9,  $H_2O$  content (air-dried) 2.5—3.7, volatile matter 32.3—35.2, fixed C 57.1—59.5, C (dry, ash-free basis) 84.6—86.3, H 5.1—5.5, N 1.5—1.9, S (combustible) 0.6—1.3, P in ash (as % of coal) 0.0057—0.047%; calorific val. (dry, ash-free) 15,040—15,330 B.Th.U./lb. The ash fusion points are fairly const. and, with one exception, the ash melts in an oxidising atm. at  $1300$ — $1400^\circ$ . Considerable reserves of the seam exist in the south of the field, and it is estimated that 95% of the coal still remains in the extreme south.

H. C. M.

Investigations of Canadian coals, including their testing, classification, and utilisation. B. F. HAANEL and R. E. GILMORE (Fuel, 1938, 17, 80—90, 109—118, 128—134).—The total Canadian coal production in 1935 was nearly 14 million short tons, and represented about 55% of the consumption. Methods of analysis and testing are summarised. Some account is given of the classification of Canadian coals (cf. B., 1933, 609; 1934, 739), of tests in an experimental domestic hot- $H_2O$  boiler (cf. B., 1930, 128, 445), of tests in a pulverised fuel-fired boiler (see Mines Branch Publ. No. 725, 1933), of coking tests (cf. B., 1930, 128; 1934, 529), and of the low-temp. carbonisation (cf. B., 1930, 88; 1932, 583), briquetting (cf. B., 1932, 583), and hydrogenation (cf. B., 1937, 514) of coals suitable for these purposes. A few new data are added to those published previously.

A. B. M.

Pure coal, a competitor of petroleum. M. F. BERTRAND (Compt. rend. XVII Cong. Chim. Ind., 1937, 218—227).—A process for preparing coal containing <1% of ash, with the final object of utilising low-ash cokes in place of petroleum coke, is described (cf. B., 1935, 883).

H. C. M.

Brown coal as a chemical raw material. W. HAMMER (Kohle u. Erz, 1937, 34, 373—380).—A review. R. B. C.

Anthracite blends. I. J. LANE and J. W. COBB (Proc. S. Wales Inst. Eng., 1938, 54, 19—38).—Vals. were determined experimentally for the *d*, porosity, ignition temp., and reactivity to  $CO_2$  at  $900^\circ$  of (a) raw anthracite, (b) cokes prepared in the laboratory from a Welsh highly coking bituminous coal and from anthracite, carbonised separately at temp. from  $400^\circ$  up to  $1100^\circ$ , and (c) blend cokes made at  $800^\circ$ . The reactivity to  $CO_2$  at  $900^\circ$  of the cokes from the bituminous coal decreased continuously as the carbonisation temp. rose. With anthracite, however, the



reactivity increased with the temp. of carbonisation to a max. at 800° and subsequently decreased; a corresponding max. in porosity at 800° was also noted. The properties of the blend carbonised at 800° were very far from being an average of those of its constituents. Thus the carbonised 50/50 blend, which was mechanically the strongest coke obtained, had a lower ignition point and a higher reactivity than those of either the anthracite or bituminous coal carbonised separately. Impregnating the anthracite coal and coke with 0.5% of  $\text{Na}_2\text{CO}_3$  increased their reactivity sixfold, whilst larger additions of  $\text{Na}_2\text{CO}_3$  caused a further increase in reactivity. The methods of test employed are described in detail. H. C. M.

**Physical aspects of coal structure.** H. L. RILEY (Trans. Inst. Min. Eng., 1938, 95, 48—61).—The application of X-ray diffraction in the study of anthracite and coal, and of the constituents of the latter, is reviewed. In nearly all cases there is evidence of the presence of crystallites having nearly the same plane-spacing as graphite, but containing in some cases very few layers. A parallel, based on X-ray spectra, adsorptive powers, and products of chemical treatment, is drawn between the processes of coalification and carbonisation. A. R. PE.

**Action of bacteria on coal.** L. CZAPLICKI (Bull. sci. Assoc. des Élèves des Écoles spéc. Univ. Liège, 1938, 35, 156—165).—Work in this field is reviewed. The possibility of bacteria contributing to the spontaneous combustion of coal and to the formation of inflammable gases, e.g.,  $\text{CH}_4$ , is discussed in relation to available data. R. B. C.

**[Storage of] gas in coal.** G. LEHMANN (Glückauf, 1938, 74, 311—313).—A review, with special reference to the work of Coppens. R. B. C.

**State of methane in coal.** L. COPPENS (Compt. rend. XVII Cong. Chim. Ind., 1937, 507—524; cf. B., 1937, 102).—Sorption isotherms of  $\text{CH}_4$  on 4 different types of coal at 20° and at pressures up to 180 atm., in one case up to 381 atm., have been determined. In all cases the coals became saturated with  $\text{CH}_4$  at pressures of 130—140 atm. The results also confirm a previous finding that the relative adsorbing power of coals for  $\text{CH}_4$  increased with decreasing content of volatile matter (B., 1935, 706). It is concluded that the  $\text{CH}_4$  is retained by the coal by simple adsorption. H. C. M.

**Ignition of firedamp by coal-mining explosives.** W. PAYMAN and R. V. WHEELER (Trans. Inst. Min. Eng., 1938, 95, 13—47).—Tests in the steel gallery at Buxton show that factors favouring ignition are: inverse firing, thick cartridges, high rate of detonation, short shot holes, and a narrow gallery. Since the test shots do no work on the cannon walls, their igniting power is > that of shots in rock or coal, so that the test is fully stringent enough to cover practical conditions. As regards the immediate cause of ignition, no evidence was obtained that adiabatic compression is predominant in igniting firedamp even in breaks communicating with the shot hole. Other factors, the operation of which depends on circumstances, are the projection of hot solid particles from the cartridge and contact with the gaseous products

of detonation or with flame produced by decomposition products of the cartridge wrapping; photographic records and diagrams of these phenomena are discussed. A sheath of inert material such as  $\text{NaHCO}_3$  greatly reduces the incendive power of a cartridge, especially in respect of firedamp in a break, by accelerating the cooling of the hot products. Selection of the most efficient sheathing materials would be facilitated by a reduction in the no. of permitted explosives. A. R. PE.

**Laboratory determination of inflammability [limits] of coal dust.** J. FUGLEWICZ (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 131—137).—The various methods adopted, e.g., that of the Safety in Mines Research Board and of Taffanel, are described and sources of error discussed. R. B. C.

**Combustible gas indicator used for detection of hot spots in coal-storage piles.** G. F. CAMPAU (Combustion, 1938, 9, No. 10, 30).—A gas-sampling tube connected with a  $\text{CH}_4$  detector is plunged into the coal pile at different points; if the % of  $\text{CH}_4$  in the air is > a given amount overheating has reached a dangerous limit. The exact location of the hot spot is found subsequently by means of a thermocouple. R. B. C.

**Recent types of presses for production of coal briquettes.** C. BERTHELOT (Génie Civil, 1938, 112, 221—225). R. B. C.

**Friability of Alabama coals.** E. S. HERTZOG and J. R. CUDWORTH (U.S. Bur. Mines, 1938, Rept. Invest. 3384, 8 pp.).—Data have been obtained by using the tumbler test, a complete description of which is given. H. C. M.

**Pulveriser performance as affected by grindability of coal and other factors.** M. FRISCH and A. C. FOSTER (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 441—466).—The relative rating of a coal as to its pulverising characteristics (grindability) depends on the method used; no two methods assign the same relative rating to the same coal. However, the ratings for the same coal obtained by the two tentative methods of the Amer. Soc. Test. Mat. may be correlated. Pulverisers of different sizes, though of the same type, do not rate coals alike. Laboratory grindability ratings can be used to predict the performance of a pulveriser on a coal of known grindability without test provided the grindability-capacity relationship for the pulveriser is known, and the effects of feed size, moisture, and fineness are taken into consideration. The grindabilities of coals tested by the Hardgrove method as modified by Frisch and Holder (F.-W. method) can be correlated with those obtained by other methods. R. B. C.

**Separation process in the Rheolaveur [coal washer].** R. SEMBOL (Glückauf, 1937, 73, 969—977, 993—997).—The various stages of separation are examined. The application of the data obtained to commercial practice is discussed. R. B. C.

**Investigation of the performance of coal washeries with the aid of Tromp's product-distribution curves.** G. FRIELINGHAUS (Glückauf, 1938, 74, 223—225).—A method whereby the oper-



ative efficiency of the washery can be estimated from graphs derived from the results of float-and-sink analyses of the material before and after passing through the plant is described. R. B. C.

**Cost of ultra-clear coal.** C. W. H. HOLMES (Colliery Eng., 1938, 15, 148—150).—The increasing demand for coal containing  $\geq 2\%$  of ash, sources of low-ash coals, and coal-cleaning costs are discussed. R. B. C.

**Dewatering and drying of coal.** J. R. CUDWORTH and E. S. HERTZOG (U.S. Bur. Mines, 1938, Inf. Circ. 7009, 31 pp.).—The advantages of dewatering and drying in various fields, the classification of moisture in coal, and the effect of size and surface area on dewatering are discussed. Methods of dewatering and heat-drying of coal are described in detail, examples of American practice being given. H. C. M.

**Industrial purification of coal by the use of dense media. Flotation with sand.** C. BERTHELOT (Compt. rend. XVII Cong. Chim. Ind., 1937, 543—547).—A detailed description is given of the Chance sand-flotation process for the washing of coal. H. C. M.

**Determining moisture gradient within particles of brown coal, and its dependence on particle size and drying temperature.** K. SÄUBERLICH (Braunkohlenarch., 1937, No. 48, 3—21).—A method for determining the moisture gradient in brown coal sized from 8—10 mm. down to 2—3 mm. after drying at 105—190° is described. The gradient increased linearly with particle size and was a max., for drying temp. of 150—190° (17—25% of H<sub>2</sub>O in the coal). The method is not applicable to raw coal. The data obtained are discussed in relation to the briquetting of brown coal. R. B. C.

**Standard recipes [for analysis of solid fuels].** HOOFDCOMMISSIE VOOR DE NORMALISATIE IN NEDERLAND (Chem. Weekblad, 1938, 35, 330—338).—Minute details are given of proposed standard methods for the examination of solid fuels for free and combined H<sub>2</sub>O, ash, volatile constituents, and calorific val., together with H<sub>2</sub>O in the products of combustion. S. C.

**Determination of phosphorus in coals for metallurgical use.** A. ACCARDO (Compt. rend. XVII Cong. Chim. Ind., 1937, 459—464).—The method prescribed recently by the German Coke Oven Committee for the determination of P in coals and cokes (B., 1937, 311) is found to give consistently low results when applied to coals containing appreciable amounts of V. An alternative method for use with such coals is suggested, in which it is recommended that pptn. of the P as phosphomolybdate should be made at room temp. after first reducing the V present by SO<sub>2</sub>. Ti if present in amount  $< 0.2\%$  of the ash in the coal has little effect on the P determination. H. C. M.

**Oxidation of coal with potassium permanganate under acid conditions.** A. P. PETRICK and P. GROENEWOUD (J. Chem. Met. Soc. S. Africa, 1938, 38, 370—383).—When powdered coal is heated with acidified aq. KMnO<sub>4</sub> the latter is decomposed with

evolution of O<sub>2</sub>; at the same time, however, the finer coal particles are oxidised with formation of CO<sub>2</sub>, CO, and H<sub>2</sub>O. A. B. M.

**Testing the suitability of coal for coking.** G. N. DMITRIEV (Zavod. Lab., 1938, 7, 212—216).—Small-scale coking equipment is described. R. T.

**Crushed coke size as affected by coke breeze admixture to coal prior to carbonisation.** F. J. PFLUKE (Proc. Amer. Gas Assoc., 1937, 619—627).—The effect of adding various amounts and sizes of coke breeze to high-volatile or blended coal prior to carbonisation on the distribution of sizes in the coke obtained after crushing was investigated. Provided  $\geq 4\%$  of breeze of  $< \frac{1}{32}$  in. size, 3% of  $< \frac{1}{16}$  in. size, or 2% of  $< \frac{1}{8}$  in. size is blended with the coal the % of saleable coke obtained on crushing is about the same as that from coal containing no breeze and subjected to similar treatment. R. B. C.

**Transient fusion of coal. Separation of the fused coal into two phases.** A. GILLET and J. COLLIN (Compt. rend. XVII Cong. Chim. Ind., 1937, 260—263).—It has been observed that at a certain stage during the fusion of a fat coal separation of the fused mass into two distinct liquid phases occurs. One phase is black, more or less viscous, and persistent; the other is a transparent, practically colourless, and volatile liquid which froths up as a mass of bubbles in which the black phase is dispersed in filament form. The bearing of this observation on the nature of the mechanism of the formation of coke and semi-coke is discussed. H. C. M.

**Composition and fusibility of ashes from coals from the north of France and Pas-de-Calais.** H. LEFEBVRE and P. BOULANT (Compt. rend. XVII Cong. Chim. Ind., 1937, 1170—1178).—The nature of the distribution of mineral matter in coal, and the effect of washing, not only on the ash content of the coal but also on the nature and fusibility of the ash, have been studied for 30 coals drawn from the north of France. Ashes prepared by slow combustion of the coals in a muffle at 800° contained neither Fe<sub>2</sub>O<sub>3</sub> nor Fe<sub>3</sub>O<sub>4</sub> in the free state, but always some ferrites. The effect of adding small quantities of SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, CaO, MgO, kaolin, etc. on the fusion point of coal ash is also discussed. H. C. M.

**Pressure gasification of solid fuels with oxygen.** F. DANULAT (Metallges. Periodic Rev., 1938, No. 13, 13—21).—A review. (Cf. B., 1937, 104.) R. B. C.

**Liquefaction and gasification of coal.** T. WATANABE (J. Fuel Soc. Japan, 1938, 17, 23—24).—Japan plans to produce 10<sup>6</sup> kl. of gasoline and a similar amount of heavy oil in 1943, the former by coal liquefaction and the latter by low-temp. carbonisation. Admixture of EtOH with gasoline is to be made compulsory. An extended use of gas, in particular producer gas, is also to be recommended. A. B. M.

**Distillation of lignites, bituminous schists, and asphaltic rock in carbon dioxide and hydrogen.** J. BARLOT (Compt. rend. XVII Cong. Chim. Ind., 1937, 135—138).—The quality and quantity of crude oil produced on distillation of bituminous schists



and asphalts depend to a considerable extent on the nature of the gaseous atm. in which distillation is effected. In particular, the presence of  $\text{CO}_2$  appears to favour the formation of creosotes, whereas  $\text{H}_2$  or a gas rich in  $\text{H}_2$  (e.g., water-gas) increases the total yield of oil and suppresses coke formation.

H. C. M.

Detailed characterisation of coals and cokes as practised at a large coke-oven plant. P. FERRERO (Compt. rend. XVII Cong. Chim. Ind., 1937, 496—506).—A descriptive account is given of the methods employed for testing the coals used and for controlling the quality of the cokes produced.

H. C. M.

Materials for blending with fat coals for preparation of metallurgical cokes. F. BONGARÇON (Compt. rend. XVII Cong. Chim. Ind., 1937, 105—110).—It is considered that, in view of the high rates of working now being employed in blast-furnace practice, coke breeze is to be preferred to anthracite as a blending medium, mainly owing to the low reactivity of anthracite.

H. C. M.

Blending of high-volatile coals with [low-volatile] Beckley Bed coal, and effect on yield and quality of carbonisation products. J. D. DAVIS and C. R. HOLMES (Proc. Amer. Gas Assoc., 1937, 670—681).—Various high-volatile coals blended with 20 or 30% of Beckley coal were carbonised at  $900^\circ$  in the 18-in. Bureau of Mines-American Gas Association retort. The yields of products from blends could not be calc. precisely from those from 100% charges of the constituent coals. In general, blends yielded the best coke.

R. B. C.

Low-temperature carbonisation of bituminous coal in a current of heating gas. A. JÄPELT and A. STEINMANN (Braunkohlenarch., 1937, No. 48, 22—27).—Carbonisation of poorly-caking bituminous coal mixed with brown-coal briquettes (1 : 2 or 1 : 3) or bituminous semi-coke (7 : 3), and of the coal alone after thermal pretreatment, is easily carried out in the apparatus described by Schmidt and Groh (cf. B., 1936, 354). The best results are obtained when using superheated steam. Yields obtained at  $400^\circ$ ,  $500^\circ$ , and  $650^\circ$  are tabulated. Further work is necessary, however, before the process can be considered as satisfactory.

R. B. C.

Low-temperature carbonisation and gasification of "Heckel" briquettes from finely-divided brown coal. A. JÄPELT and A. STEINMANN (Braunkohle, 1938, 37, 215—219).—The briquettes were made by the "Hepandur" process (cf. Rammler, B., 1938, 122) from Bohemian brown coal. They were carbonised at  $500$ — $600^\circ$  in an internally-heated vertical retort without difficulty and gave a good tar yield (94% of the Fischer assay yield). The coke was only slightly coherent and could readily be ground to give a pulverised fuel. The briquettes were better utilised by gasification, when they gave a gas of good calorific val. (about 1400 kg.-cal./cu.m. nett) and a tar (52% of the Fischer assay yield) of almost the same composition as the low-temp. tar. The briquettes retained their strength better during gasification than during carbonisation. A. B. M.

Coalene [Record-Loutitt] process of low-temperature carbonisation of coal by heating in steam. A. THAU (Feuerungstech., 1938, 26, 73—76).—A plant having a capacity of 15—20 tons of coal per day is diagrammatically described. Yields are tabulated and a heat balance is given.

R. B. C.

Carbonisation of coal with electricity. A. THAU (Glückauf, 1938, 74, 205—206).—A review.

R. B. C.

(A) Improving the quality of coke (carbonisation process). (B) Testing of coke and coal. (C) Combustion of coke. MIDLAND COKE RES. COMMEE. (Fuel, 1938, 17, 105—108).—(A) When coking nut or run-of-mine coal the blending therewith of semi-cokes of high volatile matter content was less effective than the blending of high-temp. coke dust in raising the impact hardness of the cokes produced. Addition to the coal of up to 4% of cokes (ground to 50% through 50-mesh) produced by under-carbonising coke-oven charges improved the  $1\frac{1}{2}$ -in. shatter index of the coke from the blend, and did not adversely affect its abrasability. Cokes obtained from a Scottish cannel coal and a Staffordshire coal have been examined. Relationships between coal composition and yields of tar etc. therefrom are discussed. By plotting volatile matter against calorific val. (on the dry, mineral matter-free basis) coals fall into a band of regular shape from anthracite to the end of the bituminous coals, but lignites (brown coals) spread out in an irregular manner. A coal may be classified by its position in the band. The calorific val. of the pure coal is a useful index of the rank of high-volatile coals. (B) The amount of dust produced in the Cochrane drum test for abrasability is  $\propto$  the square root of the no. of revolutions. The Cochrane test distinguishes between "hard" and "soft" gas cokes and between semi-cokes and metallurgical cokes which have the same shatter index. Cokes of high shale content have a low Cochrane index, whereas cokes of high inherent ash content may have a high index. The Cochrane test has been correlated with the Sheffield abrasion test. Reports on the  $d$  of coke, the crit. air-blast test, etc. have been published. Some coals develop excessive plasticity which may cause "squating" in an oven and consequent difficulty in pushing the charge. (C) Beds of coke of small size range show a resistance to the passage of air given by  $P = KV^{1.64}$ , where  $P$  is the pressure drop per unit thickness of bed,  $V$  the gas velocity, and  $K$  a const. The val. of  $K$  rises 5-fold with decrease in the mean size of the coke from  $1\frac{1}{2}$  to  $\frac{1}{2}$  in. The permeability of prisms of coke has been studied. Some tests on the use of an alkali-activated coke and of a vertical retort coke for domestic heating are recorded.

A. B. M.

Retort for carbonising wood. L. MECKLENBURG (Chem.-Ztg., 1938, 62, 317—318).—The retort is constructed of light sheet Fe provided with strengthening ribs, and is covered on the outside with heat-insulating material. The wood is introduced into the retort in open-framework wagons. Heating is effected by circulating hot gases through pipe flues in the retort. Ease of transport and erection, high thermal efficiency, and high yields of products, de-



comp. of which by cracking due to local overheating is avoided, are claimed. A. B. M.

**Carbonisation of woods and their principal immediate constituents. III. Lignins.** P. LEBEAU, P. MARMASSE, R. MICHEL, G. VIEL, and M. VOYER (Ann. Off. nat. Comb. liq., 1937, 12, 929—958; cf. B., 1938, 473).—The lignins of furze, chestnut, elder (wood, root, and pith), teak, etc., prepared by the Willstätter method, were subjected to dry distillation in 100° stages up to 1000°. Tables show the % composition of the gas evolved at different temp. and the % of residual C. In general, gas evolution was a max. at 700°. R. B. C.

**Developments in the construction of coke ovens and recovery of the by-products of carbonisation.** C. BERTHELOT (Compt. rend. XVII Cong. Chim. Ind., 1937, 1179—1183).—Vertical twin flues for economical and uniform heating, reduction of cracking by improved gas-offtake arrangements, and recovery of  $C_{10}H_8$  by cooling in presence of tetralin vapour are discussed. A. R. PE.

**Coke from oil shale.** V. CHARRIN (J. Usines à Gaz, 1938, 62, 206—207).—The crude oil distilled from Autun shale is cracked in a Dubbs plant at 500° and the residue, which contains very little ash and S, can be used for making electrode C and in many other ways. The process gives a good yield of petrol, and extensive development is foreshadowed. A. R. PE.

**Coke preparation.** M. BRABANT (J. Usines à Gaz, 1938, 62, 193—203).—Methods of breaking and grading coke are described briefly and an illustrated description is given of the grading, storage, and handling arrangements at the Brussels municipal coke ovens. A. R. PE.

**Rapid determination of water in peat coke and manganese or iron ores, by the exothermic method.** P. I. DOLINSKI (Zavod. Lab., 1938, 7, 223—226).—The  $H_2O$  content is derived from the temp. rise following addition of conc.  $H_2SO_4$  to the powdered samples. R. T.

**Sulphur recovery at coke ovens.** W. REERINK (Glückauf, 1938, 74, 303—309).—Processes for recovering S from coke-oven gas are reviewed, with special reference to German conditions. R. B. C.

**Radiometer for use with open domestic fires.** A. BLACKIE (J. Inst. Heat. Vent. Eng., 1938, 6, 95—100).—An apparatus which gives a continuous record of the radiation emitted from an open coal or coke fire is diagrammatically described. R. B. C.

**Manufacture of blacks of the carbon-black type from materials other than natural gases.** G. BRUNI and T. G. LEVI (Rubber Tech. Conf., 1938, Preprint 29, 2 pp.).—Experiments with an impingement process using flames obtained by burning combustible gases enriched with vapour of  $C_{10}H_8$ , anthracene, etc., and also the  $C_2H_2$  flame, have demonstrated that it is possible thereby to produce a high-class C black and that the use of natural gases is not essential. D. F. T.

**Survey of methods for evaluating carbon blacks [in rubber].** I. DROGIN (Rubber Tech. Conf., 1938, Preprint 18, 12 pp.).—Especial reference

is made to tests based on a compression-flexometer, an impact- and rebound-pendulum, the T-50 characteristics, and the dielectric properties. These are much more informative than is the older method of tensile testing. Numerous physical and chemical characteristics of C blacks are tabulated together with an indication of the influence of each property on the behaviour in rubber. D. F. T.

**Carbon gas-black. Technical methods of control for the printing ink industry.** G. L. ROBERTS (Amer. Ink Maker, 1938, 16, No. 3, 18—21).—Instructions for testing colour, tinting strength, oil absorption, and flow properties are given. D. R. D.

**Action of hydrogen on coal. III. Development of a small-scale liquid-phase continuous plant.** N. BOOTH, F. A. WILLIAMS, and J. G. KING (Dept. Sci. Ind. Res., Fuel Res. Tech. Paper 44, 1938, 27 pp.; cf. B., 1936, 305).—The apparatus and technique are described (cf. B., 1937, 1294) and results obtained with Beamshaw (C 82.7, H 5.2%), Rock Fawr (C 83.3, H 5.7%), and Elled (C 87.2, H 5.0%) coals are tabulated. The reaction temp. was 440—460° and the throughput 1 kg. of paste (ratio of coal to vehicle 0.67 : 1 to 1 : 1) per hr.; low-temp. tar or "hydroil" (an oil produced in the process) was used as vehicle and 0.1% of  $Sn(OH)_2$  (calc. on the coal) was added as catalyst. The lower-C coals were processed satisfactorily and conversion into oil was high. Elled coal was processed only with difficulty and the conversion into oil was low. Increasing the pressure from 200 to 250 atm. had little effect on the results with the first two coals, but slightly improved the conversion in the case of Elled coal. A. B. M.

**Hydrogenation of South African coals.** A. J. PETRICK, B. GAIGHER, and P. GROENEWOUD (J. Chem. Met. Soc. S. Africa, 1938, 38, 334—337; cf. B., 1938, 12).—Results of hydrogenation tests on 17 other coals are tabulated. The org. insol. residue varied from 12.6 to 42.6% of the dry, ash-free coal. Some Natal coals appear to be as amenable to hydrogenation as good Transvaal coals. A. B. M.

**Reduction in ash content of some South African coals.** J. C. VOGEL (J. Chem. Met. Soc. S. Africa, 1938, 38, 337—342).—A no. of coals that had previously been shown to be amenable to hydrogenation (cf. preceding abstract) present difficulties in cleaning by gravity separation, and yield relatively small amounts of coal of 4% or even 6% of ash, even when finely crushed. Much higher yields (63—96%) of coal of 4—6% of ash were obtained by grinding the coal to a fine powder in presence of oil and  $H_2O$ , when the low-ash coal is recovered as a paste (cf. Trent process, B.P. 183,430; B., 1923, 392A, and subsequent patents). A. B. M.

**Utilisation of coal with particular reference to production of oil.** C. LEGRAND and M. SIMONOVITCH (Fuel, 1938, 17, 65—68, 96—104, 145—160; cf. B., 1938, 341).—The development since the war of the coking industry and of high- and low-temp. carbonisation in Great Britain and on the Continent is outlined. The hydrogenation of coal is described with reference to the I.C.I. plant at Billingham. A. B. M.



**Stationary charcoal gas producer.** M. FUJIBAYASHI (J. Fuel Soc. Japan, 1938, 17, 41—42).—Fuel consumption is 20—40% higher with lump than with small charcoal. H. C. M.

**Recovery of anhydrous tar in the purification of producer gas.** ANON. (Teer u. Bitumen, 1938, 36, 93—94).—The Ab-der-Halden process is diagrammatically described. The gas is washed at a temp. above the dew point with a liquid miscible with the tar, e.g., anthracene oil. Data are given.

R. B. C.

**Production of carbon monoxide and hydrogen by means of the methane-steam reaction.** S. TSUTSUMI (J. Fuel Soc. Japan, 1938, 17, 24—28).—Using a Ni catalyst [made by heating a mixture of  $\text{Ni}(\text{NO}_3)_2$  with the nitrate or oxide of the promoter and then reducing the mixture in  $\text{H}_2$  at the reaction temp.] for the water-gas reaction ( $\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + \text{H}_2$ ) at 700° and 800°,  $\text{MgO}$  (10%) was the best promoter, followed by  $\text{MnO}$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ , etc.;  $\text{CuO}$  was the least active promoter.  $\text{ZnO}$  alone was an effective catalyst for this reaction. Using Ni as catalyst for the hydrogenation of  $\text{C}_6\text{H}_6$ ,  $\text{Al}_2\text{O}_3$  was the best promoter. In the  $\text{CH}_4$ -steam reaction  $\text{Ni} + 10\%$  of  $\text{MgO}$  was the most effective catalyst both at 700° and 800°. The effect of the promoter alone on this reaction was slight. Promoters that were effective for the hydrogenation of  $\text{C}_6\text{H}_6$  were also effective for the thermal decomp. of  $\text{CH}_4$ . The order of activities of catalysts with different promoters was, however, different for the  $\text{CH}_4$ -steam reaction and the thermal decomp. of  $\text{CH}_4$ . The effects of varying the proportion of promoter and of using a carrier were also studied.

A. B. M.

**Removal of carbon monoxide from town's gas.** A. ANTONI (Compt. rend. XVII Cong. Chim. Ind., 1937, 190—204).—The process based on the reaction  $\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + \text{H}_2$  is discussed and the plant operating it at Hameln described (cf. B., 1936, 434, 725). With suitable design and disposition of plant the catalyst temp. can be maintained by the heat of reaction alone.

A. R. PE.

**French limonite for [town's] gas purification.** V. CHARRIN (J. Usines à Gaz, 1938, 62, 173—175).—Extensive deposits of Fe ore in the Mare valley, for the most part cheaply accessible by open workings, include limonite containing, after drying at 100°,  $\text{Fe}_2\text{O}_3$  68 and  $\text{MnO}_2$  0.9%. Laboratory tests show the limonite to possess satisfactory activity towards  $\text{H}_2\text{S}$ .

A. R. PE.

**[Removal of naphthalene by] introduction of tetralin into [town's gas] distribution system by portable equipment.** M. E. SHEA (Amer. Gas J., 1938, 148, No. 4, 31—34, 53).—The technique is diagrammatically described.

R. B. C.

**A[eration] T[est] B[urner] number control of town gas.** W. S. STREDWICK and W. F. THORNE (Gas J., 1938, 222, 368—372, 375).—Linear relationships exist between A.T.B. nos. and calorific vals. for both coal gas and carburetted water-gas, and a formula is given whereby the A.T.B. no. of any mixture of the two can be calc., but its relationship with calorific val. in this case is complex, so that if both these char-

acteristics of such a mixture are to be kept const., the calorific vals. of the constituent coal gas and water-gas must be fixed at vals. depending on their vol. ratio in the mixture. Practical methods of controlling these vals. are described. Appliances are set to gas of A.T.B. no. one unit above the standard supplied, which is maintained within  $\pm 2$ . Adequate ventilation is important in using the A.T.B.

A. R. PE.

**Immersion [gas] burner.** R. F. MANN (Amer. Gas J., 1938, 148, No. 4, 9—14).—Its construction and applications, e.g., in the melting of soft metals, are described.

R. B. C.

**Motor traction with town's gas.** L. LÉVÊQUE (Monatsbull. schweiz. Ver. Gas- u. Wasserfachm., 1938, 18, 25—27).—Tests carried out with a 5-ton lorry the engine of which was adapted to use town's gas instead of petrol are described. Acceleration at full load was retarded by the conversion; this difficulty, however, could be obviated by increasing the compression ratio. In general, satisfactory results were obtained with town's gas.

R. B. C.

**Utilisation of industrial and waste gases by the Lurgi processes.** G. ROESNER (Metallges. Periodic Rev., 1938, No. 13, 22—30).—Developments in the electrical pptn. of dust and tar from flue gases and coke-oven gas, the use of active C for recovering  $\text{C}_6\text{H}_6$  from town's gas, the removal of S from fuel gases, and the production of  $\text{H}_2\text{SO}_4$  from  $\text{SO}_2$  are discussed in relation to the work in these fields of the Lurgi Apparatebau G.m.b.H.

R. B. C.

**Determination of the specific gravity of [fuel] gas by the effusion method.** C. W. WILSON (Proc. Amer. Gas Assoc., 1938, 777—782).—Data for the  $d$  of coke-oven gas, town's gas, petroleum refinery gas, and water-gas obtained by means of a Schilling or Bureau of Mines effusion apparatus and an Edwards sp.-gravity balance were compared. Sources of error when employing the effusion method, and precautions and corrections necessary to obtain reasonably accurate results, are discussed.

R. B. C.

**Critical study of methods for determining oxygen [in gases].** S. COHN (Proc. Amer. Gas Assoc., 1937, 783—786).—An investigation was made of absorbents, e.g., aq.  $\text{MnCl}_2$  and  $\text{Na}_2\text{S}_2\text{O}_4$  and solid P, and apparatus best suited for the determination of  $\text{O}_2$  in natural gas, carburetted water-gas, coke-oven gas, flue gas, air, and commercial  $\text{O}_2$ . Recommendations regarding the choice of method in a particular case, based on a table showing the accuracy of the methods studied, are given.

R. B. C.

**Analysis of combustion gases from fuels containing sulphur.** A. R. SPREGA (Calore, 1937, 10, 6—8).—The extent to which the presence of  $\text{SO}_2$  can interfere with the analysis of combustion gases is discussed. It is advisable to eliminate  $\text{SO}_2$  before analysing gas containing a high % of S.

R. B. C.

**Absorption vessel for industrial gas analysis.** C. ROY-POCHON (Compt. rend. XVII Cong. Chim. Ind., 1937, 448—450).—The gas is led into the absorbent liquid by a vertical tube carrying externally a series of co-axial discs which reach nearly to the wall



of the vessel and offer a large absorbing surface when wetted.

A. R. PE.

**Gas calorimeter tables.** ANON. (U.S. Bur. Stand., 1938, Circ. C 417, 42 pp.).—Data for calculations necessary in using a  $\text{H}_2\text{O}$ -flow calorimeter are tabulated, with explanations, where necessary, of their basis and use, and directions for recording results.

A. R. PE.

**New porous material for dissolved acetylene.** G. ANCIEN (Proc. XII Internat. Congr. Acetylene, 1936, 4, 984—987).—The advantages of a patented material (wood-charcoal) are described, especially from the viewpoint of its capacity to arrest explosions.

P. G. McC.

**Testing of porous substances for dissolved acetylene cylinders.** G. W. J. VAN SIERENBERG DE BOER (Proc. XII Internat. Congr. Acetylene, 1936, 4, 979—983).—The regulations concerning the safety of  $\text{C}_2\text{H}_2$  cylinders are discussed and the theoretical basis underlying the use of porous material as a safety factor is questioned. An alternative theory accounting for explosions in cylinders is supported by experiment, and it is proposed that a safety cap fitted to the cylinder would solve the problem. It is also indicated that the pressure applied when internal-combustion experiments are made is too low and should be  $< 20$  atm.

P. G. McC.

**Rate of generation of acetylene in the acetylene generator.** O. MIES (Proc. XII Internat. Congr. Acetylene, 1936, 4, 951—962).—A mathematical study of the operation of  $\text{C}_2\text{H}_2$  generators is attempted on the basis of curves showing the rate of generation of  $\text{C}_2\text{H}_2$ . The rates of generation in carbide-to- $\text{H}_2\text{O}$ ,  $\text{H}_2\text{O}$ -to-carbide, and immersion generators are separately considered. Various curves and figures resulting from experiment are given.

P. G. McC.

**Oxy-acetylene torch.** C. PICARD (Chaleur et Ind., 1938, 19, 140—144).—Data showing the effect of variations in the composition of the  $\text{O}_2$ - $\text{C}_2\text{H}_2$  on the performance of the torch are given.

R. B. C.

**Injector-type oxy-acetylene torches.** N. MANSON (Chaleur et Ind., 1938, 19, 145—152).—The causes of the sudden change in the nature of the  $\text{O}_2$ - $\text{C}_2\text{H}_2$  flame due to the heating of the jet of the torch in use have been investigated. Experimental data are given.

R. B. C.

**Supplying blowpipes with oxygen and acetylene.** R. MAGLOIRE (Chaleur et Ind., 1938, 19, 197—198).—The advantages of employing  $\text{O}_2$  and  $\text{C}_2\text{H}_2$  at similar pressures in welding torches are discussed.

R. B. C.

**Industrial flames.** H. GUILLON (Chaleur et Ind., 1938, 19, 195—196).—The techniques adopted in the measurement of the temp. of (a) a blast-furnace gas flame used to heat a  $\text{H}_2\text{O}$ -tube boiler, and (b) the flame in a coal-fired boiler furnace fitted with a chain-grate stoker are described.

R. B. C.

**Utilisation of flames of premixed gases in laboratory and industrial furnaces.** G. MEKER (Chaleur et Ind., 1938, 19, 178—182).—The characteristics of flames produced by combustible mixtures

deficient in air and by homogeneous mixtures are discussed.

R. B. C.

**Applications of flames of premixed gases and of surface combustion in furnaces.** E. DAMOUR (Chaleur et Ind., 1938, 19, 191—194).—An illustrated review.

R. B. C.

**Surface combustion by projection.** H. CASSAN (Chaleur et Ind., 1938, 19, 125—135).—A review.

R. B. C.

**Limitations to the use of flames of premixed gases in metallurgical furnaces.** C. LE CHATELIER (Chaleur et Ind., 1938, 19, 183—184).—A discussion.

R. B. C.

**Properties of welding and oxygen-cutting flames.** R. GRANJON and D. SÉFÉRIAN (Chaleur et Ind., 1938, 19, 153—158).—A review.

R. B. C.

**Velocity of propagation of flame in a homogeneous combustible mixture under constant pressure. Theory of the blue cone.** G. RIBAUD (Chaleur et Ind., 1938, 19, 23—27).—Mathematical.

R. B. C.

**Speed of propagation of combustion : uniform movement of the flame.** P. LAFFITTE (Chaleur et Ind., 1938, 19, 33—37).—The calculation of the velocity of uniform movement of a flame in complex gas mixtures is discussed.

R. B. C.

**New combustion equations and their geometrical representation.** N. CESAREO (Arch. Wärmewirts., 1938, 19, 105—109).—Equations which take into account the effect of five variables, viz., the vol. of  $\text{O}_2$ ,  $\text{CO}_2$ , and  $\text{CO}$ , the wt. of unconsumed fuel, and the excess of air, are developed and represented geometrically. The Ackermann and Ostwald-Seufert triangles are shown to be special cases of the general diagram developed.

R. B. C.

**Combustion efficiency with special reference to intermittent kilns.** N. S. GRAY (Trans. Ceram. Soc., 1938, 37, 100—114).—The principles and practice of "semi-producer" gas-firing are described in detail. The advantages of the system are : reduced fuel consumption, elimination or reduction of smoke emission, better control and distribution of temp., possibility of using cheaper fuel, and reduced labour costs.

J. A. S.

**Gaseous fuel in the varnish and chemical industries.** W. JANTZEN (Gas- u. Wasserfach, 1938, 81, 334—336).—Advantages of gas firing for running gum resins, preparing edible fats, etc. are discussed.

A. R. PE.

**Estimation of tar yields of coals.** R. McADAM (Coal Carbonisation, 1938, 4, 76—77).—Briggs' equation for calculating the yield of oil from a carbonaceous material, viz.,  $y = 0.47(V - 2O)^{1/2}$ , where  $y$  is the yield of crude oil in gals./ton,  $V$  the % of volatile hydrocarbons, and  $O$  the % of  $\text{O}$ , was applied to a large no. of Scottish bituminous and cannel coals, oil shales, and torbanites. Good agreement was found between the calc. and experimental data. Nomograms for the solution of Briggs' equation, and of Seyler's equation for calculating volatiles in coal ( $V = 10.61H - 1.24C + 84.15$ ), are given.

R. B. C.

**Extraction method of analysis of medium-temperature coal tar.** G. DESCHALIT and R.



GVIRTZMAN (Ukrain. Chem. J., 1938, 13, 132—138).—An analytical procedure involving extraction with different solvents ( $\text{Et}_2\text{O}$ ,  $\text{CHCl}_3$ , aq.  $\text{NaOH}$ , light petroleum) is described. The results given differ from those obtained by fractional-distillation procedures chiefly in a much higher phenol, and a correspondingly lower asphalt, content. R. T.

**Hydrogenation of various tars and oils.** I, II. S. ANDO (J. Fuel Soc. Japan, 1938, 17, 33—40).—Low-temp. tar, low-temp. tar oil, creosote oil, crude shale oil, and heavy mineral oil were hydrogenated at 465—490°/200 atm. in a small-scale continuous plant, throughput 600 g./hr., using  $\text{NH}_4$  thiomolybdate on pumice as catalyst, and the compositions of the resultant gasolines determined. In all cases, the gasolines produced contained <1.5 wt.-% of unsaturated hydrocarbons. The content of aromatic hydrocarbons varied from 34 to 63%, being highest with creosote oil and lowest with shale oil. The highest naphthene hydrocarbon content, 42%, was obtained with mineral oil; in all other cases an average figure of 30% was obtained. The content of paraffin hydrocarbons ranged from 6 to 35%, being highest with shale oil and lowest with creosote oil. Gasolines of the highest (81) and of the lowest  $\text{C}_8\text{H}_{18}$  no. (59) were obtained with creosote and shale oil, respectively.

II. The residual oils boiling above 190° obtained in the above series were hydrogenated in a small batch autoclave at 480°/230—280 atm., using  $\text{MoO}_3$  as catalyst, and the compositions of the gasolines obtained were studied. In general, the gasolines had a higher aromatic and a lower paraffin hydrocarbon content than the corresponding gasolines obtained by hydrogenation of the crude oils. H. C. M.

**Development of a semi-large-scale plant for hydrogenating tar oils and primary bitumens from bituminous coal.** G. RÜHL (Bergbau, 1937, 50, 289—298, 303—309).—Experience gained in the operation of a pilot plant (described) for the continuous hydrogenation of 5 kg. of tar per hr. is recorded. Hydrogenation is carried out in both the liquid and vapour phases, the  $\text{H}_2$  being obtained from coke-oven gas and hydrogenation waste gases in a special type of converter. Cost data for a projected hydrogenation plant for treating 15 tons of tar per day are given.

R. B. C.

**Bleaching of bitumen.** H. WALTHER (Vedag-Buch, 1937, 10, 111—121).—Glass plates coated with various types of hard or soft bitumen or bituminous coal-tar pitch were immersed in  $\text{H}_2\text{O}$ , or  $\text{H}_2\text{O}$  containing  $\text{O}_2$  or air, in sealed Uviol-glass tubes and exposed to sunlight for 90 hr. Photographs show the relative bleaching of the specimens. Pitch was unaffected. A photochemical process entailing  $\text{O}_2$  absorption is involved.

R. B. C.

**Bituminous mixtures [for roadmaking].** B. E. GRAY (Rock Products, 1938, 41, No. 3, 43).—When bonding soil and gravel, of which 12% passes 200-mesh, 3—4% of  $\text{H}_2\text{O}$  is essential, increasing to 15% as the proportion of fine matter increases. G. H. C.

**Bitumen and metal.** H. WALTHER (Vedag-Buch, 1937, 10, 101—110).—Glass plates coated with blown or high-vac. bitumen or bituminous coal-tar

3 F (B.)

pitch were placed over  $\text{H}_2\text{O}$  in sealed Uviol-glass tubes containing  $\text{O}_2$  and exposed to ultra-violet light for 600 hr. The plates were periodically washed with  $\text{H}_2\text{O}$ , the acid and aldehyde contents of which were subsequently determined. Deterioration, as measured by loss in wt., adhesion to the plate, and acid formation in the  $\text{H}_2\text{O}$ , was greatest in the case of blown bitumen; high-vac. bitumen was rather more stable, whilst pitch was scarcely affected. Strips of Zn, Cu, and Pb were arranged below glass plates coated and treated as above, and corrosion due to the action of the rinsing  $\text{H}_2\text{O}$  was investigated. Blown bitumen was highly corrosive, whilst pitch was practically non-corrosive. Photographs are given. R. B. C.

**Pitches.** A. CELERIER (Compt. rend. XVII Cong. Chim. Ind., 1937, 713—721).—The nomenclature and general properties of pitches of various origins are given. Investigations of their constitution by fractional dissolution or distillation, hydrogenation, and X-ray diffraction are reviewed, and the properties of the groups of components separable by means of various solvents are classified. A. R. PE.

**The Kraemer-Sarnow method of determining the softening point of pitch.** H. LEFEBVRE and R. FAIVRE (Compt. rend. XVII Cong. Chim. Ind., 1937, 1166—1169).—Satisfactory precision is attainable if the size and shape of the pitch plug, the amount of Hg, and the rate of heating are standardised. Control of the last-mentioned factor being difficult, a correction based on the use of a reference sample of pitch is suggested. A. R. PE.

**Utilisation of pitch.** J. ROBERTS (Coal Carbonisation, 1938, 4, 69, 72).—The blending of pitch with non-coking coal for the production of coke, and the use of pitch as a boiler fuel and as a source of electrode C, are discussed. R. B. C.

**Classifying asphalts by means of the penetration index.** J. P. FFEIFFER and P. M. VAN DOORMAL (Nat. Petrol. News, 1938, 30, No. 8, 78, 80—82R, 84R).—Because of the time required to determine abs.  $\eta$ , a method for determining the penetration index based on the relation existing between the penetration val. and the softening point (ring-and-ball method) has been developed. A nomogram from which the index can be obtained is given and a slide rule for facilitating rapid determination described. Asphalts can be grouped into various types according to their penetration indices. R. B. C.

**Qualitative examination of asphalts and pitches.** F. NEUBER (Petroleum, 1938, 34, No. 17, 1—3).—About 0.5 g. of the bitumen is dissolved in 10 c.c. of  $\text{CCl}_4$  and a drop of the solution is placed on a filter-paper. After evaporation of the solvent the spot containing the dry residue is cut out and placed on a second filter-paper. A drop of  $\text{Pr}^3\text{OH}$  is placed on the spot and the paper is gently warmed from below, whereby the material sol. in  $\text{Pr}^3\text{OH}$  is transferred to the second filter-paper. The process is repeated with 15—20 successive drops of the solvent when, in general, all sol. material has been so transferred. The extraction is repeated successively with  $\text{COMe}_2$ , light petroleum, and  $\text{CCl}_4$ , using a fresh filter-paper each time. The appearance of the extracts,



both in daylight and in ultra-violet light, serves to characterise the bitumen with precision.

A. B. M.

**Determination of benzene [vapour in the air] by means of the Dräger-Schröter apparatus.** K. GEMEINHARDT (Petroleum, 1938, 34, No. 15, Motorenbehr., 9, 2—3).—A known vol. of air is drawn through a layer of active C by means of a small hand pump. The C is washed with EtOH to extract the  $C_6H_6$  and the latter is determined by the depth of colour produced at the interface between the EtOH solution and conc.  $H_2SO_4$  containing  $CH_2O$  (cf. B., 1932, 625).

A. B. M.

**Stability of wash oil.** I. T. BARDAGOV and V. I. DAL (Koks i Chim., 1938, No. 2—3, 69—73).—Deterioration of wash oil is ascribed to condensation and polymerisation of its constituents (chiefly unsaturated) in presence of  $O_2$ ,  $H_2S$ , and Fe catalysts. The process is retarded by elimination of PhOH and  $C_5H_5N$  from oil, and by distilling off  $C_6H_6$  at  $>130^\circ$ .

R. T.

**Petroleum in Tunis.** A. ROUX and M. SOLIGNAC (Ann. Off. nat. Comb. liq., 1937, 12, 865—904).

R. B. C.

**U.O.P. [Universal Oil Products] laboratory test methods for petroleum and its products.** (Universal Oil Products Co., Chicago, 1937, 250 pp.).

R. B. C.

**Bleaching earths and their evaluation in the mineral oil industry.** E. ERDHEIM (Petroleum, 1938, 34, No. 15, 1—6).—Curves have been constructed showing decolorising action as a function of % of earth used for a no. of bleaching earths of different origin and for both light and heavy oils. The curves vary in form especially with the different oils. Such curves form a better criterion of the relative efficiencies of a series of earths than single tests giving the decolorising effect with a fixed % of the earth or the amount of earth giving a fixed decolorising effect.

A. B. M.

**Dehydration of natural gas.** J. R. COWLES (Petroleum Eng., 1937, 8, No. 11, 75—76, 78; No. 12, 28—29; 9, No. 1, 50, 52, 54; No. 2, 72, 74, 76).—A review.

R. B. C.

**Odorisation of natural gas.** E. L. HENDERSON (Amer. Gas J., 1938, 148, No. 4, 29—30).—Calorant (a mixture of hydrocarbons and org. S compounds), Pentalarm ( $C_5H_{11}SH$ ), and EtSH are being added to natural gas in Texas, U.S.A. The types of odoriser used are illustrated.

R. B. C.

**Physical constants of paraffin hydrocarbons.** G. EGLOFF and A. V. GROSSE (Universal Oil Products Co., Chicago, Bookl., 219, 1938, 90 pp.).—A comprehensive review and bibliography.

R. B. C.

**Practical thermodynamic chart for hydrocarbons.** J. E. HEDRICK (Refiner, 1938, 17, 140—142).—Two charts are given in which the free energies of formation of various paraffinic, olefinic, and aromatic hydrocarbons are plotted at 1 atm. and at  $298^\circ K$ . and  $500^\circ K$ ., respectively.

R. B. C.

**Separation of the three methyloctanes from midcontinent petroleum.** J. D. WHITE and A. R. GLASGOW, jun. (J. Res. Nat. Bur. Stand., 1937, 19,

423—435).—The separation, by means of repeated distillation, extraction, and crystallisation, of  $\beta$ -,  $\gamma$ -, and  $\delta$ -methyloctane is described. The compounds, in the order named, are present in petroleum in the proportion 3 : 1 : 1, the total methyloctane content in the crude oil being approx. 0.3%. Vals. for m.p., f.p.,  $d$ , and  $n$  are in good agreement with vals. for synthetic compounds. The crit. solution temp. in  $NH_2Ph$  have been determined.

C. R. H.

**[Separation of mixtures of]  $\alpha$ -[1-] and  $\beta$ -[2-] methylnaphthalenes from Rumanian crude oil.** V. T. COȘCIUG (Petroleum, 1938, 34, No. 16, 3—6; cf. B., 1935, 1081).—Attempts to obtain pure 1- (I) and 2- $C_{10}H_7Me$  (II) by fractional crystallisation of the mixed picrates from EtOH failed. By refractionation of the hydrocarbons recovered from a fraction of the mixed picrates pure (II) was obtained; it was, however, not possible to obtain pure (I) by this method. The m.p. of the pure picrates are  $141^\circ$  (1-) and  $115.5$ — $116^\circ$  (2-), respectively. The m.p. of a mixture of the picrates changes very slowly from pure 2- to 40% 2-picrate; this occasions difficulty in attempts to separate the compounds from mixtures by fractional crystallisation, using the m.p. as criterion of purity.

A. B. M.

**Chemical constituents of Rumanian crude oil.** VI. Dimethylnaphthalene from Rumanian crude oil. T. COȘCIUG (Petroleum, 1938, 34, No. 17, 4—7; cf. B., 1938, 615).—The aromatic hydrocarbons (10.75%) in the fraction of the crude oil of b.p.  $130$ — $132^\circ/20$  mm. were separated as the picrates. They consisted of a mixture of the isomeric dimethylnaphthalenes. Only 2 : 6- $C_{10}H_6Me_2$ , however, could be isolated in the pure form. The aromatic hydrocarbons recovered from the fraction  $140$ — $142^\circ/20$  mm. were also mixtures of dimethylnaphthalenes. None, however, could be detected in the fraction  $150$ — $152^\circ/20$  mm.

A. B. M.

**South African oil shales. II. Distribution of sulphur during carbonisation of oil shale. Carbonisation of oil shale pretreated with lime and acetates.** A. J. PETRICK and B. GAIGHER (J. Chem. Met. Soc. S. Africa, 1938, 38, 347—365; cf. B., 1937, 406).—Two samples of shale were carbonised in a steel retort of the Fischer type taking a charge of 50 g. Of the S in the original shales (1.006 and 0.736%, respectively) about 13.5 and 32%, respectively, appeared in the oils produced; in both cases about 30% appeared in the gas. Addition of 5—20% of  $Ca(OH)_2$  to the shale had little effect on the S content of the oil, but considerably reduced that of the gas. A slight improvement in the quality of the oil, e.g., lower tar acid content and higher light oil content, was effected by distilling the shale in presence of  $NaOAc$  or  $Ca(OAc)_2$ .

A. B. M.

**Cracking of Fushun shale oil.** T. MASHIO (J. Fuel Soc. Japan, 1938, 17, 42—43).—Data on the production of cracked gasoline by the cracking of crude shale oil are tabulated. Cracking of the oil was effected at  $475$ — $490^\circ/257$  lb. per sq. in., the yield of gasoline ( $C_8H_{18}$  no. 60) being 62—65%.

H. C. M.

**Catalysts on hydrocarbon chemistry.** E. K. RIDEAL (J. Inst. Petroleum Tech., 1938, 24, 221—



224).—The increasing application of catalytic processes for the conversion of natural hydrocarbons into more valuable derivatives is demonstrated by the growing range of products that are now commercially available from such processes. It is shown that these processes can be formulated on a radical mechanism. Homogeneous reactions can be brought about by free radicals, and heterogeneous reactions by chemisorbed radicals. In the latter, the energy of activation is only about 25% of the former; thus lower operating temp. and greater efficiency and control are possible. *o-p*-H<sub>2</sub> and D<sub>2</sub> have been applied in the study of the mechanism of hydrogenation, and this application is outlined.

T. C. G. T.

**Sludge and sludge formation in cracked residues.** J. VOSKUL and I. ROBU (J. Inst. Petroleum Tech., 1938, 24, 181—206).—Residues from cracking processes liberate, under certain conditions, a sludge of "asphaltenes" believed to be polymerised hydrocarbons. Various cracked residues have been examined microscopically and a method of indirectly estimating the sludge, based on precipitant hydrocarbon mixture, is elaborated with much experimental evidence. The occurrence of heater sludge in the preheaters of oil burners, and conditions favouring its formation, are discussed.

T. C. G. T.

**Special products plant enlarged and improved.** J. C. ALBRIGHT (Refiner, 1937, 16, 436—438).—A plant for producing C<sub>3</sub>H<sub>8</sub> and C<sub>4</sub>H<sub>10</sub> from straight-run gasoline is described.

R. B. C.

**How to select a motor oil from the point of view of the consumer.** W. S. JAMES (Amer. Soc. Test. Mat. Symp. on Lubricants, Mar., 1937, 75—89).—A discussion.

R. B. C.

**Requirements of a high-speed Diesel fuel.** M. L. STEWART (J. New Zealand Inst. Chem., 1937, 2, 29—34).—The properties desirable in Diesel fuel are discussed. The factors affecting "ignition delay" are briefly reviewed and methods for evaluating the ignition quality of fuels described and compared.

H. C. M.

**Fundamentals of fuel oil combustion [in boiler furnaces].** E. G. ROBERTS (Power Plant Eng., 1938, 42, 111—114).—The chemical reactions which take place after gasification of the oil when sufficient or insufficient O<sub>2</sub> for combustion is present, and conditions necessary for perfect combustion, are discussed.

R. B. C.

**Oxidation index of mineral oils. Modification of Sligh's apparatus.** J. DEMETER (Ind. Quim., 1937, 2, 63—66).—Lubricating oil is maintained at 200° in a special tared flask under an atm. of O<sub>2</sub> for 24 hr., the total residue after extraction with petrol (b.p. >130°) giving the oxidation index.

F. R. G.

**Direct oxidation of oils by air. Formation of peroxides.** P. MONDAIN-MONVAL and S. MARTEAU (Ann. Off. nat. Comb. liq., 1937, 12, 923—928).—Various oils of mineral, vegetable, or animal origin, e.g., paraffin, olive, and cod-liver oils, were caused to flow slowly through an inclined, heated glass tube containing air. Dense white fumes were evolved, and a bluish luminescence appeared within the tube.

The reaction product removed from the tube contained unchanged oil and alkyl peroxides, mineral oils yielding the largest amount of the latter. Oxidation commenced at 155—225° and was greatest at 180—300°. Vaseline and paraffin oils were less resistant to oxidation than castor, rape-seed, and arachis oils. Peroxidation is believed to be the cause of explosions in air compressors.

R. B. C.

**Economics of the synthesis of motor spirit.** C. BERTHELOT (Compt. rend. XVII Cong. Chim. Ind., 1937, 424—429).—The possibilities of existing synthetic processes and of substitutes for liquid motor fuels are discussed from the viewpoint of French national policy.

A. R. PE.

**Rating motor spirits.** W. A. WHATMOUGH (Fuel, 1938, 17, 134—144; cf. B., 1936, 1076).—The results of engine tests on five motor spirits (Essolene, Shell, National Benzole mixture, Cleveland Discol, and Esso Ethyl) are discussed. Data relating to the composition, distillation range, C<sub>8</sub>H<sub>18</sub> no., etc. of the spirits are also given. The engine tests were carried out in a Coventry Climax 10-h.p. overhead-inlet valve engine. The max. power obtainable with the five spirits differed by <1%. The relative fuel efficiencies (with air : fuel ratio of 12 : 1) varied from 99 with Essolene to 106 with Nat. Benzole mixture (Shell-100). The prevalent use of over-rich mixtures is responsible for much fuel waste. The claim that extra power is obtained from fuels of high C<sub>8</sub>H<sub>18</sub> no. requires qualification; it is true only when the compression ratio of the engine is too high for commercial and first-grade motor spirits. Unsaturated hydrocarbons reduce fuel efficiency owing to their low H content. Aromatic hydrocarbons increase fuel efficiency, the H defect being more than compensated for by high *d*. EtOH reduces fuel efficiency, but this is compensated for by adding benzol and by a slight gain in power output with rich mixtures.

A. B. M.

**Carburation by transference.** J. VILLEY (Compt. rend., 1938, 206, 890—892).—The theory of the Rochefort engine is further discussed (cf. B., 1938, 603).

A. J. E. W.

**Fuel for permissible flame safety lamps.** A. B. HOOKER and E. J. COGGESHALL (U.S. Bur. Mines, 1938, Rept. Invest. 3389, 5 pp.).—The results of a limited study to determine what satisfactory fuels are available and the specification limits of such fuels, and to suggest modifications of assembly and care of the lamps to improve performance with any satisfactory fuel, are given.

H. C. M.

**Influence of acetone on water-tolerance of benzine-alcohol mixtures.** E. AFFEONI (Olii Min., 1937, 17, 85—86).—The H<sub>2</sub>O-tolerance (*W*) of mixtures of benzine with EtOH, Pr<sup>n</sup>OH, or Bu<sup>n</sup>OH is > that of benzine-COMe<sub>2</sub> mixtures; e.g., the *W* of a 3 : 1 mixture of benzine and alcohol is 22.2 c.c./l., compared with 2.6 c.c./l. for 3 : 1 benzine-COMe<sub>2</sub> mixture. The *W* of benzine and cyclohexane with mixtures of COMe<sub>2</sub> and alcohols is > with COMe<sub>2</sub> and alcohol alone. In the case of benzine, addition of COMe<sub>2</sub> increases *W*, but to a smaller extent than does addition of a similar quantity of alcohol.

R. B. C.



Patent literature of [petroleum] refining technology. (A) Synthetic lubricant additives of mineraloid character. (B) Straight synthetic lubricants. J. H. BYERS (Nat. Petroleum News, 1937, 29, No. 48, 359—364R; 1938, 30, No. 6, 42—47R; No. 8, 67—74R).—(A) Substances added to lubricants for improving their stability and  $\eta$ , and for depressing the pour point etc. are reviewed.

(B) Processes for the production of lubricants by means of heat and pressure in presence of catalysts from petroleum and coal tar etc. are reviewed.

R. B. C.

Chemical refining of lubricating oils. II. R. NAVARRE (Bull. Assoc. franç. Techn. Pétrole, 1937, No. 40, 37—57; cf. B., 1938, 613).—The PhOH oil extraction and PhOH-recovery plants at Port Jérôme oil refinery are described. The theoretical principles involved, e.g., application of the temp. gradient and use of triangular diagrams, are discussed.

R. B. C.

Cresol as a solvent in the refining of lubricating oil. H. SUIDA and H. PÖLL (Petroleum, 1938, 34, No. 2, 1—14).—Recent work is reviewed and proposals are made for simplifying and clarifying the nomenclature of the subject by the use of the terms solvent-raffinate and extract for the portions of the oil dissolved and extracted, respectively. The term selectivity (of the solvent) is recommended for use when denoting the quality of raffinate as distinct from the yield. Anhyd. cresol is more selective than PhOH, or than any other solvent used for oils in practice except PhNO<sub>2</sub>. Yield of raffinate depends on temp. of separation, using anhyd. cresol. The properties of commercial cresol are specified and tables given showing the effect of adding H<sub>2</sub>O to PhOH and cresol on the quality and yield of raffinate. The system oil-cresol-H<sub>2</sub>O behaves quite differently from oil-PhOH-H<sub>2</sub>O and has properties much more adapted to oil-refining, enabling a two-stage process involving anhyd. and aq. cresol to be used. This process is improved by addition of 20—35% of PhNO<sub>2</sub>, as regards the separation of the two layers and the quality of the second (aq.) raffinate. The S.N.P. process utilising this system (cf. B.P. 436,194; B., 1935, 1127) is described and diagrams and illustrations of a semi-technical plant are given, together with tables showing analytical data and yields given by the process on oils of different origins.

H. C. R.

Use of vegetable oils for lubricating internal-combustion engines. M. FREUND and S. THAMM (Petroleum, 1938, 34, No. 6, 8).—Special methods (not described) have been developed for investigating the resistance of vegetable oils to heat and oxidation. Unstabilised rape oil mixtures (i.e., free from inhibitors) are not suitable for engine lubrication.

C. C.

Hypoid gears, axles, and lubricants. W. A. WITHAM (J. Soc. Auto. Eng., 1937, 41, 509—513T).—A machine for testing hypoid lubricants for load-carrying capacity is diagrammatically described.

R. B. C.

Steel-mill lubricants and lubricants for anti-friction bearings. O. L. MAAG (Iron Steel Eng., 1938, 15, No. 2, 58—61).—A discussion.

R. B. C.

Automotive bearings—effect of design and composition on lubrication. A. F. UNDERWOOD (Amer. Soc. Test. Mat. Symp. on Lubricants, Mar., 1937, 29—52).—A discussion.

R. B. C.

Measurement of lubricating power by means of an inclined-plane apparatus. M. L. GOLDOVSKI (Zavod. Lab., 1938, 7, 106—108).—Apparatus is described.

R. T.

Apparatus for determination of oiliness in lubricants. A. W. RALSTON, E. I. HOFFMANN, and E. S. STEPHENS (Nat. Petroleum News, 1937, 29, No. 44, 288—290R).—Three half-ball bearings held in a steel plate and attached to a motor rotating at 120 r.p.m. bear upon a steel disc, the load being adjustable through a spring. The bearing assembly is enclosed in a cup filled with oil, the temp. rise being determined at 5-min. intervals during a 90-min. test. Xylyl and phenoxyphenyl heptadecyl ketones were found to have film-forming properties.

R. B. C.

Rapid determination of sulphur in petroleum and lubricating oils. S. I. SCHODTZEY and V. I. BLAGOVESCHTSCHENSKAJA (Zavod. Lab., 1938, 7, 88—89).—0.1 g. of oil is vaporised in a stream of air, and the mixture passed over powdered SiO<sub>2</sub> at 1000°. The combustion products are absorbed in 3% H<sub>2</sub>O<sub>2</sub>, and the resulting H<sub>2</sub>SO<sub>4</sub> is titrated.

R. T.

Determination of ash content of lubricating oils. E. FEIGL (Petroleum, 1938, 34, No. 2; Motoren-ber., 11, No. 1, 5—6).—The time taken by this determination is reduced from 20 to 6 hr. without loss of accuracy by distilling off 90% of the oil from an Engler flask at 1 atm. and ashing the residue.

H. C. R.

Constitution of mineral lubricating oils. E. H. KADMER (Oel u. Kohle, 1938, 14, 32—39; cf. B., 1938, 247).—Tables and diagrams are given connecting  $d$  with  $n_D^{20}$ , ring analysis (Vlugter *et al.*, B., 1935, 934), and H content. The bearing of chemical constitution on stability to oxidation is also examined, the results of experimental work on a no. of oils of different origins being tabulated and graphed. It is concluded that information on the nature of the hydrocarbon mixture can be obtained from a comparison of these physical consts., but that the conclusions as to lubricating val. should not be deduced from mere considerations of the "paraffinicity" or otherwise of an oil. All mineral oil products, even including paraffin wax, appear to contain cyclic compounds.

H. C. R.

Apparatus for investigating oils and similar substances at low temperatures. B. STEIGER (Petroleum, 1938, 34, No. 2, 14—16).—A convenient and simple apparatus for filtering (as in the separation of paraffin wax) is illustrated. Me<sub>2</sub>O only is required for temp. >—25° and solid CO<sub>2</sub> and COMe<sub>2</sub>, EtOH, or liquid air are necessary for lower temp.

H. C. R.

Engine and laboratory tests of stability of aviation [lubricating] oils. O. C. BRIDGEMAN and E. W. ALDRICH (J. Soc. Auto. Eng., 1937, 41, 483—492T).—Attempts to develop a laboratory test method for predicting the stability of oils under service conditions are described. Data obtained by



heating 22 different oils at various temp. and for different times in air with the surface exposed, with or without aëration, are compared with engine data for the same oils. Curves show the increase in  $\eta$ , the development of insol. substances and C, and changes in the neutralisation no. with heating time. A test involving aëration was too severe. Laboratory data obtained by heating the oils at 175° without aëration, however, correlated satisfactorily with service data in engines of moderate output.

R. B. C.

**Ageing of paraffinic and naphthenic mineral oils.** E. HAUS (Oel u. Kohle, 1938, 14, 299—309, 321—327).—A paraffinic and a naphthenic lubricating oil were "aged" by passing O<sub>2</sub> through them at 150—250° for different periods, and the asphalt and resins formed were separated by Pöll's method (B., 1937, 407). The rate of formation of resins at a given temp. was at first  $>$  that of asphalt, but later reached a const. val. or passed through a max.; the formation of asphalt increased progressively with time. The formation of asphalt in the paraffinic oil exhibited an induction period. The rate of formation of both asphalt and resins increased with rising oxidation temp. Ultimate analyses and mol. wts. of the oils, resins, and asphalts are tabulated and the changes in ultimate composition, and also composition as determined by Waterman's analysis (B., 1936, 776), are shown graphically. The adhesive powers of the resins and asphalts, determined by means of Schopper's apparatus, are also recorded. On the basis of these results it is concluded that the resins form an intermediate stage in the production of asphalt; when the latter separates from the oil as an insol. ppt. it carries down adsorbed resins with it.

A. B. M.

**Regeneration of used [lubricating] oils.** P. M. E. SCHMITZ (Bull. Assoc. Franç. Tech. Pétrole, 1938, No. 42, 5—42).—A comprehensive survey is made of methods of reclaiming used lubricating oils, including machine, motor, insulating, and turbine oils. Processes described include filtration, centrifuging, mechanical and chemical methods, earth treatment, solvent extraction, hydrogenation, polymerisation, distillation, etc. A no. of patents are briefly summarised, as also are references in the literature to various aspects of reclaiming. The significance of oil reclaiming, particularly as it affects France, is discussed.

C. C.

**Structure of lubricating greases.** A. S. C. LAWRENCE (J. Inst. Petroleum Tech., 1938, 24, 207—220).—The greases considered are thickened oils which are virtually soap-oil systems. Fats and solid-liquid emulsions, such as butter, are not considered. Commercial greases exist as true gels or as pseudo-gels which are pastes of micro-crystals in oil. These greases are not emulsions, as is often believed. There is a well-defined temp. of transition from true gel to pseudo-gel, dependent on the nature of the soap used and the presence of polar substances such as fatty acid, H<sub>2</sub>O, or glycerin. The gelations are shown to be crystallisations and the mechanical properties of the systems due to the peculiar crystal habit and properties of the soap particles. Small amounts of

fatty acids profoundly affect these properties, and the need for further work on the effects of added polar substances is emphasised. The strength of gels appears to be parallel to the hardness of the soap.

T. C. G. T.

**Viscosimetry.** Flow of furnace gases.—See I. Products from oxidation of hydrocarbons. Crystallisation of C<sub>10</sub>H<sub>8</sub>. Purifying anthracene. Fatty alcohols. Org. syntheses.—See III. Pulp from lignite.—See V. Effect of hydrocarbon gases on refractories.—See VIII. Weathering tests on asphalts.—See IX. Cast Fe and the gas industry. Steel mill lubrication. Coal mining in Greece. Heat effect of the O<sub>2</sub>-C<sub>2</sub>H<sub>2</sub> flame.—See X. Electrostatic charges in flowing gases. Bituminous insulation.—See XI. Paints for gas-works. Rust-preventive paints. Paint adhesion on concrete. Mineral oil varnishes.—See XIII. Purifying NH<sub>3</sub> liquor.—See XXIII.

See also A., I, 328, Purifying graphite electrodes. II, 245, Isolation of 2:3-dimethyl-8-ethyl-quinoline from petroleum.

## PATENTS.

**Coal cleaning.** BIRTLEY CO., LTD., and C. W. H. HOLMES (B.P. 484,109, 31.10.36).—The dampness of raw coal passing to a continuous dry coal cleaning plant is continuously gauged by electrical means at a given point in the feed, and relay devices are connected so that while the H<sub>2</sub>O in the coal exceeds a certain amount the feed is automatically diverted from the cleaning plant.

D. M. M.

**Flotation of fine refuse coal.** AMER. CYANAMID CO., Assecs. of N. HEDLEY (B.P. 482,931, 17.8.37. U.S., 1.9.36).—The coal is subjected to froth flotation with an amount of reagent (preferably a mixture of aliphatic alcohols having C<sub>7-10</sub>, stabilised with a hydrocarbon) insufficient to float the fine high-ash particles, whereby a concentrate is obtained containing most of the fine low-ash particles. The flotation tailings are classified and the fine sizes rejected; the coarse sizes are floated with an amount of reagent sufficient to float coarse low-ash particles.

A. B. M.

**Manufacture of smokeless fuel briquettes.** L. KERN (B.P. 483,549, 19.8.36).—Powdered bituminous material is treated with an electropositive solution, e.g., dil. HCl and/or MnCl<sub>2</sub>, one after the other, and the mixture formed is subjected to pressure in presence of a colloid precipitant consisting of an electronegative solution, e.g., NaOH, and then moulded into briquettes which are dried at 120° and coked at 600—900° (700°).

D. M. M.

**Extraction of fossil gum from lignite and like substances.** A. E. BROUE (B.P. 482,975, 15.12.36).—The lignite etc. is admixed with H<sub>2</sub>O and finely ground. The mixture is passed into a settling tank and the fossil gum and other constituents are then drawn off at their respective settlement levels.

A. B. M.

**Manufacture of solid fuel.** NAT. COKE & OIL CO., LTD., and J. L. STREVEVS (B.P. 485,083, 12.9.36).—A free-flowing mixture of oil and finely-divided carbonaceous material, e.g., coal, which yields a



highly reactive coke after undergoing low-temp. carbonisation, is mixed, before carbonisation, with sufficient coke of low reactivity, *e.g.*, coke breeze, also finely-divided, to provide in the finished coke a low-reactive coke amounting to 5–15% of the highly-reactive coke. The oil-coal-coke mixture is carbonised at low temp. without any preheating treatment and under complete refluxing conditions. D. M. M.

**Apparatus for heating solid fuel.** METALLGES. A.-G. (B.P. 481,781, 1.3.37. Ger., 9.5.36).—Direct heating for drying or degasifying is effected in two vertical shafts arranged adjacent, with chambers for the supply and exhaust of hot gases between them, the latter chambers being utilised for dust extraction without much heat loss. B. M. V.

**Oven for low-temperature carbonisation of solid fuels.** L. BOULANGER (B.P. 483,412, 16.3.37).—Coal etc. dust is carbonised at low temp. (450°) by being fed progressively into and through a stationary metal cylinder by a conveying worm rotated from outside, the whole being supported horizontally in a refractory chamber traversed by heating gases. The heating gases around the lower half of the cylinder move in a contrary direction, and around the upper half move in the same direction, as the feed of coal dust. D. M. M.

**Coke ovens for low-temperature carbonisation of moulded pieces of coal.** H. STEINFELDT (B.P. 482,872, 1.11.37. Ger., 15.3.37).—The coal is packed into carrier frames which are lowered into the oven chambers. A gap is provided down the centre of the frame parallel to the side walls of the chamber for leading off the distillation gases. Passage of the gases along the hot chamber walls is prevented by closing the tops of the gaps between the walls and the frame. A. B. M.

**[Regenerative] coke-oven batteries.** W. W. GROVES. From DR. C. OTTO & Co. G.M.B.H. (B.P. 483,462, 17.11.37).—A method of fixing the supporting stays for the internal walls running in the longitudinal direction of the oven chamber is claimed. D. M. M.

**Carbonisation of coal-tar pitch, petroleum pitch, and like materials.** A. R. GRIGGS (B.P. 484,324, 8.12.36).—The pitch etc. is carbonised in two stages, of which the first occurs in ordinary externally heated retorts where the volatile matter is reduced to 8–14%. The coke is then broken up and conveyed to a vertical retort where it is further heated, *e.g.*, to 1000–1100°, by direct passage of hot gases, *e.g.*, burnt gas from a producer, until the volatile matter has been reduced to a very low figure. D. M. M.

**Distillation of carbonaceous slack, peat, shale, and the like, and apparatus for such purpose.** F. P. and F. N. HULL (B.P. 483,375, 18.9.36).—Carbonaceous material is subjected to low-temp. carbonisation in an inclined cylindrical rotating retort in which the heating gases, provided by the separate combustion of gaseous fuel, are led through an inner drum which acts as a bearing for the outer drum and thereby indirectly heats the material to be carbonised from within the retort. A no. of arcuate

segments are arranged between the inner and outer drums which divide the main stream of coal into a no. of streams and turn the coal over in the course of the rotation of the drum. D. M. M.

**Destructive distillation at low temperature.** H. E. G. ROWLEY. From SOC. CHIM. DE LA GRANDE PAROISSE (AZOTE & PROD. CHIM.) (B.P. 484,050, 12.7.37).—Mineral or org. materials, *e.g.*, oil shale, are distilled at low temp. by means of substantially horizontal gas streams, and the hot residues drop into another chamber below the distillation chamber where they are subjected to the action of a stream of gas containing  $O_2$  so as to burn, at least partly, the carbonaceous substances in the residues. The gas produced by this combustion is used for indirect heating of the gases used for distillation. D. M. M.

**Production of granular active carbon.** W. HENE (B.P. 484,197, 25.9.36).—Carbonaceous materials, *e.g.*, wood, coal, coke, etc., in coarse granular form, are treated with a solution of an activating chemical, *e.g.*,  $KHSO_4$ , and then heated to activating temp. after mixing with a substantially equal or greater quantity of a reaction mixture which evolves a non-oxidising gas at the activating temp. A suitable reaction mixture is  $K_2SO_4$  and ground anthracite. D. M. M.

**Carbon body.** H. BENDER, Assr. to GREAT WESTERN ELECTRO-CHEM. Co. (U.S.P. 2,074,885, 23.3.37. Appl., 15.3.35).—Porous bodies, *e.g.*, C, for use as chlorination reaction chambers etc., are rendered impervious by first heating them to burn out or volatilise all wax, oil, etc. and then  $H_2O$  or a very dil. silicate solution is forced through them until they are wet through. The concn. of the solution is then increased until a conc. solution is being forced through. The bodies are dried slowly and dry, hot  $Cl_2$  is passed through the article at 360°. D. M. M.

**Treatment with hydrogenating gases of extraction products of solid carbonaceous materials.** H. E. POTTS. From INTERNAT. HYDROGENATION PATENTS Co., LTD. (B.P. 484,334, 12.1.37).—Products obtained by extracting solid carbonaceous materials with org. solvents are filtered to remove solid materials and then an org. diluent having a higher b.p. than that of the solvent, *e.g.*, tar middle (b.p. 250–325°) and/or heavy oil, is added. The solvent is distilled off and the mixture of diluent and extract treated with  $H_2$  at >250° (300–500°)/20–1000 (600) atm. in presence of heavy-metal oxides or sulphides or of org. salts of Sn or Zn as catalysts. D. M. M.

**Production of hydrocarbon products from bituminous coal by destructive hydrogenation.** INTERNAT. HYDROGENATION PATENTS Co., LTD., Assees. of I. G. FARBENIND. A.-G. (B.P. 484,132, 26.1.37. Ger., 1.2.36).—Yields of liquid hydrocarbon products in the destructive hydrogenation of bituminous coal with >84% C are increased if the coal is pretreated for  $\frac{1}{2}$  hr. with NO at 50–200° (50–100°). D. M. M.

**Gas producers or generators.** R. J. TUGWOOD. From HANSA GAS-GENERATOREN G.M.B.H. (B.P. 484,029, 15.4.37).—An up-draught gas generator with



a fire-basket suspended from its upper end in a casing has the whole or part of the lower edge of the basket above the grate so that air or steam is admitted laterally beneath the elevated edge, thus allowing a protective layer of ash or clinker to be formed on the grate, the angle of repose of this and the fuel allowing a free surface for admission of air. D. M. M.

**Mechanical generator for water-gas machines.** C. H. HUGHES, Assr. to SEMET-SOLVAY ENG. CORP. (U.S.P. 2,074,472, 23.3.37. Appl., 22.12.31).—A  $H_2O$ -jacketed water-gas generator is provided with an annular space exterior to the jacket and connected to the interior of the generator. It also has a rotating grate through which blast air enters, becoming pre-heated by cooling the rotating grate. Steam is admitted at the bottom for the up-run and through the carburettor or superheater for the back-run. In the latter part of the cycle the water-gas is removed by way of the annular chamber exterior to the  $H_2O$ -jacket, which is thus heated from both sides. D. M. M.

**Discharging ashes from water-gas generators and the like.** HUMPHREYS & GLASGOW, LTD., and E. C. MENGEL (B.P. 485,048, 21.4.37).—A water-gas generator with a rotating ashpan constituting a  $H_2O$ -seal to the generator bottom is provided with fixed ploughs for discharging the ashes over the rim of the pan at two or more points. The pan is described. D. M. M.

**Acetylene generators.** I. G. FARBENIND. A.-G. (B.P. 484,601, 9.11.36. Ger., 9.11., 5.12., and 7.12.35).— $C_2H_2$  is generated by the dry method from  $CaC_2$  in a special generator in two stages. In the first stage the  $CaC_2$  is sprayed with  $H_2O$  while being kept in motion inside a rotatable screen. In the second the fines from the first stage are kept stirred and in contact with the atm. of the chamber on a series of rotatable plates, after which they pass to a  $Ca(OH)_2$  store. D. M. M.

**Apparatus for producing acetylene and lime hydrate.** PREST-O-LITE CO., INC., Assees. of H. V. KOJOLA and M. O'BRIAN (B.P. 483,601, 27.2.37. U.S., 27.3.36).— $C_2H_2$  and dry  $Ca(OH)_2$  are prepared by interaction of  $CaC_2$  and  $H_2O$  in an apparatus where the  $CaC_2$  is continuously fed into a reaction chamber and there brought in contact, during continual agitation, with an amount of  $H_2O$  sufficiently large to react with the  $CaC_2$  but small enough to produce a reaction temp. of 110–400°. D. M. M.

**Apparatus for supplying water and gas to recording gas calorimeters.** J. G. STEWART (B.P. 484,242, 12.2.37).—Gas to be tested and a liquid as medium for testing the calorific val. of the gas, e.g.,  $H_2O$ , are delivered separately to the calorimeter by piston pumps so arranged that the rate of gas delivery bears a fixed relation to the rate of  $H_2O$  delivery. Automatic means are provided for varying the flow to compensate for local changes in atm. temp. and pressure. D. M. M.

**Gas-purification material.** J. W. AYERS, Assr. to C. K. WILLIAMS & CO. (U.S.P. 2,069,194, 2.2.37. Appl., 28.7.33).—Aq.  $Fe_2(SO_4)_3$  is treated with  $Ca(OH)_2$ ; the ppt. of  $Fe(OH)_3 + CaSO_4$  (approx.

30%  $Fe_2O_3$ ) is washed, distributed on wood shavings, and employed as  $H_2S$  absorbent. L. C. M.

**Purification of fuel gases.** GAS LIGHT & COKE CO., H. HOLLINGS, W. K. HUTCHISON, G. DOUGILL, and A. R. MORCOM (B.P. 483,706, 21.10.36).—A combustible gas containing N oxides, conjugated diolefines, and  $O_2$  is passed through a reaction vessel at the inlet to purifiers, the reaction vessel being so dimensioned that the NO in the gas is reduced to a negligible amount by interaction, in the vessel, with the conjugated diolefines and  $O_2$ . Any particles of resinous products are removed in subsequent purification. D. M. M.

**Purification of gaseous mixtures and particularly fuel gases.** W. C. HOLMES & CO., LTD., G. P. MITCHELL, and G. E. H. KEILLOR (B.P. 483,758, 4.12.36).—Humidity and temp. conditions in Fe oxide purifying boxes are controlled by regulating, independently, the temp. and  $H_2O$  content of the gases at the inlet to each purifier by means of tubular heaters and having devices for introducing  $H_2O$  when necessary. D. M. M.

**Extracting and recovering volatile hydrocarbons from gases.** H. E. DRENNAN, Assr. to PHILLIPS PETROLEUM CO. (U.S.P. 2,074,644, 23.3.37. Appl., 11.10.35).—Volatile hydrocarbons, e.g.,  $C_3H_8$  or  $C_4H_{10}$ , are extracted from gases by a two-stage absorption process in which the absorbent in the first stage is light and partly volatile, so that the gas entering the second stage is saturated with it, whilst that in the second stage is non-volatile. Both stages work under pressure and the rate of absorbent feed in the first stage is  $\leq$  twice that in the second. D. M. M.

**Treatment of bitumina and allied substances.** L. D'ANTAL (B.P. 483,907, 27.7.36. Ger., 26.7.35).—Bituminous substances, e.g., coal or lignite tar, crude oil residue, etc., are autoclaved at 180–360° in presence of S acids containing  $\leq 4$  O atoms, or their anhydrides, preferably at  $\leq 10$  atm. and using  $H_2SO_4$  of  $< 70\%$  concn. Successive treatments with more dil. acids are preferred to one with more conc. acid. The products are hard, plastic, or tough masses suitable for use on roads or for insulating purposes. D. M. M.

**Preparation of bituminous emulsion.** C. L. MCKESSON, Assr. to AMER. BITUMULS CO. (U.S.P. 2,074,731, 23.3.37. Appl., 18.2.36).—Bituminous emulsions of the oil-in- $H_2O$  type and comprising a preformed, quick-breaking emulsion are stabilised with  $H_2O$ -miscible blood either as received from the slaughterhouse or defibrinised; the emulsion is kept at  $p_H$  9–11. D. M. M.

**Hydrocarbon oil conversion.** N. V. NIEUWE OCTROOI MAATS., Assees. of A. P. SACHS (B.P. 484,527, 8.3.37. U.S., 1.4.36).—Vaporised hydrocarbons are cracked at  $> 482^\circ$  with the aid of a heat-carrier gas, liquefiable products are removed, and the residual gas is compressed, e.g., to 150–300 lb./sq. in., cooled, and all products of b.p. above that of  $C_2H_6$  are removed in an absorber by means of a gasoline fraction. The absorbed gases are released in stages, first  $H_2$ ,  $CH_4$ , and  $C_2H_6$  and then, separately,



all with  $>C_3$ . The latter are passed to a polymeriser and polymerised to motor fuel, and the lean gas is used as a heat-carrier gas. D. M. M.

**Catalytic treatment of paraffin hydrocarbons.** UNIVERSAL OIL PRODUCTS Co. (B.P. 484,417, 9.11.36. U.S., 11.11.35).—Mixtures of paraffin hydrocarbons, e.g., casing-head gas mixtures or refinery gases, are dehydrogenated to produce olefines by bringing them in contact with a catalyst composed of granular activated  $Al_2O_3$  and a minor proportion of  $Cr_2O_3$  at  $400$ – $770^\circ$  ( $500$ – $650^\circ$ ). The catalyst may be prepared from bauxite or from pptd.  $Al(OH)_3$  by calcination at  $600$ – $900^\circ$ , grinding the product, and mixing with a warm aq. solution of acids or salts of Cr, e.g.,  $H_2CrO_4$  or  $Cr(NO_3)_3$ , after which it is dried and heated. The catalyst may be periodically regenerated by passing  $O_2$  or air over it at  $500$ – $600^\circ$ . D. M. M.

**Manufacture of knock-stable gasoline by destructive hydrogenation of carbonaceous materials.** H. E. POTTS. From INTERNAT. HYDROGENATION PATENTS Co., LTD. (B.P. 484,084, 27.10.36).—Gasoline is obtained from middle oils by hydrogenating the latter at  $300$ – $500^\circ$  ( $400^\circ$ )/ $50$ – $500$  (200) atm. in presence of small known amounts of regulators, e.g.,  $NH_3$ , org. N bases, phenols, etc., which may either be present as impurities in the middle oil itself or may be added, and the quantity of which is closely adjusted to  $0.1$ – $0.5\%$  of N base, calc. as wt. of N, and  $0.2$ – $2.0\%$  of phenols. D. M. M.

**Production of hydrocarbon products by treatment with hydrogenating gases of liquid or semi-liquid carbonaceous materials.** H. E. POTTS. From INTERNAT. HYDROGENATION PATENTS Co., LTD. (B.P. 484,127, 27.11. and 15.12.36).—The carbonaceous materials are given a mild catalytic hydrogenation at  $270$ – $420^\circ$  ( $300$ – $380^\circ$ )/ $<50$  atm., whereby the asphalt content is reduced by  $<90\%$  and also  $<5\%$  ( $<2\frac{1}{2}\%$ ) of gaseous hydrocarbons (calc. as C on the C of the original material) and  $<20\%$  of products boiling at  $<350^\circ$  are newly formed. The initial material should include suitable diluents, e.g.,  $C_{10}H_8$ , tetralin, to reduce the asphalt content below  $15$ – $20\%$ . D. M. M.

**Production of light liquid hydrocarbons by hydrogenation of low-temperature tar.** F. PUENING (B.P. 483,371, 15.9.36).—Hydrocarbons such as petrol may be produced by hydrogenating at  $450^\circ$  tar produced by low-temp., e.g.,  $550^\circ$ , carbonisation of coal, using as a source of  $H_2$  the gases obtained by overheating, e.g., to  $900^\circ$ , without the use of steam, the coke obtained in the low-temp. carbonisation. D. M. M.

**Regenerating catalysts for benzene synthesis.** RUHRCHEMIE A.-G. (B.P. 484,962, 22.9.37. Ger., 22.9. and 6.10.36).—Spent catalysts which have been repeatedly regenerated by  $H_2$  until they fail to respond are first treated with a stream of  $H_2$  or other gas, at  $>300^\circ$ , until most org. impurities, e.g., paraffin wax, have been removed. The catalyst is then moistened with  $H_2O$ , dissolved in  $HNO_3$ , filtered off, and the active metals are pptd. by adding aq. NaOH. The washed and dried catalyst after reduction with  $H_2$  is again suitable for use. D. M. M.

**Manufacture of voltolised products from mineral oils.** J. C. ARNOLD. From STANDARD OIL DEVELOPMENT Co. (B.P. 485,105, 13.11.36).—Mineral oils containing paraffinic and non-paraffinic components are extracted with a solvent having a preferential solvent action on the latter, e.g.,  $PhOH$ , and the non-paraffinic concentrate so obtained is subjected to a silent electric discharge at  $2500$ – $3000$  v./ $1200$ – $10,000$  ~/sec. and  $4$ – $6$  mm. Hg pressure for 28 hr.  $0.1$ – $2\%$  of S may be added before starting the electric treatment. The products are found to reduce the oxidation rate and pour point of petroleum lubricating oils when added in amounts of  $0.5$ – $10$  vol.-%. D. M. M.

**Treating, clarifying, and separating oil-fuel residue in ships' tanks and other vessels.** T. W. STINCHCOMBE (B.P. 484,522, 14.1.37).— $H_2O$ -in-oil emulsions in the tanks are caused to separate *in situ* by pumping on to the emulsion a prep. consisting of a similar emulsion of similar fuel oil with an aq. solution of Na or K soap, alkaline salts of Ca, Mg, or Na and NaOH, a little  $PhOH$ , or  $CO_2$  with a little metallic Ni,  $CuSO_4$ , or bauxite. This prep. is well mixed with the emulsion to be treated, either artificially or by the rolling of the ship, so that the  $H_2O$  separates and is removed. D. M. M.

**Manufacture of Diesel fuels.** F. UHDE and T. W. PFIRRMANN (B.P. 482,783, 25.3.37. Ger., 20.5.36).—An oil poor in H produced by the hydrogenation of bituminous or brown coal, coal extract, etc. is mixed with an oil rich in H produced by synthesis from CO and  $H_2$  or by the more intensive hydrogenation of coal. Coal extract or primary bitumen, or distillates thereof, may also be added. Excess of the oil rich in H may be added and removed again after separation of the pptd. asphalt. A. B. M.

**Treatment of the gaseous charge supplied to internal-combustion engines.** G. E. HEYL (B.P. 483,361, 29.5.37).—CO formation in such engines is inhibited by bringing the air supplied to the cylinders in contact with turpentine oil, preferably slightly heated before it reaches the fuel. D. M. M.

**Catalytic treatment of motor fuels.** A. L. MOND. From UNIVERSAL OIL PRODUCTS Co. (B.P. 484,368, 16.6.37).—The antiknock val. of straight-run motor fuels is increased by subjecting them to a reforming temp. of  $450$ – $700^\circ$  in contact with a catalyst of solid siliceous material comprising feldspars or zeolites in which the alkali or alkaline-earth metals have been partly or wholly replaced by other metals, e.g., Al, Fe, Co, Ni, Cr, Mo, W, Zn, Cd, Hg, or Cu. The reforming preferably takes place under normal or slight pressures. D. M. M.

**Low-boiling hydrocarbon oils.** C. L. GUTZEIT, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 2,074,467, 23.3.37. Appl., 8.1.31).—Gum formation is inhibited in cracked motor spirit by addition of  $0.0005$ – $0.1$  wt.-% of a compound having a  $C_6H_5$  ring containing two  $NH_2$  groups, or one  $NH_2$ - and one OH-group, in the *para* position, preferably with at least one of the H atoms of an  $NH_2$  substituted by alkyl ( $< C_5$ ), e.g.,  $p-OH-C_6H_4-NH-C_5H_{11}$  (sec.). D. M. M.



**Manufacture of lubricating oils.** A. P. LOWES, D. E. WHITE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 483,316 and 485,165, [A] 15.10.36, [B] 11.11.36).—(A) Lubricating oils are manufactured by mixing chlorinated paraffin wax containing 22–30% (22%) of Cl with  $C_6H_6$  or a homologue in sufficient quantity to render the mixture easily mobile at low temp. ( $-10^\circ$ ), filtering off any separated materials at this low temp., and condensing the filtrate in presence of  $AlCl_3$ . The product is separated into two layers, the upper one being washed with HCl and  $H_2O$  and residual  $C_6H_6$  distilled off under low pressure, leaving a lubricating oil of low pour point. (B) The upper layer resulting from the condensation of a chlorinated aliphatic hydrocarbon of mol. wt. about 200 with an aromatic hydrocarbon, e.g.,  $C_6H_6$  or PhMe, in presence of  $AlCl_3$  is separated from the lower layer and treated at, e.g.,  $30-40^\circ$  with a solid alkaline material, e.g.,  $Na_2CO_3$ , CaO, etc., or with an aq. solution of  $NH_3$  or an  $NH_4$  salt. In the first case treatment may be by filtration; in the second the aq. layer is separated and the residue filtered. In both cases the filtrate is steam-distilled to yield a lubricating oil. D. M. M.

**Dewaxing mineral oil.** TEXACO DEVELOPMENT CORP., Assrs. of E. C. KNOWLES (B.P. 483,818, 21.8.36. U.S., 20.9. and 18.11.35).—The rate of filtration of pptd. wax from oil-solvent mixtures containing natural or added wax crystal-modifying material, e.g., crude montan wax or Al stearate, is greatly increased by first heating the mixture to  $8-28^\circ$  above the min. temp. at which the wax and oil are dissolved in the solvent, e.g., to  $60-80^\circ$  before chilling. D. M. M.

**Separation of paraffin waxes or oil-wax mixtures.** BURMAH OIL Co., LTD., and R. E. DOWNER (B.P. 484,207, 2.11.36).—An oil-wax mixture is chilled in an apparatus containing a no. of vertical perforated ducts, by passing a cooling medium around a no. of imperforate ducts surrounding the perforated ducts. After solidification, the core of wax within the perforated ducts is melted out by the application of local heat, e.g., by an electric wire vertically suspended through these ducts, and when they are clear the wax cake between the imperforate and the perforated ducts is subjected to sweating by passing a heating medium through the space around the imperforate ducts. The sweated products exude through the walls of the perforated ducts and descend within them to a bottom collecting chamber. The mass to be chilled may be supported on a body of  $H_2O$  during chilling, which is removed before starting sweating. D. M. M.

**Lubricating oils.** STANDARD OIL DEVELOPMENT Co. (B.P. 483,796, 23.8.37. U.S., 22.9.36).—Lubricating oils are dewaxed by chilling in presence of selective solvents consisting of aliphatic ketones containing a  $Bu^\bullet$  radical and a total of 6–7 C in the mol., e.g.,  $COMe$  (or  $Et$ ) $Bu^\bullet$ . D. M. M.

**Lubricating oils.** A. FURLOTTI (B.P. 484,249, 22.3.37).—Castor oil containing mineral oil 10–25 and  $N(C_2H_4 \cdot OH)_3$  0.01–0.5 wt.-% is claimed. D. M. M.

**Lubricating oils.** B. H. LINCOLN and A. HENRIKSEN, Assrs. to LUBRI-ZOL DEVELOPMENT CORP. (U.S.P. 2,074,338, 23.3.37. Appl., 12.5.32).—Lubricants of high film strength, high oiliness, and low sludging no. are produced by adding to a mineral lubricating oil a small amount (0.5%) of a halogenated higher fatty acid, e.g., chlorinated stearic or oleic acid. D. M. M.

**Lubricants.** C. C. WAKEFIELD & Co., LTD., and E. A. EVANS (B.P. 483,306, 14.10.36).—The acid- and sludge-forming properties of lubricating oil are diminished by addition of 0.05–1.0% (0.1%) of an aromatic compound containing a nuclear OH or ether group and a nuclear *tert.*-alkyl substituent, e.g., *tert.*-butylcresol. D. M. M.

**Lubricants.** F. P. BOWDEN (B.P. 484,579, 5.11.36).—Lubricants with a low coeff. of friction and causing low surface wear are produced by dissolving or suspending in an org. liquid, e.g., methylcyclohexyl oxalate, and/or mineral oil  $\leq 1.0\%$  of org. compounds not containing metallic atoms and consisting of  $\leq 3$  interconnected rings, the interconnection being either directly by 1 atom only or indirectly by means of aliphatic radicals, or inorg. non-metallic atoms or groups of atoms. Examples of the org. compounds are  $(CHPh)_2$ ,  $C_6H_4Ph_2$ , or  $CPh_3 \cdot OH$ . D. M. M.

**Manufacture of viscous products suitable for lubrication.** N. V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 484,964, 27.9.37. Holl., 1.10. and 24.12.36).—The products are obtained by polymerising an ester of an unsaturated aliphatic acid and an aliphatic saturated or unsaturated mono- or di-hydric alcohol (which alcohol does not contain a  $CH_2 \cdot CH$  group) by means of  $< 5$  (1–3)% of  $BF_3$  as catalyst at  $70-100^\circ$ . Amyl, oleyl, or cetyl alcohol or ethylene glycol may be used in the form of esters of oleic, linoleic, or acrylic acid. The polymerisation may be carried out in presence of other polymerisable substances, e.g., fatty oils or unsaturated hydrocarbons. D. M. M.

**Coke-oven door.** P. VAN ACKEREN, Assr. to KOPFERS Co. (U.S.P. 2,072,537, 2.3.37. Appl., 5.12.30. Renewed 16.12.35. Ger., 9.12.29).

**Treatment [conversion] of crude oil.** A. P. SACHS, Assr. to PETROLEUM CONVERSION CORP. (U.S.P. 2,073,456, 9.3.37. Appl., 26.5.34).

**Treatment [conversion] of hydrocarbon oils.** L. DE FLOREZ, Assr. to TEXAS Co. (U.S.P. 2,074,539, 23.3.37. Appl., 25.7.31).

**Hydrocarbon oil conversion.** H. C. WEBER and W. H. McADAMS, Assrs. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 2,074,196, 16.3.37. Appl., 6.1.32).

**Hydrocarbon [conversion] process.** I. A. ANSON (U.S.P. 2,072,789, 2.3.37. Appl., 2.1.36).

**Conversion of hydrocarbon oils.** E. F. NELSON, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 2,072,123, 2.3.37. Appl., 8.2.32). D. H. MACE, Assr. to TEXAS Co. (U.S.P. 2,072,524, 2.3.37. Appl., 2.5.32).

**Conversion of hydrocarbon oils in the vapour phase.** A. P. SACHS, Assr. to PETROLEUM CON-



VERSION CORP. (U.S.P. 2,072,131, 2.3.27. Appl., 18.2.32).

**Conversion and coking of hydrocarbon oils.** E. F. NELSON, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 2,072,378, 2.3.37. Appl., 30.3.32).

**Cracking of hydrocarbon oils.** C. B. BUEGER, Assr. to GULF OIL CORP. (U.S.P. 2,072,394, 2.3.37. Appl., 21.7.26).

**Stabilisation of low-boiling hydrocarbon oils and particularly cracked hydrocarbon vapours.** J. K. ROBERTS and G. W. WATTS, Assr. to STANDARD OIL Co. (U.S.P. 2,073,073, 9.3.37. Appl., 25.11.31).

**Treatment of hydrocarbon oil.** J. G. ALTHER, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 2,074,198, 16.3.37. Appl., 6.1.32. Renewed 13.11.35).

**Art of cracking [in gasoline manufacture].** E. C. HERTHEL, Assr. to SINCLAIR REFINING Co. (U.S.P. 2,073,934, 16.3.37. Appl., 16.6.33).

**Recovery and stabilisation of gasoline.** D. G. BRANDT, Assr. to DOHERTY RES. Co. (U.S.P. 2,074,978, 23.3.37. Appl., 13.2.33).

**Pressure distillation [of heavy hydrocarbon oil].** D. G. BRANDT, Assr. to DOHERTY RES. Co. (U.S.P. 2,074,120, 16.3.37. Appl., 23.7.26).

**Stabilisation of hydrocarbon distillate.** P. C. KEITH, jun., Assr. to GASOLINE PRODUCTS Co., INC. (U.S.P. 2,072,456, 2.3.37. Appl., 1.12.34).

**Method of and radiant-heat stills for distilling hydrocarbon oils.** D. L. THOMAS, Assr. to GASOLINE PRODUCTS Co., INC. (U.S.P. 2,072,535, 2.3.37. Appl., 21.11.31).

**Refining of mineral oils.** D. G. BRANDT, Assr. to DOHERTY RES. Co. (U.S.P. 2,073,622, 16.3.37. Appl., 30.1.34).

**Refining of hydrocarbon oils.** E. ELLSBERG, Assr. to TIDE WATER ASSOCIATED OIL Co. (U.S.P. 2,073,446, 9.3.37. Appl., 1.6.33).

**Treatment [refining] of [petroleum] hydrocarbons.** H. M. WEIR and R. B. CHILLAS, jun., Assrs. to ATLANTIC REFINING Co. (U.S.P. 2,073,953, 16.3.37. Appl., 16.10.31).

**Intimate mixing of sulphuric acid and lubricating oil stock.** G. M. PFAU, D. C. BOLIN, and E. W. ZUBLIN, Assrs. to TEXAS PACIFIC COAL & OIL Co. (U.S.P. 2,073,253, 9.3.37. Appl., 9.8.32).

**Apparatus for refining and purifying used and dirty lubricating oil.** S. BRAMLEY-MOORE (B.P. 482,366, 27.6.36).

**Storage of [inflammable] liquids or other materials.** E. W. A. and P. H. I. HUMPHREYS (B.P. 481,886, 18.9.36).

**Separating H<sub>2</sub>O from oil.** Fractional distillation. Vaporising C<sub>4</sub>H<sub>10</sub>. Temp.-measuring plugs.—See I. [Wax] coating [for paper].—See V. H<sub>2</sub>.—See VII.

### III.—ORGANIC INTERMEDIATES.

**Catalytic oxidation of hydrocarbons in the vapour phase as a source of technically valuable**

**products.** W. VON PIOTROWSKI and J. WINKLER (Petroleum, 1938, 34, No. 16, 1—3).—A mixture of hydrocarbons of *d* 0.770—0.850 and b.p. 170—250° is vaporised in preheated air and passed through a reaction chamber packed with contact material; the reaction temp. is 260—300°. The products are condensed and fractionated; they consist of unsaturated hydrocarbons with one or two double linkings, aromatic hydrocarbons, saturated and unsaturated aldehydes and ketones, lactones, alcohols, and small quantities of carboxylic acids and phenols. The lightest and heaviest fractions have the highest O content. The products find application (a) for odorising gas (cf. B., 1932, 488), (b) as a denaturant for EtOH, and (c) as agents for the prevention of C<sub>10</sub>H<sub>8</sub> and gum deposition in gas mains (cf. B., 1933, 611).

A. B. M.

**Catalytic polymerisation of ethylene at atmospheric pressure.** VI. Polymerisation activity of iron catalyst. VII. Qualitative test on polymerisation activity of nickel catalyst. VIII. Selective activity of the catalyst; considerations regarding the polymerisation mechanism. Y. KONAKA (J. Soc. Chem. Ind. Japan, 1938, 41, 22—23B; cf. A., 1937, II, 438).—VI. Ignited Fe(NO<sub>3</sub>)<sub>3</sub> catalyst was inactive (300—400°). Fe<sub>2</sub>(CO)<sub>9</sub> reduced at 480° gave small amounts of polymeric at >300°. Fe—Cu—U<sub>3</sub>O<sub>8</sub> catalyst was best, and gave 1.7 c.c. of oil from 16 l. of C<sub>2</sub>H<sub>4</sub> (4 hr., 350°). Alkalis decreased the activity of Fe catalysts.

VII. Ni catalysts (pptd. by K<sub>2</sub>CO<sub>3</sub>) were very active at 240—270°. The effect of precipitants was in the order K<sub>2</sub>CO<sub>3</sub> > KOH > Na<sub>2</sub>CO<sub>3</sub> > burned catalyst > NaOH > aq. NH<sub>3</sub>. Addition of inactive oxides, e.g., of Pb, Cu (>3%), Ag, destroyed the activity. U<sub>3</sub>O<sub>8</sub>, CrO<sub>3</sub>, MnO, and Al<sub>2</sub>O<sub>3</sub> (<15%), and the Ni—Mn series (particularly in presence of U<sub>3</sub>O<sub>8</sub> or Al<sub>2</sub>O<sub>3</sub>) were promoters.

VIII. The polymerisation is a selective catalytic phenomenon. The reduction temp. of NiO by H<sub>2</sub> is lowered by other oxides, particularly by those of Cu and U, but that of U promoted and of Cu inhibited polymerisation, so that activity must depend mainly on the crystal structure. Polymerisation is a complex thermal reaction involving dehydrogenation, hydrogenation, and polymerisation. About 2—3% of C<sub>2</sub>H<sub>2</sub> is present throughout the reaction, and is probably an essential intermediate product. Butadiene was not detected.

I. C. R.

**Stability of butadiene at different temperatures in presence of Lebedev's catalyst (complex catalyst for synthesis of butadiene from ethanol).** I. A. VOLSHINSKI, G. M. KOGAN, and O. M. NEIMARK (Sintet. Kautschuk, 1936, No. 1, 4—8).—The catalyst decreased the stability of (CH<sub>2</sub>:CH)<sub>2</sub> at 500°.

CH. ABS. (c)

**New large-scale organic syntheses.** G. NATTA (Chim. e l'Ind., 1938, 20, 185—198).—A lecture, in which industrial processes involving the syntheses of org. substances from C and from H and O (either in the elementary state or combined as H<sub>2</sub>O) are summarised, e.g., synthesis of water-gas, MeOH, hydrocarbons, higher alcohols, CH<sub>2</sub>O, explosives, and rubber.

O. J. W.



**Fatty alcohols and sulphonated fatty alcohols.** M. COULERU (Compt. rend. XVII Cong. Chim. Ind., 1937, 722—728).—The applications of the higher aliphatic (oleyl and cetyl) alcohols in pharmacy, lubrication, perfumery, etc., and of the sulphonated alcohols as wetting agents etc., are summarised.

E. L.

**Polymerisation of vinyl acetate.** L. MEUNIER and G. VAISSIÈRE (Compt. rend., 1938, 206, 677—679).—Polymerisation of commercial vinyl acetate (I) takes longer in air or  $O_2$  below  $120^\circ$  than in  $N_2$  because in the former case peroxidation is the first reaction. Above  $120^\circ$  this peroxide is unstable. Polymerisation by ultra-violet light is similarly inhibited by  $O_2$ . When (I) is heated with an equal vol. of EtOH or EtOH- $H_2O$  (50—95% of EtOH) containing 1% of  $Bz_2O_2$  at  $80^\circ$  for 3 hr., polymerisation occurs, but the polymeride has a low mol. wt. The probable course of the reaction is described.

J. L. D.

**Formation of esters from alcohols.** S. L. LEITSCHUK, M. V. VELISTOVA, and E. J. GAVRILOVA (Prom. Org. Chim., 1938, 5, 287—292).—The yields of EtOAc or  $PrCO_2Bu$  obtained when MeCHO or  $PrCHO$  is passed in a stream of  $N_2$  over  $Cu-Al_2O_3-Cr_2O_3$  catalyst at  $275^\circ$  are very small as compared with those obtained in presence of  $H_2$  or  $H_2O$ , or from EtOH or BuOH. Synthesis of the esters from alcohols is not inhibited by presence of acids in the mixture. EtOAc is obtained in good yield from acetal, but it is improbable that acetal is an intermediate product. Production of ester under the given conditions takes place almost exclusively from acid and alcohol; in the case of aldehydes ester is formed only after reduction to alcohol and oxidation to acid, by  $H_2O$  formed or present. Direct condensation of 2 mols. of aldehyde to yield ester does not take place.

R. T.

**Catalysts in the preparation of vinyl esters.** M. JEANNY (Rev. Gén. Mat. Plast., 1937, 13, 203—205, 267—270).—A review of patent literature on the use of salts of Hg, Zn, and Cd as catalysts.

F. McK.

**Vapour pressure of solvents.** D. H. KILLEFFER (Ind. Eng. Chem., 1938, 30, 565—567).—One nomograph is given for the v.p.-temp. relations of 33 common solvents with b.p. between  $150^\circ$  and  $200^\circ$ , and another for 31 with b.p. above  $200^\circ$ .

R. C. M.

**[Preparation of] methyl ethyl ketone.** V. S. BATALIN and E. V. SEKRETAREVA (Sintet. Kautschuk, 1936, No. 1, 14—20).— $Bu^iOH$  is heated for 2—3 hr. at  $400$ — $555^\circ$  (optimum  $500^\circ$ ) with calcined ( $450^\circ$ ; 3—4 hr.) ZnO and the product fractionated to yield 85—88% of COMeEt and 1—3% of unsaturated hydrocarbons.

CH. ABS. (c)

**Influence of water and of other impurities on crystallisation of naphthalene from the gaseous phase.** S. S. URAZOVSKI, K. A. BELOV, and V. V. DIBSKI (Ukrain. Chem. J., 1938, 13, 55—68).—The size of the crystals deposited from  $C_{10}H_8$  vapour diminishes with rising  $[C_6H_6]$ , and rises with increasing  $[H_2O]$  of the vapour. In presence of PhOH the deposit is imperfectly cryst. or amorphous. The effects are ascribed to surface-energy changes.

R. T.

**Preparation of high-grade anthracene and carbazole from crude anthracene.** M. I. POLIAKOVA (Koks i Chim., 1938, No. 2—3, 75—81).—Crude anthracene is heated for 4 hr. at  $140$ — $150^\circ$  with a 115% excess of maleic anhydride (I), the product heated with 10%  $Na_2CO_3$  or NaOH, and the solution filtered. The washed residue is shaken with an equal vol. of  $C_6H_6$  (1 hr. at  $20^\circ$ ) and filtered, when the residue consists of 70—77% carbazole, whilst the filtrate yields, when evaporated, 45% phenanthrene. Excess of  $H_2SO_4$  is added to the alkaline filtrate at room temp., and the  $C_6H_6$ -(I) adduct collected, washed, dried, and heated at  $300^\circ$  to yield a sublimate of anthracene and (I). The washed sublimate is heated with 10% NaOH to remove undissociated adduct, and the residue washed, dried, and recryst. from  $C_6H_6$  to yield 95—97% anthracene.

R. T.

**Preparation of pure anthracene and carbazole from pressed crude anthracene by the alkalifusion method.** I. I. TZUKERMAN (Prom. Org. Chim., 1938, 5, 248—251).—The method described previously (B., 1937, 1017) gives 80—84% anthracene in 75% yield, and 90—91% carbazole in 60% yield, on a semi-industrial scale.

R. T.

**Production of metol in the autoclave.** A. E. BAUMAN and Z. S. SCHENKER (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 5, 52—56).— $p-NH_2-C_6H_4-OH$  can be methylated in an autoclave by the use of MeOH at  $160$ — $170^\circ/21$ —26 atm. (yield 65%).

CH. ABS. (c)

**By-products  $[C_{10}H_8]$  from coke ovens.** 1- and 2- $C_{10}H_7Me$  from crude oil. Methyloctanes from petroleum.—See II. Carbagel.—See VII. Rubber antioxidants.—See XIV. Butyl-fermentation.—See XVIII. Glycerin for photographic emulsions.—See XXI.

See also A., II, 214, Detecting MeOH. 215, Prep. of anhyd. pinacol, of diacyloxy-derivatives of ketones, of acid anhydrides, and of  $Ac_2O$ . Synthesis of  $Na_2PhPO_4$ . 225, Prep. of  $o-(NO_2)_2$ -compounds. 228, Synthesis of perylene from anthracene. 231, Methylation of  $CPh_2OH$ . 237, New synthesis of metal salts of hydroxyanthraquinones. 238, Isolation of guaiacol from waste sulphite liquor. 243, Prep. of pyrrolidines. 245, Isolation of 2:3-dimethyl-8-ethylquinoline from petroleum. III, 525, Toxic effects of volatile solvents in industry. 534, Succinic acid.

## PATENTS.

**Preparation of normal olefines containing  $\Delta^a$ - and  $\Delta^b$ -olefines (mainly  $\Delta^b$ -olefines).** A. H. STEVENS. From PHILLIPS PETROLEUM CO. (B.P. 482,427, 24.6.36).— $\Delta^a$ - and  $\Delta^b$ -olefines ( $\neq C_4$ ) are prepared from mixtures containing also paraffins and *tert.*-olefines by treating with 80—100%  $H_2SO_4$  at atm. temp. and separating the acid-ester mixture before sulphation is complete. *tert.*-olefines are polymerised and  $\Delta^a$ - and (chiefly)  $\Delta^b$ -olefines are regenerated by diluting the acid-ester mixture with  $>100\%$  of  $H_2O$  (to yield 44—65%  $H_2SO_4$ ) and heating ( $85$ — $150^\circ$ ).

A. H. C.



**Stabilisation of polyisobutylene.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 482,547 and 482,573, 28.9.36).—(A) Polymerised  $\text{iso-C}_4\text{H}_8$  is stabilised by adding  $\geq 1\%$  of a cyclic amine or phenol. The use of  $p\text{-CH}_2\text{Ph-NH-C}_6\text{H}_4\text{-OH}$  is described. (B) The use of  $\geq 1\%$  of an org. sulphide, e.g., di-(2-hydroxy-5-butylphenyl) disulphide, is claimed. A. H. C.

**Manufacture of ethyl chloride.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 483,051, 8.10.36).— $\text{Cl}_2$  and  $\text{C}_2\text{H}_6$  (1—1.25 mols.) are led over cryst. C (graphite) deposited on metal carriers which are resistant to  $\text{Cl}_2$  and  $\text{HCl}$  and may be cooled, at  $400\text{--}700^\circ$  to yield (70—80% of)  $\text{EtCl}$ . A. H. C.

**Manufacture of polymerisation products.** I. G. FARBENIND. A.-G. (B.P. 482,583, 28.9.36. Ger., 28.9.35).—Unsaturated substances, either singly or in mixture, which can be vaporised and are to be polymerised, e.g., vinyl halides, are passed in the form of fine gas bubbles up a column of liquid in which they are insol. and which contains an accelerator in solution; unpolymerised gas is recirculated. Among examples,  $\text{CH}_2\text{:CHCl}$  is passed through a fine nozzle up a tower containing 1% aq.  $\text{K}_2\text{S}_2\text{O}_8$  at  $50\text{--}60^\circ$ . The liquid is eventually converted into a stable emulsion of the polymeride, which is isolated by salting. K. H. S.

**Manufacture of polymerisation products.** W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 482,647, 28.9.36. Cf. B.P. 482,583; preceding abstract).—A gaseous, polymerisable org. compound, particularly a vinyl halide, alone or in admixture with other polymerisable gaseous compounds, is finely distributed in a liquid medium ( $\text{H}_2\text{O}$ ) in which it is practically insol. in presence of a per-compound ( $\text{K}_2\text{S}_2\text{O}_8$ ) as catalyst at  $\geq$  atm. pressure. The liquid medium may also contain solid or liquid compounds capable of being polymerised. R. G.

**Manufacture of alcohols of high mol. wt.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 482,970, 18.11.36).—Hydroxylated condensation products of high mol. wt. suitable for use as textile assistants, softening agents, synthetic resins, etc. are prepared by condensing  $\text{CHMe:CH-CHO}$  or an aldehyde producing this (e.g.,  $\text{MeCHO}$ , aldol) with compounds having a reactive H and/or a polymerisable double linking in presence of  $\text{MOAlk}$  ( $\text{M}$  = alkali metal) and (catalytically) reducing the product. The use of  $\text{COMe}_2$ ,  $(\text{CH-CO})_2\text{O}$ , cyclohexanone,  $\text{COMeEt}$ ,  $\text{CH}_2\text{:CH-CO}_2\text{Et}$ ,  $\text{CH}_2\text{:CH-COEt}$ , diisobutene,  $\text{PhOH}$ , and  $(\text{MeCHO})_3$  as the second component is described. A. H. C.

**Stabilisation of polyvinyl ethers.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 482,512, 28.9.36).—Polyvinyl ethers are stabilised before polymerising by adding  $\geq 1\%$  of a cyclic org. amine or a substance containing S and/or aromatic  $\text{NH}_2$  or OH groups. The stabilisation of  $\text{OBu}^t\text{-CH:CH}_2$  (polymerised with  $\text{BF}_3$ ) by di-(2-hydroxy-5-butylphenyl) disulphide and by the analogous  $\text{Bu}^t$  compound is described. A. H. C.

**Manufacture of polymerisation products.** I. G. FARBENIND. A.-G., and W. W. GROVES (B.P. 482,440 and B.P. 482,507, [A] 29.9.36, [B] 29.12.36. Addns.

to B.P. 459,515; B., 1937, 468).—(A) Polyvinyl ketones are treated with alkaline condensing agents ( $\text{NH}_3$ , org. amines,  $\text{NH}_4$  compounds) and the reaction is stopped by adding an equiv. amount of acid when the desired  $\eta$  has been attained, the products being still sol. (B) Polymeric compounds, other than polyvinyl ketones, containing CO groups, and if desired  $\text{CO}_2\text{H}$  in addition to CO groups, and treated as in (A). Examples describe the treatment of products from  $\text{CH}_2\text{:CH-COMe}$  with  $\text{CH}_2\text{:CH-CO}_2\text{Me}$  or  $\text{CH}_2\text{:CH-OAc}$  and from styrene,  $\text{CH}_2\text{:CH-CHO}$ , and  $\text{CH}_2\text{:CH-OAc}$ . R. G.

**Preparation of  $\beta$ -p-hydroxyphenylisopropyl-methylamine.** KNOLL A.-G. CHEM. FABR. (B.P. 482,414, 26.5.37. Ger., 26.5.36 and 18.5.37).— $p\text{-OMe-C}_6\text{H}_4\text{-CH}_2\text{-COMe}$  is condensed with  $\text{NH}_2\text{Me}$ , the product either simultaneously or subsequently reduced, and the OMe hydrolysed (e.g., with  $\text{HBr}$ ).  $\text{NH}_2\text{Me}$  may be replaced by  $\text{NH}_3$  and the base methylated (e.g., with  $\text{CH}_2\text{O}$  and activated Al in  $\text{EtOH}$ ). Examples describe the use of  $\text{Pt-H}_2$ ,  $\text{Ni-H}_2$ , and activated Al in  $\text{EtOH}$  and in  $\text{H}_2\text{O}$  to effect reduction. A. H. C.

**Manufacture of hydroaromatic nitrogen compounds.** W. J. TENNANT. From HENKEL & Co. G.M.B.H. (B.P. 482,580, 28.8.36).—Saturated hydroaromatic compounds containing at least one aliphatic hydrocarbon radical of  $\leq \text{C}_4$  and containing reactive Cl, OH, or CO are caused to interact with  $\text{NH}_3$  or primary or sec. amines, if necessary in presence of  $\text{H}_2$ . Among examples, 2-methyl-4-sec.-dodecylcyclohexanone, b.p.  $162\text{--}168^\circ/2\text{ mm.}$  (280) (formed by interaction of dodecene and o-cresol followed by hydrogenation and oxidation), is heated with  $\text{CH}_2\text{Ph-NH}_2$  (107) and  $\text{HCO}_2\text{H}$  (138 pts.) at  $100\text{--}150^\circ$ , producing 2-methyl-4-sec.-dodecylcyclohexylbenzylamine, b.p.  $200\text{--}230^\circ/1\text{ mm.}$  Similarly n-octene and  $\text{PhOH}$  afford 4-sec.-octylcyclohexanone, which with  $\text{NH}_2\text{Me}$  in aq.  $\text{MeOH}$  with  $\text{Ni-H}_2$  at 30 atm. for 20 hr. produces 4-sec.-octylcyclohexylmethylamine, b.p.  $170\text{--}175^\circ/14\text{ mm.}$ ; 2-methyl-4-sec.-octylcyclohexylmethylamine, b.p.  $148\text{--}157^\circ$ , is obtained similarly. K. H. S.

**Manufacture of aromatic polysulphonamido-compounds.** I. G. FARBENIND. A.-G. (B.P. 482,524, 3.10.36. Ger., 5. and 12.10.35).—Products of val. as tanning agents, reserving agents for wool against substantive dyes, or precipitants for basic dyes are prepared by interaction of an aromatic disulphonic or dicarboxylic acid halide, an aliphatic dicarboxylic acid halide, or  $\text{COCl}_2$  with an aminosulphonic acid (2 mols.) in which  $\leq 2$  aryl residues are linked together by  $\text{CO-NH}$  and/or  $\text{SO}_2\text{-NH}$ , and in which there may also be present readily hydrolysable (aliphatic)  $\text{NHAc}$ ,  $\text{NO}_2$ , or additional  $\text{NH}_2$ , this free or developed  $\text{NH}_2$  being finally condensed with an aryl-sulphonyl or -carboxyl halide; the final products have  $\leq 4$   $\text{SO}_2\text{-NH}$ ,  $\leq 5$  aryl nuclei, and  $\leq 2$   $\text{SO}_3\text{H}$ . E.g.,  $p\text{-NH}_2\text{-C}_6\text{H}_4\text{-SO}_3\text{Na}$  is condensed with  $m\text{-NO}_2\text{-C}_6\text{H}_4\text{-SO}_2\text{Cl}$  (I) in presence of  $\text{CaCO}_3$ , the product is reduced (Fe), condensed with further (I) (1 mol.), again reduced, and finally condensed with 1:2-dichlorobenzene-4:6-disulphonyl chloride, m.p.  $110\text{--}111^\circ$  ( $o\text{-C}_6\text{H}_4\text{Cl}_2$  and excess of  $\text{ClSO}_3\text{H}$ ) (0.5 mol.); the resulting product is converted into  $\text{NH}_4$  salt



which is extremely sol. in  $H_2O$  and in presence of acids is a tanning agent. H. A. P.

**Manufacture of condensation products containing nitrogen and sulphur.** W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 482,515, 30.9.36).—“Sulpho-betaines” are prepared by interaction of a metal salt of an aliphatic halogenosulphonic acid with a *tert.* amine; reaction is said to be favoured by  $H_2O$  if the product has  $H_2O$  of crystallisation. *E.g.*, the inner *anhydride*, m.p. 249–250°, of  $\beta$ -pyridiniummethanesulphonic acid is prepared by heating  $Cl[CH_2]_2SO_3Na$  (I) with  $C_5H_5N$  at 140–150°. Similar products are obtained from (I) and  $NEt_3$ , and from  $CH_2Cl\cdot CH(OH)\cdot CH_2\cdot SO_3Na$  and quinoline (m.p. 318°), and  $NEt_2[CH_2]_2\cdot OH$  (m.p. 189–190°).

H. A. P.

$C_2H_2$  and  $Ca(OH)_2$ .—See II. Leuco-compounds.—See IV. Textile assistants.—See VI. Catalytic composition.—See VII. Sulphonic acid amide compounds.—See XX.

#### IV.—DYESTUFFS.

**Oxidation in the dyestuffs industry.** F. HENSEY (J. Soc. Dyers and Col., 1937, 53, 345–347).—The use of various agents in oxidising leuco-compounds, particularly of the  $CHPh_3$  series, is discussed with special reference to the effect on shade and yield. Comparison is made between oxidation with  $AcOH + PbO_2$  (I), dichromate +  $H_2C_2O_4$  (II), and  $H_2C_2O_4 +$  dichromate (III) mixtures, the reagents being added in the order given. In the case of Disulphine Green B, (I) is superior to (II) and (III). However, with leuco-Acid Green G, this difference is not so pronounced, although both (II) and (III) give bluer shades [(III) > (II)]. With leuco-Disulphine Blue V, all three reagents give good yields, but with leuco-Disulphine Blue A, (II) and (III) give very poor yields and green, dull shades. Freshly prepared  $MnO_2$  is better than  $KMnO_4$  in some cases (*e.g.*, in the oxidation of the compound produced by condensing  $o\text{-}C_6H_4Cl\cdot CHO$  with  $o\text{-}C_6H_4Me\cdot NH_2$ ), and in a process involving two stages of oxidation (*e.g.*, in the prep. of Milling Blue B) sufficient reagent ( $K_2Cr_2O_7$ ) to effect both oxidations may sometimes be added. During the air-blowing of indoxyl, the  $H_2O_2$  formed (especially at low temp.) produces some  $o\text{-}NH_2\cdot C_6H_4\cdot CO_2H$  and decreases the yield of indigo. This effect is min. at 70°.

R. J. W. R.

See also A., I, 307, Behaviour of dyes towards clay etc. II, 229, Congo-red synthesis. 243, Dyes from acenaphthenequinone. Green vat dyes from thiophen and 3-substituted 4-hydroxy-anthranols.

#### PATENTS.

**Conversion of leuco[anthraquinone] compounds into their oxidised form.** G. LORD and G. REEVES (B.P. 482,582, 26.9. and 14.10.36).—Leuco-compounds which do not require the addition of  $O_2$  for conversion into their oxidised form, *e.g.*,  $OH$ - and  $NH_2$ -derivatives of anthraquinone, are dehydrogenated by heating with unsaturated org. compounds or compounds capable of reacting as such, *e.g.*,  $C_6H_4$ ,  $COMe_2$ ,  $MeCHO$ , terpenes, alkylene oxides,  $(CH_2)_2NH$ .

The method is applicable to the development of vat-dyed textiles. *E.g.*, leuco-1:4-diaminoanthraquinone (60 pts.) is heated with  $(CH_2)_2O$  (13 pts.) in  $MeOH$  (600 pts.) at 150° for 4 hr.; 1:4-diaminoanthraquinone and  $EtOH$  are formed.

H. A. P.

**Manufacture of dyes of the phthalocyanine series.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 482,387, 13.11.36).—Metal phthalocyanines are prepared by heating *o*-dinitriles or compounds yielding such nitriles during the reaction (*e.g.*,  $o\text{-}CN\cdot C_6H_4\cdot CO\cdot NH_2$ ) in presence of metals or metal compounds under pressure in presence of an org. diluent free from N and OH groups, preferably one of b.p. 80–150°. Examples are given of the prep. of Mg, Zn, Cu, Na, Pb, Ni, Cu, Co, Cr, and Fe phthalocyanines in  $PhMe$ ,  $PhCl$ , etc. *Hg phthalocyanine*, obtained by heating  $o\text{-}C_6H_4(CN)_2$  and  $HgPh_2$  in xylene at 230°, is brilliant green in shade. Cu tetraphenylphthalocyanine is obtained in a  $\beta$ -modification (soft and insol. in  $C_6H_6$ ) by heating 3:4-dicyanodiphenyl and  $CuCl$  in  $PhMe$  at 190–200° for 8–10 hr.

S. C.

**Sensitising emulsions. Polymethine dyes.**—See XXI.

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

**Stress-strain characteristics of wool as related to its chemical constitution.** (A) J. B. SPEAKMAN. (B) M. HARRIS and J. A. SOOKNE (Amer. Dyestuff Rep., 1938, 27, 168–171p, 171–173p).—(A) The conclusions of Harris and Sookne (B., 1938, 264) are disputed and reference is made to previous and hitherto unpublished researches to prove that fibre swelling is of less importance than the salt linkings formed from the acid and basic side-chains of wool in determining the physical stability of wool fibres in aq. and acid solutions. It is affirmed that new cross-linkings between the polypeptide chains are formed by the action of quinone on wool and this (but not swelling) explains the increased resistance to extension of the treated fibres. The statement of Harris and Sookne that the resistance to extension of wool fibres in aq.  $HCl$  at  $p_H$  1.42–4.95 is unchanged by saturating the fibres with Orange II is contradicted and evidence is given to show that the dye particles increase this resistance by clogging the fibre structure; the hysteresis between extension and contraction of wool fibres is increased from 53.7% to 80.4, 71.3, and 73.8% by dyeing with 50% of Solway Green G., Solochrome Black, and Solway Blue Black BS, respectively. Data showing the % reduction in work required for 30% extension of fully deaminated fibres in solutions of  $p_H$  1.00–11.77 at 22.2° prove that the resistance to extension is independent of the  $p_H$  in acid solutions; this agrees with the salt-linking theory since such linkings are broken by deamination. It is concluded that deamination was incomplete in the experiments of Harris and Sookne. It is contended that Harris and Sookne's conclusion that swelling is a sufficient cause of the increased ease of fibre extension in aq. solutions of neutral salts (with and without the presence of an acid) is based on a misinterpretation of the experi-



mental data, and it is affirmed that salt linkings play an important part. Aq. solutions of neutral salts (e.g., 0.2M-HgCl<sub>2</sub> in 0.1N-HCl) may have a drastic action on a strained (but not unstrained) cystine linking.

(B) A reply. The importance of fibre swelling is again emphasised. The formation of new cross-linkings by quinone fails to explain the much easier extension of the treated fibre in alkaline solutions, especially because it is found that no quinone is removed from the wool by the alkali. It is contended that simple mechanical hindrance by dyes does not explain that extension of dyed fibres in solutions of  $p_H$  1.4—5.0 requires exactly the same energy as untreated fibres and much less energy at  $p_H$  6.9. It is affirmed that the ease of extension of completely deaminated fibres is not independent of the  $p_H$  in solutions of  $p_H < 5.0$ . Speakman's contention that the behaviour of wool fibres in aq. solutions of inert inorg. salts is the same as when exposed to atm. in equilibrium with these solutions is denied, and this is supported by the fact that the energies required to extend fibres 30% in aq. 5N-LiBr and -NaCl are 0.82 and 1.22, respectively, although the R.H. of the atm. in equilibrium with these solutions are nearly equal (65 and 78%, respectively). Harris adheres to a conclusion (with Mease; B., 1937, 538) that wool forms a sulphamic and not a sulphonic acid when treated with 80% H<sub>2</sub>SO<sub>4</sub> although this is disputed by Speakman.

A. J. H.

**Photochemical reaction of wool.** M. HARRIS and A. L. SMITH (Amer. Dyestuff Rep., 1938, 27, 175—178p, and J. Res. Nat. Bur. Stand., 1938, 20, 563—569).—During irradiation of wool (surrounded by dry N<sub>2</sub>) with ultra-violet light from a glass-enclosed C arc (Fadeometer) 5.4% of the total S is liberated as H<sub>2</sub>S; in moist N<sub>2</sub> this decomp. is increased to 22%. Contrary to the conclusions of King (B., 1928, 707) and Meunier and Rey (B., 1926, 974), all the loss of S during irradiation can be accounted for by formation of H<sub>2</sub>S and not of SO<sub>2</sub>. Curves show the rates of H<sub>2</sub>S formation during irradiation for 900 hr. in dry and moist N<sub>2</sub>. Irradiation of wool surrounded by moist air produces only traces of free H<sub>2</sub>S, this being immediately oxidised to SO<sub>2</sub> so that the wool ultimately contains a considerable amount of H<sub>2</sub>SO<sub>4</sub>. H<sub>2</sub>S formation is not accompanied by liberation of NH<sub>3</sub>. Although the loss of S in moist N<sub>2</sub> is 4 times that in dry N<sub>2</sub> the corresponding losses of cystine, as determined by the Sullivan method, are nearly equal, and it is therefore suggested that irradiation does not at first produce a hydrolytic cleavage of the -S-S- group as postulated by Crowder and Harris for alkaline degradation (B., 1936, 782), but that the primary action is an activation of this group resulting in a change of state of the S with a corresponding lowering of the cystine content; the evolution of H<sub>2</sub>S is a secondary reaction. In irradiation of wool in air, the H<sub>2</sub>SO<sub>4</sub> further catalyses the photochemical decomp. and this accounts for the high alkali-solubility of the resulting wool.

A. J. H.

**Detection of oxidation in wool.** H. A. RUTHERFORD and M. HARRIS (Amer. Dyestuff Rep., 1938, 27, 179—180p, and J. Res. Nat. Bur. Stand., 1938, 20, 555—557).—Use is made of the power of

oxidised wool (produced by treatment with H<sub>2</sub>O<sub>2</sub>, Cl<sub>2</sub>, Br, or irradiation with ultra-violet light in presence of H<sub>2</sub>O and O<sub>2</sub>) to oxidise Fe<sup>II</sup> to Fe<sup>III</sup>. Oxidation is detected by boiling for several min. (until air in the flask is displaced by H<sub>2</sub>O and COMe<sub>2</sub> vapour) 1 g. of cut-up wool immersed in a mixture of 40 c.c. of solution A (equal vols. of COMe<sub>2</sub> and H<sub>2</sub>O acidified by addition of 1 vol.-% of 6N-H<sub>2</sub>SO<sub>4</sub>) and 5 c.c. of solution B (1 g. of KCNS dissolved in 30 c.c. of A), and then adding 5 c.c. of solution C [prepared by dissolving 1 g. of Fe(NH<sub>4</sub>)<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>·6H<sub>2</sub>O in 50 c.c. of A and 15 c.c. of 6N-H<sub>2</sub>SO<sub>4</sub>, preferably in an atm. of CO<sub>2</sub> or N<sub>2</sub>]; a pink colour develops on the wool, the depth depending on the degree of oxidation. A blank test is made simultaneously and if the test solution becomes pink during the boiling, H<sub>2</sub>O is added until it just disappears; an equal addition is then made to the test solution containing the wool. Before testing, the wool must be freed from Fe. The test has no quant. significance; e.g., wool bleached for 2 hr. in 0.6% H<sub>2</sub>O<sub>2</sub> gave a deeper pink than wool similarly bleached with 1.7% H<sub>2</sub>O<sub>2</sub>. A positive test was obtained with wool bleached for 24 hr. with 3% H<sub>2</sub>O<sub>2</sub>.

A. J. H.

**Emulsion oiling of wool.** R. C. PALMER and C. M. BLOW (J. Text. Inst., 1938, 29, P91—93).—Deposition of oil on wool occurs if these have opposing electrokinetic potentials. With stabilisers such as Lissapol, Igepon-T, or soap the oil is negatively charged and is deposited on wool at  $p_H < 3.5$ , but with stabilisers such as C<sub>16</sub>H<sub>33</sub>NMe<sub>3</sub>Cl, dodecyltrimethylsulphonium methosulphate, or cetylpyridinium bromide (Fixanol etc.) the oil is positive and is deposited at  $p_H > 7$ .

A. G.

**Methods of determining oil, soap, and other extraneous matter in textile materials. I, II. Nature of the material obtained by extraction of wool with ethyl alcohol. III. Nature of the material obtained by extraction of commercially clean wool with ethyl ether.** B. A. RYBERG (Amer. Dyestuff Rep., 1937, 26, 461—467p; 1938, 27, 8—13p, 180—183p).—I. After wool is thoroughly extracted with good oil solvents such as Et<sub>2</sub>O, CCl<sub>4</sub>, and (CHCl<sub>3</sub>)<sub>2</sub>, it yields a further 0.75—1.00% of extract with EtOH (95%). The preliminary extract with Et<sub>2</sub>O is reduced and the subsequent EtOH extract correspondingly increased by first drying the wool at 105—110° for 1.5 hr. Tabulated results are given of the examination of the EtOH extract of Australian wools (one degreased by a commercial solvent process and the other by scouring with soap-Na<sub>2</sub>CO<sub>3</sub>), air-dried and first extracted 12 times with Et<sub>2</sub>O.

II. The above experiments were repeated, using a redesigned and larger Soxhlet extractor (described). The extracts obtained with 95% EtOH from the two types of wool were 1.1 and 1.2%, respectively; they consisted mainly of esters of the higher alcohols, the remainder being free acids of equiv. wt. 254. The presence of nitrogenous substances in the extract suggests that the EtOH removes the wool substance.

III. Samples of the degreased wools were further rinsed in warm H<sub>2</sub>O, carded, and dry-combed, the (soap + Na<sub>2</sub>CO<sub>3</sub>) scoured wool further carded, back-



washed with a solution of a fatty alcohol sulphonate, and dry-combed, and then separately extracted 12 times with  $\text{Et}_2\text{O}$ , whereby extracts of 0.66 and 0.84% were obtained, respectively. It is concluded that the extracts (exhaustively analysed and results tabulated) were entirely residual wool grease, and that oils using in manufacturing operations are entirely removed in back-washing and are easier to remove than is wool grease.

A. J. H.

**Reaction of wool with hydrogen peroxide.** H. A. RUTHERFORD and M. HARRIS (Amer. Dyestuff Rep., 1938, 27, 173—174, and J. Res. Nat. Bur. Stand., 1938, 20, 559—561).—Reduction of the acid-combining power of wool observed (cf. B., 1936, 827) in oxidising it with  $\text{H}_2\text{O}_2$  is now attributed to addition of O to the cystine ( $\cdot\text{S}\cdot\text{S}\cdot$ ) linking to form such compounds as  $\text{SO}\cdot\text{S}\cdot$ ,  $\cdot\text{SO}\cdot\text{SO}\cdot$ ,  $\cdot\text{SO}_2\cdot\text{SO}\cdot$ , etc.; confirmatory data are given to show that by treatment at  $50^\circ$  for 10—20 hr. with 3% aq.  $\text{H}_2\text{O}_2$  wool increases by 1.17 wt.-%, whilst the ratio C:H:N:S remains const.

A. J. H.

**Adsorption of alcohols by wool.** F. J. RIZZO and H. CHRISTISON (Amer. Dyestuff Rep., 1938, 27, 2—6r).—Completely dry or air-dried wool, first purified by scouring and successive extraction with  $\text{Et}_2\text{O}$  and EtOH, adsorbs 1.8% of EtOH when saturated with the EtOH and dried at  $105\text{--}110^\circ$  to const. wt. It is believed that the adsorbed EtOH forms an ester with the wool- $\text{CO}_2\text{H}$  and this is hydrolysed with corresponding loss of EtOH when the wool is exposed to moist air. Under corresponding conditions 1.2% of MeOH is absorbed, but the adsorption of a MeOH-EtOH mixture is > that of EtOH provided that the mixture contains <20% of MeOH. 8.1% of alcohol is adsorbed from a 1:1 mixture of MeOH and iso-amyl alcohol, but other alcohols above  $\text{Pr}^n\text{OH}$  are not adsorbed. Wool adsorbs a small amount (0.5%) of the enol form of  $\text{COMe}_2$  with consequent permanent yellowing of the wool and a lowering of its isoelectric point, probably due to reaction with the wool  $\text{NH}_2$ -group. Non-hydroxylic or non-polar substances are not adsorbed by wool. The adsorptions of EtOH and MeOH are  $\propto$  to their mol. wts., and assuming this rate to hold in the case of  $\text{H}_2\text{O}$  it is calc. that wool at  $105\text{--}110^\circ$  will adsorb (retain) 0.7% of  $\text{H}_2\text{O}$ ; heating to a higher temp. to remove this  $\text{H}_2\text{O}$  results in yellowing due to decomp. of the wool.

A. J. H.

**Bibliography on the chemistry of wool.** A. K. SMITH and M. HARRIS (Amer. Dyestuff Rep., 1938, 27, 183—198r).—146 references to acid and alkali absorption, bacteria, enzymes, carbonisation, and chemical constitution are given.

A. J. H.

**Determination of various fibres in mixtures, with special reference to determination of Lanital in wool-Lanital mixtures.** P. LAROSE (Canad. J. Res., 1938, 16, B, 61—67).—Determination of Lanital (I) in (I)-wool mixtures by Da Schio's method (B., 1937, 533) requires extreme precautions to secure accurate results. A flotation method is proposed in which pieces of the yarn  $>1$  mm. long are shaken with a  $\text{PhMe}\cdot\text{CCl}_4$  mixture of such  $d$  that (I) floats whereas the wool sinks to the bottom of the liquid; the separated portions are weighed and their homo-

geneity is established microscopically. With fabrics several determinations have to be made to obtain a fair average val. since the variations along the yarn are considerable.

H. W.

**Distribution of wax in cocoon silk.** W. BERGMANN (Text. Res., 1938, 8, 195—199).—Extraction of wax from 4 successive layers of a cocoon by successive refluxing with 80 and 95% aq. EtOH for 24 hr. and with  $\text{Et}_2\text{O}$  for 48 hr., followed by evaporation of the EtOH extracts, taking up the residue with  $\text{Et}_2\text{O}$ , and adding to the filtered main  $\text{Et}_2\text{O}$  extract showed that the external, the 1st and 2nd middle, and the inside layers contained (yellow Italian cocoons) 1.02, 0.89, 0.79, and 0.45%, and (white Chinese cocoons) 0.72, 0.37, 0.29, and 0.26% of wax, respectively. Wax determinations on yellow Italian cocoons are somewhat inaccurate because the wax easily oxidises to form products difficultly sol. in  $\text{Et}_2\text{O}$ . Preliminary extraction of the silk with EtOH is necessary since simple extraction with  $\text{Et}_2\text{O}$  fails to remove all the wax, and hence it is concluded that the wax penetrates the fibre so that preliminary swelling of this is necessary to facilitate its removal with  $\text{Et}_2\text{O}$ ; in this the wax resembles the yellow pigment. The sericin content of silk also decreases from the external to the internal layers, but the distribution of yellow pigment is irregular. The uneven distribution of  $\text{H}_2\text{O}$ -repellent wax is believed to be connected with difficulties encountered in wetting raw silk.

A. J. H.

**Fixation of sericin of raw silk. III. Deamination of sericin and fixation of deaminised sericin by chromium salts.** M. OKU and Z. HIROSE (J. Agric. Chem. Soc. Japan, 1938, 14, 309—317; cf. B., 1938, 630).—Raw silk becomes less sol. in boiling  $\text{H}_2\text{O}$  after deamination and fixation with Cr salts, and adsorption of  $\text{Cr}_2\text{O}_3$  and  $\text{SO}_4^{--}$  follows Freundlich's adsorption isotherm. Deaminised raw silk after treatment with Cr salts is much more  $\text{H}_2\text{O}$ -stable than that chromed without deamination. The loss of N on deamination is greater with  $\beta$ - (II) than with  $\alpha$ -sericin (I). Combination of  $\text{Cr}_2\text{O}_3$  and  $\text{SO}_4^{--}$  with (I) and of  $\text{SO}_4^{--}$  with (II) follows the adsorption isotherm. Deaminised (I) and (II) adsorb less  $\text{Cr}_2\text{O}_3$  and  $\text{SO}_4^{--}$  than non-deaminised sericin, whilst deaminised (II) adsorbs more  $\text{Cr}_2\text{O}_3$  and less  $\text{SO}_4^{--}$  than deaminised (I). Deaminised chrome-sericinate are more  $\text{H}_2\text{O}$ -stable than chrome-sericinate.

J. N. A.

**Fermentative degumming of waste silk. IV. Enzymic action of degumming bacteria (*B. cereus* sp.) on sericin and fibroin.** H. KATAGIRI and T. NAKAHAMA (J. Agric. Chem. Soc. Japan, 1938, 14, 243—247; cf. B., 1938, 143).—The active agent of *B. cereus* is the sol. enzyme "degumase" (I), since clear filtrates from cultures had active degumming properties in presence of PhMe. The optimum  $p_H$  for the enzyme is 7.0—8.0 and the optimum temp.  $40^\circ$ . (I) is sensitive to acids and is inactivated by keeping at  $65^\circ$  for 2 hr. No noticeable decomp. of fibroin occurs, but sericin-A and -B are attacked at approx. the same rate.

J. N. A.

**Composition of the ether-soluble [wax] fraction of raw silk.** W. BERGMANN (Text. Res., 1938, 8, 221—225).—A light-brown wax (0.54%, on wt. of



raw silk) constituting the final  $\text{Et}_2\text{O}$ -sol. extract of the combined extracts obtained by extracting Chinese raw silk successively with 80% and 95% aq.  $\text{EtOH}$  and  $\text{Et}_2\text{O}$  had m.p. 50–65° and consisted of 35% of primary alcohols ( $\text{C}_{26-32}$ , m.p. 80–81°), 25% of hydrocarbons ( $\text{C}_{25-31}$ ), and 20 and 11.5% of lower and higher acids, respectively ( $\text{C}_{26-32}$ ); no secondary alcohols were present. Silk wax resembles closely in composition plant cuticles and the cuticlin of the silkworm. The shiny, wax-like, surface layer of the mulberry leaf contains the same constituents as are found in silk wax.

A. J. H.

**New fluorescence tests [for silks].** J. A. RADLEY (Analyst, 1938, 63, 266).—When treated with Aconol-yellow TS, Bomberg silk fluoresces in ultra-violet light with a brilliant bluish colour, but viscose gives a very dull blue. With Primuline AS, the former appears canary-yellow in ultra-violet light, the latter bluish-white. 10 p.p.m. of Al in sizing materials etc. can be detected by means of a vivid orange-red fluorescence with Solochrome Red ERS and Solochrome Violet RS.

E. C. S.

**Composition of straw, nutshells, and other lignified vegetable fibres.** G. BERTRAND and G. BROOKS (Compt. rend., 1938, 206, 293–295).—The xylose and cellulose contents of a no. of plant products have been determined.

T. F. D.

**Determination of fibre in cane.** H. W. KERR and N. G. CASSIDY (Bur. Sugar Exp. Sta., Brisbane, Tech. Comm. 4; Int. Sugar J., 1938, 40, 180–183).—A discussion, mainly of sampling technique. In the analysis, 100 g. of the fibrated sample are weighed into calico bags, which are placed first in running  $\text{H}_2\text{O}$  and squeezed by hand several times during 1 hr., and then in circulating boiling  $\text{H}_2\text{O}$  for 1 hr. and squeezed 4 times. Finally the bags are pressed to eliminate surplus  $\text{H}_2\text{O}$  and then dried to const. wt. at 100–105° and the dried fibre is weighed.

J. P. O.

**Manufacture of textile casein and casein staple fibre.** H. SÖHNGEN (Kunstseide, 1938, 20, 78–82).—The properties of casein depend on the  $p_H$  at which it is pptd. An account is given of the prep. of a suitable grade for textile purposes by use of sufficient  $\text{H}_2\text{SO}_4$  to give  $p_H$  2.9–3.0 in the whey. After dissolution of the casein in  $\text{NaOH}$  and ripening, threads are spun and coagulated in a manner similar to that used for viscose, although coagulation is somewhat slower and a higher temp. may be used. The threads are hardened and shrunk by treatment in a bath or series of baths containing  $\text{NaCl}$  and  $\text{CH}_2\text{O}$ .

W. A. R.

**Artificial wool from casein.** P. DIATSCHENKO (Lait, 1938, 18, 233–240).—Previous methods of making wool from proteins are reviewed. The properties of Lanital (prep. described) are compared with those of natural wool. The former shows increased elastic properties and resistance to boiling with  $\text{H}_2\text{O}$  and treatment with aq.  $\text{Na}_2\text{CO}_3$ , but inferior resistance to breakage in both the dry and wet forms. The elementary compositions of natural and artificial wools are given, and a comparison is made between acid and rennet casein.

W. L. D.

**Artificial textile fibres and their importance from the economic viewpoint.** F. WISLICKI (Compt. rend. XVII Congr. Chim. Ind., 1937, 2009–2113).

W. A. R.

**Device for slicing textile fibres for microscopical examination.** ANON. (Text. Rec., 1938, 56, No. 662, 52).

A. J. H.

**[Apparatus for] testing the durability of textile materials.** A. SCHOPPER (Textilber., 1936, 17, 844–849).—The apparatus (described and illustrated) consists of an upper clamp from which hangs a strip of the textile material suitably loaded at its lower end, and mechanical arrangements are provided to oscillate the clamp regularly from  $-90^\circ$  to  $90^\circ$  (total  $120^\circ$ ) on its horizontal axis with consequent bending of the strip; the durability is measured by the no. of oscillations which causes breakage of the strip. Durability data for wool, cotton, rayon, jute, and paper are given.

A. J. H.

**Measurement of the pliability of textile materials.** WERZMIRZOWSKY (Textilber., 1938, 19, 483–486).—The effect of conditions of testing (load, rate of bending, width of strip of textile material), using the Schopper apparatus (see preceding abstract), were investigated and are discussed with reference to variation and accuracy of the results.

A. J. H.

**Equilibrium moisture content of some textile materials.** E. K. STRACHAN (Amer. Dyestuff Rep., 1938, 27, 240–242P).—Existing data mainly relating to cotton are discussed, and reference is made to the heat liberated in printed cotton fabrics during ageing (steaming). 1 g. of bleached cotton fabric liberated 178 g.-cal. when completely wetted with steam, thereby confirming the results of Masson and Richards obtained with absorbent cotton (B., 1907, 89), but the corresponding anticipated temp. rise in printed fabric during ageing is not obtained because the R.H. of the surrounding air is lowered as the temp. rises and the cotton absorbs less  $\text{H}_2\text{O}$ . The temp. rise of printed goods is  $>$  that of unprinted goods, due to the fact that starch present in the former has an absorptive capacity for  $\text{H}_2\text{O}$  equal to that of cotton. Under similar conditions viscose rayon shows a higher temp. rise than cotton, because of its higher  $\text{H}_2\text{O}$  regain.

A. J. H.

**Physical properties of nitrocellulose manufactured by various methods.** M. PAVLIK (Compt. rend. XVII Cong. Chim. Ind., 1937, 1058–1082).—Tabulated data show the decrease in  $\eta$  of nitrocellulose (10.6–12.3% N) by treatment at boiling temp. with various compounds; the depression decreased in the order: glycerol (I) (at  $130^\circ$ ),  $\text{C}_5\text{H}_5\text{N}$  (II) (0.3%),  $\text{NH}_3$  (0.05 and 1%),  $\text{H}_2\text{SO}_4$  (1%), and the  $\eta$  ("Wasag" method) in each case was approx. a linear function of the duration of heating. Autoclaving at  $110-140^\circ/3.6$  atm. produced a similar series of curves; pressure alone had little action and direct and indirect heating gave much the same data. Denitration was greatest with (II) and  $\text{NH}_3$ , and appreciable with (I). Variations of  $\eta$  with solubility in  $\text{EtOH}$  and N content are graphed. Slight yellowing also developed with reduction in  $\eta$ . Examination of the mechanical properties of the films show that tensile strength,



elongation, and plasticity decrease with even a small decrease in  $\eta$ ; the method of treatment of the nitro-cellulose exerted apparently little difference, except that (II) was most active, and the effect cannot be attributed to denitration. It therefore appears impossible to prepare a low- $\eta$  product without adverse effect on the film properties. These results are discussed in the light of the Guth-Rogovin theory (A., 1937, I, 239). S. M.

**Influence of admixture of cellulose nitrate on the properties of acetate films.** I. O. GOLDMAN and F. SCHERMAN (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 6, 26—34).—Film bases made of a cellulose nitrate acetate are mechanically more resistant than are pure cellulose acetate bases, especially against folding (optimum 30% of nitrate). The swelling of mixed bases is an additive property. The rate of burning is  $\propto$  the cellulose nitrate (I) concn., but also depends on the plasticiser used. The decomp. temp. is const. for the range 100—40% of (I). For <40% of (I) it increases linearly as the concn. of (I) diminishes. Bases with <30% of (I) do not ignite spontaneously in the projector gate using an arc lamp, even when no  $H_2O$  cell is used. CH. ABS. (e)

**Cellulose nitrate acetate as a material for film base.** I. O. GOLDMAN (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 5, 43—51).—A review. The only commercial process for preparing the nitrate acetate is the acetylation of weakly nitrated cellulose. CH. ABS. (e)

**Ageing of cellulose ester films.** P. V. KOZLOV and R. V. ZUEVA (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 5, 14—26).—Ageing of film base is accentuated by heat and by exposure to ultra-violet light. The increase in brittleness and in yellowing is associated with depolymerisation of the ester complex, as shown by a decrease in the  $\eta$  of its solutions. CH. ABS. (e)

**Transparent films from marine algæ.** J. PEHOREY (Rev. Gén. Mat. Plast., 1937, 13, 270—274).—Suitable marine algæ are described and the method of extraction of algin is given; the prep. of films according to the Bonniksen process is outlined. F. MoK.

**Determination of the properties of film bases.** A. J. DRINBERG (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 5, 57—59).—A discussion of changes in the film during its production. CH. ABS. (e)

**Cellulose formate. IX. Effects of formic acid concentration on quality of product.** Y. UYEDA and S. NAKAMURA (J. Cellulose Inst. Tokyo, 1938, 14, 91—93; cf. B., 1938, 496).—The results of formylation (at 25° and 30°) of tissue paper and of an  $\alpha$ -pulp with 96.5—98.3%  $HCO_2H$  are tabulated for comparison with results of previous experiments with 100%  $HCO_2H$  (cf. *loc. cit.*). The properties of the cellulose formate investigated are the  $HCO_2H$  content, sp.  $\eta$ , tensile strength, and % elongation. D. A. C.

**Factory methods of cellulose acetate control.** M. S. SVERDLIN (Zavod. Lab., 1938, 7, 41—45).—The  $Ac_2O$  content of the homogeneous systems obtained towards completion of acetylation is derived from the heat effect obtained when 25 ml. of 80%  $AcOH$  are

added to 50 ml. of the syrup. The  $H_2O$  content is determined analogously, by adding 25 ml. of  $Ac_2O$  in place of 80%  $AcOH$ . The degree of esterification is derived from determination of the amyl acetate (I) no., this being the no. of ml. of (I) which has to be added to a solution of 0.5 g. of syrup in 9.5 ml. of  $AcOH$  in order to attain standard turbidity. R. T.

**Filtration of viscose at high temperatures.** A. V. PAKSCHVER and P. IONINA (Prom. Org. Chim., 1938, 5, 270—274).—The following empirical formulæ are shown to hold for viscose solutions:  $\eta = C_1/t$ ;  $Q = C_2/\eta = Ct$ ;  $Z = C/t^{2\theta}$ , where  $C_1$ ,  $C_2$ , and  $C$  are consts. for a given viscose solution,  $\eta$  is its viscosity,  $t$  the temp. between 16° and 35°,  $Q$  the rate of filtration,  $Z$  the maturity of the viscose, and  $\theta$  the time of maturation. R. T.

**Corrosion of iron by viscose.** G. S. RANSHAW (Chem. Age, 1938, 38, 409).—The corrosion of Fe plant used in the manufacture of viscose rayon is discussed. The presence of delustring substances, e.g.,  $PhCl$ , methylhexanol, cyclohexanol, and terpenes, in viscose solutions increases (catalytically) their corrosive action tenfold. A. J. H.

**Evaporation of volatile solvents from solutions of cellulose esters. I. Evaporation in a resting medium. II. Evaporation in an air current.** A. PAKSCHVER and E. MANKASCH (J. Phys. Chem. Russ., 1938, 11, 124—133, 134—143).—I. The initial rate of evaporation is identical for pure solvents and solutions, but the average rate of evaporation for solutions is < that for the solvents when  $EtOH-Et_2O$  mixtures contain >2% of cellulose nitrate, or when  $COMe_2$  contains >4% of cellulose nitrate or >10% of cellulose acetate. The retardation of evaporation from solutions is due to formation of a surface film.

II. The evaporation is formally analogous to the cooling process, and is governed by the same empirical formulæ. In an air current the evaporation of  $EtOH + Et_2O$  and of  $COMe_2$  is retarded even by small amounts of cellulose esters. J. J. B.

**Fractionation of a water-soluble methylcellulose.** R. SIGNER and J. LIECHTI (Helv. Chim. Acta, 1938, 21, 530—534).—Fractional pptn. of commercial methylcellulose from  $H_2O$  first by  $Na_2SO_4$  and then by  $COMe_2$  gives fractions of varying OMe content (22.6—34.6%) and mol. wt. (20,000—140,000). The partial sp. vol. varies regularly with the OMe content. Fractions of medium mol. wt. have the lowest OMe content. R. S. C.

**Use of electrolytic chlorine for manufacture of cellulose.** U. POMILIO (Trans. Electrochem. Soc., 1938, 73, Preprint 24, 343—351).—The Pomilio pulping process is briefly described, and the history of its development, as well as that of the electrolytic  $Cl_2$  cell, on which the process is based, are sketched. One of the great advantages of the process is held to be the close interlocking of the  $NaOH$ ,  $Cl_2$ , and pulp industries. D. A. C.

**Degradation of cellulose by oxidising agents.** SCHELLER (Papier-Fabr., 1938, 36, 111).—A reply to criticisms by Staudinger and Jurisch of the author's paper in Textilber., 1935, 318 (cf. B., 1938, 145). D. A. C.



**Wood chemistry. XI. Chemical composition of Rakuyosho (*Larix Kaempferi*, Sarg.).** Y. UYEDA and T. OHTA (J. Cellulose Inst. Tokyo, 1938, 14, 94; cf. B., 1938, 43).—Analytical data are given, including cellulose 48.65, lignin 24.72, and loss on drying 15.36%. The wood is considered to be suitable for making rayon pulp. D. A. C.

**Microscopical fibre analysis.** A. NOLL (Papier-Fabr., 1938, 36, 133—135).—Existing stains for differentiating unbleached from bleached sulphite, and chemical pulp from groundwood, are described. A new method of differentiating all three with a single staining consists in the application of a solution containing 0.1 g. of a pure basic or basic-mordant dyestuff, and 25 c.c. each of methylglycol, glycerin (*d* 1.27), and 4% aq. aniline sulphate (I). A suitable dye is methylene-blue, which under the mordant action of the sulphonated lignin stains the unbleached sulphite but does not colour the bleached sulphite and groundwood. The (I) has affinity only for native lignin and therefore stains only the groundwood. D. A. C.

**Possibility of producing pulp from lignite.** R. BEYSCHLAG (Papier-Fabr., 1938, 36, 105—108).—Preliminary investigation showed that for any reasonable chemical action to take place the lignite has first to undergo a mechanical crushing action followed by sieving to remove the loosened incrustants. Subsequent acid digestion gave very variable results; some lignites did not react at all, whilst others were decomposed completely. Mild alkali treatment, however, was more successful and it was possible to obtain a pulp from practically every type of lignite. The unbleached pulp yield was 15—25%. At 15% pulp yield it is estimated that about  $10^6$  tons of pulp could be produced yearly from the various sources of lignite in Germany. D. A. C.

**Production of pulp from flax wastes and its conversion into artificial silk.** P. ECKERT and K. PLAESCHKE (Papier-Fabr., 1938, 36, 113—119, 129—132).—Investigation of the production of viscose pulp from flax wastes by the  $\text{HNO}_3$  method gave a very high (97%)  $\alpha$ -cellulose pulp, the physical and chemical properties of which closely resembled those of existing commercial viscose pulps. Extensive pre- and after-treatments are necessary, however, which not only reduce the yield (27%), but also heavily strain the economics of the process. Thus the flax waste is dusted and washed before the  $\text{HNO}_3$  digestion, after which it is treated with hot 2% NaOH, bleached in alkaline  $\text{OCl}^-$  solution in two stages, purified with cold 5% NaOH, and finally acidified with dil. HCl. Flax wastes obtained by the dew and  $\text{O}_3$  retting processes have practically the same chemical composition and show no differences in their behaviour towards  $\text{HNO}_3$ . D. A. C.

**Chemical pulps. V. Lauan woods.** E. HU and T. ITO (J. Cellulose Inst. Tokyo, 1937, 13, 496—497; cf. B., 1938, 632).—Analyses of Lauan woods from the Philippines, Dutch Indies, etc. show that their ash content is practically always < 1%, whilst the resin content, depending on the species, varies between 2 and 10%. 31—44% of lignin is present, the

deeper-coloured woods being the richer, and 9—17% of pentosans. D. A. C.

**Estimation of [pulp]-beating degree.** E. GRUND (Papier-Fabr., 1938, 36, 141—148).—The effect of beating an extra strong sulphite pulp in the Rieth hollander to varying wetness (25—85° S.R.) and under roll pressures of 0.5—2.0 kg./sq. cm. is investigated, by means of fibre length and strength measurements. There is a decrease in the mean fibre length with increase in wetness at const. beating pressure, and with increase in pressure at const. wetness. Since it is shown that the same wetness can be reached under widely differing beating conditions resulting in divergent strength and mean fibre lengths, it is considered that wetness is not a full criterion of beating degree (cf. B., 1938, 359). "Zero" breaking length decreases with increase in beating pressure because of the fibre shortening which takes place. The breaking length (ordinary test-strip lengths) similarly decreases and the max. breaking length is reached at comparatively low S.R. vals. with the heavier beating pressures. The curves of breaking length plotted against mean fibre length are mirror images of those plotted against wetness. The results show the importance of pressure control during beating, which is considered to be one of the pre-requisites of any laboratory beater if accurate results are to be yielded. D. A. C.

**Use of caustic soda in the bleaching of wood pulp.** G. E. SCHMIDT, B. L. SHERA, and T. W. TOOVEY (Paper Trade J., 1938, 106, TAPPI Sect., 284—287).—Both kraft and unbleached sulphite western hemlock pulps have been digested with NaOH over a wide variety of conditions of alkali concn., temp., and pulp consistency, as the main treatment between prechlorination with  $\text{Cl}_2$  gas, and a slight final bleaching with  $\text{Ca}(\text{OCl})_2$ . The effects of these conditions on both the physical and chemical properties of the final pulps are discussed. H. A. H.

**Use of chlorine gas in industrial [cellulose] pulp manufacture.** U. POMILIO (Paper-Maker, 1938, 95, ts 68—80, 67).—The Pomilio process for manufacturing pulp from such fibres as straw, esparto, bamboo, and bagasse is both technically and industrially described. The chemical and physical qualities of these and other pulps are discussed, and production data for several of the existing Pomilio plants are given. H. A. H.

**Chlorine as a deodorant in sulphate paper pulp manufacture.** W. O. GORDON and E. E. CRETZ (Paper Trade J., 1938, 106, TAPPI Sect., 253—257).—Quant. experiments on the relief gases afforded by a miniature sulphate pulping plant indicate that the issuing mercaptans and org. sulphides can be fairly well deodorised by using 25 lb. of  $\text{Cl}_2$  (as hypochlorite) per ton of pulp. H. A. H.

**Digester blowdown condensing systems [for sulphate-pulp manufacture].** P. W. FOSTER, jun. (Pulp and Paper Mag. Canada, 1938, 39, 334—337).—A plant for recovering both heat and turpentine from the digester relief gases in sulphate-pulp manufacture is described. H. A. H.



**Preventing corrosion in the sulphate-pulp mill.**

J. A. LEE (Trans. Electrochem. Soc., 1938, 73, Preprint 31, 425—431).—Corrosion problems are discussed and instances cited. Metals which have been found to be most suitable for the different sections of the plant are given, among which 18:8 Cr-Ni steel is being tried for digester shells.

D. A. C.

**Alloy-steel materials of construction for pulp and paper mills.** J. H. FAUNCE, jun. (Paper Trade J., 1938, 106, TAPPI Sect., 237—239).—The increasing use of certain types of stainless steels, where corrosion is likely to occur in the mills, is briefly discussed.

H. A. H.

**Analysis of bisulphite [in sulphite-pulp] cooking liquors with calcium hypochlorite.** K. A. KOBE and B. A. BURKE (Pacific Pulp and Paper Ind., Mar., 1938, 12, 20—21; Pulp and Paper Mag. Canada, 1938, 39, 344—345).—Both  $\text{SO}_2$  and  $\text{NH}_3$  in  $\text{NH}_4\text{HSO}_3$  cooking liquor may be determined by the use of  $\text{Ca}(\text{OCl})_2$ . Details are given.

H. A. H.

**Dependence of the heat requirements of a multiple-stage evaporator on the initial and end concentration of the [paper-pulp] liquor.** J. KUUSINEN and S. HAGERLUND (Papier-Fabr., 1938, 36, 159—163).—A method of calculating the heat balance of multiple-stage pulp-cooking liquor evaporators is described and illustrated by application to a 4-stage evaporator. It is shown that the heat requirements of the plant are not  $\propto$  the quantity of  $\text{H}_2\text{O}$  evaporated alone, since they also depend on the  $\text{H}_2\text{O}$ -equiv. of the conc. liquor obtained.

D. A. C.

**Photographic study of the motion of fibres and water in flowing fibre suspensions [on paper machines].** L. A. MOSS and E. O. BRYANT (Paper Trade J., 1938, 106, TAPPI Sect., 226—237).—The motion of individual fibres in papermaking stock as it flows on to the paper-machine wire has been investigated under a wide variety of conditions by the method of spark photography. Multiple (usually triple) exposures showing successive fibre images separated by a time interval of 1/120 sec. enable satisfactory photographic results to be obtained even at a machine speed of 500 ft. per min., from which stream lines, vortex formation, and the linear and angular velocities of individual fibres can be inferred. The fibre orientation in free-flowing stock is shown to be random, but in all cases studied machine direction alignment begins immediately the fibres enter the zone of acceleration just behind and under the slice, although those fibres perpendicular to the line of flow are not so rapidly affected as are the others. Such fibre alignment during accelerated flow is independent of stock consistency over the range 0.001—0.25%, and of stock wetness between about 15° and 69° S.R. (69° S.R.?). The effect of size and alum could not be measured owing to pptn. on the equipment. In smooth flow the fibres move at the same speed as the stream, and even during acceleration there is little or no lag. Their velocity at the top of the stream issuing from a vertical slice is, however,  $\gg$  that at the bottom (cf. Lund, B., 1936, 830). Several other types of slices have been similarly studied.

H. A. H.

**Physical chemistry of clay as related to paper filling.** C. G. ALBERT (Trans. Electrochem. Soc., 1938, 73, Preprint 35, 473—482).—The physical chemistry of clay with its colloidal reactions is briefly reviewed and the particle-size distribution of a no. of different clays is given.

D. A. C.

**Investigation of a Sveen-Pedersen flotation saveall.** W. BRECHT and K. SCHEUFELN (Papier-Fabr., 1938, 36, 121—129, 136—140; cf. B., 1938, 147).—The backwater is aerated under pressure before it enters the saveall, when flotation of the solid matter is obtained by the release of the air. Flotation is assisted by addition of small quantities of specially ripened glue solution (containing resin size), the action of which is thought to be colloid-chemical in maintaining the air bubbles in a finely-divided state. An average recovery of 95% (99.3—90.6%) was obtained with unloaded papers; loading is more difficult to float and when making papers with 30% of loading the yield may be reduced by 6%. The efficiency of the saveall is not impaired by wide fluctuations in backwater flow and concn., but it is necessary, especially where loading is present, for the glue solution to be adequately ripened. Very high concns. of thick stock are obtainable (ratio of dil. to thick stock concns. 1:15—20), which are considerably  $>$  those yielded by the Adka-type saveall. A disadvantage of the Sveen-Pedersen saveall is its high consumption of power and chemicals.

D. A. C.

**Magno method of treating [paper] mill process water.** A. F. MEYER (Zellstoff u. Papier, 1938, 18, 201—202).—The method is used for eliminating  $\text{CO}_2$  and Fe and Mn salts from waters with temporary hardness  $> 15^\circ$ . The active agent is a dolomitic stone which is subjected to controlled calcination so that it contains only  $\text{CaCO}_3$  and  $\text{MgO}$ , and is crushed to act as a filter.  $\text{CO}_2$  is eliminated by absorption, but Fe and Mn are removed by pptn. and adsorption.

D. A. C.

**Deterioration of woollen dryer felts by means of acid.** F. W. HOLL (Papier-Fabr., 1938, 36, 153—155).—Two of the main causes of felt deterioration are high temp. and presence of acids, conditions which occur simultaneously in the paper-machine dryers. A method of measuring the acid content of the felt is described and consists of  $p_{\text{H}}$  determinations of the aq. extract (Soxhlet) of a const. quantity of sample. The sample is measured by its surface area and not wt., and the  $p_{\text{H}}$  of the felt is calc. from the  $p_{\text{H}}$  of the extract. A no. of felts investigated gave a min.  $p_{\text{H}}$  of 2.3, which alone in some cases is stated to produce rapid deterioration.

D. A. C.

**Deterioration of paper as indicated by gas-chamber tests.** T. D. JARRELL, J. M. HANKINS, and F. P. VEITCH (U.S. Dept. Agric., 1938, Tech. Bull. 605, 21 pp.).—Sheets of various grades of paper were tightly bound in slotted "lock post" binders and exposed to the gaseous products of S combustion for a max. of 330 days at 29—48% R.H. and 50°. Parallel exposures were made in S-free air. In presence of S gases there was marked deterioration at the edges of the sheets of all grades; "hard-finish" rag ledger and highly purified wood-fibre bond papers, containing 2.8% and 1.8% of glue, respectively, were least



affected. Deterioration, however, progressively decreased as the distance from the edges increased. Deterioration was most strikingly indicated by drop in folding endurance, but also by changes in  $p_H$ ,  $H_2O$ -sol. sulphates, Cu no., and  $\alpha$ -cellulose content of the paper. In S-free air, papers with  $p_H > 5.4$ , Cu no.  $< 0.8$ , and  $\alpha$ -cellulose  $> 90\%$  showed a max. deterioration of 8%. The results confirm that absorption of acidic S compounds is one of the most serious causes of deterioration of book and record papers, and it is suggested that neutralising agents should be incorporated in the paper to assist their permanence. D. A. C.

**Origin of damaging of paper.** G. REICHARDT (Papier-Fabr., 1938, 36, 157—158).—Factors liable to cause damage to paper and arising in the pulp and paper mill and during printing are reviewed.

D. A. C.

**Fastness to light of coloured papers.** H. A. HARRISON (Paper Trade J., 1938, 106, TAPPI Sect., 275—283).—A slightly abridged report of previous work (cf. B., 1936, 491, 980). It is now found that the previously described optical wedges made of paper are not sufficiently permanent in practice to withstand prolonged exposure without change in their transmission characteristics.

H. A. H.

**Two-sidedness in coloured papers.** B. CORNELLY (Zellstoff u. Papier, 1938, 18, 192—194).—This is ascribed to four causes, viz., to wire and felt marks etc., differences in fibre composition and filler distribution, varying affinity of dyes for different fibres, and finally the effects produced by contact of the paper with the hot drying-cylinder surfaces. Remedies are suggested based mainly on the use of dyestuff combinations, the individual constituents of which will neutralise each other under the conditions leading to two-sidedness.

D. A. C.

**Oil-penetration rate of paper.** G. A. ALBERT (Paper Trade J., 1938, 106, 14 Apr., 30—32).—The Williams and the Westinghouse penetrometers for measuring the rate of oil penetration through papers used for laminated synthetic resin boards are described. It is shown that the different experimental results which these two instruments give are due solely to the different areas under test, and that when the area of paper is the same identical results are obtained.

H. A. H.

**Cobb test for greaseproof paper.** R. M. COBB (Paper Trade J., 1938, 106, 14 Apr., 28—29).—It is suggested that the Cobb sizing test, designed originally for estimating  $H_2O$  absorption, should be employed for evaluating greaseproof papers by measuring their turpentine absorption. Experimental details and some preliminary results are given (cf. B., 1934, 397; 1937, 894).

H. A. H.

**Determination of mechanical wood pulp in paper.** S. V. SERGEANT (Analyst, 1938, 63, 264—266).—Aiyar and Krishnan's criticism (B., 1937, 1322) of the Halse method is misleading, since they fail to take into account the known limits of application of the method, and the correction from "ash" to "filler" is omitted. Recalculation of their data shows the Halse method in a more favourable light. E. C. S.

**Structure of wool. Dyeing viscose, and paper.**—See VI. Extraction of wood.—See IX.

See also A., I, 311, Structure of cellulose. II, 237—8, Lignin and related substances. 238, Isolation of guaiacol from waste sulphite liquor.

#### PATENTS.

**Manufacture of artificial fibres, films, and the like.** W. W. GROVES. From ACETA GES.M.B.H. (B.P. 484,661, 4.11.36).—The process of B.P. 455,849 (B., 1937, 28) may be applied to organophilic, highly polymeric substances, in particular cellulose derivatives, wherein the mass to be shaped contains an ester of a polymeric carbohydrate or carbohydrate derivative with an org. sulphonic acid or sulphamic acid, the ester being sol. or converted into a plastic mass in org. solvents. Substances, such as polyvinyl esters, which are converted by mild hydrolysing agents into products possessing a greater capacity for swelling in  $H_2O$  than the main component may be added, as well as highly polymeric substances having acid or latent acid groups. Amination is carried out in the same manner as in the prior specification.

R. G.

**Production of fibrous cellulose from fibre-bearing plant stalks.** G. A. LOWRY and J. A. GRANT (B.P. 484,089, 28.10.36).—Scutched but unretted flax undergoes a preliminary hot- $H_2O$  digestion; the  $H_2O$  is removed and the material then digested in absence of air, oxidising agents, acidic and soapy reagents, with 6—10% aq. NaOH at 150—180° for 3 hr. The material, which now comprises 25—30% of the original, is washed several times, at least one wash containing a reagent of a non-acid character which will remove Fe. The resultant fibre finally receives a mild  $Cl_2$  bleach.

D. A. C.

**Production of pulp from highly resinous woods.** R. NIETHAMMER (KÜBLER & NIETHAMMER, CHEM. FABR. COSWIG-ANHALT G.M.B.H.) and K. SCHWABE (B.P. 483,964, 20.9.37).—In producing groundwood from pine,  $H_2O$ -sol. Ba salts are added to the pulp during or after grinding. The quantities added are 0.1—1 kg./cu. m. of wood. The  $p_H$  of the slush pulp, however, should be maintained at  $> 7$ . It is claimed that pitch troubles on the paper machine are thus prevented.

D. A. C.

**Manufacture of [glass-filled] paper.** N. V. MAATS. TOT BEHEER EN EXPLOIT. VAN OCTROOIEN (B.P. 483,769, 12.2.37. Ger., 13.2.36).—Glass fibres are incorporated in the paper while it is in the process of forming on the Fourdrinier wire. The glass fibres are made *in situ* by extrusion in the molten state through fine jets, the fibres being forced on to the paper by a blast of air or steam.

D. A. C.

**Manufacture of sheets of absorbent paper or paper boards.** W. P. WILLIAMS. From Soc. ANON. F. DOBLER (B.P. 483,766, 26.1.37).—Paper (or board) which has been sized with resin or pectic substances is passed through a bath of warm aq. NaOH or  $Na_2CO_3$  (e.g., of 2% concn.), pressed, and dried. Paper so treated becomes very absorbent.

D. A. C.



**Manufacture of material for impregnating and coating purposes.** W. GEBHARDT (B.P. 482,833, 5.10.36. Ger., 31.10.35).—>10% (on wt. of dry rubber) of rubber latex is stirred into molten paraffin wax, coal-tar pitch, etc. at 60–90° (80–90°). The mixture is then heated to 200–250°, with stirring, until all the H<sub>2</sub>O is driven off. The mixture becomes homogeneous, and may be used as an alkali-resisting coating agent for paper or paper articles etc.

D. A. C.

**Paper backing.** MINNESOTA MINING & MANUFACTURING Co., Assees. of R. G. DREW (B.P. 482,815, 27.6.36. U.S., 29.6.35. Cf. B.P. 482,575; B., 1938, 822).—Porous and absorbent paper is impregnated with aq. glue solution (e.g., 17% concn.) containing glycerin, and dried under such conditions of temp. and R.H. that the paper retains some of its porosity. One side of the paper is then treated with a more conc. (30%) glue solution which, after drying, is hardened with CH<sub>2</sub>O.

D. A. C.

**Rendering adhesive surfaces insensitive to accidental moistening.** D. W. GLOVER and E. A. TAYLOR (B.P. 483,861, 10.12.36).—A very thin (e.g., 10<sup>-6</sup> in.) film of cellulose nitrate or acetate is deposited from a solvent on the surface carrying the H<sub>2</sub>O-sol. adhesive. The gummed surface is thereby prevented from adhering to neighbouring surfaces with which it is in contact on storage in a moist atm. The cellulose protective layer is removed by such friction as is ordinarily used in wetting gummed surfaces.

D. A. C.

**[Machines for] cleaning and opening cotton or like fibrous material.** BRIT. COTTON IND. RES. ASSOC., T. C. WILLIAMS, and S. A. SHORTER (B.P. 483,653, 22.10.36).

**[Apparatus for] production of staple fibres.** O. MIYAKI (B.P. 483,486, 19.10.36. Jap., 29.10.35).

**Apparatus for treating fibrous materials with liquid [oil].** N. W. SCOULAR and R. W. BLACKWOOD (B.P. 484,820 and 484,897, 26.11.36).

**Keeping pipes clean in paper-making machines or the like.** V. J. B. APPARTEBAU-GES. M.B.H. (B.P. 481,705, 21.5.37. Ger., 9.6., 13.7., and 7.8.36).

**Filter fabric. Consistency control of paper-pulp suspension.**—See I. Rot-proofing paper etc.—See VI.

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

**Bleaching of cellulose.** T. ELM's (Rev. Gén. Mat. Plast., 1938, 14, 37–41).—A review, with particular reference to the hypochlorite process.

F. McK.

**Importance of the method [used] in textile bleaching, dyeing, printing, and finishing industries.** J. MUIR (Compt. rend. XVII Cong. Chim. Ind., 1937, 252–259).—The importance of rational organisation in the dyeing and allied industries is emphasised.

R. J. W. R.

**Problems in processing [scouring, dyeing, and finishing] of textile mixture materials.** K. JOCHUM (Textilber., 1938, 19, 433–435).—Problems arising mainly from the presence of Vistra (I.G.;

viscose-rayon staple fibre) in mixture materials are discussed and the adverse effect of alkali treatment on the rayon is emphasised. Results are given to show that the tensile strength of Vistra yarn and fabric is decreased by washing at 45° for ½ hr. with 0.2% aq. soap, but is increased by similar washing with Igepon-T or Igepal-W. Tylose-TWA is suitable for sizing Vistra materials.

A. J. H.

**Use of ammonium salts in the dyeing of wool and union goods.** ANON. (Textilber., 1938, 19, 436–437).—The function of NH<sub>4</sub>OAc (I), HCO<sub>2</sub>NH<sub>4</sub> (II), and (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> when used as additions to wool dyebaths containing acid or metachrome dyes and as substitutes for the more powerful corresponding free acids is complicated by their buffer action so that in most cases it is necessary to add a small amount of the free acid to secure satisfactory exhaustion of the dye. E.g., addition of 6–8% of (I) requires 2–3% of AcOH. The acid val. of (III) is < that of (I) and (II), owing to its smaller dissociation, so that it is unable to effect the complete exhaustion of Acid Alizarine Red B. In dyeing union goods, preferential absorption of the dye by the cellulose fibre (cotton or rayon) is prevented by addition of (I), (II), or (III), but in such cases Vegan Salt A (B., 1938, 363) is also recommended. The presence of NH<sub>4</sub>CNS in the dyebath prevents shade changes similar to those produced by Cu impurities.

A. J. H.

**Dyeing of wool with acid dyes.** R. O. HALL (J. Soc. Dyers and Col., 1938, 54, 172–173).—Since the main function of both heat and acid, during the dyeing of wool with acid dyes, is to decompose NH<sub>4</sub> salt linkings and effect separation of the polypeptide chains, the possibility of dyeing wool in presence of cold aq. HCO<sub>2</sub>H (I) and AcOH (which have a similar effect on micellar subdivision) is suggested and demonstrated. A H<sub>2</sub>O-sol. dye of low mol. wt. (Kiton Red S) is readily absorbed from 5% cold aq. (I). With dyes of lower solubility and higher mol. wt., a correspondingly higher concn. of (I) is required, concns. of 40% and 60%, respectively, being necessary in dyeing with Cloth Fast Red GR and Diamine Sky Blue FF. AcOH is slightly less effective than (I). Conc. solutions of (I) should facilitate the adsorption of large quantities of dye since they produce extreme micellar subdivision.

R. J. W. R.

**Uneven dyeing of wool with acid and chrome dyes. I. Reasons for uneven dyeing properties of wool staples and cloth damaged by exposure.** E. RACE, F. M. ROWE, J. B. SPEAKMAN, and T. VICKERSTAFF. **II. Method of correcting uneven dyeing properties of wool staples and cloth damaged by exposure.** E. RACE, F. M. ROWE, and J. B. SPEAKMAN (J. Soc. Dyers and Col., 1938, 54, 141–158, 159–171).—I. Wool fibres which have been exposed to light and air (e.g., natural "tip" wool and irradiated fabric) show an increased swelling capacity in acid or alkaline solutions, due to hydrolysis of the -S-S- linking between the peptide chains, with the formation of S-OH and SH groups. The former then undergo decomp., losing S and giving rise to CHO groups; exposed wool contains both CO groups and less S than ordinary wool. Owing to increase in swelling capacity, exposed fibres are more accessible



to, and dye deeper with, colloidal dyes. Crystalline dyes, although dyeing level at first, ultimately give lighter shades in the damaged portions owing to ease of removal. Damaged portions are also deficient in surface scales, and are consequently more readily wetted out, thus accentuating unlevel dyeing. The most practicable method of obtaining level dyeings on damaged fibres with both crystalloidal and colloidal dyes is by modifying the degree of dispersion in the dyebath (by addition of  $\text{H}_2\text{SO}_4$  or use of auxiliary products); increase or decrease of fibre swelling during dyeing to mask the minor swelling differences in exposed and unexposed portions is less satisfactory. However, level dyeings obtained on damaged fibres show a tendency to become unlevel on after-chroming, and the exposed portions frequently develop a different hue. This may be due to the deposition of more Cr on exposed than on unexposed fibre. Only in the case of an AcOH-chroming bath, using thoroughly wetted-out wool, is the amount of Cr deposition identical on exposed and unexposed wool. The Cr, however, is in a more completely reduced form in the exposed portions (due to presence of SH and CHO groups). Therefore, to obtain level dyeings on after-chroming, this potential reducing action must be eliminated, if possible by the formation of new cross-linkings.

II. The development of different hues on exposed and unexposed wool fibres on after-chroming level acid dyeings is only partly overcome by use of oxidising agents (I, NaOCl, Chloramine-T, Dichloramine-T). Treatment of damaged wool with  $\text{CN}\cdot\text{NH}_2$  [which reacts with the SH groups present, giving rise to  $\cdot\text{S}\cdot\text{C}(\text{NH}_2)\cdot\text{NH}$  groupings] leads to the production of uniform after-chromed dyeings, the Cr being deposited in the fibres in a less reduced form than that usually deposited in untreated exposed wool. However, an aggregating or dispersing agent must also be present in the dyebath to ensure level dyeing. Better results are obtained by treating exposed wool with metal salts which afford cross-linking between peptide chains containing cysteine groups (cf. B., 1937, 24). Use of Cr acetate leads to the production of uniform, level dyeings, preventing the formation of excessively reduced Cr in the damaged portions of the fibre on chroming, combining with SH groups, and forming cross-linkings (indicated by diminished swelling and supercontraction capacities). Since swelling is diminished there is less need for the use of aggregating or dispersing agents in the dyebath to obtain level dyeing. Optimum conditions for obtaining level acid and after-chromed dyeings on exposed wool are to treat the well-washed material with 3% basic Cr acetate solution (19.8% Cr, 1 Cr/1.65 mol. AcOH, and aq. solution containing an equiv. of 8% of  $\text{Cr}_2\text{O}_3$  and having  $p_{\text{H}}$  3.8) and 4% AcOH at 40° for  $\frac{1}{2}$  hr. (liquor/wool ratio, 50 : 1).

R. J. W. R.

**One-bath diazotisation process [for wool-union dyeing].** W. HAHN (Textilber., 1938, 19, 437—438).—A simplified method is described for producing fast black shades on wool-Zellwolle (viscose-rayon staple fibre) mixture materials containing 30—50% of the rayon. It is made possible by the discovery that certain acid dyes, including Diamond

Black PBB, PV, PG extra, and Chromogen Black ETOO, and the (I.G.) shading dyes Anthracene Yellow BN, Chrome Orange GR, Acid Anthracene Brown KE, and Acid Alizarine Red G, may be applied (and good exhaustion obtained) together with the direct cotton dye Oxydiaminogen Black OT in a bath at 92—95° and initially slightly acid (this assists maintenance of the wool quality) so that the final shade may be developed by diazotising and coupling on the fibre with Developer H (I.G.) followed by after-chroming. A. J. H.

**Fine structure of wool [as revealed by dyeing].** K. OHARA (Textilber., 1938, 19, 407—408).—Microscopical examination of dyeings of 3 varieties of merino wool with specified basic and acid dyes made in solutions buffered to  $p_{\text{H}}$  7.0 shows that with basic dyes the convex side of bent wool fibres is dyed deeper than the concave side, even in those cases where concave and convex bending occurs in different parts of the same fibre. This differential dyeing is also obtained by dyeing cross-sections (6  $\mu$ . thick). Among the basic dyes, this effect is shown readily by the difficultly diffusible dyes Janus Green, Pyronine, Neutral Violet, and Methylene Blue, but only slightly by Safranin. "Bulky" and "Shafty" merino wools show the effect > the "Hungry" variety. Acid dyes, including those difficultly diffusible (Methyl Blue, Acid Magenta, and Light Green FS) and easily diffusible (Eosin and picric acid), do not show this differential dyeing, but Orange G dyes the concave side of the fibre more deeply. It is concluded that the convex side of a bent wool fibre has a higher negative electric charge than the concave side and that this accounts for the higher absorption of basic dye. The non-differential dyeing obtained with acid dyes is attributed to the preponderating influence of their large particle size and small  $\text{H}_2\text{O}$ -solubility and diffusibility. The dyeing of silk fibres is also influenced by their fine structure (cf. Ohara; A., 1933, 849). A. J. H.

**Dyeing and finishing of lace curtains.** ANON. (Text. Rec., 1938, 56, No. 662, 41—43).—Methods for producing white and coloured (tinted and vat-dyed) curtains are described. A. J. H.

**Dyeing textile fibres, particularly hemp ropes.** L. IVANOVSKY (Farben-Chem., 1938, 9, 149—152).—Light-fast and  $\text{H}_2\text{O}$ -resistant products are obtainable with substantive dyes; methods are described.

S. M.

**Colouring of cellulose foil with substantive dyes.** D. KRÜGER (Zellstoff u. Papier, 1938, 18, 241—244).—The effect of such dyes on the light-absorption of the foil compared with that of corresponding solutions of the dyes is studied, using viscose (Heliocell) and cuprammonium (Cuprophane) cellulose. In each case the foil was first freed from electrolytes and plasticisers by washing with  $\text{H}_2\text{O}$  or various dil. aq. acids. Max. light-absorption of the dyed foil was always at a longer  $\lambda$  than that of the dye solution, the difference being as much as 30 m $\mu$ . The light-absorption of the foil was not affected by variations in the method of purifying nor by traces of S acids, but it depends on the temp. and [NaCl] of the dyebath.



Heliocell and Cuprophane behaved similarly towards the majority of the substantive dyes examined; Heliocell, however, owing to its larger content of  $\text{CO}_2\text{H}$  groups, adsorbs basic dyes more rapidly than does Cuprophane, resulting in characteristic differences in shade. This provides a means for differentiating the two foils. D. A. C.

**Spectrographic investigations of substantive dyeings of cellulose sheets (Heliocell and Cuprophane).** D. KRÜGER and H. RUDOW (Ber., 1938, 71, [B], 709—712).—Comparison of the absorption spectra of a no. of dyes in aq. solution and applied to cellulose sheets shows that in the latter the absorption max. is invariably displaced towards longer  $\lambda$ . The degree of displacement varies with the different dyes, but pretreatment of the sheet with  $\text{H}_2\text{O}$  or dil.  $\text{HCl}$  is without influence except in the case of Diamine-blue AZ. In addition, an inflexion of the graph is usually observed to the right of the main max. In all cases the position of the chief max. and of the inflexion appear identical for Heliocell and Cuprophane. Except with Columbia-blue G the character of the absorption curve appears to be independent of  $[\text{NaCl}]$  in the dyebath. A fall of the dyeing temp. from  $80^\circ$  to  $20^\circ$  causes the inflexion to be less marked or to disappear completely. The position of the absorption max. remains unchanged unless the complete nature of the graph is modified. H. W.

**Properties of cellulose acetate rayon fibres of interest to dyers and finishers.** H. SMITH (Amer. Dyestuff Rep., 1938, 27, 213—217p).—The chemistry of cellulose acetate is discussed and the hygroscopic, thermoplastic, and saponification properties of this rayon are described and compared with those of other rayons, cotton, and wool. Moisture-regain curves for scoured viscose-rayon, mercerised cotton, scoured cotton, and acetate rayon show these fibres to have regains decreasing in the order named except that the regain of viscose rayon exceeds that of scoured wool when the R.H. is  $> 85\%$ . Complete drying of textile fibres adversely affects them, especially as regards softness of handle, and it is recommended not to dry to  $< 5\%$  (wool, viscose rayon) or  $< 2.5\%$  (cotton, silk, cellulose acetate rayon) of moisture, and regain curves are given showing the R.H. of the surrounding air which must be maintained during drying at  $21$ — $88^\circ$  to preserve these min. regains. Wet regenerated cellulose rayons show a linear rate of extension during stretching with rising temp., whereas the linear extension of cellulose acetate rayon changes into a flow at  $66^\circ$  which increases rapidly with rise in temp., and this must receive attention in the wet-processing of this rayon. A. J. H.

**Dyeing of viscose with indanthrene dyes during spinning.** D. C. KANTER, S. F. KULEVNIK, and M. N. ANANINA (Prom. Org. Chim., 1938, 5, 264—269).—The strength and uniformity of coloration of fibres spun from highly disperse suspensions of indanthrene dyes in viscose compare favourably with those obtained by dyeing ready-spun fibres. R. T.

**Use of standard dyeings in tests for colour fastness to light.** W. D. APPEL (Amer. Dyestuff Rep., 1938, 27, 15—16p).—Necessary precautions in

using the dyeings and in interpreting the results are discussed. A. J. H.

**Formation of alizarin [Turkey] red.** H. E. FIERZ-DAVID (Helv. Chim. Acta, 1938, 21, 432; cf. B., 1938, 637).—Alizarin-red, produced when the mixed Al and Ca alizarin salts (formed on the fibre owing to the presence of excess of  $\text{Ca}^{++}$  and  $\text{Al}^{+++}$  from the soaps) are steamed, is largely or wholly an Al complex since this is the most stable compound, is insol., symmetrical, and of low energy content. The fatty acids act only as assistants. R. S. C.

**[Preparation of] vat printing pastes.** L. F. GLEYSTEEN (Amer. Dyestuff Rep., 1938, 27, 14—15p).—Contrary to Glarum's conclusions (B., 1937, 1326) concerning the prep. of printing pastes having a British gum-starch ratio of 1 : 1, max. economy in the use of such thickeners in pastes having a similar ratio of 1 : 1 is obtained by a short cooking at the optimum temp. of  $80^\circ$ . A. J. H.

**Test for mercerisation in presence of dyes.** S. M. EDELSTEIN (Amer. Dyestuff Rep., 1936, 25, 186—190p).—The simplified Neale method described for determining Ba activity of mercerised cotton (B., 1931, 920) is found to be satisfactory for determining the degree of mercerisation of cottons dyed with vat, S, direct, insol. azoic, and basic (on Sb tannate mordant) dyes. The method consists in scouring together the unknown sample and a standard "grey" cotton yarn with soap- $\text{Na}_2\text{CO}_3$ , washing, drying, conditioning, and then steeping separately 1 g. of each in 30 c.c. of 0.25N- $\text{Ba}(\text{OH})_2$  at room temp. for 2 hr., followed by determination of the non-absorbed  $\text{Ba}(\text{OH})_2$  by titration with 0.1N- $\text{HCl}$  (phenolphthalein). A. J. H.

**Effect of aniline-black on barium activity determinations [on dyed cotton fabric].** S. M. EDELSTEIN (Amer. Dyestuff Rep., 1937, 26, 460p).—It is recommended that  $\text{NH}_2\text{Ph}$ -black-dyed fabric be boiled for 1 hr. in 1% aq.  $\text{NaOH}$  (additional to the boil with soap- $\text{Na}_2\text{CO}_3$ ; cf. preceding abstract) before determination of its Ba absorption, otherwise this absorption may be 20% too high. A. J. H.

**Countercurrent mercerisation of cellulose.** C. G. MAIZEL and I. D. BLIDNI (Prom. Org. Chim., 1938, 5, 275—277).—A final concn. of 1.5—2% of hemicellulose in aq.  $\text{NaOH}$  can be attained by countercurrent washing of cellulose. R. T.

**Making of wool unshrinkable.** ANON. (Amer. Dyestuff Rep., 1937, 26, 239—241).—The Dri-sol process, using  $\text{SO}_2\text{Cl}_2$  (cf. B.P. 464,503; B., 1937, 1041), is described with special reference to the influence of the initial  $\text{H}_2\text{O}$  content of the wool being treated and the effect of the process on cotton dyed with direct dyes. A humidity-shrinkage curve has an abrupt bend, indicating that the action of the  $\text{SO}_2\text{Cl}_2$  increases rapidly for wool the initial  $\text{H}_2\text{O}$  content of which is increased by contact with air of 49% instead of 33% R.H. Diphenyl-Red 7BL, Sky Blue FF, Diphenyl-Yellow C4GL, Direct-Scarlet 4BS, Chlorazol-Orange RS, and Formic-Black C are direct cotton dyes which are unchanged by the Dri-sol treatment, but are destroyed by the usual chlorination process for rendering wool unshrinkable. A. J. H.



**Evaluation of crease-resistant finishes for fabrics.** H. F. SCHIEFER (J. Res. Nat. Bur. Stand., 1938, 20, 241—252).—The creasing angle, flexometer, and modified compressometer methods for the measurement of commercial crease-resistant finishes are described. Data are given on the results of tests by these methods on paper, Cellophane, cotton, rayon, worsted, and rubber. The "resilience," i.e., the ratio of the energy of recovery to the energy required to deform the specimens, is related to crease-resistance and may be measured by the methods given. T. W. P.

**Use of plastics in the German textile industry.** W. BEHA (Kunstharze, Plast. Massen, 1938, 8, 106, 108).—The use of vulcanised fibre and phenolic resins in place of metals, for the construction of machine parts, containers, etc., is suggested. F. McK.

**Impregnation of textiles with [rubber] latex.** J. DUARRY (Compt. rend. XVII Cong. Chim. Ind., 1937, 578—584).—A process is described for the complete impregnation of textiles with 15—50% of rubber by applying latex, stabilised with  $\text{Na}_2\text{SiO}_3$  and the latex of the cactus *Figa india*, under high pressure (300—400 kg./sq. cm.) and raised temp. The wearing qualities of the products are improved thereby. D. F. T.

**Properties of driving and conveyor belts obtained by weaving textiles deeply impregnated with [rubber] latex.** J. C. BONGRAND (Compt. rend. XVII Cong. Chim. Ind., 1937, 1115—1121).—A favorable account is given of the production of belting by weaving and vulcanising "Filastic" thread which is obtained by the application of latex to textile threads under special conditions (cf. preceding abstract). D. F. T.

**Fundamental properties of textile[processing] waste [liquors].** I. Foreword. F. K. CAMERON (Text. Res., 1938, 8, 189—191). II. **Electrophoresis.** J. E. MAGOFFIN (*ibid.*, 191—194).—The physical and chemical principles underlying the purification of effluents from textile works are discussed. A. J. H.

**Fatty alcohols.**—See III. **Bleaching pulp.**—See V.

#### PATENTS.

**Manufacture of pulverulent synthetic textile assisting agents.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 482,367, 8.7.36 and 22.1.37).—Difficultly volatile non-pulverisable synthetic textile assistants containing at least one aliphatic group of  $\text{C}_2$  and one hydrophilic group are brought into powder form by spraying on to fine powders which are intensively stirred. Alternatively a substance readily converted into powder is atomised simultaneously with the textile assistant, at least one of the substances being dispersed in a volatile medium. Among examples, octylphenol polyglycol ether having 8 glycol residues is sprayed at room temp. on NaCl which has been spray-dried at 200° from a 25% aq. solution; a voluminous, flowing powder is obtained. K. H. S.

**Rot-proofing of textiles, paper, and other fibrous materials.** NAT. PROCESSES, LTD., and

W. J. CARTER (B.P. 484,576, 5.11.36).—The fibrous materials are rot-proofed and sized by simultaneous treatment with a  $\text{H}_2\text{O}$ -insol. rot-proofing agent (I) consisting of a metallic (Al, Zn) salt or an ester of naphthenic acid, or mixture of such salts and/or esters, dispersed in an aq. vehicle which will not coagulate the sizing liquid, and a sizing composition (II), preferably using a composite liquid consisting of a stable aq. dispersion of (I) and (II) (e.g., a rosin-wax size). If desired, the materials may be rot-proofed with a stable aq. dispersion of (I) prior to the sizing operation. R. G.

**Water-separating device [for dry-cleaning solvents].** R. A. HETZER, Assr. to AMER. LAUNDRY MACHINERY Co. (U.S.P. 2,072,206, 2.3.37. Appl., 3.5.35).— $\text{H}_2\text{O}$  is separated from the solvents by settlement; decantation (of the lower liquid) is controlled by means of a pair of electrodes at the interface of the conducting ( $\text{H}_2\text{O}$ ) and non-conducting liquids. B. M. V.

**Apparatus for treating [cakes of] threads with liquids.** COURTAULDS, LTD., and E. A. MORTON (B.P. 483,856, 25.11.36).

**Alcohols of high mol. wt. Polysulphonamido-compounds.**—See III. **Leuco-compounds.**—See IV.

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

**Sulphuric acid manufacture. Recent progress in the Petersen tower process.** K. WARMING (Compt. rend. XVII Cong. Chim. Ind., 1937, 1198—2008).—The development of the tower process is discussed, the plant at Kalundborg, constructed in 1930, and its operation are described, and construction, maintenance, and operational costs are given. In the Riga plant (1937) larger towers and acid circulation, and the substitution of quartzite packing (surface area 150—160 sq. m. per cu. m.) for flint (40—60) have resulted in a production of 100 kg. of 78%  $\text{H}_2\text{SO}_4$  per cu. m. per 24 hr. compared with 46.4 kg. for Kalundborg (in 1936—7). I. C. R.

**Reactions in the lead chambers [in sulphuric acid manufacture].** F. SALSAS SERRA (Compt. rend. XVII Cong. Chim. Ind., 1937, 374—396).—From a detailed survey of the literature it is concluded that the main reactions occurring in the gaseous phase are  $2\text{NO} + \text{O}_2 = \text{N}_2\text{O}_4$  (or  $2\text{NO}_2$ ) and  $\text{SO}_2 + \text{NO}_2 + \text{H}_2\text{O} = \text{SO}_5\text{NH}_2$  (I)  $= \text{H}_2\text{SO}_4 + \text{NO}$ . Only a small amount of  $\text{N}_2\text{O}_3$  is formed in equilibrium with  $\text{NO} + \text{NO}_2$  and the formation of (I) from  $\text{SO}_2 + \text{N}_2\text{O}_3 + \text{H}_2\text{O}$  is therefore small.  $\text{SO}_5\text{NH}$  (II) is produced only when there is a shortage of  $\text{H}_2\text{O}$ . In the liquid phase  $\text{SO}_2 + \text{HNO}_2 =$  (I)  $+ \text{NO} = \text{H}_2\text{SO}_4 + 2\text{NO}$  is the main reaction, but with a large excess of  $\text{HNO}_2$  (I) is oxidised to (II). The effect of  $[\text{H}_2\text{SO}_4]$  and of the presence of Fe is discussed. I. C. R.

**Simple method for separating sulphur dioxide and trioxide in roaster gases and nitrogen trioxide-containing stack gases of sulphuric acid plants.** H. LOHFERT (Angew. Chem., 1938, 51, 228—231).—Comparative tests show that the Kraus method for determining  $\text{H}_2\text{SO}_4$  mist (cf. B., 1935,



492) gives high vals. due to  $\text{SO}_2$  oxidation in the apparatus. A method is described in which the gases are passed through a series of Schott gas filters (7G 1, 2, 3, 4; pore size 90—150, 40—90, 15—40, 5—15  $\mu$ , respectively) which remove  $\text{SO}_3$  mist, and then through two absorption flasks containing  $\text{N-NaOH}$ , for  $\text{SO}_2$  absorption. Oxidation of  $\text{SO}_2$  is small, even in presence of  $\text{N}_2\text{O}_3$ , and the method may therefore be used for stack as well as roaster gases. 10 l. of roaster gas at 5 l./hr., and 100 l. of stack gas at 10—20 l./hr., are used in the tests. I. C. R.

**Study of certain platinum alloys [for ammonia oxidation].** I. E. ANADUROV (J. Chem. Ind. Russ., 1937, 14, 917—924).—The activity and stability of 97 : 3 Pt-Co catalyst of  $\text{NH}_3$  oxidation are < those of Pt. 97 : 3 Pt-W is twice as active as, but not more stable than, Pt. 92 : 5 : 3 Pt-Rh-W has a high activity, and is extremely resistant to corrosion. Pt-Ag-W is considerably more active than Pt, and is slightly more stable. R. T.

**Lime.** R. BARTA (Compt. rend. XVII Cong. Chim. Ind., 1937, 535—542).—Factors governing the texture, colour, and the slaking of  $\text{CaO}$ , and the properties of mortar are reviewed. The  $\text{CO}_2$  may be used for prep. of pptd.  $\text{CaCO}_3$ . G. H. C.

**Hydrated lime.** ANON. (Chem.-Ztg., 1938, 62, 296—297).—The processes of crushing and hydration of burnt  $\text{CaO}$ , the centrifugal separation of the resulting powder, together with the advantages of using hydrated  $\text{CaO}$  in cement and leather manufacture,  $\text{H}_2\text{O}$  purification, and hardening of resin are described. D. P.

**Rapid determination of magnesium oxide in limestones.** A. V. VINOGRADOV (Zavod. Lab., 1938, 7, 179—181).—2—20 g. of limestone are dissolved in  $\text{HNO}_3$  and the solution is filtered. The filtrate is evaporated to dryness and the residue dissolved in  $\text{H}_2\text{O}$ . The solution is filtered, and Mg, Fe, and part of the Ca are pptd. as hydroxides. The ppt. is dissolved in  $\text{HCl}$  and  $\text{NaOH}$  added until the solution is only slightly acid.  $\text{CaCO}_3$  is then added, the solution diluted to 100 ml. and filtered, and 50 ml. of filtrate are boiled to expel  $\text{CO}_2$ . Excess ( $a$  ml.) of 0.1N- $\text{Ba}(\text{OH})_2$  is added, followed by  $\text{H}_2\text{O}$  to 250 ml. 50 ml. of the filtered solution are added to  $x$  ml. of 0.1N- $\text{HCl}$ , excess ( $y$  ml.) of which is titrated.  $\text{MgO}$  % is given by  $0.4032\{a - 5(x - y)\}/w$ , where  $w$  is the wt. of limestone taken. R. T.

**Softening in brine purification.** G. HABERMANN (Osterr. Chem.-Ztg., 1938, 41, 157—161).—The hardness of brine used in the manufacture of alkalis and  $\text{Cl}_2$  is caused by Ca and Mg salts. Evaporation of crude brine leaves an insol. crust of gypsum. The brine must be softened by pptn. of Ca with  $\text{Na}_2\text{CO}_3$  and subsequent decantation or filtration. Mg causes hardness only in alkaline solutions and hence excess of  $\text{Na}_2\text{CO}_3$  must be avoided. Methods for determining and calculating the degree of hardness are given. K. W. P.

**Decomposition of sodium sulphate solutions at elevated temperatures.** W. O. TAFF, H. F. JOHNSTONE, and F. G. STRAUB (Trans. Amer. Soc. Mech. Eng., 1938, 60, 261—265).—Aq.  $\text{Na}_2\text{SO}_3$  was

heated in a bomb at 277—305° for 36 hr. in absence of  $\text{O}_2$ , samples being removed at intervals and analysed. The data obtained show that decomp. into sulphide, sulphate, and thiosulphate occurs at >277°, the main reaction being  $4\text{Na}_2\text{SO}_3 \rightarrow \text{Na}_2\text{S} + 3\text{Na}_2\text{SO}_4$ . Variation of the  $p_{\text{H}}$  of the solution from 9.5 to 11 (by addition of  $\text{NaOH}$ ) has no effect on the rate of reaction or the proportions of the decomp. products formed. A first-order reaction takes place. The heat of activation of the Arrhenius equation is 32,300 g.-cal./g.-mol. R. B. C.

**Losses of potassium chloride in flue gases from rotary dryers.** V. M. TICHOMIROV (Kalii, 1937, No. 10, 14—18).—Investigations carried out at the First Potash Combine factory, U.S.S.R., show that losses of  $\text{KCl}$  after the cyclone installation following the dryer amount to 0.6%. Tables showing quantities and analyses of the dust collected are given. D. G.

**Rapid determination of moisture in carnallites by the carbide method.** V. M. TICHOMIROV (Kalii, 1938, No. 1, 26—29).— $\text{CaC}_2$ , previously dried at 150°, is added to the mineral and the  $\text{C}_2\text{H}_2$  evolved is measured volumetrically. Using the standard desiccation method for comparison, the error is about 0.1—0.2%. The apparatus is described. D. G.

**Staining method for differentiation between felspar and quartz.** A. L. ENGEL (U.S. Bur. Mines, 1937, Rept. Invest. 3370, 69—70).—The ground sample, free from slime, is digested for 5 min. with warm 1 : 1  $\text{HCl}$ , washed free from acid, dried, and covered with a 2% solution of Safranin-O in 3 : 7  $\text{EtOH-H}_2\text{O}$ . After keeping for 15 min. in a warm place the material is washed, dried, and hand-sorted, the felspar alone being stained yellow. The process is adapted to the examination of screening products. A. R. P.

**"Pick" process for treating coarse-grained mineral mixtures.** E. BIERBRAUER (Metall u. Erz, 1937, 34, 599—610).—The process, which is adapted to the separation of coarse-grained mixtures of non-metallic minerals, e.g., phosphorite (I) or calcite (II) from quartz, depends on the fact that if the mixture is treated with an emulsion of petroleum (10 g.) in aq. Na oleate or palmitate (5 g./l.), washed with  $\text{H}_2\text{O}$ , and passed over a flat or curved surface coated with semi-solid mineral bitumen the particles of the mineral which have been rendered hydrophobic by the soap treatment [(I) or (II)] adhere to the bitumen, whereas the quartz is readily washed off. A roll-type separator for carrying out the process is described and some results obtained on various mineral mixtures (grain size 5—30 mm.) are tabulated. A. R. P.

**Relation between contact angle and floatability of oxidised minerals.** P. SIEDLER and E. WAGNER (Metall u. Erz, 1938, 35, 110—118).—The angle of contact of an air bubble on fluor spar (I) or calc spar (II) increases hyperbolically to a max. of 102° with increase in the Na oleate concn. and with prolongation of the time of contact. The presence of an oleate film on (I) reduces its solubility in  $\text{H}_2\text{O}$  appreciably, but only slightly retards the rate of dissolution of (II). Rise in temp. accelerates ad-



sorption of the oleate film on both minerals, whilst on addition of  $C_8H_{17}OH$  to the solution the contact angle diminishes almost linearly with alcohol concn. Flotation tests show that the floatability is improved by working under conditions which tend to give the max. contact angle. Since quartz and feldspar give a contact angle of  $0^\circ$  in oleate or stearate solutions these minerals cannot be floated. A. R. P.

**Formation of soluble phosphate by treatment of phosphorites and tricalcium phosphate with humic lignites.** I. UBALDINI and I. CIARROCHI (Annali Chim. Appl., 1938, 28, 69—77).—Finely-ground lignite, rich in humic acid, reacts with aq. suspensions of phosphate rock or  $Ca_3(PO_4)_2$  to give sol.  $PO_4^{3-}$ . The reaction is considerably increased by pretreatment of the lignite with dil. HCl. F. O. H.

**Continuous manufacture of superphosphate. Description of the Moritz-Standaert system.** ANON. (Ind. Chem., 1938, 14, 112—114).—The den consists essentially of a rotating cylindrical container with a stationary central shaft (vertical). The phosphate rock and acid are fed from a mixer into the annular space between the shaft and the shell, where the mass hardens and is carried around until, after 4—10 hr., it meets a rotary cutter, is broken up, and falls on to a rubber conveyor. Particle size is controlled by cutting speed. Construction is of concrete. The roof of the den supports the mixer and operating mechanisms. Power requirements are low, amounting to about 1 kw.-hr. per ton of superphosphate for an output of 25 tons/hr. I. C. R.

**Decomposition of crude phosphates by sin-tering with alkali silicate.** A. MESSERSCHMITT (Angew. Chem., 1938, 51, 197—203).—In this process of fertiliser manufacture, crude phosphate is intimately mixed with a material containing alkali, e.g., phonolite (average composition  $KNaO, Al_2O_3, 3SiO_2$ ) or leucite ( $K_2O, Al_2O_3, 4SiO_2$ ) ( $\approx 1:1 Na_2O:P_2O_5$ ), and  $CaCO_3$  and calcined in a rotary kiln at  $1150$ — $1250^\circ$ . When F is present, e.g., as in apatite, sufficient excess of alkali must be present to combine with the F, but the fluoride need not be removed. NaCl may be used as a source of alkali, but the corrosive action of the HCl evolved has prevented exploitation of the method. A process in which a mixture of phosphate,  $K_2SO_4$ ,  $SiO_2$  (clay), and coal is heated at  $1100$ — $1200^\circ$  in a slightly reducing atm. has recently been developed; the  $SO_4^{2-}$  is reduced to  $SO_2$  or S. Experiments carried out over several years on the effect on  $P_2O_5$  solubility of calcining pure  $Ca_3(PO_4)_2$  (I) mixed with other substances shows that when heated alone or with  $CaCO_3$  the citric acid-solubility is reduced, but less rapidly if  $SiO_2$  is present. With  $Na_2CO_3$  (1:1 mol.) (I) forms  $CaNaPO_4$  (II), which is sol. in both citric acid and  $NH_4$  citrate solutions, and with  $\frac{1}{2}$  mol. of  $Na_2CO_3$  in excess conversion is complete. (II) is also formed, with Ca silicates, when  $SiO_2$ , with or without  $CaCO_3$ , is present. The economic importance of the process in saving  $H_2SO_4$  which would be required in superphosphate manufacture, and its suitability for use with low-grade phosphates, are stressed. I. C. R.

**Acicular zinc oxide.** L. O. KEKWICK and A. PASS (J. Oil Col. Chem. Assoc., 1938, 21, 118—133).—Acicular ZnO (photomicrographs given) is prepared by a combination of the "direct" and "indirect" processes. Exposure trials show that it is more durable than ordinary ZnO, which is amorphous. The difference is attributed to the production of more flexible paint films; strains due to temp. and other changes are relieved by the formation of "vac. pockets" at points of the crystals. It is more effective than the amorphous variety in reducing the checking and cracking of white-Pb and lithopone and also retards chalking and fading of various pigments. It produces a more mobile paint, thus permitting greater pigment concn., and appears to be less reactive towards oils, but it is not so white and has slightly lower opacity. S. M.

**Concentration of southern barite ores.** R. G. O'MEARA and G. D. COE (U.S. Bur. Mines, 1938, Rept. Invest. 3376, 12 pp.).—The results of experiments on the concn. of low-grade barite ores by classification and tabling and by froth flotation are given. The former method gave good results with ores containing fluorite and calcite, and the latter with ores containing  $SiO_2$  and Fe oxides. D. K. M.

**Acid bleaching of iron-stained barytes.** H. W. GARTRELL and L. M. ABELL (Chem. Eng. Min. Rev., 1938, 30, 137).—All the  $Fe_2O_3$  was removed from Fe-stained barytes by leaching the finely-ground ore with 30%  $H_2SO_4$  containing 5% of NaCl at  $100^\circ$  for 30 min. By using the acid again the consumption of chemicals was reduced to 84 lb. of  $H_2SO_4$  and 168 lb. of NaCl per ton of  $BaSO_4$ . A. R. P.

**Carbagenl: a form of calcium chloride.** G. F. JAUBERT (Compt. rend. XVII Cong. Chim. Ind., 1937, 1136—1141).—Carbagenl,  $CaCl_2$  on porous C (1:1), absorbs 4—5 g. of  $H_2O$  per g. of  $CaCl_2$ , compared with 0.97 g. for  $CaCl_2$  alone. It can completely dehydrate  $SiO_2$  or  $Al_2O_3$  gel at room temp. and is regenerated at about  $100^\circ$ , e.g., by a current of dry air. Alcohols, esters, and org. acids which form definite compounds with  $CaCl_2$  are readily absorbed, and may be recovered on heating; aliphatic and aromatic hydrocarbons are only slightly absorbed. I. C. R.

**Geologic factors in the interpretation of fluor-spar reserves in the Illinois-Kentucky field.** L. W. CURRIER (U.S. Geol. Surv., 1937, Bull. 886-B, 14 pp.).—A new estimate of reserves places future production at >500,000 tons. L. S. T.

**Deposits of crystalline magnesite and their distribution in the mountain structure of the Eastern Alps.** R. SCHWINNER (Berg- u. Hütten-männ. Jahrb., 1937, 85, 306—314). R. B. C.

**Exploitation of Greek bauxites.** C. ZENGHELIS (Compt. rend. XVII Cong. Chim. Ind., 1937, 635—638).—Greek bauxite closely resembles the Provence mineral and contains  $Al_2O_3$  55—60,  $Fe_2O_3$  18—20, and  $SiO_2$  3.0—3.5%. Its solubility in NaOH, however, varies greatly with the physical condition of the  $Al_2O_3$ . X-Ray examination indicates that low-solubility samples contain diaspor, as is also the case with



similar bauxites from Rumania. All samples become sol. if calcined with  $\text{Na}_2\text{CO}_3$ . C. I.

**Preparation of pure alumina from Manchurian clay.** III. **Treatment of Fukushima aluminous shale by the Bayer and lime-soda processes.** T. ARIMORI (J. Soc. Chem. Ind. Japan, 1938, 41, 34—35B; cf. B., 1938, 509).—The calcined ore was treated with  $\text{CaO}$  (or  $\text{MgO}$ ) and caustic alkali under 8 atm. pressure in the Bayer process in an attempt to remove  $\text{SiO}_2$  as  $\text{Ca}$  (or  $\text{Mg}$ ) silicate and hence diminish the amount of soda lost as  $\text{Na Al}$  silicate. In the lime-soda process the ore was heated with  $\text{Na}_2\text{CO}_3$  and  $\text{CaCO}_3$  for 1 hr. at  $1000^\circ$ . Results showed that 72.7 and 72.2% of  $\text{Al}_2\text{O}_3$ , respectively, was extracted and the amount of soda lost per kg. of  $\text{Al}_2\text{O}_3$  extracted was 0.276 and 0.083 kg. of  $\text{Na}_2\text{O}$ , respectively. For each kg. of  $\text{SiO}_2$  in the ore 0.797 and 1.157 kg. of  $\text{Al}_2\text{O}_3$  and 0.585 and 0.25 kg. of  $\text{Na}_2\text{O}$ , respectively, were lost. K. W. P.

**Sulphuric acid leaching of Washington clays for production of alumina and aluminium metal.** H. C. PARKMAN (State Coll. Wash., Met. Res. Lab., 1935, Bull. E., 51 pp.).— $\text{Al}_2\text{O}_3$  can be extracted with 50%  $\text{H}_2\text{SO}_4$ . Roasting is detrimental. Recrystallisation of  $\text{Al}_2(\text{SO}_4)_3$  from the impure leach solution gave a product of sufficient purity for the Al industry. CH. ABS. (e)

**Manufacture of aluminium sulphate from the trachytic tuffs of Lesbos.** C. ZENGHELIS, D. DALMAS, and K. EVANGELIDES (Compt. rend. XVII Cong. Chim. Ind., 1937, 585—588).—This rock contains 14—32% of  $\text{Al}_2\text{O}_3$  sol. in acid, present as hydroxide and basic sulphate, and is almost free from  $\text{Fe}_2\text{O}_3$ . A pilot plant is operating at Athens in which it is heated at  $750\text{--}800^\circ$  in a rotary kiln, thereby losing  $\text{SO}_3$ ; the residue is dissolved in dil.  $\text{H}_2\text{SO}_4$  for production of  $\text{Al}_2(\text{SO}_4)_3$ . The insol. residue is principally  $\text{SiO}_2$ . C. I.

**Treatment of vanadinite [for extraction of vanadic acid].** P. G. GIRE (Compt. rend. XVII Cong. Chim. Ind., 1937, 80—82).—Vanadinite is  $\text{Pb}$  chlorovanadate containing also  $\text{SiO}_2$  and oxides of  $\text{Fe}$ ,  $\text{Cu}$ ,  $\text{Zn}$ , and  $\text{Mn}$ . It may be dissolved in dil.  $\text{H}_2\text{SO}_4$  and neutralised, when  $\text{Fe}$  and  $\text{Zn}$  vanadates are pptd. By the author's process the mineral is mixed to a paste with conc.  $\text{H}_2\text{SO}_4$ , heated to  $100\text{--}120^\circ$ , extracted with cold  $\text{H}_2\text{O}$ , and the acid solution evaporated at  $150^\circ$ .  $\text{V}_2(\text{SO}_4)_5$  is then heated to  $500\text{--}600^\circ$  in a current of air, giving a mixture of  $\text{V}_2\text{O}_5$  with some  $\text{Fe}_2\text{O}_3$ , other metals remaining as readily extractable sulphates. C. I.

**Hydrolysis of vanadium sulphate solutions.** G. GIRE and F. RIVENQ (Compt. rend. XVII Cong. Chim. Ind., 1937, 90—94).—The equilibrium of the reaction  $\text{V}_2(\text{SO}_4)_5 + 5\text{H}_2\text{O} \rightleftharpoons \text{V}_2\text{O}_5 + 5\text{H}_2\text{SO}_4$  is shown to vary with concn. according to the equation  $[\text{SO}_3]/[\text{V}_2\text{O}_5] = k$  (a const.) and with temp. by  $\log k = (A/T) + B$ , where  $A$  is the heat of hydrolysis,  $\pm$  the abs. temp., and  $B$  a const. The val. of  $k$  at  $50^\circ$  is 6.4, except in great dilution, when the val. is depressed by the formation of colloidal vanadic acid.  $\text{V}^{IV}$  if present is less readily hydrolysed,  $k$  in this case varying with  $\log$  (initial concn.). C. I.

**Concentration of titanium magnetite from the deposits of Kusinsk.** N. P. TITKOV (Gornui Shur., 1934, 110, No. 8, 63—65).—Methods of controlled magnetic separation of  $\text{Fe}$  and  $\text{Ti}$  concentrates are described. CH. ABS. (e)

**Production and applications of solid carbon dioxide.** J. KOBOLD (Z. Ver. deut. Ing., 1938, 82, 365—369).—A review. R. B. C.

**Atomic hydrogen flame.** Dissociation of gases in the [Langmuir] arc. D. SÉFÉRIAN (Chaleur et Ind., 1938, 19, 76—83).—The temp. of the at. H flame, the theory of which is given, is calc. Data on the dissociation of  $\text{N}_2$ ,  $\text{NH}_3$ , and  $\text{He-N}_2$  in the Langmuir arc are given. R. B. C.

**Manufacture of hydrogen under pressure by indirect electrolysis.** G. F. JAUBERT (Compt. rend. XVII Cong. Chim. Ind., 1937, 1130—1135).— $\text{H}_2$  under pressures of up to 200 atm. is produced by adding  $\text{H}_2\text{O}$  to a mixture of  $\text{Fe-Si}$  (75—90%  $\text{Si}$ ) and dry  $\text{NaOH}$  in an autoclave.  $\text{Na}_2\text{SiO}_3$  is first formed, and this reacts with more  $\text{Si}$  to produce  $\text{NaHSiO}_3$ ,  $\text{H}_2$  being evolved in both stages. The process is especially suited for the production of  $\text{H}_2$  in the field, e.g., for refilling cylinders for  $\text{H}_2$  storage, where the purity of the  $\text{H}_2$  is important, as impurities would lower the lifting power, e.g. of balloons. I. C. R.

**Detection of carbon monoxide in medicinal oxygen.** F. K. BELL and J. C. KRANTZ, jun. (J. Amer. Pharm. Assoc., 1938, 27, 118—119).—The  $\text{O}_2$  is passed through aq.  $\text{PdCl}_2$ , the resulting  $\text{Pd}$  caused to react with aq.  $(\text{NH}_4)_2\text{MoO}_4$ , and the  $\text{Mo}$ -blue produced determined colorimetrically. The presence of 10 p.p.m. of  $\text{CO}$  is detectable. The method, however, is equally as non-sp. as the  $\text{I}_2\text{O}_5$  method (B., 1934, 299),  $\text{H}_2$  and  $\text{C}_2\text{H}_2$  interfering with the test. F. O. H.

**Determination of acetylene in liquid oxygen.** L. S. AIZENSCHTEIN (Zavod. Lab., 1938, 7, 29—32).—1—2 l. of liquid  $\text{O}_2$  are filtered and the residue of cryst.  $\text{C}_2\text{H}_2$ , together with the last 100 ml. of  $\text{O}_2$ , is evaporated in a stream of  $\text{N}_2$ , the gas being passed through  $\leq 5$  absorbers with Ilosvay reagent. The  $\text{C}_2\text{H}_2$  content as given by this method is 10—20 times  $>$  by the ordinary Linde method; this is ascribed to incomplete absorption of  $\text{C}_2\text{H}_2$  in the latter method. R. T.

**Remarkable instances of peroxide formation.** F. HUNDESHAGEN (Chem.-Ztg., 1938, 62, 328—329).—Peroxides have been detected in (1) efflorescence on walls plastered with gypsum plaster in cold, wet weather ( $\text{CaO}_2$ ), (2) the oxide layer on anodically oxidised Al ("Eloxal" process), and (3) the ppt. from cold dil. solutions of Al salts and  $\text{NH}_3$  in presence of  $\text{H}_2\text{O}_2$ . In (1) no  $\text{Ba}$  was present to act as carrier. In (3) the amount of peroxide increased with  $[\text{H}_2\text{O}_2]$ ; the formula  $[\text{O} \cdot \text{Al}(\text{OH})_2]_2$  is suggested. I. C. R.

**Assay of nitrogen monoxide.** F. K. BELL, C. J. CARR, and J. C. KRANTZ, jun. (J. Amer. Pharm. Assoc., 1938, 27, 103—105).—Slight modifications of the method published previously (B., 1933, 505) are described. F. O. H.

**Determination of sulphur dioxide in presence of nitrogen oxides.** G. V. RAKOVSKI (Zavod. Lab., 1938, 7, 174—176).—A sample of gas is shaken with



neutral 3%  $\text{H}_2\text{O}_2$ , and  $\text{H}_2\text{SO}_4$  is determined in the solution by a benzidine pptn. method. R. T.

**Separation of tellurium from selenium in the analysis of ores.** T. L. POKROVSKAJA (Zavod. Lab., 1938, 7, 15—18).—The Te + Se ppt. obtained in the usual way is weighed, then dissolved in  $\text{H}_2\text{SO}_4$ — $\text{HNO}_3$ , the solution diluted to a  $[\text{H}_2\text{SO}_4]$  of 10%, and Se pptd. by adding 10%  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{SO}_4$  and boiling for 10 min. The ppt. of Se is washed, dried, and weighed; Te is given by difference. R. T.

**Preparing and packaging liquid chlorine and allied products for water plants.** L. L. HEDGE-PETH (J. New England Water Works Assoc., 1938, 52, 1—29).—Electrolytic  $\text{Cl}_2$  production and its drying, purification from wax-forming impurities, liquefaction, packing, and precautions in handling and conveying are reviewed. The valve of an emptied  $\text{Cl}_2$  cylinder should immediately be closed to prevent  $\text{H}_2\text{O}$  etc. being sucked in and causing corrosion failure. The utilisation of the by-products,  $\text{H}_2$  for HCl and hydrogenation of oils, NaOH,  $\text{FeCl}_3$ , etc., is discussed. O. M.

**Rust-protecting [potash] plant.** Dryice.—See I. S from coke ovens. CO and  $\text{H}_2$ . Determining  $\text{O}_2$  in gases.—See II. Electrolytic  $\text{Cl}_2$  in making cellulose.—See V. Mining in Greece. Intercryst. corrosion of soft Fe by aq.  $\text{NH}_4\text{NO}_3$ . V and Ti in ironsand.  $\text{V}_2\text{O}_5$ .—See X.  $\text{NaClO}_3$ . Electrolytic oxidation. Decomp. of Sn ores.—See XI. Determining  $\text{PbO}_2$  in red-lead.—See XIII. Rubber in [acid-storage] plant.—See XIV. Determining F in insecticides.—See XVI. Determining  $\text{H}_2\text{S}$  in air, and industrial poisons.—See XXIII.

See also A., I, 317, Oxidation of  $\text{PbO}$  to  $\text{Pb}_3\text{O}_4$ . Catalytic oxidation of  $\text{NH}_3$ . 322, Rapid determination of S in org. substances.

#### PATENTS.

**Manufacture of hydrobromic acid.** G. F. DRESSEL and O. C. ROSS, Assrs. to DOW CHEM. CO. (U.S.P. 2,070,263, 9.2.37. Appl., 30.10.33).— $\text{H}_2$  is bubbled through Br at 37—42° so as to form a gas mixture containing approx. 10% excess of  $\text{H}_2$ , which is mixed thoroughly by passage through porous C, and after ignition by a spark is allowed to burn, the flame impinging on a perforated cap of refractory material maintained at 600—850° by adjusting the rate of flow of gas. The product is passed over active C at 150—200°, where combination of residual Br occurs; the HBr produced is absorbed in  $\text{H}_2\text{O}$  to yield a colourless 48% solution. L. C. M.

**Devices for separating out impurities from lime-slaking equipments.** H. SPOERRI, and SPOERRI & Co. (B.P. 482,706, 9.11.37).—An oversize discharge device for a rotating cylindrical screen is described. B. M. V.

**Manufacture of carbonates, hydroxides, and fluorides of the alkali metals.** CONSOLIDIRTE ALKALIWERKE (B.P. 474,159, 27.4.36. Ger., 27.4., 2., 6., and 31.5.35, and 9.3.36).— $\text{K}_2\text{SiF}_6$  or  $\text{Na}_2\text{SiF}_6$  is treated with  $\text{CaCO}_3$ , e.g., at 100°, in accordance with equations (1)  $\text{K}_2\text{SiF}_6 + 3\text{CaCO}_3 = 3\text{CaF}_2 + \text{K}_2\text{CO}_3 +$

$2\text{CO}_2 + \text{SiO}_2$ , or (2)  $\text{K}_2\text{SiF}_6 + 2\text{CaCO}_3 = 2\text{CaF}_2 + 2\text{KF} + \text{SiO}_2 + 2\text{CO}_2$ . In (1) the  $\text{K}_2\text{CO}_3$  is separated by fractional crystallisation from aq. sol. fluoride, and obtained in a pure state. By treatment with  $\text{Ca(OH)}_2$ , KOH is obtained. In (2) treatment of KF with  $\text{Ca(OH)}_2$  yields KOH; KF with NaCl yields NaF, which with  $\text{Ca(OH)}_2$  yields NaOH, and this process is preferable, for the production of NaOH, to obtaining NaF by (2), on account of the insolubility of NaF. In all cases  $\text{K}_2\text{SiF}_6$  (or  $\text{Na}_2\text{SiF}_6$ ) is recovered from the residues by treatment with HCl and KCl (or NaCl). Fluorides of other metals may be obtained by treating  $\text{K}_2\text{SiF}_6$  with the corresponding carbonates. I. C. R.

**Manufacture of coarsely crystallised ammonium bicarbonate.** G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 474,164, 14.5.36).—To an agitated, cooled, saturated solution of  $\text{NH}_4\text{HCO}_3$ , preferably containing free crystals, are added conc. aq.  $(\text{NH}_4)_2\text{CO}_3$  and  $\text{CO}_2$  so slowly that the crystal nuclei grow to the required size, e.g.,  $<1 \times 2$  mm. Alternatively, aq.  $(\text{NH}_4)_2\text{CO}_3$  is saturated with  $\text{CO}_2$  before it is added, with  $\text{CO}_2$ , to the saturated aq.  $\text{NH}_4\text{HCO}_3$ . I. C. R.

**[Electrolytic] production of alkali sulphides.** L. ACHILLE (B.P. 470,033, 25.5.36. It., 15.6.35).—Na—Hg is prepared by electrolysis of aq. NaCl, using a Hg cathode, and then carried continuously into a cell wherein it reacts with aq.  $\text{Na}_2\text{S}_4$ , which is continuously added (or to which S is added), the stoichiometric ratios (138 Na : 174  $\text{Na}_2\text{S}_4$ ) being maintained during the reaction. I. C. R.

**Production of ammonium nitrate and mixtures containing it.** DIRECTIE VAN DE STAATSMIJNEN IN LIMBURG (B.P. 474,181, 6.11.36. Holl., 18.11.35).—The apparatus consists of an evaporator under vac. with two pipes dipping into aq.  $\text{NH}_4\text{NO}_3$  contained in an open vessel below it. Into one of the pipes gaseous  $\text{NH}_3$  and 42.5%  $\text{HNO}_3$  are separately introduced, the heat of reaction causing the temp. to rise in the upper portion of the pipe, where the liquor boils and the gases evolved effect circulation by a lift-pump action. The liquor continues to boil in the evaporator, and after concn., e.g., to 60% of  $\text{NH}_4\text{NO}_3$ , falls by gravity through the other pipe to the container, from which part is drawn off. Loss of N in the vapour is about 0.05% if the acidity is kept low, e.g., 4 g. of  $\text{HNO}_3$  per l. With conc.  $\text{HNO}_3$  almost anhyd.  $\text{NH}_4\text{NO}_3$  may be obtained. Other substances, e.g.,  $\text{H}_2\text{SO}_4$ , phosphates, peat, may be added to the circulating liquor to produce mixed fertilisers. I. C. R.

**Production of (A) phosphorus and phosphate fertiliser, (B) phosphate fertiliser and nitric acid.** H. A. CURTIS, Assr. to TENNESSEE VALLEY AUTHORITY (U.S.P. 2,069,225—6, 2.2.37. Appl., [A] 5.6.35, [B] 6.6.35).—(A) A charge of phosphate rock,  $\text{SiO}_2$ , and C is melted in the electric arc furnace, and the major portion of the P is separated from the vapour by condensation and electrostatic pptn. The residual CO +  $\text{N}_2$  containing a trace of P is burned in a rotary furnace wherein phosphate rock is melted and atomised to form a finely-divided fertiliser material. (B) The mixture of  $\text{N}_2$ ,  $\text{P}_2\text{O}_5$ , and  $\text{CO}_2$  obtained by



burning the gases from a similar furnace is passed through a flame arc furnace which is used for melting and atomising phosphate rock; the  $P_2O_5$  is absorbed and  $HNO_3$  obtained by oxidation of the filtered gaseous product containing NO. L. C. M.

**Direct manufacture of sodium perborate.** J. S. REICHERT, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,065,744, 29.12.37. Appl., 27.5.32).—Dry  $NaBO_3 \cdot 4H_2O$  is prepared by treating borax,  $B_2O_3$ , or  $H_3BO_3$  with  $Na_2O_2$  and conc. aq.  $H_2O_2$ ; e.g., powdered  $H_3BO_3$  (2 mols.) is stirred into aq.  $\pm 32\%$   $H_2O_2$  (1 mol.) and then powdered  $Na_2O_2$  (1 mol.) is added with agitation; the paste is cooled to  $35^\circ$ , spread out, allowed to solidify, and ground. L. C. M.

**Sodium aluminate.** D. LURIE, Assr. to AMER. CYANAMID & CHEM. CORP. (U.S.P. 2,066,209, 29.12.36. Appl., 17.10.34).—Bauxite (I) 1400 is boiled with a solution of NaOH 1000 lb. in  $H_2O$  120 U.S. gals. for 2.5–3 hr.; the solution is diluted to  $d$  1.26–1.28 and filtered. Further (I) 350 lb. is added to interact with the excess of NaOH, and the solution is evaporated at  $138^\circ$  until it solidifies on cooling; the product is then roasted for 3–4 hr. at  $700^\circ$ . If a high-grade product be required, pure  $Al_2O_3$  is substituted for (I). L. C. M.

**Zinc oxide.** F. B. GEARHART and F. A. STEELE, Assrs. to NEW JERSEY ZINC Co. (U.S.P. 2,065,687, 29.12.36. Appl., 8.6.32).—In order to improve the dispersion of ZnO in rubber compounds it is treated with a spray of 0.1–1 wt.-% of coconut oil fatty acids at  $80^\circ$  before bolting, and "aged" at  $85^\circ$  for 24 hr. in an atm. of 40% R.H. L. C. M.

**Separation of cadmium from its ores.** R. W. HYDE (U.S.P. 2,064,835, 22.12.36. Appl., 8.8.35).—A mixture of powdered, roasted ore (e.g., ZnS containing 0.8% of Cd with traces of Cu and Pb) with  $CaF_2$  in slight excess of the proportion required to form  $CdF_2$  is sintered at  $>1000^\circ$ . Cd, Cu, and Pb fluorides are volatilised, condensed, and treated with  $H_2SO_4$ , the evolved HF is absorbed by  $Ca(OH)_2$ , regenerating  $CaF_2$  for return to the process, and Cd is recovered from the sulphated residue. L. C. M.

**Manufacture of oxides or suboxides of lead.** J. AITKEN (B.P. 474,267, 13.7.36).—Pb, or partly oxidised Pb, is ground to  $<300$  mesh/in., and carried in a stream of air to a chamber where it is oxidised by  $O_3$ , the raw material and/or the mill, the oxidising chamber, and the air to the ozoniser being cooled so that the temp. at all points is  $<60^\circ$ . Cold air may be admitted for cooling or to prevent further oxidation of partly oxidised material. The product may be bleached by ultra-violet irradiation. L. C. R.

**Lead product [from scrap battery plates].** S. S. SVENDSEN, Assr. to BASIC METALS CORP. (U.S.P. 2,065,408, 22.12.36. Appl., 5.7.32).—The plates are disintegrated, and the powdered metal, after roasting at  $<$  the m.p., is digested with hot aq. NaOH (190–250 g./l.); the residue of Pb free from Sb is washed and calcined, yielding  $PbO$ , and the filtrate is treated with granulated Pb, whereby Sb is pptd. and aq. NaOH regenerated. L. C. M.

**Separation of molybdenite from copper sulphides.** E. H. BROWN, Assr. to MINERALS SEPARATION N. AMER. CORP. (U.S.P. 2,070,076, 9.2.37. Appl., 13.7.35).—CuS is floated from a concentrate of CuS + molybdenite, using pine oil + xanthate mixture as flotation agent and starch–NaOH to depress the molybdenite, which subsequently is raised by alkaline treatment with pine oil and mineral oil or tannin. L. C. M.

**Obtaining manganese values from carbonate ores.** A. T. SWEET and J. D. MACCARTHY, Assrs. to GEN. MANGANESE CORP. (U.S.P. 2,070,496–7, 9.2.37. Appl., [A] 16.9.29, [B] 23.9.29. Renewed [B] 26.6.35).—Low-grade ore (containing approx. 16% of Mn) is crushed and agitated with boiling aq.  $NH_4X$  [where  $X = (A) Cl'$  or  $(B) \frac{1}{2}SO_4'$ ]; the evolved  $NH_3$  and  $CO_2$  are absorbed in  $H_2O$ , yielding aq.  $(NH_4)_2CO_3$  (I), and the insol.  $Fe_2O_3$ ,  $SiO_2$ , etc. is removed by filtration. The solution is treated with raw ore to complete the removal of Fe, filtered, and  $Mn(OH)_2$  pptd. with aq.  $NH_3$ ; the mother-liquor is treated with (I), whereby  $MgCO_3$  and  $CaCO_3$  are pptd. and aq.  $NH_4X$  is regenerated. L. C. M.

**Luminescent material.** H. W. LEVERENZ, Assr. to RADIO CORP. OF AMERICA (U.S.P. 2,066,044, 29.12.36. Appl., 30.8.32).—The use of  $M_2GeO_4$  (where  $M = Mg$  or  $Zn$ ) containing a trace of Mn salt, prepared, e.g., by fritting at  $1000^\circ$  a mixture of ZnO and  $GeO_2$  moistened with aq.  $MnCl_2$  (0.0001–1 wt.-%), is claimed. The Zn compound gives a greenish-yellow and the Mg an orange-red colour. L. C. M.

**Preparation of catalytic composition.** W. A. LAZIER, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,066,153, 29.12.36. Appl., 31.12.31).—Promoted chromite catalytic masses for hydrogenation or dehydrogenation of org. compounds, e.g., EtOH, containing  $Cr_2O_3$ , MO, and  $M'O$ , where  $M = 2Ag$ , Cu, Cd, Pb, Hg, Sn,  $\frac{2}{3}Bi$ , or  $\frac{2}{3}Fe$ , and  $M' = Mg$ , Zn, or Mn, and prepared, e.g., by ignition at  $400^\circ$  of the ppt. obtained by neutralising a solution containing  $Cd(NO_3)_2$ ,  $ZnSO_4$ , and  $(NH_4)_2Cr_2O_7$  with aq.  $NH_3$  are claimed. L. C. M.

**Recovery of acid gases [carbon dioxide from waste gases].** W. R. KNAPP, Assr. to HORVITZ PATENT HOLDING CORP. (U.S.P. 2,064,838, 22.12.36. Appl., 28.2.34).—After removal of suspended material and  $SO_2$  from natural or industrial furnace gas,  $CO_2$  is absorbed by scrubbing with a solution containing  $Na(NH_4)_2PO_4$  18.55,  $NaNH_4HPO_4$  5.52, and  $(NH_4)_2CO_3$  1.85% at  $32$ – $42^\circ$ ;  $CO_2$  is continuously regenerated from a portion of the circulating liquid by heating by heat exchange with incoming hot gas. L. C. M.

**Separation of acidic gases [carbon dioxide].** R. R. BOTTOMS, Assr. to GIRDLER CORP. (U.S.P. 2,065,112, 22.12.36. Appl., 1.12.33).— $CO_2$  is absorbed from flue gases etc. by scrubbing with aq. 35–50% sec. or tert. aliphatic  $NH_2$ -alcohols, e.g.,  $\alpha$ -diaminopropan-3-ol; the  $CO_2$  is continuously regenerated by heating a portion of the circulating fluid, which is non-corrosive. L. C. M.

**Production of hydrogen.** J. C. WOODHOUSE, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P.



2,064,867, 22.12.36. Appl., 15.8.30. Renewed 23.12.33).—Ni catalyst mass for the production of  $H_2$  from steam and hydrocarbon gas is prepared by ignition of briquetted, pptd. NiO in  $H_2$  at  $175^\circ$  for 1 hr., followed by activation by raising the temp. to  $450^\circ$  at  $25^\circ/\text{hr.}$  in an atm. of  $H_2 + CO$  (2 : 1 by vol.).  
L. C. M.

**Manufacture of [hydrogen] peroxide.** J. B. PIERCE, jun., Assr. to BARIUM REDUCTION CORP. (U.S.P. 2,066,015, 29.12.36. Appl., 26.6.34).—Before use in the production of  $H_2O_2$ , commercial  $BaO_2$  (85–90%) is freed from sol. impurities, e.g.,  $Ba(OH)_2$ , by stirring the ground material (1 pt.) at  $50\text{--}90^\circ$  for  $\frac{1}{2}$ –1 hr. with  $H_2O$  (2.5 pts.), allowing to settle, decanting, and drying the sludge at  $100^\circ$ .  
L. C. M.

**Production of oxygen-enriched mixtures from air.** R. LINDE, Assr. to UNION CARBIDE & CARBON CORP. (U.S.P. 2,066,115, 29.12.36. Appl., 17.5.35. Ger., 17.5.34).—In a two-stage process producing, e.g., gas containing 45% of  $O_2$  in the first and 80% in the second, in order to effect heat balance between the two stages a vol. of air equal to that of the  $N_2$ -enriched gas eliminated is introduced into the second stage.  
L. C. M.

**(A) Free-running sulphur. (B) Prepared sulphur.** (A) F. W. WIEDER, (B) E. C. MISSBACH, Assrs. to SAN FRANCISCO SULPHUR CO. (U.S.P. 2,069,568 and 2,069,710, 2.2.37. Appl., [A] 9.3.36, [B] 26.2.34).—In order to prevent clotting of finely-ground S for fungicidal use, (B)  $ZnO$ ,  $ZnCO_3$ , or other insol. compound, or preferably (A)  $CaHPO_4$ , 1–10 (2%) is incorporated with the S during grinding.  
L. C. M.

**Production of sulphur dioxide [from sulphide ores].** E. J. MULLEN, Assr. to GEN. CHEM. CO. (U.S.P. 2,070,235–7, 9.2.37. Appl., [A] 8.9.32, [B] 10.3.33, [C] 31.12.34).—Constructions of furnaces for roasting sulphide ore fines are claimed; the ore is introduced at the top of a vertical, cylindrical combustion chamber while the air enters at the bottom.  
L. C. M.

$C_2H_2$  and  $Ca(OH)_2$ .—See II. Pb oxides [from accumulator plates]. Auriferous pyrites.—See X. Th product.—See XI. Litharge.—See XIII.

## VIII.—GLASS; CERAMICS.

**Boric oxide and zinc oxide as subsidiary glass-forming materials.** F. H. ZSCHACKE (Glashütte, 1938, 68, 255–256).—The conclusions of Enss (Glastech. Ber., 1936, 14, 279) are incorrect because he failed to allow for the other changes of composition on adding  $ZnO$  and  $B_2O_3$ . In a series of glasses where this allowance was made, the effect of  $ZnO$  was found to be small compared with that of  $B_2O_3$ .  
G. H. C.

**Calculations from the raw mix in glass manufacture, and their practical value.** F. JOCHMANN (Glashütte, 1938, 68, 215–216).—The composition of glass may be calc. from the raw mix, and from this the coeff. of expansion may be estimated, enabling the best application of the glass to be determined, and a suitable pot chosen in which to melt it.  
G. H. C.

**Glass for general scientific and heat-resisting purposes. Review of British development, 1916–37.** W. E. S. TURNER (J. Soc. Glass Tech., 1938, 22, 28–42p).—A lecture.  
J. A. S.

**Optical glass.** W. M. HAMPTON (J. Soc. Glass Tech., 1938, 22, 16–19p).—The nature, properties, and certain problems in the manufacture of optical glass are briefly described. The future improvement of the qualities of the glass depends on the development of refractories highly resistant to pot attack.  
J. A. S.

**Calculation of the physical properties of glass. II. Dilatation and density.** P. GILARD and L. DUBRUL (Verre et Silicates Ind., 1938, 9, 25–28, 37–39, 50–52).—The procedure proposed for calculating expansion coeffs. (*ibid.*, 1934, 5, 122, 141) has been tested against published measurements; consts. are added for Li, Rb, and Be oxides. No satisfactory const. could be deduced for  $B_2O_3$ . The  $d$  of a glass may be calc. from:  $\Sigma(x)/d = \Sigma(ax + bx^2)$ , where  $d$  represents the density of the glass, and  $x$  the % of the particular oxide for which  $a$  and  $b$  are consts. Vals. of  $a$  and  $b$  are deduced from the published data of other workers for the oxides of Li, Na, K, Rb, Cs, Be, Mg, Ca, Ba, Zn, Pb,  $Mn^{II}$ , B, Al, Bi,  $Fe^{III}$ , Si, Ge, Ti, and Zr. (Cf. B., 1938, 650.)  
G. H. C.

**Viscosity of soda-silica glasses at high temperatures and its bearing on their constitution.** E. PRESTON (J. Soc. Glass Tech., 1938, 21, 45–81r).—The shape of the  $\eta$ -composition curves for a series of glasses ( $Na_2O$  15.19–50.04) was studied over the range  $800\text{--}1500^\circ$ , care being taken to allow sufficient time before each measurement for the attainment of physical, chemical, and thermal equilibrium. Two very crit. but definite discontinuities (min.) in the curves were found to correspond with the presence in the molten glasses of  $Na_2O \cdot 3SiO_2$  and  $Na_2O \cdot 2SiO_2$ . The degree of these min. decreases with rise in temp. and thus strongly supports the association theory of the constitution of glass. Full experimental details of the rotating viscosimeter are given. It is suggested that the variation in  $\eta$  which was attributed by Vickers (B., 1938, 372) to the effect of adsorbed gases is much more likely to be due to slight differences in composition between the various experimental samples of glass.  
J. A. S.

**Measuring the surface tension of glass by the fibre-weight method.** J. BAILEY (J. Soc. Glass Tech., 1938, 22, 38–40r).—The equation used by Keppeler (B., 1937, 545), which gives vals. one half those given by the bubble method, is shown to be erroneously deduced. The correct equation is— $\gamma = grld$ , where  $r$  and  $l$  are the radius and length of the fibres, respectively.  
J. A. S.

**Physico-chemical properties of annealed glass, in relation to conditions of air-annealing.** L. A. GEZBURG and I. V. BOROVNIKOV (Ukrain. Chem. J., 1937, 12, 492–506; 1938, 13, 47–54).—The mechanical strength of glass annealed in a stream of air is  $>$  that of ordinary glass, except for a slightly smaller resistance to crushing. The resistance to corrosion is unaffected, and to thermal factors raised, by air-annealing.  
R. T.



**Microscopical examination and identification of crystalline products in commercial glasses.**

II. A. J. HOLLAND and E. PRESTON (J. Soc. Glass Tech., 1938, 22, 82—98T; cf. B., 1938, 163).—The appearance of quartz, tridymite, cristobalite,  $\alpha$ - and  $\beta$ -wollastonite, devitrite, diopside, nephelite, mullite, and corundum is illustrated by photomicrographs.

J. A. S.

**Three phases of glass. Solid, plastic, liquid.** P. BARY and J. HERBERT (Compt. rend. XVII Cong. Chim. Ind., 1937, 1030—1034).—See B., 1937, 911.

J. A. S.

**Luminescence of glasses.** E. REXER (Glastech. Ber., 1938, 16, 90—91).—General observations are made on the phosphorescence and fluorescence (under cathode- and X-rays and ultra-violet light) of a glass  $\text{Na}_2\text{O} \cdot 2\text{SiO}_2$ , with and without addition of 0.01% of Cu as activator and in the glassy and cryst. states. Crystallisation in each case greatly increased the luminescence and phosphorescence. The marked difference in the reaction of the glasses to irradiation by cathode rays and the position of bands in the fluorescence emission as the result of X-irradiation are good criteria for the "purity" and cryst. nature of the glasses.

J. A. S.

**Colorimetric determination of small quantities of iron oxide in glasses and glass-making sands.** R. C. CHIRNSIDE (J. Soc. Glass Tech., 1938, 22, 41—44T).—Full details are given for the use of thioglycollic acid in place of  $\text{NH}_4\text{CNS}$ . The method is unaffected by large amounts of  $\text{Al}_2\text{O}_3$  and other radicals which interfere with the  $\text{NH}_4\text{CNS}$  method.

J. A. S.

**Potentiometric determination of silica in silicate ores.** V. M. TARAJAN (Zavod. Lab., 1938, 7, 176—179).—A sharp end-point is obtained in the electrotitration of Si by Schucht and Möller's method (B., 1906, 1176) when  $\text{Ba}(\text{NO}_3)_2$  is added to the solution.

R. T.

**Theory and practice of the preparation of selenium-pink and -red [glasses].** H. PONGRATZ (Glashütte, 1938, 68, 299—300, 327—329).—Previous work is summarised (cf. Springer, B., 1933, 507; Weckerle, B., 1935, 22; Höfler, B., 1935, 545). Pink colours are due to colloidal dispersions of Se, and brown colours to true solutions of alkali selenides. The former are favoured by rapid cooling. Directions and formulæ are given for preparing a no. of clear and opal glasses.

G. H. C.

**White opacifiers for enamel.** H. KIRST (Glashütte, 1938, 68, 199—201).—The white, diffuse reflexion from enamel depends on the scattering of light by small reflecting particles in a clear medium. The efficiency of a given opacifier depends on the size of the particles and the difference of  $n$  between them and the medium. The particles may be introduced as such (e.g.,  $\text{SnO}_2$  etc.) or produced by crystallisation (e.g.,  $\text{CaF}_2$  by reaction of  $\text{AlF}_3$ ,  $\text{NaF}$ ), solidification of an emulsion due to the system separating into two liquids on cooling (e.g., phosphate opacifiers), or by liberation of gas.

G. H. C.

**Titanium oxide as raw material for enamels.** R. ALDINGER (Glashütte, 1938, 68, 290—291).— $\text{TiO}_2$

may be used as an opacifier, but requires reinforcing with  $\text{ZrO}_2$ ,  $\text{Sb}_2\text{O}_5$ , or some other oxide, owing to its low intrinsic opacity. It improves the acid-resistance of enamel.

G. H. C.

**Acid-resisting enamel.** H. LANG (Glashütte, 1938, 68, 186—189).—Opinions expressed by other authors are discussed. Acid-resistance can be obtained without any sacrifice of other properties or greatly increased cost, and diminishes poisoning risks. Such enamels need not be fired as high as  $950^\circ$ . The alternative use of  $\text{CaF}_2$  or  $\text{NaF}$ ,  $\text{AlF}_3$  is quite optional, neither having any well-defined advantage.

G. H. C.

**Abrasion-resistance of enamel coatings.** R. ALDINGER (Glashütte, 1938, 68, 184—186).—Of the previously described techniques for evaluating abrasion-resistance, those in which the loss of reflecting power under mechanical abrasion is measured are preferred to those based on loss of mass.

G. H. C.

**Cleaning of ironware for enamelling.** R. ALDINGER (Glashütte, 1938, 68, 313—316).—The efficient removal of all grease and dirt is essential, and may be effected by burning off at  $700^\circ$ , by treatment with soap and alkalis, or by sandblasting. Scouring with sand or enamel mix is useless with cast ware.

G. H. C.

**"Burning off" sheet- and cast-iron goods for enamelling.** H. LANG (Glashütte, 1938, 68, 343—346).—Besides removing grease and dirt, the process removes internal stresses. Electrolytic and chemical processes are useless for the latter purpose. Directly-fired kilns save fuel, but the subsequent pickling process is easier and cheaper when muffles are used. A temp. of  $600$ — $650^\circ$  is best for sheet goods and  $800$ — $850^\circ$  for cast Fe. The practice of dipping the ware in spent pickle before burning off has no merit. The burning reduces the tendency to form bubbles on cast Fe by removing free graphite and other gas-producing materials from the surface layers, and loosens grains of sand, oxide, etc. It also increases the coeff. of expansion of the Fe.

G. H. C.

**Copperheading of sheet-steel ground coats.** T. D. HARTSHORN (Bull. Amer. Ceram. Soc., 1938, 17, 166—168).—The tendency to copperheading is reduced by: avoiding blistering conditions; using ground coats with a high  $\text{Fe}_2\text{O}_3$  solubility, low  $\eta$ , and quick sealing properties; correct firing conditions; and using Ni dip.

J. A. S.

**Consideration of copperheads [in ground-coat enamels].** L. K. SOSEY (Bull. Amer. Ceram. Soc., 1938, 17, 159—163).—Copperheading may be caused by faulty pickling, nature of the steel, ground-coat frit, furnace atm., and loading. The sporadic incidence of copperheading is due to the plant being run with conditions adjusted so that the total of the factors of resistance is just sufficient to prevent the fault. Complete freedom from the fault was attained by the individual optimum adjustment of each condition.

J. A. S.

**Copperheading.** H. C. BEASLEY (Bull. Amer. Ceram. Soc., 1938, 17, 163—166).—The various



factors (especially faulty pickling and firing) causing the fault are discussed. J. A. S.

**Enamel chipping: relationship of ground-coat adherence to thickness and yield value of sheet steel.** G. SIROVY and E. P. CZOLGOS (Bull. Amer. Ceram. Soc., 1938, 17, 168—170).—Fracture of the enamel under tension occurs only if the elastic limit of the steel is exceeded. Fractures caused by impact are independent of the thickness of the steel if deformation does not occur, but decrease in extent with increase in thickness if deformation is allowed.

J. A. S.

**Behaviour of enamels in contact with liquids at high temperatures and pressures.** G. H. SPENCER-STRONG and P. C. STUFFET (Bull. Amer. Ceram. Soc., 1938, 17, 170—173).—The good resistance of enamels to treatment with  $H_2O$  and dil. acid and alkali in an autoclave (60—300 lb./sq. in.) suggests their wider application in conditions of corrosion by  $H_2O$  at moderately high temp. and pressure. The better resistance was shown by ground-coat, acid-resisting, hard, and overfired enamels. A simulated service test is proposed.

J. A. S.

**Determination of whiteness of enamelware.** K. P. AZAROV and N. S. CHARTSCHENKOVA (Zavod. Lab., 1938, 7, 238—239).—A photoelectric reflectometer is described.

R. T.

**Should the downdraught periodic kiln be round or rectangular?** W. D. RICHARDSON (J. Amer. Ceram. Soc., 1938, 17, 197—200).—The chief objections to the rectangular kiln have been the difficulties of arch repair and renewal, but these have now been overcome by the flat, suspended arch. The Laclede-Christy arch is described.

J. A. S.

**Stoker-fired round downdraught kilns.** J. H. ISENHOUR (J. Amer. Ceram. Soc., 1938, 17, 201—202).—The improved quality of ware, fuel economy, and other advantages to be obtained by stoker firing are briefly described.

J. A. S.

**Tunnel kiln in the ceramic industry. Theory of the tunnel kiln [progressive heating].** E. DAMOUR (Compt. rend. XVII Cong. Chim. Ind., 1937, 1000—1012).—Calculations are made of the fuel and air consumptions required to reach a given temp. when heating materials which (1) are thermally inert (e.g.,  $SiO_2$  and  $MgO$  bricks), (2) undergo endothermic reactions (e.g., clay products), and (3) are further worked on at high temp., thereby losing the heat which is not recoverable (e.g., metal reheating).

J. A. S.

**Regenerative heating in tunnel kilns for ceramics.** E. SCHIRM (Keram. Rundsch., 1938, 46, 142—145, 179—181, 193—195).—Regenerative arrangements need careful consideration in tunnel kilns in order to produce a regular disposition of the heat. A no. of countercurrent heat-exchanging systems and alternate flow arrangements are described.

G. H. C.

**Practical hints on ring kilns.** ANON. (Tonind.-Ztg., 1938, 62, 383—384).—Poor output often originates in leaky flues, which may become cracked owing to moisture coming up from the kiln foundations if these be not properly drained. The condition of

the clay and the drying of the ware also influence output. If the former condition demands higher or longer burning fuel consumption will be increased. It may be necessary to increase the height of the chimney or to instal fans to enable a higher temp. to be reached. Automatic methods of stoking make for evenness of operation.

G. H. C.

**Chemical constitution of the clay molecule. VI. Review of later theories.** J. W. MELLOR (Trans. Ceram. Soc., 1938, 37, 118—125).—The author's well-known theory of the action of heat on the clay mol. has been confirmed by recent work.

J. A. S.

**Drying characteristics of a calcareous surface clay.** R. K. HURSH and C. R. FILIPPI (J. Amer. Ceram. Soc., 1938, 17, 206—209).—Tests of the rate of drying were made under varied conditions of temp. and humidity. Even though the humidity was adjusted to maintain the same rate of  $H_2O$  loss, drying of this clay at above a certain crit. temp. caused excessive cracking. The cracks occurred early in the drying process and appeared to be due to thermal shock. The ordinary drying process at low temp. and low humidity is recommended for this clay.

J. A. S.

**Purification of clay.** J. GREWE (Tonind.-Ztg., 1938, 62, 403—405).—Various types of machine for removing grit and coarse matter are described.

G. H. C.

**Felspar and kaolin deposits in middle, east, and south Europe and their economic importance.** F. KIRNBAUER (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 291—297).

R. B. C.

**Use of euganean trachyte in the ceramic industry.** E. CREPAZ and O. CENTANIN (Chim. e l'Ind., 1938, 20, 199—200).—The possibility of using euganean trachyte mixed with clay for the production of artificial sandstone material is discussed. The product containing 7.5% of clay is very resistant to the action of conc. acids and sufficiently so towards alkalis.

O. J. W.

**Applications of electrophoresis and electro-osmosis in the ceramic industries.** C. E. CURTIS (Trans. Electrochem. Soc., 1938, 73, Preprint 33, 449—455).—Industrial methods (Schwerin) of de-watering clay suspensions based on electrophoresis are described and their advantages relative to the usual methods of settling and filter-pressing are discussed. Electro-osmosis is used for lubricating steel dies in the stiff-mud process.

D. A. C.

**Toughening ceramic coatings.** J. H. BENRUBI (Compt. rend. XVII Cong. Chim. Ind., 1937, 178—181).—It is possible to toughen glazed surfaces by chilling, as with glass; thus leading to an increase of thermal and mechanical resistance.

G. H. C.

**Effect of hydrocarbon gases on refractory materials. I. Effect of methane.** E. ROWDEN and A. T. GREEN (Trans. Ceram. Soc., 1938, 37, 75—99).—After being exposed to  $CH_4$  at  $800^\circ$  for 67 hr. several firebricks were completely disintegrated by the deposition of C, but  $SiO_2$  bricks were only discoloured. The soot-like deposit which formed around Fe spots consisted of a strongly magnetic Fe com-



pound, C, and a small amount of carbide. It is considered that a catalyst formed during the early stages becomes active during the later stages of the reaction. A comprehensive survey of the subject and a bibliography are given. J. A. S.

**Attack of refractories by wood ash.** M. LE-PINGLE (Compt. rend. XVII Cong. Chim. Ind., 1937, 141—165).—The attack is due to alkali, and only 2 out of 16 commercial firebricks of the  $\text{SiO}_2\text{-Al}_2\text{O}_3$  type resisted attack. Immunity appears to be due to closeness of texture and freedom from impurities, and is correlated to the presence of org. matter naturally present in the materials of manufacture. G. H. C.

**Development of a slagging test for refractories.** H. M. KRANER (Met. & Alloys, 1938, 9, 79—83).—The conditions that have to be represented by an adequate test are discussed, with special reference to open-hearth steel furnaces. S. J. K.

**Constitution of steatite. I. Crystalline phase.** W. BÜSSEM and C. SCHUSTERIUS. **II. Glass phase.** W. BÜSSEM, C. SCHUSTERIUS, and K. STUCKARDT (Wiss. Veröff. Siemens-Werken, 1938, 17, 59—89).—X-Ray investigations show that the metastable  $\text{MgSiO}_3$  proto-enstatite (I) is the main cryst. ingredient of steatite, and that the disintegration of steatite is due to change of (I) into klno-enstatite (II). In manufacture the stabilisation is favoured by small particle size, presence of the glass phase, and absence of much stress. The relations between (I), (II), and enstatite are discussed. Studies of the phases formed in the systems  $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2$  and  $\text{Mg}_2\text{SiO}_4\text{-CaAl}_2\text{Si}_2\text{O}_8\text{-SiO}_2$  indicate that admixture of clay and  $\text{CaCO}_3$  during burning causes dissolution of the initially formed  $\text{MgSiO}_3$ , yielding considerable amounts of glass. This is confirmed by the observations that X-ray data and expansion curves indicate the presence of very little cristobalite, and by the production of fluorescence in presence of  $\text{UO}_3$ . In technical steatite 25—50% of glass is present. J. W. S.

**Protecting chemical plant.**—See I. **Physical chemistry of clay.**—See V. **Cement-kiln lining.** **Magnesite linings.**—See IX. **Determining moisture in moulding sands.** **Flower pots.**—See XVI.

See also A., I, 314, Influence of  $(\text{NH}_4)_2\text{SO}_4$  on fusion of  $\text{Na}_2\text{O-CaO-SiO}_2$  glass.

#### PATENTS.

**Methods of heating rapidly-revolving tube furnaces for melting glass, silicates, and other refractory materials.** G. ZOTOS (B.P. 482,163, 3.2.37. Ger., 14.2.36).—A furnace of the type in which the charge spreads over the whole interior surface is heated by a gas flame and the very hot gases from combustion (and steam if desired) are passed through reducing material and used again as much as possible in the furnace, the remainder being burned in a superheater for the regenerated gas. B. M. V.

**Making and use of a glass batch.** B. A. JEFFERY and F. H. RIDDLE, Assrs. to CHAMPION SPARK PLUG CO. (U.S.P. 2,062,907, 1.12.36. Appl. 20.5.33).—The batch mixing is ground to form a 3 H (B.)

slip, spray-dried to produce pellets, and fed into the melting furnace. J. A. S.

**Heat-resisting fluoride borosilicate glass.** H. P. HOOD, Assr. to CORNING GLASS WORKS (U.S.P. 2,072,207, 2.3.37. Appl., 19.3.34).—A glass which is heat-resisting but has a moderate softening temp. and is stable to alkaline solutions comprises borosilicate ( $\text{SiO}_2$  80—90%, i.e., 6—12 times the  $\text{B}_2\text{O}_3$  content), but is substantially free from alkaline earths and from O compounds of alkali metals by reason of the presence of F (<25% of the alkali oxides); smaller proportions of Cl are permissible, the content of F being >0.75% and of  $\text{Na}_2\text{O}$  <5%. B. M. V.

**Manufacture of glass sheets, and particularly of coloured glass and opaque glass, coloured or not.** COMP. RÉUNIES DES GLACES ET VERRES SPÉCIAUX DU NORD DE LA FRANCE (B.P. 469,962, 10.2.36. Fr., 13.6.35).—A slot is provided near the bottom of the tank, through which glass is fed continuously to a rolling mill and lehr. The mill and lehr form a unit which may be moved laterally to serve a series of tanks placed in line. Devices to regulate the flow and temp. of the glass are described. J. A. S.

**Tempered glass articles.** PILKINGTON BROS., LTD., and J. B. MITFORD (B.P. 469,994, 2.1.36).—A method is described for producing a uniform degree of tempering in an article of non-uniform thickness and/or curvature. The article is "over-tempered" and reheated to a temp. such that the temper in the over-tempered parts is diminished and approaches equality to that of the least tempered parts which are unaffected by the reheating process. The degree of reheating is decreased until the "fragmentation size" of the glass is suitably > that of the over-tempered glass and yet the glass is able to withstand the specified shock test. J. A. S.

**Method of reducing the tendency of tempered glass articles to yield under their internal stresses.** R. HADDAN, From CORNING GLASS WORKS (B.P. 482,914, 24.12.36).—The article is tempered to a stress > that finally desired; e.g., respectively 4 and 3 kg./sq. mm., and the stress is subsequently reduced to the lower val. by reheating to a temp. substantially below the strain point. B. M. V.

**Manufacture of fibres from glass and similar meltable materials.** A. E. EDWARDS, From N. V. MAATS. TOT BEHEER EN EXPLOIT. VAN OCTROOIEN (B.P. 481,690, 8.2.37).—Small streams of molten material are acted on by blasts of steam or fuel gas flowing in the same general direction. B. M. V.

**Production of fibres from molten glass and similar meltable materials.** P. MODIGLIANI (B.P. 481,827, 17.2.37).—A small stream of molten glass is further heated while flowing in an unenclosed helical path and is then subdivided and the threads are drawn out. A no. of non-pneumatic devices for the drawing are described. B. M. V.

**Methods of forming siliceous fibres, especially glass fibres.** N. V. MAATS. TOT BEHEER EN EXPLOIT. VAN OCTROOIEN (B.P. 482,085 and Addn.



B.P. 482,090, [A] 27.5.37, [B] 22.6.37. U.S., [A] 28.5.36, [B] 24.7.37.—(A) The material immediately prior to and during passage through fine orifices (a no. in parallel, diameter 0.02—0.08 in.) is maintained at a temp. of complete fluidity (1260°) and thereafter is rapidly cooled by air currents and mechanically drawn to  $>5\mu$ , the air currents being preferably in a direction to assist drawing. Prior to winding, the fibres may be coated with lubricant; their tensile strength is claimed to be  $(1.0-1.5) \times 10^6$  lb./sq. in. (B) The fibres are pulled upwards and the die plate on the surface of the liquid is heated under control.

B. M. V.

**Manufacture of safety glass.** SOC. DES USINES CHIM. RHÔNE-POULENC (B.P. 483,143, 29.11.37. Fr., 17.12.36).—The intermediate layer for the glass sheets is  $<2$  mm. thick and consists of a cellulose derivative (acetate) with which is incorporated 34—55% of a plasticiser, e.g.,  $\text{Ph}_3\text{PO}_4\text{-}o\text{-C}_6\text{H}_4(\text{CO}_2\text{Me})_2$ -triacetin.

S. M.

**Laminated glass.** E. L. FIX and B. J. DENNISON, Assrs. to DUPLATE CORP. (U.S.P. 2,072,583, 2.3.37. Appl., 17.2.34).—The safety layer comprises a cellulose plastic (preferably of the "ethyl-type") and this is cemented on both sides by a solution containing  $\text{H}_2\text{O}$ , a cellulose derivative similar to that forming the sheet, a solvent thereof, and an alkali stannate, citrate, phosphate, arsenate, oxalate, bromide, molybdate, silicate, tungstate, aluminate, chromate, antimonate, permanganate, or vanadate.

B. M. V.

**Manufacture of laminated glass.** C. S. SHOE-MAKER, Assr. to AMER. WINDOW GLASS CO. (U.S.P. 2,069,425, 2.2.37. Appl., 8.6.36).—Clean glass sheets are coated with a thin film of polymerised acrylic ester, dried by hot air, and sprayed with  $o\text{-C}_6\text{H}_4(\text{CO}_2\text{Bu})_2$ ; the warm (66°) plates are then pressed together and autoclaved at  $>20$  (50) lb./sq. in. for 45 min. at room temp.

L. C. M.

(A) Sealing of, (B) manufacture of, laminated or compounded safety glass. TUDOR SAFETY GLASS CO., LTD., C. T. PUGH, and W. ASH (B.P. 482,169—70, [A] 3.3.37, [B] 26.11.37).—(A) The safety layer is grooved out around the edges, the groove filled with bitumen, and the whole pressed at 50—200 lb./sq. in. for  $<\frac{1}{2}$  hr. at a temp. to soften the bitumen. (B) The sheet comprises 2 layers of glass between which are 3 layers of cellulose acetate, the centre one containing 18% and the others 50% of plasticiser; a solvent may also be used to promote adhesion.

B. M. V.

**Glass-to-metal seal.** H. SCOTT, Assr. to WESTINGHOUSE ELECTRIC & MANUFACTURING CO. (U.S.P. 2,065,404, 22.12.36. Appl., 19.7.34).—The use of Fe alloy containing Ni 42—50, Co 0.1—20, and 1—7% of one or more of the elements Mn 1—5, Cr 0.2—7, Si 0.1—2, Al 0.02—1, and B 0.02—1%, which yields an oxide-filmed surface easily wetted by glass of  $\alpha = (7-12) \times 10^{-6}/^\circ\text{C}$ , is claimed.

L. C. M.

**[Tunnel] oven and system of ventilation therefor.** H. E. SOMES (U.S.P. 2,040,884, 19.5.36. Appl., 20.12.34).—A tunnel oven for baking synthetic enamels or the like embodies electric induction

heating and comprises two metallic shells separated by material which is an insulator of both heat and electricity. Provision is made for a supply of heated air.

B. M. V.

**Treatment of clays.** ENGLISH CLAYS, LOVERING, POCHIN & CO., LTD., and R. J. DAVIES (B.P. 471,554, 17.3.36).—Casein sol (with or without  $\text{H}_2\text{SO}_4$ , alum, etc.) is used as a flocculating agent to facilitate the separation of clay from a suspension.

J. A. S.

**Ceramic tile composition.** A. MALINOVSKY, Assr. to MALINITE CORP. (U.S.P. 2,072,460, 2.3.37. Appl., 13.3.33).—The tile is composed of talc, steatite, tremolite, soapstone, and/or serpentine 29—60, common glass 10—52, and common clay 4—30%, the mixture being such that when burned at 870—1200° for 1 hr. the magnesian materials are united by a glassy matrix and uncombined  $\text{SiO}_2$  disappears. The tile tenaciously retains a glaze.

B. M. V.

**Production of ceramic particles resistant to spalling.** MAGNESITAL GES.M.B.H. (B.P. 473,834, 16.3.36. Ger., 19.3.35).—A magnesite brick is made by adding to the raw material a small amount (2—6%) of substances which retard or prevent recrystallisation, e.g., chrome ore,  $\text{Cr}_2\text{O}_3$ ,  $\text{MnO}_2$  ore, talc, but not  $\text{Al}_2\text{O}_3$  or its compounds.

J. A. S.

**Manufacture of ceramic products.** C. F. RAMSEYER, Assr. to CHICAGO DISTRICT ELECTRIC GENERATING CORP. (U.S.P. 2,055,706, 29.9.36. Appl., 6.6.32).—"Fly ash" from the combustion of pulverised fuel, after treatment to remove S and any C in excess of 2%, is used as a constituent of ceramic mixes, using 4—5% of bentonite clay as binder.

J. A. S.

**Refractory materials.** V. M. GOLDSCHMIDT (B.P. 474,038, 21.4.36. Austr., 20.2.36).—A material resistant to attack by slag is produced by burning a mixture consisting of coarsely-granular  $2\text{MgO}\cdot\text{SiO}_2$  (e.g., olivine) and finely-ground material such as sintered magnesite, chromite, chrome-spinel,  $\text{ZrO}_2$ , talc, etc. E.g., a suitable mixture consists of olivine rock (grain 1—10 mm.) 75, caustic magnesite 2.5, chromite 20, and clay 2.5% (grain  $<0.1$  mm.).

J. A. S.

**Manufacture of refractory products.** C. ARNOLD, From NON-METALLIC MINERALS, INC. (B.P. 470,028, 8.2.36).— $2\text{CaO}\cdot\text{SiO}_2$  (I) which does not undergo a shattering inversion on cooling is made (without the use of stabilisers such as  $\text{Cr}_2\text{O}_3$  etc.) by heating very finely-divided  $\text{SiO}_2$  (or hydrated  $\text{SiO}_2$ ) with CaO. Products containing substantial amounts of such stable (I), with or without admixture of MgO, are highly refractory. The material may be crushed, mixed with  $\text{H}_2\text{O}$ , moulded, and allowed to harden.

J. A. S.

**Grinding wheels.** NORTON GRINDING WHEEL CO., LTD. From NORTON CO. (B.P. 469,993, 1.1.36).—The ceramically bonded wheel is fired to the vitrifying temp. and subsequently cooled so that the central portion is solidified before the outer portion, whereby the continued contraction of the former imposes a permanent compressive strain on the latter. The compressive strain neutralises the centrifugal tensile strain and thereby increases the bursting



strength of the wheel. The differential contraction may be introduced by reheating an already fired wheel to the softening temp. of the bond. Suitable apparatus is described. J. A. S.

**Grinding wheels and other abrasive articles.** NORTON GRINDING WHEEL CO., LTD. (B.P. 482,351, 26.9.36. U.S., 28.9.35).—In order that a ceramic bond may be used with oxidisable grains, a substance capable of preferential reaction with oxidising gas, e.g., Si, Al, Mg, B, BC, or B suboxide, is also incorporated ( $\geq 1:1$  of the bond) with the mixture. B. M. V.

**Buffing and polishing composition and method of using it.** P. R. PINE, Assr. to CHANDLER CHEM. CO. (U.S.P. 2,055,220, 22.9.36. Appl., 7.2.35).—A composition capable of adhering to a polishing wheel consists of a bond and abrasive powder, both of which are sol., saponifiable, or emulsifiable in the same cleaning bath. E.g., an article polished with stearic acid 25,  $\text{Na}_2\text{SO}_4$  75%, or stearic acid 20, tallow 5, powdered fused borax 25,  $\text{Na}_2\text{SO}_4$  50%, is readily cleaned with alkali solutions. J. A. S.

**Treatment of glass [to prevent moisture condensation thereon].** A. J. M. MILLER (B.P. 473,749, 18.3.37).

[Airtight door for] apparatus for de-airing clay and similar plastic substances. J. M. and C. L. WILLIS (B.P. 482,968, 6.11.36).

**Spun-glass insulation.**—See I. Glass-filled paper.—See V. Enamelled sheet Fe.—See X.

## IX.—BUILDING MATERIALS.

**Burning of cement in kilns with grates.** E. SCHIRM (Tonind.-Ztg., 1938, 62, 367—372).—Lellep's preheating grate is applicable only to dry-process plants, but arrangements are described for drying slurry with similar devices, such as rocking stepped grates, rotating frames festooned with loops of chain which dip into a pool of slurry, rotating cylindrical grates with a radial flow of hot gases, and circular flat grates with rotating radial vanes. Vac. dewatering on a moving belt is also used, but is possible only with those types of raw material which do not choke filters. A kiln is described in which the actual burning of the clinker is carried out on a chain grate. The  $\text{H}_2\text{O}$  content of slurry may be reduced without excessive  $\eta$  by foaming with air. G. H. C.

**Magnesite linings in kilns.** W. F. ROCHOW (Rock Products, 1938, 41, No. 4, 82—83).—Such linings in the burning zones of cement or dolomite kilns have far longer lives at overload outputs than can be attained with high- $\text{Al}_2\text{O}_3$  bricks. G. H. C.

**Dolomite lining of the sintering zone of cement kilns.** P. P. BUDNIKOV, K. F. MUCHIN, and D. O. NIRENSCHTEIN (Ukrain. Chem. J., 1938, 13, 115—131).—Dolomite ( $\text{SiO}_2$  6.64,  $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$  6.08,  $\text{Mn}_2\text{O}_4$  0.2,  $\text{CaO}$  27.98,  $\text{MgO}$  17.59%) burned at  $1560^\circ$  did not deteriorate after exposure to atm. conditions during 2 years, and is suitable for lining the kilns. The lining reacts with firebrick at  $1200^\circ$ , so that its extent should considerably exceed the sintering zone. In the case of rammed linings anhyd. coal tar should

be used as binder (8—10% on the wt. of dolomite), and heating conducted gradually until elimination of hydrocarbons is complete. Directions for prep. of dolomite bricks are given. R. T.

**Verification of the heat balance of a rotary [cement] kiln.** H. GYGI (Compt. rend. XVII Cong. Chim. Ind., 1937, 589—602).—See B., 1937, 1054.

G. H. C.

**Manufacture of Portland cement from calcium sulphate.** J. NICOLETIS (Compt. rend. XVII Cong. Chim. Ind., 1937, 729—736).—An English plant is described which yields a satisfactory product. Substitution of  $\text{CaSO}_4$  for  $\text{CaCO}_3$  leads to presence of 8% of  $\text{SO}_2$  in the flue gases, which can be used to produce  $\text{H}_2\text{SO}_4$ . The temp. required to decompose  $\text{CaSO}_4$  is diminished by addition of C and  $\text{SiO}_2$ . G. H. C.

**Non-shrinking and expanding cements.** H. LOSSIER (Rev. Univ. Min., 1937, 13, 166—169).—Concrete cubes containing 300 kg./cu.m. of a special cement (composition not stated) were either removed from the mould after 24 hr. and stored in a damp atm. or stored under the same conditions in steel moulds capable of preventing expansion in all directions. The compressive strengths of the cubes of both series at 7, 28, and 45 days, and the elongation of rods of neat cement and of the concrete, are given. R. B. C.

**Sulphate-resisting [Portland] cement.** S. RORDAM (Trans. Amer. Soc. Mech. Eng., 1938, 60, 233—234).—Cements resistant to attack by sea- $\text{H}_2\text{O}$ , the compositions of which are reviewed, are recommended for use in oil wells especially when the temp. of the corrosive  $\text{H}_2\text{O}$  encountered is  $< 93^\circ$ . R. B. C.

**Influence of clinker composition on chemical stability of puzzuolanic Portland cements.** I. O. ALEXANDROV (Ukrain. Chem. J., 1938, 10, 105—114).—The corrodibility of puzzuolanic cements with respect to sea- $\text{H}_2\text{O}$ , aq.  $\text{CaSO}_4$ , and  $\text{MgSO}_4$  rises with diminishing saturation of the constituents with  $\text{Ca}(\text{OH})_2$ . Raising the  $\text{Ca}(\text{OH})_2$  content with the object of increasing the mechanical strength of the cements should be avoided. R. T.

**Minor constituents in Portland cement clinker.** H. INSLEY and H. F. McMURDIE (J. Res. Nat. Bur. Stand., 1938, 20, 173—184).—The application of polished sections for examination with the metalurgical microscope, and of a technique involving polished thin sections for examination by the metalurgical and petrographical microscopes, in the investigation of the minor components of Portland cement clinker is described. Free  $\text{MgO}$  may be determined in the unetched section and free  $\text{CaO}$  in the section after etching. Interstitial material between the silicate crystals may be differentiated into white and grey products. The former is identified as  $4\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3$  (I); the latter is usually glass, but is occasionally shown in cryst. form either as prisms of a compound of  $\text{CaO}$ ,  $\text{Na}_2\text{O}$ , and  $\text{Al}_2\text{O}_3$  or, more rarely, as rectangular crystals of  $3\text{CaO} \cdot \text{Al}_2\text{O}_3$ . Data are also given of the system  $\text{MgO}$ —(I), which is shown to be a simple eutectic type, the eutectic being at 8%  $\text{MgO}$ ,  $t = 1370^\circ$ . The difficulties in the determin-



ation of the compound composition of clinker are discussed. T. W. P.

**Determination of Portland cement clinker minerals under the polarising microscope.** O. E. RADCZEWSKI and H. E. SCHWIETE (Zement, 1938, 27, 246—257, 275—280, 287—291).—The Rosiwal method (*ibid.*, 1921, 10, 220; 1922, 11, 442) consists in traversing a thin section across the microscope field and integrating the linear traverse across each mineral component. Two commercial integrating stages are described. It is necessary to make a total run of 50—70 mm., and the reproducibility is  $\pm 2\%$  on good sections or  $\pm 6\%$  on poor ones; different clinker grains from the same sample may show variations of 5%. Voids must be measured in the same manner as the mineral components and the analysis afterwards corr. for them. From a rotary kiln hourly clinker samples were examined over a period of 11 hr. and in the grains between 7—10 mm. the content of  $3\text{CaO}\cdot\text{SiO}_2$  (I) varied between 51 and 70%,  $2\text{CaO}\cdot\text{SiO}_2$  from 0.5 to 10%, and pore vol. 11.5 to 24%. High vals. of (I) and low pore vol. were associated with hard burning. In one sample pore vol. increased with grain size. The val. found for (I) was  $>$  that calc. by Bogue's method. G. H. C.

**Determination of [cement] fineness with the turbidimeter.** H. E. VON GRONOW (Tonind.-Ztg., 1938, 62, 301—365).—The instrument consists of a lamp, a cell containing liquid in which the cement or kiln feed is dispersed, a photoelectric cell, a rheostat, and a microammeter. The rheostat is adjusted until the meter indicates 100 on its scale with the cell full of liquid but no cement. A known wt. of cement is dispersed in the liquid and the % diminution of the light read directly. The log of this is  $\propto$  the sp. surface, the transmission factor of the cement, and the mass of cement dispersed. A 2:1 mixture of castor oil and petrol is recommended as dispersing liquid. A table is given, applicable to cells 30 mm. thick, for concns. near 3 mg./ml. and transmission factors between 0.37 and  $0.49 \times 10^{-4}$ . Most cements require a factor of about  $0.46 \times 10^{-4}$  and cement kiln feed  $0.40 \times 10^{-4}$ . G. H. C.

**Dental cements.** J. C. P. BESFORD (Brit. Dental J., 1938, 64, 82—84).—Oxyphosphate dental cements are not truly adhesive. The alleged deleterious action of silicate cement on the pulp is best guarded against by a ZnO-eugenol and not an antiseptic Cu-cement lining. W. O. K.

**Constitution and hydraulicity of slags.** L. CHLASSEVENT (Compt. rend. XVII Cong. Chim. Ind., 1937, 1041—1048; cf. B., 1938, 378).—Chemical, optical, and X-ray analytical methods do not distinguish the hydraulic properties of slags. Hydraulicity is best indicated by the resistance of the slag to attack by acid and alkali (rate of dissolution and decrease in strength; thermal reaction). J. A. S.

**The puzzuolana reaction.** G. BATTÀ and A. LEFEBVRE (Compt. rend. XVII Cong. Chim. Ind., 1937, 8—20).—Mortars containing Portland cement and trass, "gaize," or slag were attacked only slightly less strongly than cement and sand. The CaO-fixing faculty of puzzuolanas is destroyed by Mg salts; and

their protective action is purely mechanical. Trass shows a marked base-exchanging property. G. H. C.

**Influence of fineness of cement on permeability of concrete.** M. MARY (Compt. rend. XVII Cong. Chim. Ind., 1937, 264—271).—Permeability is determined principally by the particle sizes of the finer part of the aggregate and of the cement, the least permeable concrete containing cement of greatest sp. surface. G. H. C.

**Coloured and decorative concrete in roads and buildings.** H. A. HOLT (Chem. and Ind., 1938, 467—468).

**Examination of set concrete.** A. STEOPOE (Tonind.-Ztg., 1938, 62, 305—367).—When inert aggregate has been used, the proportioning of the mix may be found by dissolving in 3.5% HCl, and treating the insol. residue with 5% NaOH, to remove gelatinous  $\text{SiO}_2$  remaining from the cement. Alternatively, the mass may be broken up by dissolving in conc. HCl, or by heating and quenching, and the cement removed by washing. Determination of "sol.  $\text{SiO}_2$ " gives high results. The grading of the aggregate is found from the insol. residue. The "sol.  $\text{SiO}_2$ " content of the sand appears to have an influence on the properties of the concrete. G. H. C.

**Plastic mortar cubes.** H. W. LEAVITT (Prog. Amer. Soc. Test. Mat., 1937, 37, 1, 321—332).—Three different methods of preparing 2-in. cubes for use in testing the compressive strength of concrete were investigated by ten co-operating laboratories. No one method was better than another. R. B. C.

**Crushed stone research.** A. T. GOLDBECK (Rock Products, 1938, 41, No. 3, 44—46).—Tests of three gradings of crushed limestone (3 in. down, with, respectively 8, 14, and 20%  $< 200$ -mesh) and one grading with added clay were made with a loaded, pneumatically-tyred wheel on a circular track. Although the track was quite stable when dry, ruts were rapidly formed when  $\text{H}_2\text{O}$  was present. The fine matter keeps  $\text{H}_2\text{O}$  out, but clay confers plasticity and is deleterious. Asphalt which retains too much volatile matter has the same effect; in general, its effect is primarily exclusion of  $\text{H}_2\text{O}$ . It is ineffective if no dust be present. The proportion of voids serves as a good measure of angularity of crushed stone or sand. Concrete made with splintery or flaky sand needs more  $\text{H}_2\text{O}$ . G. H. C.

**Water-penetrability of clay and shale building brick.** J. W. MCBURNEY and A. R. EBERLE (J. Amer. Ceram. Soc., 1938, 17, 210—216).—The results of  $\text{H}_2\text{O}$ -adsorption tests on 1600 brick samples are considered with respect to a specification demanding a  $\text{H}_2\text{O}$ -adsorption range per brick (after 3 min. partial immersion) of 1—4 oz. J. A. S.

**Aqueous salt solutions for laying road dust.** H. WIESENTHAL (Teer u. Bitumen, 1937, 35, 294—295).—The advantages and disadvantages of aq.  $\text{CaCl}_2$  and  $\text{MgCl}_2$  are discussed. R. B. C.

**Weathering tests on filled [and unfilled] coating asphalts.** O. G. STRIETER (J. Res. Nat. Bur. Stand., 1938, 20, 159—171).—The durability of the asphalts was determined both in outdoor and in



accelerated exposures. The filled were the more durable; the increase in durability depending on character, proportion, and particle size of the filler.  $\text{Ca}(\text{OH})_2$  as a filler was an exception and did not increase durability. The data demonstrate the similarity between outdoor and accelerated weathering. T. W. P.

**Action of cement on wood.** W. DOMINIK and M. HAUS (Przemysł Chem., 1938, 22, 74—82).—The harmful action of cements on timber is due exclusively to  $\text{Ca}(\text{OH})_2$ , which causes dissolution of lipins, and decomp. chiefly of pentosans, to a smaller extent of lignin, and least of all of cellulose. The destructive action of clay cements is < that of Portland cement. R. T.

**Modern methods of timber preservation.** C. SISLEY (Oil and Col. Tr. J., 1938, 93, 750—755).—The life history of and damage caused by different species of fungi and beetles are described and the use of wood preservatives is briefly reviewed. D. R. D.

**Examination and preservation of wood poles, and prolongation of their life, by the oxy-acetylene scouring and charring process.** H. C. MORGAN (Proc. XII Internat. Congr. Acetylene, 1936, 5, 1138—1155).—A general description of the process (now of commercial importance in Australia) and treatment plant is given and the monetary savings effected and advantages over the older preservative methods are discussed. P. G. McC.

**Fire-protective treatment of wood.** K. PESCHER (Österr. Chem.-Ztg., 1938, 41, 179—182).—Thermal decomp. of wood begins at  $105^\circ$  and becomes rapid at  $>200^\circ$ . It becomes exothermic at  $260$ — $290^\circ$ , according to its physical properties. Methods of testing wood impregnated with fire-resistant materials are described, and impregnation and coating methods of treatment are compared. The protective materials used are generally aq. solutions, 75% of them being based on water-glass with various admixtures. Wood previously freed from  $\text{H}_2\text{O}$ , resin, etc. by heating, and impregnated with low-m.p. metals (Pb, Sn, and alloys), develops no combustible gas and shows good fire-resistance. Plates made from sawdust and scrap wood, bound with water-glass and cement, are very fire-resistant. Another process involves impregnation with materials which on heating evolve  $\text{H}_2\text{O}$  vapour, which dilutes the combustible gases. The wood may also be impregnated with a non-volatile liquid, which gives mechanical protection from the atm. J. W. S.

**Fire tests of treated and untreated wood partitions.** C. R. BROWN (J. Res. Nat. Bur. Stand., 1938, 20, 217—239).—Tests are described on 4-ft. square partitions of untreated longleaf pine and of the latter treated with varying amounts of  $\text{NH}_4\text{H}_2\text{PO}_4$ . Three different thicknesses were tested. Further tests on partitions (10 ft.  $\times$  16 ft.) of treated birch are also described. Results from the former indicated that the fire-resistance varied with the thickness and design of the specimens, but that the concn. of solution had little effect. The size of the specimen was not important. Fire-tube and flame-penetration test data are given. Fire-resistance as given by the

first tests does not bear any relation to the fire-tube tests, but compares with the flame-penetration test on partitions of the same type of construction. T. W. P.

**Collapse [of timber] and its removal: recent investigations with *Eucalyptus regnans*.** W. L. GREENHILL (Counc. Sci. Ind. Res. Australia, 1938, Div. Forest Prod., Tech. Paper 24, 29 pp.).—Collapse in timber, resulting in excessive shrinkage, may be permanently removed by reconditioning in steam ( $70$ — $100^\circ$ ) for periods up to 24 hr. E. A. R.

**Extraction of wood by glycol monoethyl ether.** W. DOMINIK and M. HAUS (Przemysł Chem., 1938, 22, 97—107).—The residue (55%) from extraction of pine sawdust with  $\text{OH}[\text{CH}_2]_2\text{OEt}$  (I) containing 0.2% of  $\text{H}_2\text{SO}_4$  (12 hr. at the b.p.) consists of  $\alpha$ -cellulose (II) 72 and lignin 17%; the yield of (II) falls when the  $[\text{H}_2\text{SO}_4]$  is altered, or when other acids ( $\text{HNO}_3$ ,  $\text{H}_2\text{C}_2\text{O}_4$ ) are taken. The corresponding residues from ash or willow contain more (II) and less lignin than from pine. The extracts are diluted 10-fold, when resins and lignin separate, leaving carbohydrates in solution (8% yield). Alternatively, the extracts are distilled, when a brittle, black residue of resins + lignin, m.p.  $105^\circ$ , is obtained. (I) is determined in the extracts by distillation from  $\text{H}_2\text{SO}_4$ -HBr and measuring the vol. of EtBr collecting in the receiver. R. T.

**Phenol-formaldehyde resin as a plywood adhesive.** L. E. STOUT and B. BREW (Mod. Plastics, 1938, 15, No. 7, 39—40, 41, 68, 70).—From tests carried out on maple, red gum, cottonwood, and birch it is concluded that  $\text{PhOH}-\text{CH}_2\text{O}$  resin gives a satisfactory moisture-resistant bond for plywood under properly controlled conditions. Optimum bonding temp. range from  $190^\circ$  to  $200^\circ$ , and suitable pressures are 100 and 250 lb./sq. in. for soft and hard woods, respectively. F. McK.

**Gluing together of plywood.** E. MÖRATH (Chem.-Ztg., 1938, 62, 293—294).—The supply of glue can be increased by a more careful utilisation of tanned leather scrap, bones, and fish refuse. Blood-albumin and by-product protein glues obtained from pressed soya-bean and castor oil seed are used to replace imported casein. Wood joints made by using  $\text{PhOH}-\text{CH}_2\text{O}$  resin glues, or urea or  $\text{CS}(\text{NH}_2)_2$  resins, and hot-pressed are very resistant to the action of damp and mould. Very flexible joints are produced by polyvinyl and polyacrylic acid resin glues. D. P.

**Wood waste for steam generation.**—See I. Roadmaking mixtures.—See II.  $\text{CaO}$ . Hydrated  $\text{CaO}$ . Peroxidation.—See VII. Paint adhesion on concrete.—See XIII.

#### PATENTS.

**Cooling of cement.** C. E. EVERY-CLAYTON. From N. A. AHLMANN (B.P. 482,831, 5.10.36).—The  $\text{H}_2\text{O}$  vapour is removed from ground cement, prior to the final cooling in heat-conductive apparatus, either by specially injected air or by conveying the cement pneumatically. B. M. V.



**Colouring of stone chippings and the like.** G. H. HODGSON, and PENMAENMAWR & WELSH GRANITE CO., LTD. (B.P. 483,016, 9.10.36 and 3.9.37).—The colouring matter is bound by pptd.  $\text{SiO}_2$ . Preferably Na silicate, colouring matter, and acid or salt are applied, in that order (possibly the last two together), and setting is effected by heat. B. M. V.

**Construction of roads, floorings, tennis courts, etc.** D. KOMLOS (B.P. 481,868, 18.6.36).—Binders of drying oils and oil- or spirit-sol. resins for aggregates free from powder are claimed. [Stat. ref.]

B. M. V.

**Wallboards.** F. B. DEHN. From PLASTERGON WALL BOARD CO. (B.P. 482,640, 24.5.37).—The margins (and, if desired, other parts) of the board are stiffened with a suitable agent (urea-aldehyde resin), but considerable interior areas are left unstiffened to take up expansion strains. B. M. V.

**Spun-glass insulation.**—See I. Treating bitumina.—See II.

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

**Flotation treatment of specular iron ore.** G. GERTH, A. BAUMGARTEN, and W. PRÜFER (Metall u. Erz, 1937, 34, 616—619).—The ore can be satisfactorily floated in a slightly acid pulp ( $p_H$  4.7—4.9) in presence of K benzylxanthate or  $\text{C}_{10}\text{H}_7\text{NH}_2$  as collector,  $\text{H}_2\text{SiF}_6$  as a depressant for pyrite, and "Texapon" or oleic acid as a frother. The ore must be ground to a max. particle size of 150  $\mu$ . to obtain >90% yield of a concentrate containing 90—95% of  $\text{Fe}_2\text{O}_3$  free from pyrite. Grinding finer than 50  $\mu$ . renders it difficult to prevent entanglement of much quartz in the flocculated  $\text{Fe}_2\text{O}_3$ . A. R. P.

**Geology and mining of the chrome-iron ore deposits of the Balkan mountains.** G. HIESS-LEITNER (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 338—344). R. B. C.

**Utilisation of low-grade German iron ores.** W. LUYKEN (Metall u. Erz, 1937, 34, 611—616).—The relative economic vals. of the direct acid-slag smelting process, dry and wet magnetic-separation processes, magnetising roasting, and the Krupp pelletising-reduction process for the treatment of low-grade Fe ores are discussed with reference to the 4-year plan. A. R. P.

**Comparison of the results given by the Zimmerman-Reinhardt and Knop methods for determination of iron in ores.** J. I. SCHTSCHERBAKOV (Zavod. Lab., 1938, 7, 97—98).—The two methods give identical results when org. matter in the ores is eliminated by ignition or by oxidation with  $\text{KClO}_3$ . R. T.

**Pressure operation of the pig iron blast furnace and the problem of solution loss.** J. M. AVERY (Amer. Inst. Min. Met. Eng., 1938, Tech. Publ. 921, 10 pp.; Met. Tech., 1938, 5, No. 3).—A crit. review. R. B. C.

**Temperature readings in a blast-furnace stock column.** H. W. JOHNSON (Blast Furn. Steel Plant, 1938, 26, 165—168).—The technique is described. R. B. C.

**Blast furnace and raw materials development.** T. L. JOSEPH (Blast Furn. Steel Plant, 1938, 26, 47—52).—Recent developments in American blast-furnace practice are reviewed. R. B. C.

**Blast-furnace dust, a German insulating material from iron works.** H. A. WAHLS (Brennstoff u. Warmewirts., 1938, 20, 45—51).—Developments in the production and application of insulating materials prepared from the finely-ground dust are reviewed. A paste consisting of the dust mixed with asbestos can be painted on to pipes etc. R. B. C.

**Natural gas in the open-hearth [furnace].** R. VAILL (Iron Age, 1938, 141, No. 9, 34—36).—Various types of furnace are discussed in relation to the efficient use of natural gas. The maintenance of the full heat input at certain parts of the heat cycle is more difficult with a non-luminous than with a luminous flame. R. B. C.

**British open-hearth data and their correlation.** OPEN-HEARTH COMMEE. OF THE IRON AND STEEL INDUSTRIAL RES. COUNC. (Iron & Steel Inst., Symp. on Steelmaking, 1938, May 4—6, Advance copy, 33 pp.).—British production and practice are surveyed. A basis of measurement for determining the operating efficiency of an open-hearth furnace, "the performance figure," is established. Normal practice produces 2.0 and 1.6 lb. of steel/hr./therm, respectively, for fixed and tilting furnaces; the latter show a lower refractory consumption. The area of the air port should be  $\leq 6$  times that of the gas port. A charge with a high % of hot metal and a high metalloid content is worked in a deeper bath. The basic, hot-metal, fixed furnace gives the highest production per unit capacity. S. J. K.

**Application of physical chemistry to steel-making.** A. McCANCE (Iron & Steel Inst., Symp. on Steelmaking, 1938, May 4—6, Advance copy, 43 pp.).—A survey of published work on the reactions:  $\text{MeO} + \text{C} = \text{Me} + \text{CO}$ ;  $\text{FeO} + \text{Mn} = \text{MnO} + \text{Fe}$ ;  $2\text{FeO} + \text{Si} = \text{SiO}_2 + 2\text{Fe}$ ;  $2\text{MnO} + \text{Si} = \text{SiO}_2 + 2\text{Mn}$ ; and the S and P reactions. Conclusions having direct bearing on open-hearth steel-making practice are drawn. S. J. K.

**Studies of regenerative and recuperative furnaces.** W. A. MORTON (Iron Steel Eng., 1938, 15, 24—40, 45).—Recent types of furnace, e.g., a producer gas-fired, regenerative blast furnace, and an Armco non-reversing pit furnace for ingot heating are diagrammatically described, and trends in furnace design are discussed. R. B. C.

**Melting of [iron or steel] scrap in the cupola.** E. PIWOWARSKY and K. ACHENBACH (Giesserei, 1938, 25, 74—80).—Massive Fe is decarburised by gases in the cupola shaft; cementation by the coke present occurs only to a very small extent. Steel melts as such in the cupola and picks up C only by contact with coke in the hearth. The amounts of coke required for melting high-steel, steel-free, or



low-steel mixtures are about the same. The reactions occurring in the cupola are discussed. R. B. C.

**Novel development in melting practice.** V. C. FAULKNER (Found. Tr. J., 1938, 58, 235—236).—The construction of the Walbro cupola is described. C and S pick-up is low, and the temp. of the metal as tapped is above normal. R. B. C.

**[Steel] slab-heating furnaces.** ANON. (Indust. Heating, 1938, 5, 140—142; Steel, 1938, 102, No. 5, 54—56).—The construction of the Rust continuous furnaces, fired with coke-oven gas or tar, is described. R. B. C.

**Accelerated analysis of Martens slag.** A. P. DUBINSKI, L. S. ZAIKIN, and V. D. PONOMAREV (Zavod. Lab., 1938, 7, 93—94).—0.5 g. of slag is dissolved in 20 ml. of  $\text{HNO}_3$ — $\text{HCl}$ — $\text{HF}$  mixture, the solution is boiled for 30 min. with 20 ml. of  $\text{HClO}_4$ , and  $\text{Cr}^{\text{VI}}$  titrated in the cooled diluted solution. Mn is determined in the titrated solution by known methods.  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$ ,  $\text{P}_2\text{O}_5$ , and Fe are determined in a second portion of slag by the ordinary methods. R. T.

**Rapid determination of iron in slags.** N. M. MILOSLAVSKI and L. A. LIUBIMOVA (Zavod. Lab., 1938, 7, 91—92).—0.1 g. of slag is heated for 5 min. at  $1050^\circ$  with 0.5 g. of 20:3  $\text{MgO}$ — $\text{KNO}_3$  mixture, and the product is dissolved in 30 ml. of conc.  $\text{HCl}$ .  $\text{Fe}^{\text{III}}$  in the solution is titrated with standard  $\text{TiCl}_3$ . R. T.

**Determination of calcium and manganese sulphide in blast-furnace slags.** N. F. MICHAİLOVA (Zavod. Lab., 1938, 7, 95—96).—0.5 g. of slag is boiled with 35 ml. of 40%  $\text{MgCl}_2$ , the  $\text{H}_2\text{S}$  evolved is absorbed by aq.  $\text{Cd}(\text{OAc})_2$ , and the  $\text{CdS}$  pptd. is titrated iodometrically. A second portion of slag is shaken with saturated I in  $\text{EtOH}$ , and Mn determined in the filtrate by known methods; the Mn content of the slag is calc. therefrom. R. T.

**Magnetic after-effect in weak alternating fields.** I. Carbonyl iron in the recrystallised state. II. Dependence of after-effect of carbonyl iron on the mechanical state. III. Influence of annealing on the demagnetised state of carbonyl iron. H. SCHULZE (Wiss. Veröff. Siemens-Werken, 1938, 17, No. 2, 39—58, 59—67, 68—73).—I. A magnetic after-effect, which varies with frequency and temp. and is independent of the Jordan after-effect, is described.

II. The after-effect is observed only in the recryst. state.

III. After demagnetisation the after-effect is not observed unless the specimen is heated for 2 hr. at  $450^\circ$  or for a short time above the Curie temp. The effect again disappears at temp.  $>160^\circ$ .

E. S. H.

**Cast iron research and the gas industry.** J. G. PEARCE (Inst. Gas Eng., Comm. 183, 1938, 26 pp.).—The uses of cast Fe in connexion with gas and coke manufacture are considered and the strength and resistance to heat, corrosion, and wear of different types of cast irons are discussed. L. N.

**Melting cast iron in the foundry.** S. E. DAWSON (Found. Tr. J., 1938, 58, 219—221).—Data on melting

costs for cupolas, crucible furnaces, oil- and coal-fired rotary furnaces, and the electric furnace are given. Fuel consumption, the life of linings, and changes in composition of Fe during melting are discussed. R. B. C.

**Influence of copper on malleable cast iron.** F. ROLL (Giesserei, 1938, 25, 80—84).—Data on the solubility of Cu in Fe are reviewed. The effect of Cu on the mechanical, casting, and corrosion-resistance properties of white- and black-heart malleable cast Fe, and on the tendency of cast Fe to assume the white or grey forms in sections of different thicknesses, is discussed. R. B. C.

**Castings of non-magnetic iron.** G. A. ODING (Metallurg, 1935, 10, No. 6, 38—47).—Castings with C 3.4—3.7, Si 2.5—3.0, Mn 7—9, Cu 1.5—2.0, and P 0.5—0.7% have a magnetic permeability of approx. 1.3. The hardness and microstructure vary greatly with the rate of cooling. The P content may be reduced to 0.1% without reducing the fluidity.

CH. ABS. (e)

**Contraction in [iron] castings.** W. MACHIN (Iron Steel Ind., 1938, 11, 173—177).—Abnormal contraction and cracking of castings are caused by the use of unsuitable cores and moulds. The heat-treatment of a casting, e.g., an Fe wheel cast in a sand mould, to relieve stress is described. R. B. C.

**Influence of degree of deformation on ageing and recrystallisation [of iron].** W. LAMARCHE (Mitt. Kohle u. Eisenforsch. G.m.b.H., 1937, 1, 181—186).—Armco Fe (C 0.02, Si 0.01, P 0.01, S 0.02, and Cu 0.05%) was cold-worked by processes of extension, compression, and drawing to varying degrees. Recrystallisation phenomena were examined by means of grain-size determinations before and after different annealing treatments, and ageing phenomena by the determination of alterations in the impact strength. No differences could be detected in the effects of any of the three deformation processes on ageing, but the degree of deformation exerted a marked influence; as the degree of deformation increased, the impact strength decreased. Deformation by compression caused, in the crit. recrystallisation area, a grain size about 3 times as great as that caused by mechanical elongation or drawing. R. B. C.

**Structure zones in cast [iron] materials.** F. ROLL (Giesserei, 1938, 25, 25—30).—The concentric rings observed in the microstructure of pearlitic cast Fe and temper cast Fe after heat-treatment are attributed to pptn. phenomena similar to those producing Liesegang rings in colloidal systems. Numerous cases are analysed. A. R. P.

**Resistance of cast iron towards chemical and thermal influences.** F. ROLL (Korros. u. Metallschutz, 1938, 14, 93—108).—Existing information on the resistance of cast steel and all types of cast Fe to corrosion, scaling, and growth at high temp. is comprehensively reviewed. The mechanical and physical properties of certain alloy irons are given. C. E. H.

**Influence of corrosion on strength of cast iron.** E. PIWOWARSKY (Z. Ver. deut. Ing., 1938, 82, 370—



372).—A review. Corrosion is not appreciably detrimental to mechanical properties. R. B. C.

**Accelerated analysis of special cast irons and steels.** A. N. KRIVENKO (Zavod. Lab., 1938, 7, 217—220).—3–5 g. of metal are dissolved in 50 ml. of 10%  $\text{H}_2\text{SO}_4$ , and the solution is heated with 5–10 ml. of conc.  $\text{H}_2\text{SO}_4$  to copious evolution of  $\text{SO}_3$ . It is then diluted to 150 ml., heated to boiling, and 4–7 ml. of 50%  $\text{Na}_2\text{S}_2\text{O}_3$  are added. The ppt. (S,  $\text{SiO}_2$ ,  $\text{Cu}_2\text{S}$ , and graphite) is collected, washed, ignited, and weighed ( $\text{SiO}_2 + \text{CuO}$ ); it is then dissolved in  $\text{HNO}_3$ , and Cu determined electrolytically,  $\text{SiO}_2$  being given by difference. Mn and Cr are determined in aliquot parts of the filtrate from  $\text{SiO}_2 + \text{Cu}_2\text{S}$ , by known methods. R. T.

**Rapid determination of silicon in cast iron and steel.** B. M. SCHISCHKIN (Zavod. Lab., 1938, 7, 96—97).—Minor modifications of the ordinary method are described. R. T.

**Silicon impregnation of iron and steel.** H. K. IHRIG (Met. Prog., 1938, 33, 367—372).—"Ihrigising" consists in heating steel articles embedded in SiC or ferrosilicon to 1000° in presence of  $\text{Cl}_2$ . A case resistant to wear and corrosion by acids is obtained. R. B. C.

**Diffusion of silicon into steel.** H. CORNELIUS (Metallwirts., 1938, 17, 273—276).—Specimens of steels (C 0.11—1.50, Si 0.25—0.12%) were annealed at 900—1100° in Si or Fe-Si, and slowly cooled. A ferritic diffusion fringe relatively rich in Si was formed at the edges of the specimens, and the centre became enriched in C. In specimens of small diameter free  $\text{Fe}_3\text{C}$  and graphite were observed towards the centre and to a slight extent in the ferritic zone. In larger specimens no undissolved C, either free or combined, appeared in the outer layers. The  $\gamma$ -Fe solid solution absorbed little Si. C. E. H.

**Slag inclusions in steel.** H. LÖFQUIST (Jernkont. Ann., 1938, 122, 1—20).—Recent work is reviewed. Equilibrium diagrams for Fe-slag-forming substances, morphology and formation of slag inclusions, exogenic inclusions, deslagging of melted steel, influence of inclusions on the properties of the steel, and methods of identification of slag inclusions are discussed. M. H. M. A.

**Influence of free ferrite on impact strength.** N. S. ZVEREV (Vestn. Metalloprom., 1934, 14, 98—102).—Low impact strength observed in processing parts made of steel containing C 0.34—0.39, Mn 0.33—0.48, Si 0.21—0.34, and Cr 0.42—1.12% was due to the presence of free ferrite. Either this was not brought into solution before quenching, or quenching was too rapid for it to be retained in solution. CH. ABS. (e)

**Killed and rimming steels.** L. GUILLET (Rev. Mét., 1937, 34, 493—512, 545—563, 597—613, 657—664).—Replies from several steelworks to a questionnaire on the definition, methods of manufacture, properties, and uses of killed, semi-killed, and rimming steels are given in detail and existing data on the composition and vol. of the gases present in molten steel or liberated during casting are reviewed. Killed steel is defined as a steel in which the dissolved FeO

has been reduced to metal by addition of an element (Si, Al, Ti, or Zr) the oxide of which does not react with C at the casting temp., whereas a rimming steel is one in which the FeO is allowed to react with the C during solidification, liberating a large vol. of gas which concentrates as minute blowholes below an outer rim of pure Fe. This surface layer is relatively soft and takes a high finish when the metal is rolled. Rimming steel is readily welded but is highly susceptible to strain-ageing. A. R. P.

**Fracture of carbon steels at elevated temperatures.** A. E. WHITE, C. L. CLARK, and R. L. WILSON (Trans. Amer. Soc. Met., 1937, 25, 863—884).—Results of stress-time rupture tests on electric-furnace and open-hearth S.A.E. 1015 steels at 535—760° are given. A straight-line logarithmic relation exists between stress and time for fracture at any given temp. provided oxidation or corrosion does not occur. On the basis of the data obtained a method is proposed for determining the lowest temp. of recrystallisation or equicohesive temp. R. B. C.

**Control of high-speed steel for carbide liquation.** A. V. GORTSCHAKOV and V. V. SKOTNIKOV (Zavod. Lab., 1938, 7, 230—233).—A standard method and scale are given. R. T.

**[Steel] coil-spring manufacture.** J. B. NEALEY (Heat. Treat. Forg., 1938, 24, 61—64).—The method adopted by an American firm is described. Structural data relating to the gas-fired continuous furnaces used for annealing, tempering, and hardening are given. R. B. C.

**Heat-treatment of steering-gear parts.** R. FLURY (Indust. Heating, 1938, 5, 131—138).—The technique is described. R. B. C.

**Cementation.** T. BLANDFORD (Iron Coal Tr. Rev., 1938, 136, 477—479).—The process is described and its applications, e.g., in shaft sinking, are discussed. R. B. C.

**Creep tests on welded joints [in boiler steel].** H. SCHOTTKY and W. RUTTMANN (Wärme, 1938, 61, 144—147).—Creep tests were carried out at 500° on electric and autogenous welds in Mo and Cr-Mo steels containing 0.17—0.33% of Cu. Welding rods of six different compositions were used, and various heat-treatments applied to the welds. In the case of sound welds the limiting creep stress was 90—120% of that for the unwelded steel. Heat-treatment of the weld, e.g., for 500 hr. at 500°, had little effect on the results. R. B. C.

**Effect of concentrated sodium hydroxide on boiler steel under tension.** A. S. PERRY (Trans. Amer. Soc. Mech. Eng., 1936, 58, 211—216).—Conc. aq. NaOH may produce both trans- and inter-cryst. cracks. Other causes of boiler failure are discussed. CH. ABS. (e)

**Thermal analysis of deformed and quenched 18:8 steels.** G. V. AKIMOV and N. D. TOMASCHOV (Metallurg, 1935, 10, No. 6, 8—18).—The thermal effects with cold-worked 18:8 steel were: (1) at 490—540°, a combination of the exothermic effect due to disappearance of internal stresses and the endothermic effect of the  $\alpha$ - $\gamma$  transformation; (2)



at 650–695°, due to pptn. of carbides; (3) at 800°, due to recrystallisation. With quenched steels only (1) and (2) were noted. CH. ABS. (e)

**18 : 9 Chromium-manganese steels.** H. LEGAT (Metallwirts., 1938, 17, 509–513; cf. B., 1938, 384).—Tensile, deep-drawing, impact, scaling, and acid-corrosion tests have been carried out on 17 steels containing Cr 18 and Mn 9%, with or without one or more of the elements C, Si, Ni, Cu, Mo, and P. Both quenched and annealed specimens were employed, and some of the mechanical tests were carried out at temp. up to 900°. Ni appeared to be an essential addition, and particularly good properties were shown by an alloy containing Ni 3.5–3.8 and Mo 1.6–1.8%. C. E. H.

**Alloy ATV.** N. T. BALJAKIN (Vestn. Metallo-prom., 1934, 14, No. 7, 102–103).—Data are recorded for an alloy with C 0.37, Mn 1.94, S 0.003, Cr 13.27, Ni 32.67, and Fe 51.68%. CH. ABS. (e)

**Recalculation of the lattice constants under strain in the measurement of strain by X-ray methods.** H. MÖLLER and G. STRUNK (Mitt. Kaiser-Wilh.-Inst. f. Eisenforsch., 1937, 19, 305–315; cf. *ibid.*, 1934, 16, 21; 1935, 17, 157).—A relationship is derived which represents the change of lattice const. with strain better than previous equations. Data for Ni-Cr steel are recorded. J. W. S.

**Constitution of iron-chromium-manganese alloys.** C. O. BURGESS and W. D. FORGENG (Amer. Inst. Min. Met. Eng., Tech. Publ. 911, 1938, 22 pp.; Met. Tech., 1938, 5, No. 3).—Some 50 alloys containing up to 60% of Cr and 50% of Mn were submitted to metallographic analysis and to magnetic and diffraction tests. The phase diagrams prepared from the data obtained are designed to indicate the structures likely to be encountered in commercial alloys. R. B. C.

**Mechanism of precipitation phenomena in iron-nickel-copper alloys.** H. BUMM and H. G. MÜLLER (Wiss. Veröff. Siemens-Werken, 1938, 17, No. 2, 14–38).—The age-hardening of alloys containing Fe 60–50, Ni 40–34, and Cu 0–15% has been followed at different temp. by measurements of electrical resistance and magnetic properties. The influence of cold-work and annealing has been determined. E. S. H.

**Choosing a composition for low-alloy, high-strength steel.** S. EPSTEIN, J. H. NEAD, and J. W. HALLEY (Amer. Inst. Min. Met. Eng., 1936, Tech. Publ. 697, 31 pp.).—A review and discussion. C, Mn, Cr, Si, and Mo tend to give low, Cu, P, and Ni high, elastic ratios. Cu, P, and Ni raise the corrosion-resistance. Tests on sheet with C 0.10, Mn 0.50, Si 0.15, Cu 1.00, Ni 0.5, and P 0.12% are described. The impact-resistance at 20° to –40° was high and remained high after age-hardening. The ratio of endurance limits to tensile strength (= 0.72) was unusually high. CH. ABS. (e)

**Effect of temperature variation on creep strength of steels.** E. L. ROBINSON (Trans. Amer. Soc. Mech. Eng., 1938, 60, 253–259).—A review. R. B. C.

**Stress-strain diagram of mild steel in relation to the springing of the [tensile testing] machine.** G. WELTER and S. GOCKOWSKI (Metallwirts., 1938, 17, 300–304; cf. B., 1937, 680).—No drop in stress at the elastic limit was observed when the load was applied through a hydraulic-pneumatic springing device. This arrangement permits higher loads to be applied than does the mechanical springing formerly employed. C. E. H.

**Intercrystalline corrosion of soft iron in ammonium nitrate solution.** M. ŚMIAŁOWSKI (Korros. u. Metallschutz, 1938, 14, 111–113).—Intercryst. cracks were observed in stressed mild-steel parts of an  $\text{NH}_4\text{NO}_3$  plant. Tests were carried out on commercial mild steel and vac.-melted electrolytic Fe wires subjected to boiling aq.  $\text{NH}_4\text{NO}_3$  while under load. The specimens were quickly broken by stresses equiv. to 30% of the tensile strengths of the materials. There was no appreciable difference between the behaviour of the two types of Fe. C. E. H.

**Influence of tin content on rate of corrosion of copper-bearing and copper-free steels in air.** K. DAEVES (Stahl u. Eisen, 1938, 58, 603–604).—Sn has a retarding effect on the corrosion of low-C steel wires containing Sn, P, and Cu and exposed to an industrial atm., this effect corresponding with addition of Cu to Cu-free steels and of P to Cu-bearing steels. The rate of atm. corrosion bears no relation to the rate of dissolution of the steels in 2% HCl or  $\text{H}_2\text{SO}_4$ . M. A.

**Ability of non-corroding steel to resist the action of trotyl (trinitrotoluene) and picric acid.** A. V. KURDJUMOV and K. V. MISCHIN (Voenn. Chim., 1934, No. 3, 19–21).—The resistance of non-corroding steel to fused trotyl, fused picric acid + nitronaphthalene, and to conc. aq. picric acid is > that of Al or Cu. Replacement of Sn-coated Cu vessels by such steel is recommended. CH. ABS. (e)

**Stress measurements in fatigue tests [on steel].** R. GLÖCKER and G. KEMNITZ (Z. Metallk., 1938, 30, 1–3).—By coupling a synchronous rotating sector with the driving mechanism of the rotating-cantilever type of fatigue-testing machine it is possible to determine the state of stress of the specimen at any period of the test by the X-ray method. Tests made on a plain C-steel specimen with a hole drilled diagonally midway between the ends showed that the max. stresses at the edges of the hole remain practically const. until the first sign of fracture appears; if the load is below the elastic limit the whole of the stresses are taken up elastically and no fracture occurs. A. R. P.

**Deterioration of steel under service stresses.** R. A. MACGREGOR (Trans. Min. Geol. Met. Inst. India, 1937, 33, 207–228).—Conditions that modify the fatigue limit of steel, and to which most of the service failures are due, are described and illustrated. Deterioration of the steel itself, or exhaustion in course of time, is seldom responsible for failure. L. S. T.

**Magnetic investigations on precipitation-hardening iron-nickel-tin alloys.** H. LEGAT (Metallwirts., 1938, 17, 277–288).—The magnetic remanence and



coercive force of hardened alloys containing Ni 0—25 and Sn 0—24% have been determined. The coercive force is highest at approx. Ni 25 and Sn 10%. Although Sn improves the magnetic hardness, it should not be used as the principal alloying element in these steels. C. E. H.

**Surface-hardening of [ferrous] materials with coal gas and oxygen.** E. MEYER (Metallwirts., 1938, 17, 371—374).—The surface of steel articles is rapidly heated by an  $O_2$ -coal gas flame and quickly cooled, if necessary by  $H_2O$ . The interior of the article does not become hardened. The properties of the hardened surface on different steels are given. C. E. H.

**Impact-resistance of chromium-molybdenum steels at low temperatures.** I. I. BARANOV (Metallurg, 1935, 10, No. 6, 57—61).—Steel with C 0.30, Cr 0.99, Mn 0.6, Si 0.34, Mo 0.18, S 0.021, and P 0.032% was oil-quenched from 875°, drawn at 450°, and tested. The Charpy impact resistance was 9.77 kg.-m./sq. cm. at 20° and 4.90 at -60°. CH. ABS. (e)

**Low-temperature impact properties of some S.A.E. steels.** A. J. HERZIG and R. M. PARKE (Met. & Alloys, 1938, 9, 90—93).—Data for temp. down to -190°, using the Charpy specimen, are tabulated. Alloying improves the impact val. of steels. S. J. K.

**Elastic limit of steels under repeated loading.** H. BUCHOVER (Forsch. Geb. Ingenieurw., 1938, 9, 14—27).—The elastic limit was determined by temp. changes in the specimen, the occurrence of slip being accompanied by heat liberation. The elastic limit depended on the method of loading and pretreatment of the test-piece; if subjected to longitudinal stress during torsion and bending tests failure was accelerated. A definite relationship was found between the elastic limit and factors such as fatigue strength, damping, and notch-sensitivity. R. B. C.

**Determination of grain size of steel.** N. F. BOLCHOVITINOV (Zavod. Lab., 1938, 7, 46—49).—Of known methods, that of test cementation is the least trustworthy. R. T.

**Determination of grain size of steel by methods of stepwise and partial annealing.** S. M. DOROGOV (Zavod. Lab., 1938, 7, 50—52).—The cementation method is preferred to other known methods. R. T.

**Determination of grain-size number of structural medium-carbon steel.** S. K. DUNAIEV and V. N. MACHOV (Zavod. Lab., 1938, 7, 53—56).—The normalisation method is the simplest, but the cementation method is equally trustworthy, and, being generally known, is recommended as a standard method. R. T.

**Determination of oxygen in steels by Ledebur's method.** I. V. MALASCHENKO (Zavod. Lab., 1938, 7, 83—88).—The method is described. R. T.

**Determination of nitrogen in stellites and alloy steels not soluble in hydrochloric or sulphuric acid.** N. V. ZOLOTAREVA (Zavod. Lab., 1938, 7, 18—20).—2—3 g. of alloy are dissolved in  $HCl-HClO_4$ , and the  $NH_3$  content of the solution is determined by distillation from  $NaOH$ . R. T.

**Micro-determination of nitrogen in steels.** N. V. ZOLOTAREVA (Zavod. Lab., 1938, 7, 220—222).—A micro-Kjeldahl distillation procedure is described. R. T.

**Determination of sulphur in steel and ferrous alloys by combustion.** V. GRUNDBERG (Jernkont. Ann., 1938, 122, 49—51).—The specimen is burned in  $O_2$ , using Sn or S-free soft Fe as flux, and the  $SO_2$  and  $SO_3$  produced are absorbed in neutral  $AgNO_3$ . The  $HNO_3-H_2SO_4$  mixture is titrated against 0.005N- $NaOH$  (to Me-red-methylene-blue indicator). No dust trap is necessary except with Mo-steels. An accuracy of  $\pm 0.001\%$  is claimed. M. H. M. A.

**Oxidimetric and colorimetric determination of cobalt in steel.** S. I. MALOV and A. A. ELISEEV (Zavod. Lab., 1938, 7, 145—148).—0.5 g. of steel is dissolved in 30 ml. of 1:1  $HCl$ , the solution boiled for 3—5 min. with 2 ml. of  $HNO_3$ , then diluted to 250 ml., and 25 ml. of 15%  $NaOH$  and 15 ml. of 15%  $NaOH$  saturated with  $Cl_2$  are added. The ppt. of  $Fe(OH)_3 + Co(OH)_3$  is collected after 15 min., washed, suspended in 200 ml. of  $H_2O$ , and standard acid  $Fe^{II} NH_4$  sulphate is added, excess of which is titrated; the Co content is calc. therefrom. This method is less accurate than the gravimetric or colorimetric method. R. T.

**Non-ferrous foundry practice. I. Non-ferrous moulding sands.** J. LAING and R. T. ROLFE (Metal Ind. [Lond.], 1938, 52, 255—260).—For green-sand moulding, in contrast with dry-sand work, fineness of sand is essential. The factors affecting, and the recognised tests for, permeability are described. The permeability determines moulding method, and fineness determines limiting  $H_2O$ ,  $> 7.5\%$ . A moisture tester is described. Phosphor-bronze gives trouble due to penetration, and remedies are discussed. Cu-Ni alloys require extra refractoriness and Al alloys a fine sand to avoid surface defects. The composition of core mixtures, and special requirements for cores for phosphor-bronze and Al alloys, are described. S. J. K.

**Influence of pretreatment on floatability of bituminous German copper ores of the Mansfeld and Niedermarsberg type.** H. MEFFERT (Metall u. Erz, 1938, 35, 55—58).—Direct flotation of the Mansfeld carbonaceous shales results in the formation of a voluminous, thick froth which retains a large amount of gangue material and the grade of the concentrate is therefore low; conditioning of the pulp with humic acid or its alkali salts almost completely depresses flotation of the carbonaceous matter and allows concentrates to be obtained with  $> 20\%$  Cu. Very fine grinding is essential for a good recovery, which is also favoured by addition of xanthate to the mill; grinding with  $Na_2S$  has no effect on the grade of the concentrate or on the % recovery. Dry grinding and air classification seems preferable to wet grinding in some cases. Humic acid addition is unnecessary in treating the Niedermarsberg ore. A. R. P.

**Treatment of complex ores of the Rammelsberg mottled-ore type.** F. W. FREISE (Metall u. Erz, 1938, 34, 627—630).—The ore consists of an intimate mixture of finely-divided Cu pyrites 13.3, galena 11.9, blende 23.4, pyrite 21.4, pyrrhotite 1.3,



calcite 6.6, magnesite 0.5, quartz 4.7, and baryte 16.8%. It has a Mohs hardness of 5.5, but the valuable minerals cannot be liberated by fine grinding. A good extraction of the Cu can be obtained by crushing to 1 mm. size under such conditions that only the Cu and Pb sulphides are slimed; this is effected by wet grinding in presence of 0.1% of a hot-H<sub>2</sub>O extract of the seed pods of *Ceratonia siliqua*, L., or a small amount of humic acid extracted from Brazilian brown coal. The pulp so obtained is rotated at 60–70° with 10–15% aq. KCl and a catalyst (CuO or commercial rare-earth oxides) for 2–2½ hr., whereby >97% of the Cu is converted into chloride with a little sulphate. The Cu can also be extracted by a similar treatment with HCO<sub>2</sub>H in presence of a small amount of PrCO<sub>2</sub>H (produced by fermentation) and hymatomelanic acid derived from the action of dry rot on boxwood in air saturated with moisture at 32–36°. A. R. P.

**High-pressure briquetting of copper [sulphide] concentrate.** J. HOLIK (Metall. u. Erz, 1938, 35, 222–225).—Flotation concentrates obtained from a highly pyritic ore were satisfactorily briquetted with 10% of Ca(OH)<sub>2</sub> in an Apfelbeck press at 80–85°/1500–1600 atm., the pressure being applied for only 0.11 sec., provided that the moisture content did not exceed 0.15% and the proportion of material finer than 0.2 mm. was <45%. A. R. P.

**Spectrographic analysis [of ores and solutions derived therefrom].** A. C. RICE and L. A. YERKES (U.S. Bur. Mines, Rept. Invest. 3370, 1937, 21–29).—The arc method of determining Cu in chalcopyrite and Zn in blende, especially in tailing samples, is described. A. R. P.

**Determination of copper in presence of lead.** W. H. JACKSON (Chem. Eng. Min. Rev., 1938, 30, 142).—If (NH<sub>4</sub>)<sub>2</sub>MoO<sub>4</sub> is added to the acetate solution of the metals before addition of KI no interference due to the yellow colour of PbI<sub>2</sub> is encountered. This procedure avoids the necessity of pptg. the Pb as PbSO<sub>4</sub> prior to the iodide determination of Cu. A. R. P.

**Oxygen-free copper development.** ANON. (Metallurgia, 1938, 17, 207–209).—The properties of an O<sub>2</sub>-free Cu known as "Bicop" Cu are compared with those of tough-pitch Cu. Tests show that there is little difference in tensile strength or electrical conductivity of the two types of Cu in the hard or bright annealed conditions, but the O<sub>2</sub>-free Cu is superior in bend and torsion, and is not damaged by annealing in a reducing atm. No particulars are given of the method of manufacture of this O<sub>2</sub>-free Cu. L. N.

**Theory of metallic crystal aggregates. I. Density and energy changes in cold-worked copper. II. Density, coercive force, and energy changes in cold-worked iron. III. Applications of experimental work to a general theory of metallic crystal aggregates.** C. G. MAIER (Amer. Inst. Min. Met. Eng., 1936, Tech. Publ. 701, 1–18, 18–24, 25–50).—I. Changes in  $d$  in cold-working of Cu may be positive or negative. Observed changes are interpreted in terms of lattice distortion and correlated with calc. changes in energy and heat content.

II. The variation of  $d$  of Fe with cold-working is similar to that of Cu. In torsional cold-worked Fe the coercive force and  $d$  are linearly related. This is attributed to the formation of internal crystal surfaces. In cold-working by drawing, the linear relation holds only over a limited range. CH. ABS. (e)

**Metal spraying of copper.** W. E. BALLARD and D. E. W. HARRIS (Proc. XII Internat. Congr. Acetylene, 1936, 5, 1233–1238).—With a view of improving sprayed Cu coatings, the following variables which influence the O<sub>2</sub> content and, consequently, the brittleness of such coatings were investigated: type of pistol, method of spraying (whether continuous or intermittent), nature of fuel gas, air pressure, and distance of nozzle from the sprayed article. No satisfactory solution of the problem was reached. P. G. McC.

**Flux coverings for [melting] non-ferrous heavy-metal alloys.** W. CLAUS (Metallwirts., 1938, 17, 513–515).—Brass, bronze, and mixed turnings were melted without a cover and with a cover of a proprietary flux. The saving in metal due to the use of the cover was 3.5–8.4% of the wt. of the charge, the val. of which is > that of the flux used. C. E. H.

**Methods of joining copper-alloy products. IV. Tubes etc.** I. T. HOOK (Metal Ind., N.Y., 1938, 36, 6–8). L. S. T.

**X-Ray control of soldered joints in copper tubes.** V. S. TSCHERNIAK (Zavod. Lab., 1938, 7, 102–104).—X-Ray control of brass-soldered joints in Cu tubes is illustrated. R. T.

**Tests on bronzes at elevated temperatures.** J. W. BOLTON (Proc. Amer. Soc. Test. Mat., 1935, 35, 204–217).—Physical data are given for the alloy specified in A.S.T.M. standard specifications for steam-valve bronze sand-castings. The alloy with Cu 88, Sn 8, and Zn 4% consists of a solid-solution matrix, throughout which a high-Sn component (the  $\alpha$ - $\delta$ -eutectoid) is dispersed in small particles. It shows embrittlement at 315°, due to formation and possibly to penetration of the brittle eutectoid structure along grain boundaries. CH. ABS. (e)

**Copper-silicon alloys: history and foundry practice.** E. E. THUM (Met. Prog., 1938, 33, 258–262).—Everdur, Herculoy, and P.M.G. are dealt with. R. B. C.

**Quantitative spectrum analysis of non-ferrous alloys.** V. F. SMIRNOV (Zavod. Lab., 1938, 7, 190–192).—Emission spark methods of analysis of Al bronzes, Zn alloys, and babbitt metal are described. R. T.

**Piston rings.** ALDAUBS (Arts et Métiers, 1937, 90, 217–225).—Precautions necessary in the various stages of manufacture of 80:20 Cu-Sn and phosphor-bronze piston rings are discussed. R. B. C.

**Measurements of internal friction in age-hardening alloys with a modified torsion pendulum apparatus.** R. A. FLINN and J. T. NORTON (Amer. Inst. Min. Met. Eng. Tech. Publ. 914, 1938, 10 pp.; Met. Tech., 1938, 5, No. 3).—Changes in Cu-Be-Fe-Ni and Cu-Cr-Si (analyses given) during



the ageing process were studied. The data show that internal friction increases with ageing, the min. val. coinciding generally with the max. hardness. Changes in internal friction appear to indicate structural change. R. B. C.

**Determination of copper and bismuth in lead-zinc ores by internal electrolysis.** J. J. LURIE and L. B. GINSBURG (Zavod. Lab., 1938, 7, 11—15).—Oxide ores are dissolved in HCl, the solution is evaporated to dryness, and the residue extracted with 1:1 HNO<sub>3</sub>. Sulphide ores are dissolved directly in HNO<sub>3</sub>. The solutions are filtered, boiled repeatedly with HNO<sub>3</sub> to eliminate SiO<sub>2</sub>, made alkaline with aq. NH<sub>3</sub>, and then acidified with AcOH. N<sub>2</sub>H<sub>4</sub>·H<sub>2</sub>SO<sub>4</sub> is added to the solutions at 85° until they are colourless, when a Pb anode connected with an annular Pt-gauze cathode is introduced into the solutions at 85—90°. 30—40 min. later the electrodes are removed and immersed in 100 ml. of 5% NaOAc in 3% AcOH, at 80°, for 5 min. The Pt cathode is then washed with EtOH, dried at 100—105°, and weighed; gain in wt. = the Bi + Cu content of the sample. The deposit is then dissolved in HNO<sub>3</sub> and Bi determined by known methods; Cu is given by difference. R. T.

**Influence of type of coke, temperature, and time on reduction of zinc oxide.** C. F. BRENTHEL and I. A. LEROUX (Metall u. Erz, 1938, 35, 173—174).—A 5:3 mixture of ZnO and coke was heated in a graphite tube in an electric furnace for 1, 2, and 3 hr. at 950°, 1000°, 1100°, 1200°, and 1300° and the proportion of oxide reduced determined. With coke from a hard coal reduction was slow and incomplete below 1200°, but with coke from brown coal >95% reduction was obtained in 2 hr. at 1000° and >72% in 3 hr. at 950°; the latter type of coke is therefore preferable when smelting Zn. A. R. P.

**Allotropy of zinc.** A. TRAVERS (Mét. et Corros., 1938, 13, 35—36).—A review. R. B. C.

**Physical constants of purest zinc.** ANON. (Met. Prog., 1938, 33, 281).—Data are tabulated. R. B. C.

**Crystallisation force in the formation of hard zinc.** E. SCHEIL and H. WURST (Z. Metallk., 1938, 30, 4—7).—When the conditions in the galvanising bath are such that the layer of "hard Zn" is formed on the Fe surface without a layer of the  $\Gamma$ -phase application of pressure will induce this layer to form after a period which is the shorter the greater is the pressure, and, once formed, release of the pressure does not cause it to disappear; this shows that the  $\Gamma$ -phase is stable and that its non-formation in any particular case is due to its low rate of formation. Owing to its peculiar structure the "hard Zn" layer sucks liquid Zn through its hollow channels to the Fe surface and thus acquires a considerable crystallisation force which is sufficient to burst a porcelain crucible. Similar effects are shown by alloys of Zn with Mn, Co, and Ni. A. R. P.

**Die castings.** H. CHASE (Auto. Eng., 1938, 28, 180—182).—The various types of Zn-alloy castings used in the American motor car industry are illustrated. R. B. C.

**Zinc-alloy die-casting.** W. W. BROUGHTON (Met. Prog., 1938, 33, 381—386).—Process development is reviewed. R. B. C.

**Segregation phenomena in zinc die-castings.** W. CLAUS (Metallwirts., 1938, 17, 320—321).—Die-cast specimens of a Zn-Al-Cu alloy, containing approx. Al 4.3 and Cu 2.75%, were examined for heterogeneity and tensile strength after storage for 2½ years. The Al content was less in the centre of the castings than at the outside, whereas the opposite was found with Cu, but the differences in both cases were small. Annealing at 340° had little effect on the heterogeneity, but reduced the tensile strength and elongation. C. E. H.

**Testing the purity [of metals and alloys] with dithizone. I. Determination of impurities in zinc and zinc alloys.** H. FISCHER and G. LEOPOLDI (Metall u. Erz, 1938, 35, 86—88, 119—121).—A large portion of the metal is dissolved in HNO<sub>3</sub> and, after evaporating to a syrup, the solution is diluted and aliquot parts are taken for the various determinations. Pb is extracted by shaking with a CCl<sub>4</sub> solution of dithizone (I) after adding aq. NH<sub>3</sub> and KCN to convert Cu and Zn into double cyanides and NH<sub>2</sub>OH·HCl to reduce any oxidising substances; the red CCl<sub>4</sub> solution is shaken with HCl and the resulting green colour compared with that of a standard. Cu is extracted by (I) from the acid solution to which H<sub>2</sub>SO<sub>4</sub> has been added; if Ag is present this is extracted in the first shaking if only a small amount of (I) is used, giving a yellow extract, whereas Cu gives a green CCl<sub>4</sub> solution. The solution from which the Ag and Cu have been removed is treated with NaOH until all the Zn(OH)<sub>2</sub> first pptd. is redissolved, and the Cd is extracted by shaking with (I), the analysis being finished as for Pb. Results obtained in a no. of varieties of electrolytic and other commercial grades of Zn are tabulated. A. R. P.

**Corrosion-resistance of galvanised coatings.** K. DAEVES, W. PÜNGEL, and W. RADEKER (Stahl u. Eisen, 1938, 58, 410—413).—The rate of Zn destruction of galvanised wires and sheets of varying composition and galvanised according to different methods, after a given preliminary period, varied between 7 and 10 g./sq. m./year in rural atm. During the preliminary period the rate of corrosion was lower owing to O<sub>2</sub> absorption. No marked difference was attributable to the method of galvanising or the purity or thickness of the Zn coating. The rate of corrosion of galvanised material in industrial atm. was about 40 g./sq. m./year, and of non-galvanised steel was about 15 times that of galvanised. The val. of "chromatising" galvanised ware as an additional protection against corrosion is discussed, and the Cumberland process is mentioned. C. M. A.

**Production of electrolytic zinc and vanadic oxide at Broken Hill, N. Rhodesia.** O. A. E. JACKSON (J. Chem. Met. Soc. S. Africa, 1936, 36, 173—183).—Dry ore (25% of Zn) is leached without preliminary roasting or concn. Fe phosphates and vanadates are pptd. along with SiO<sub>2</sub>. Ni is removed by additions of As, Cu, and Zn dust. Cl causes dissolution of the Pb anode and is pptd. by Ag<sub>2</sub>SO<sub>4</sub>.



Cd is removed by Zn dust. The cooled solution is electrolysed to give a product containing 99.9764% Zn. A 4%  $V_2O_5$  ore is tailed. A 16% concentrate is shipped; the 7% middling is leached, first with very dil. acid to remove hemimorphite, then with conc. acid to extract V. Neutralisation of free acidity with dross ( $p_H$  3.00), followed by soda ash additions ( $p_H$  5.00), ppts. Cu vanadate. The filtrate is acidified and heated in Pb-lined tanks, when 95% of the  $H_3VO_4$  is pptd. The product contains  $V_2O_5$  93.5, Cu 0.02,  $P_2O_5$  0.01, ZnO 3.5,  $Fe_2O_3$  1.5,  $SiO_2$  0.2, and other oxides 1.27%. CH. ABS. (c)

**Spectrographic determination of impurities in commercial cadmium.** F. W. LAMB (Proc. Amer. Soc. Test. Mat., 1935, 35, 71—78).—A quantitative spectrographic method was developed for determining the following impurities: Zn 0.001—0.40, Fe 0.005, Cu 0.001—0.30, Pb 0.01—0.20, Ni 0.001—0.025, Tl 0.001—0.040%, Sn trace. Mg in Cd-base bearing alloys may also be determined spectrographically. CH. ABS. (c)

**Cadmium alloys and their applications.** G. G. MONSELMISE (Chim. e l'Ind., 1938, 20, 201—203).—The properties of the various Cd alloys used for soldering, antifriction, and protective purposes are surveyed. Some measurements of the physical properties of Pb—Cd solders are recorded.

**Indium-treated bearing metals.** C. F. SMART (Amer. Inst. Min. Met. Eng., 1938, Tech. Publ. 900, 13 pp.; Met. Tech., 1938, 5, No. 3).—Data show that addition of about 0.2% of In to Cd—Ag, Cd—Cu, or Cu—Ni bearing alloys prevents corrosion in presence of lubricants containing org. acids without impairing the fatigue-resistance. In is incorporated by electrodeposition on the bearing, followed by heat-treatment which causes diffusion of In. R. B. C.

**Causes for failure of lead and lead pipes and suggested remedies.** E. KING and K. GRAY (J. and Rec. Trans. Jun. Inst. Eng., 1934, 45, 123—138).—Mortar was a source of failure. Distilled  $H_2O$  free from  $O_2$  has no action on Pb.  $H_2O$  containing dissolved  $O_2$  rapidly oxidises Pb. In presence of  $O_2$  and  $CO_2$  protective coatings are sometimes formed. Various sources of corrosion and methods of preventing it are discussed. CH. ABS. (c)

**Accelerated analysis of refined lead.** S. J. FAINBERG (Zavod. Lab., 1938, 7, 154—158).—117.8 g. of Pb are dissolved in 420 ml. of 2:1  $HNO_3$ , 60 ml. of 2:1  $H_2SO_4$  are added, followed by  $H_2O$  to 500 ml., and the solution is filtered. 10 ml. of 10% tartaric acid and then 10% NaOH to  $p_H$  8 are added to 50 ml. of filtrate, followed by 10 ml. of 10% NaCN and 5 ml. of 5%  $Na_2S$ , and the ppt. is collected after 15 min., washed with 5%  $(NH_4)_2SO_4$ , and dissolved in 50 ml. of 1:9 HCl. The solution is filtered, and Bi determined colorimetrically in the filtrate. Cu and Fe are determined in aliquot parts of the original filtrate by known methods. R. T.

**Coating of metals with tin from the vapour phase ("stannising").** B. W. GONSER and E. E. SLOWTER (Tech. Publ. Internat. Tin Res. & Dev. Council, 1938, A, No. 76, 17 pp.).—A Sn-alloy coating

is formed on Cu and Cu alloys when the latter are heated at about 500° in a stream of  $SnCl_4$  vapour in dry  $H_2$ . The influence of time, temp., composition, and rate of flow of the "stannising" atm., and the structure of the coating has been investigated. The mechanism of vapour coating is discussed. The process appears to be specially adapted to obtaining thin, even coatings on rough, threaded, and irregular surfaces. E. S. H.

**Determination of chromium in chromite ores and concentration products.** F. W. HOERTEL (U.S. Bur. Mines, Rept. Invest. 3370, 1938, 49—57).—To ensure complete oxidation of the Cr to  $CrO_3$ , the solution derived from fusion of the ore with  $Na_2O_2$  and leaching of the melt with  $H_2O$  should be treated with 0.5 g. of  $Na_2O_2$  and boiled for 5 min. to decompose  $H_2O_2$  before acidifying with  $H_2SO_4$ . The Cr is then determined by addition of  $Fe(NH_4)_2(SO_4)_2$  and titration of the excess with  $KMnO_4$ , or with  $K_2Cr_2O_7$ , using  $K_3Fe(CN)_6$  as external indicator.

**Treatment of manganese ores in Tschiaturi.** C. HOFFMEISTER (Metall u. Erz, 1937, 34, 619—627).—The nature of the principal deposits of Mn ore in the Caucasus is described and specially constructed grinding and classification machinery for treating the ore is illustrated. Enrichment of the ore is accomplished by stage grinding followed by wet sieving and classification of the graded products; flow sheets and details of the various steps are included.

**Analysis of molybdenum [in ores].** A. C. RICE and C. E. ARRINGTON (U.S. Bur. Mines, Rept. Invest. 3370, 1938, 31—48).— $PbMoO_4$  filters most readily when it is pptd. in a solution of  $p_H$  2.3—3.0, but in the analysis of ores containing sulphides the  $SO_4^{--}$  derived from dissolution of the ore in aqua regia necessitates the adjustment of the acidity to  $p_H$  4.4 before pptn., to avoid contamination of the ppt. The presence of  $V_2O_5$  in the ore leads to incorrect results. For low-grade ores and tailings pptn. of the Mo from  $H_2SO_4$  solution at 7° by addition of  $\alpha$ -benzoinoxime followed by ignition of the ppt. to  $MoO_3$  at 550° is recommended. In some cases the product may be contaminated with impurities and its purity should therefore be checked by dissolution in aq.  $NH_3$ , followed by pptn. as  $PbMoO_4$  after acidifying with AcOH. A. R. P.

**Determination of sulphur in metals.** N. J. CHLOPIN (Zavod. Lab., 1938, 7, 89—90).—The S content of Mo, Mn, and Co is best determined by dissolving the metals in  $HNO_3$  and analysing the solutions for  $H_2SO_4$ . Schulte's method is applicable to Mn and Co, but not to Cr, W, or Mo. Methods depending on alkaline fusion are applicable to Cr and W, but not to Mo. Combustion in a stream of  $O_2$  is applicable to Mn, Mo, and Co, but not to Cr or W. R. T.

**Spectrum analysis of minerals for tin, tungsten, and molybdenum.** V. V. NEDLER (Zavod. Lab., 1938, 7, 57—61).—Curves are constructed, connecting the intensity of certain Sn, Mo, and W lines with the concn. of these elements in ores.

R. T.



**Vanadium and titanium in Taranaki ironsand.** A. D. MONRO and H. S. GIBBS (New Zealand J. Sci. Tech., 1938, 19, 523—526).—The separation of V and Ti from this ironsand by methods of possible technical application has been investigated. Fusion with  $\text{CaO} + \text{CaCl}_2$  gives the most promising results. The best extraction (90% of the Ti and V) is obtained with  $\text{CaCl}_2$ — $\text{CaO}$  (~1:1). A tentative scheme worked out for the technical separation of the Fe, V, and Ti yields (i) an improved ore freed from most of the V and Ti originally associated with it, and (ii) two concentrates, the first containing 90% of the original V and most of the Ti, and the second, Ti and no V, but both containing some Fe. L. S. T.

**Plastic working of zirconium and titanium.** J. D. FAST (Metallwirts., 1938, 17, 459—462).—Methods of producing ductile Zr and Ti and the effects of adsorbed gases are described (cf. A., 1925, ii, 243; 1926, 699; 1936, 810, 930, 1056). The metals may be hammered, drawn, rolled, or deep-drawn. The mechanical properties and temp. coeff. of electrical resistance have been determined for cold-worked and annealed Zr, and the weakening of the metal on annealing has been further studied by means of X-rays. C. E. H.

**Tantalum carbide tool compositions.** P. M. McKENNA (Amer. Inst. Min. Met. Eng., 1938, Tech. Publ. 897, 12 pp.; Met. Tech., 1938, 5, No. 2).—The properties of, and tests applied to, hard tool materials produced by processes of powder metallurgy from hard carbide constituents and various matrices of Fe, Ni, or Co, or alloys of these metals with W, or W and C, are described. Suitable compositions for use in the machining of Bakelite, rubber, glass, Fe, etc. are given. R. B. C.

**Analysis of boron carbide.** A. I. MIKLASCHEVSKI (Zavod, Lab., 1938, 7, 168—174).—0.4 g. of powdered B carbide is fused with 4 g. of  $\text{Na}_2\text{CO}_3$  and 0.1—0.2 g. of  $\text{KNO}_3$ , the melt dissolved in  $\text{H}_2\text{O}$ , and the solution acidified and diluted to 250 ml; then 50 ml. of solution are boiled for 30 min. under reflux with  $\text{CaCO}_3$  and filtered. 4—5 drops of conc. HCl are added to the filtrate + washings, which are boiled under reflux for 30 min. Excess of HCl is eliminated by adding a  $\text{KIO}_3$ —KI solution, and the I liberated is removed by excess of  $\text{Na}_2\text{S}_2\text{O}_3$ . Excess of neutral glycerol is then added and  $\text{H}_3\text{BO}_3$  titrated with 0.2N-NaOH (phenolphthalein). Free  $\text{H}_3\text{BO}_3$  is determined by boiling 1 g. of carbide with 100 ml. of 1:20 HCl containing 3 mg. of  $\text{B}_2\text{O}_3$ , and titrating  $\text{H}_3\text{BO}_3$  in the solution.  $\text{SiO}_2$ ,  $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ ,  $\text{CaO}$ , and free and combined C are determined by known methods. R. T.

**Investigation of alloys produced according to the ceramic process.** N. ZARUBIN and L. MOLKOV (Vestn. Metalloprom., 1934, 14, No. 7, 59—68).—A review of the production and properties of WC, TaC, TiC, and  $\text{Mo}_2\text{C}$ , and of the systems  $\text{Mo}_2\text{C}$ —Co, TaC—Co, and TiC—Co. CH. ABS. (e)

**Calcium: manufacture, properties, and metallurgical applications.** P. BASTIEN (Chim. et Ind., 1938, 39, 637—648).—A review. F. J. G.

**Gold mining in Jugoslavia.** S. PLANINSEK (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 364—368).—The compositions of various Au ores are given. R. B. C.

**Gold in the Danube.** D. PANTO (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 361—364).—The compositions of rubble stones containing Au are given. R. B. C.

**Establishment of ore-testing procedures; reports of tests:** (A) sulphide ore flotation tests; (B) magnetic separation tests; (C) deflocculation concentration of carnotite ores; (D) preliminary leaching tests (other than cyanidation); (E) flotation test of ores requiring sulphidisation; (F) non-sulphide flotation tests; (G) treatment of precious metal ores. C. W. DAVIS and STAFF OF ORE-TESTING SECTION (U.S. Bur. Mines, Rept. Invest. No. 3370, 1938, 75—85, 85—92, 92—96, 96—98, 98—102, 102—113, 113—161).—(A) Differential flotation of an antimonial Au ore containing 1.3% Sb and 2.7 dwt. of Au/ton, using  $\text{Bu}^{\beta}_2$  xanthate to float the  $\text{Sb}_2\text{S}_3$  and  $\text{FeSO}_4$  to depress the arsenopyrite, gave a concentrate containing 90% of the Sb and assaying 53% Sb; after addition of  $\text{Na}_2\text{S}$ , K ethylxanthate (I), and Aerofloat-25 (II) to the tailings a Au concentrate containing 2.2 oz./ton was recovered. Extraction of 95% of the Hg in a concentrate assaying 20% Hg was obtained from a highly pyritic cinnabar ore by grinding through 65-mesh in a pulp containing  $\text{CaO}$  4 and  $\text{NaCN}$  0.27 lb./ton and floating with (I), (II), and cresylic acid at  $p_{\text{H}}$  10.4. The results of tests on Zn—Pb, Cu, and  $\text{MoS}_2$  ores are briefly recorded.

(B) Results of a.-c., d.-c., and other magnetic-separation tests on shales, chromite, magnetite, psilomelane, ilmenite, and nepheline-cyanite are tabulated. A.-c. separation gave good results on roasted chromite, ilmenite, and psilomelane.

(C) Grinding of carnotite ore through 200-mesh was found to be necessary to liberate the U and V minerals; elutriation tests showed that most of the valuable minerals were in the slime, flotation of which with NaOH (as deflocculator) 5, oleic acid (as collector) 0.6—1, and cresylic acid (as frother) 0.2 lb./ton yielded a 66.88% extraction of U and V in concentrates containing 15—30% of  $\text{V}_2\text{O}_5 + \text{U}_3\text{O}_8$ .

(D) Leaching tests on alunite, halite, and chrysocolla ores are described briefly.

(E) Flotation of a calamine-cerussite ore with  $\text{Na}_2\text{S}$  3, K amylxanthate 0.2, and Aerofloat-25 0.25 lb./ton afforded a concentrate containing about 60% Pb and <8% Zn; subsequent addition of more  $\text{Na}_2\text{S}$  with  $\text{CuSO}_4$  resulted in a Zn float containing Zn 47 and Pb 2%. Prolonged contact with the reagents was necessary for good recoveries. Sulphidisation of jarosite ores does not improve the floatability of this mineral. Treatment with  $(\text{NH}_4)_2\text{S}_x$  and large amounts of xanthate gave an 80% recovery of Co and a 67% recovery of Cu from a stainerite-cuprite-malachite ore in the form of a concentrate containing Co 26 and Cu 11%.

(F) Fair recoveries in the form of rather low-grade concentrates were made by oleic acid flotation of tailings and slimes from the gravity concn. of ferberite, wolframite, psilomelane, and chromite ores.

(G) Numerous cyanide, amalgamation, gravity-



concn., and flotation tests on a wide variety of simple and complex Au and Ag ores are described.

A. R. P.

**Treatment and sale of black sands.** M. W. VON BERNEWITZ (U.S. Bur. Mines, 1938, Inf. Circ. 7000, 21 pp.).—The composition of various American black alluvial sands and methods for concentrating them and for recovering Au and Pt from the concentrates are described.

A. R. P.

**Treatment of gold tailings.** ANON. (Chem. Eng. Min. Rev., 1938, 30, 125—133).—Tailings from a W. Australian mine containing Au 11—12 dwt./ton and Cu 2.7% gave a low Au extraction by direct cyaniding and the CN' consumption was high, but >88% of the Au was recovered by roasting, re-grinding, amalgamating, and cyaniding. With tailings containing much sol. Mg salts good extractions of Au were obtained by adding sufficient CaO to ppt. the Mg and give the requisite degree of protective alkalinity. Chlorination residues from a Queensland mine failed to yield a payable extraction of Au by cyaniding or flotation, possibly because the Au was intimately associated with the Pb compounds present.

A. R. P.

**Collection of gold by iron abraded in grinding.** S. R. ZIMMERLEY (U.S. Bur. Mines, 1937, Rept. Invest. 3364, 3—7).—When hard, silicious Au ore is ground in an Fe ball mill, >90% of the Au becomes attached to the surface of the abraded Fe particles and can be recovered by magnetic separation or flotation (with K amyloxanthate). When the gangue material is softer than the Fe balls very little Au is collected by the abraded Fe. Relatively little Au is segregated with the Fe when a silicious ore is ground in a pulveriser.

A. R. P.

**Cyanidation of gold-bearing flotation and table concentrate.** J. N. BUTLER (State Coll. Wash., Met. Res. Lab., 1935, Bull. F., 48 pp.).—Economic cyanidation of flotation concentrates which have oxidised between the flotation and the cyanide circuits is impossible without using some sort of pre-treatment prior to cyanidation. A H<sub>2</sub>O wash before cyanidation is beneficial; a dil. H<sub>2</sub>SO<sub>4</sub> wash is better. Roasting to a dead roast is helpful if temp. conditions are closely controlled and the Pb is <1%.

CH. ABS. (c)

**Air-slaked lime in cyanidation.** (A) J. G. HART. (B) W. H. WESLEY (Chem. Eng. Min. Rev., 1938, 30, 147, 147—148).—It is suggested that the advantage of air-slaked over H<sub>2</sub>O-slaked CaO in reducing CN' consumption may be due to its lower causticity; Ca(OH)<sub>2</sub> decomposes some sulphides and the resulting CaS converts some of the CN' into CNS'. A. R. P.

**Control of alkalinity of cyanide pulps.** Recent work at Morro Velho. T. HADEN (Bull. Inst. Min. Met., 1938, No. 401, 16 pp.).—Optimum Au extraction and min. consumption of NaCN in the cyaniding of Morro Velho Au ore are obtained when the pulp has  $p_H$  9.6; this is obtained by using waste liquor from the pptn. boxes and an equal vol. of H<sub>2</sub>O in making the pulp, and by adding Pb salts and CaO until the correct  $p_H$  is obtained. To determine the  $p_H$  the solution is titrated with AgNO<sub>3</sub> = the NaCN present

and twice as much AgNO<sub>3</sub> is added to a second equal vol.; the clear solution is decanted from the AgCN and treated with a suitable indicator (phenolphthalein) for a colorimetric test. Rapid pptn. of the Au from the pregnant solutions is obtained by adding Na<sub>2</sub>PbO<sub>2</sub> from a dripper as the solution enters the Zn boxes.

A. R. P.

**Laboratory test for cyanidation [of gold ores].** J. A. JACKSON (U.S. Bur. Mines, Rept. Invest. 3370, 1938, 9—20).—Details of jar-cyaniding tests and the methods of calculating the results are given.

A. R. P.

**Recovery of silver, gold, and mercury from precious-metal amalgams.** C. M. HOKE (Metal Ind., N.Y., 1938, 36, 22—23).

L. S. T.

**Manufacture of precious-metal plate for jewellery.** G. FIRE (Metal Ind., N.Y., 1938, 36, 2—3).—The production of rolled-Au plated wire, tubing, etc. is described and illustrated.

L. S. T.

**Flotation of oxidised silver-lead ores as influenced by modified grinding.** S. R. ZIMMERLEY (U.S. Bur. Mines, Rept. Invest. 3364, 1937, 7—30).—When argentiferous oxidised Pb ore is ground in an Fe ball mill a heavy sponge of Pb is found in the settled pulp and the H<sub>2</sub>O contains sol. Fe<sup>II</sup>. This effect is intensified by addition of NaCl to the pulp and, in some cases, still more so if the pulp is kept slightly acid by frequent additions of H<sub>2</sub>SO<sub>4</sub>. Tests on an oxidised Utah ore which was ground in acidic brine and then subjected to flotation with a sulphidiser resulted in the recovery of 74% of the Pb and 83% of the Ag. Recoveries of >80% of the Pb and 94% of the Ag from a pyritic ore containing oxidised Pb minerals were obtained by first floating the sulphide minerals, then grinding the tailings in acidic brine, and finally floating off the reduced Pb and Ag. The best flotation results in pulps containing large amounts of sol. salts were obtained with a mixture of dixanthogen and Emulsol X-1.

A. R. P.

**Microtitration of platinum in cupellation beads.** W. B. POLLARD (Bull. Inst. Min. Met., 1938, No. 402, 31; cf. B., 1938, 389).—Cu and Pb in the beads have no influence on the results obtained and the interference of the other Pt metals is prevented by using SnBr<sub>2</sub> instead of SnCl<sub>2</sub> for the reduction.

A. R. P.

**Platinum-silver-gold alloys.** A. JEDELE (Z. Ver. deut. Ing., 1938, 82, 383).—Their properties and applications are reviewed.

R. B. C.

**[Ore and coal] mining in Greece.** K. SCHLIT-TERMANN (Berg- u. Hüttenmänn. Monatsh., 1938, 36, 16—20).—Sources of magnesite, pyrites, Cr, Ni, and Mn ores, and coal are discussed.

R. B. C.

**Photographic film in ore dressing.** W. GRÜNDER (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 209—212).—Its applications are discussed.

R. B. C.

**Metals used in the aircraft industry.** J. R. GOLDSTEIN (Met. Prog., 1938, 33, 357—361).—The types of ferrous and non-ferrous metal used in the industry are discussed.

R. B. C.

**Progress reports : 20th Annual Report of the Metallurgical Division [of the United States**



Bureau of Mines], Fiscal year 1936—7. R. S. DEAN *et al.* (U.S. Bur. Mines, 1937, Rept. Invest. 3357, 55 pp.).—Progress reports are presented of the work in hand at the Bureau, including the development of a method of concentrating gases, the use of sound waves in smoke settling, the prep. of pure Cr by  $H_2$  reduction of  $CrCl_3$ , the prep. of various ferro-alloys and electrolytic Mn, the removal of Bi from Pb, and various concn. tests on base- and precious-metal ores. (Cf. B., 1937, 448.) A. R. P.

Determination of a property [of metals] closely related to the fatigue limit by the bending-tensile test. E. MOHR (Z. Metallk., 1938, 30, 30—35).—If the specimen in Buschmann's bending-tensile test (B., 1935, 230) is bent through a small angle only, *e.g.*,  $20^\circ$ , the point of inflexion in the stress-elongation curve represents a stress identical with the fatigue limit in the alternate-bending test. In this way, therefore, it is possible to determine the endurance strength of a metal much more rapidly than by the usual fatigue test. The results obtained for pure Zn, Cu, and Ni and for various Al, Mg, Cu, and Ni alloys are shown graphically. A. R. P.

Nature of metals as shown by their properties under pressure. P. W. BRIDGMAN (Amer. Inst. Min. Met. Eng., Tech. Publ. 922, 1938, 22 pp.; Met. Tech., 1938, 5, No. 3).—A lecture. R. B. C.

Yield point in metals. M. GENSAMER (Amer. Inst. Min. Met. Eng., Tech. Publ. 894, 1938, 11 pp.; Met. Tech., 1938, 5, No. 2).—A transition between homogeneous and heterogeneous flow occurs at every point on a flow (stress-strain) curve when the slope = the true stress. Whether or not the yield point is characterised by heterogeneous flow (Lüders' lines; the Piobert effect) is determined by the stress at the yield point and the rate of work-hardening of the material. R. B. C.

Flame-hardening [of metals]. J. T. HOWAT (Steel, 1938, 102, No. 9, 60—63).—A review. R. B. C.

Quantitative analysis of non-ferrous alloys by spectroscopic methods. R. A. WOLFE (Proc. Amer. Soc. Test. Mat., 1935, 35, 87—98; cf. A., 1933, 920).—A review, with special reference to the determination of Al, Mg, Ba, Cr, and Ni in alloys. CH. ABS. (e)

Study of solid alloys by physical methods. V. G. LIVSCHITZ and A. N. KOROTKORUTSCHKO (Zavod. Lab., 1938, 7, 202—204).—The magnetic properties of solid alloys change characteristically with changes in the chemical and phase composition. R. T.

Study of orientation of polyhedral formations revealed by the method of deep etching. B. E. VOLOVİK and N. I. JASIRKINA (Zavod. Lab., 1938, 7, 192—196).—The interpretation of the figures obtained by etching metal surfaces is discussed. R. T.

Corrosion of metals in water and aqueous solutions. C. CARIUS (IVth Corrosion Congr. Ver. deut. Ing., 1934, 1—8).—A review and discussion. CH. ABS. (e)

Corrosion caused by a concentration cell. H. GRUBBSCH (Korros. u. Metallschutz, 1938, 14,

113—115).—Serious localised corrosion was experienced in a closed steel tank supplied with hot  $H_2O$  of two different compositions through separate pipes. The steel was of satisfactory composition and structure. The attack was attributed to the marked difference between the supplies of  $H_2O$ ; this view was supported by the distribution of corrosion over the surface of the tank. C. E. H.

Corrosion by the impact of falling drops. G. WELTER (Engineering, 1938, 145, 521—522).—Tests made on four types of Al alloys, an elektron alloy, and a mild steel, comparing the corrosion caused by drops of 3% aq. NaCl falling from a height of 5 m. (drop impact) with that on the specimen kept moistened, are described. The drop-impact type of corrosion was shown by tensile and loss-of-wt. tests to be the more severe, the Al alloys being most subject to penetration. Photomicrographs are reproduced. L. N.

Corrosion of metals in soils as a factor in the selection of pipe materials. S. EWING (Proc. Amer. Gas Assoc., 1937, 789—798).—Data obtained mainly by the U.S. Bureau of Standards on the corrosion of metals by soils are critically reviewed. R. B. C.

Pipe protection in the United States of America. K. H. LOGAN (Vedag Jahrb., 1937, 10, 82—100).—The work of the U.S. Bureau of Standards on the corrosion of metal pipes by soils is reviewed. R. B. C.

Apparatus for determining resistance of alloys to hot corrosive liquids. H. THYSEN and J. BOURDOUXHE (Mét. et Corros., 1938, 13, 37—38).—A diagrammatic description. R. B. C.

High-speed autogeneous welding. C. F. KEEL (Proc. XII Internat. Congr. Acetylene, 1936, 4, 821—828).—A process is described whereby the time hitherto required for the oxyacetylene welding of Fe, steel, and cast Fe is reduced by 20% while at the same time the consumption of  $C_2H_2$  is reduced in the same proportion. It consists in the simultaneous use of a so-called oxidising flame ( $O_2/C_2H_2 = 1.2—1.3$ ) and of reducing elements, such as Mn and Si, in the filling rod. Strength tests reveal that the quality of welds made in this manner is not appreciably diminished. P. G. MCC.

Oxyacetylene welding for the chemical industry. H. W. G. HIGNETT (Proc. XII Internat. Congr. Acetylene, 1936, 5, 1081—1085).—Attention is drawn more particularly to the welding of corrosion-resistant materials, and a brief review of the advantages and disadvantages of the oxyacetylene process in this branch of engineering is given. P. G. MCC.

Heat effect of the oxyacetylene flame for various exit velocities of the gas mixture [in welding]. E. STREB and H. KEMPER (Proc. XII Internat. Congr. Acetylene, 1936, 4, 814—820).—The problem whether and to what extent the heat effect of the  $O_2-C_2H_2$  flame can be improved by raising the exit velocity of the fuel-gas mixture has been investigated. By comparative temp. measurements on heated steel plates and by determining the time which for varying exit velocities is necessary to produce fusion it has been established that the optimum exit velocity is about 722 ft./sec. P. G. MCC.



**Comparison between the results obtained with modern methods of oxyacetylene welding and electric arc welding.** R. MESLIER (Proc. XII Internat. Congr. Acetylene, 1936, 4, 808—813).—The comparative costs of making butt welds (high-quality and ordinary-type welds) on steel plates of varying thicknesses are summarised in detail in a series of tables. P. G. McC.

**Suitability of welds for case-hardening.** A. ROUX (Proc. XII Internat. Congr. Acetylene, 1936, 5, 1171—1182).—The nature of the most suitable filler metals and electrodes for welding steels with the blowpipe or electric arc to ensure their correct hardness after hard-surfacing and tempering is indicated. When the Mn content of the weld is 0.40% or above the hardness is uniform, and for this purpose thick-coated electrodes should be chosen in preference to those with thin coats in the case of arc-welded joints. Photomicrographs of the hard-surfaced zones and a table giving the max. deviations in hardness over the surface of the specimens obtained with the various filler metals and electrodes are included. P. G. McC.

**Low-temperature steel welding.** E. LEWIS (Proc. XII Internat. Congr. Acetylene, 1936, 4, 829—830).—The Linde welding process as applied to pipe-line work, using a special technique, blowpipe, and filler rod, is briefly outlined. From a no. of tests made on welds so obtained, it is considered that proper development of this low-temp. process would reduce gas-welding costs and also open up new fields of application. P. G. McC.

**Welding of zinc sheets.** A. HORN (Proc. XII Internat. Congr. Acetylene, 1936, 4, 838—841).—The satisfactory welding of sheet Zn has been attained by using a special welding paste consisting of  $\text{ZnCl}_2$  and  $\text{NH}_4\text{Cl}$ . Details of the technique involved in this new process are given together with photographs and photomicrographs of typical welds. P. G. McC.

**Lead welding (lead-burning) and welding of low m p. metals and alloys by the oxyacetylene process.** E. B. PARTINGTON (Proc. XII Internat. Congr. Acetylene, 1936, 5, 1086—1092).—The difficulties confronting the oxyacetylene welding of Pb have been overcome through the evolution of a blowpipe with specially designed pressure-reducing and -regulating valves. The small flame produced in this way is sufficient to cause fusion to take place between two surfaces without the metal collapsing or falling away. Working details concerning the blowpipe are tabulated. P. G. McC.

**Mechanism of chemical reactions in weld metal.** J. H. PATTERSON (Welding J., 1935, 32, 134—135).—A standard electrode is suggested consisting of mild-steel wire with C 0.11—0.13, Mn 0.35—0.45, S < 0.4, P < 0.4%, and Si trace, and a coating of magnetic oxide (98%  $\text{Fe}_3\text{O}_4$ , 70 and  $\text{SiO}_2$  30%). It is suggested that  $\text{N}_2$  enters the weld from a deposit rich in  $\text{N}_2$  which is progressively formed and condensed in front of the electrode. CH. ABS. (e)

**Dangers in melting light metals and their avoidance.** E. S. HARTIG (Metallwirts., 1938, 17, 319—320).—The dangers of fire when melting Al and

Mg are discussed. Combustion may be caused by contact with air in the case of Mg, or by interaction of the molten metals with oxides etc. of other metals. C. E. H.

**Precautions for maintaining constant temperatures in furnaces for heat-treatment of light alloys.** L. MOENNICH (Z. Metallk., 1938, 30, 17—21).—Electrical devices controlled by thermocouples and means for circulating air through the furnace in order to control the temp. within  $\pm 2^\circ$  of any desired val. are described. Correct stacking of the charge to allow free circulation of the air to all its units is essential for uniform heating. Bare thermocouples should always be used. A. R. P.

**Beryllium-aluminium alloys for aircraft pistons.** J. B. JOHNSON (Met. & Alloys, 1938, 9, 94).—An alloy with 67.4% Be was tested at room temp. and at  $260^\circ$ . The properties at  $260^\circ$  compare fairly well with those of a 14% Si-Al alloy. S. J. K.

**Accelerated analysis of fluxes used in the production of magnesium.** K. M. POPOV and E. A. ALFEROVA (Kalii, 1937, No. 9, 18—20).—An accelerated method of analysing fluxes containing F, Cl, and  $\text{CO}_3$  is described. Ca can be determined directly, but F must be removed before Al, Fe, and Mg are determined; a specially designed heater is used to accelerate the evaporation of F. Tananaev's method (B., 1934, 1098), somewhat modified, is used to determine F; the method is accurate and the time taken for analysis is 3—3½ hr. D. G.

**Refining of aluminium.** K. SIEDENTOPF (Aluminium, 1938, 20, 71—73).—Crude Al is refined by electrolysis in the fused condition. A layer of the molten crude Al at the bottom of the furnace is the anode, and a fused mixture of, e.g.,  $\text{BaCl}_2$  60,  $\text{AlF}_3$  24, and NaF 16% floats upon it and serves as electrolyte. The cathode is a layer of refined Al which floats on the salt mixture. The control of the process and composition of the product are described. C. E. H.

**Technological properties of aluminium strip.** H. SCHIEK (Aluminium, 1938, 20, 75—79).—Vals. are given for the tensile properties, hardness, resistance to bending, and Erichsen val. of 3 grades (99.5—99.9975%) of Al strip of different degrees of hardness. Most of the tests were carried out both perpendicular and parallel to the direction of rolling. After annealing at  $300^\circ$  or  $500^\circ$  the purest Al is much more resistant to corrosion by acids than the commercial grade. C. E. H.

**Steps towards pure aluminium.** H. RÖHRIG (Aluminium, 1938, 20, 69—71).—Progress in the production of high-purity Al is reviewed. C. E. H.

**Influence of the degree of purity of aluminium on [its resistance to] localised chemical attack.** W. HELLMING and H. NEUNZIG (Aluminium, 1938, 20, 80—85).—The resistance of Al of 99.996% purity to 3% aq. NaCl + 1%  $\text{H}_2\text{O}_2$ , softened  $\text{H}_2\text{O}$  containing a little NaCl, aq. lactic acid +  $\text{BuOH}$ , 10% aq.  $\text{CaCl}_2$ , and meat extract is  $\gg$  that of Al of 99.5% purity. Whereas welds in commercial Al must be hammered and annealed in order to give them



satisfactory resistance to  $\text{H}_2\text{SO}_4$  or  $\text{HNO}_3$ , this is usually unnecessary when using 99.995% pure Al.

C. E. H.

**Relative corrosion-resistance of 99.99% aluminium and sheets clad with it in comparison with the normal light metals used in chemical plant construction.** H. U. VON VOGEL (Aluminium, 1938, 20, 85—94).—A comprehensive series of corrosion tests has been carried out on 99.997% Al, commercial Al, and on Al-Mn, Al-Mg-Si, Al-Mg-Mn, and Al-Si alloys, the last 5 materials being also tested when clad with the high-purity Al. 25 acid, alkaline, and salt solutions were employed. The use of high-purity Al reduces the corrosion to an extent dependent on the corroding medium.

C. E. H.

**Localised corrosion of pure and purest aluminium in aqueous solutions.** E. KÜHNICH (Aluminium, 1938, 20, 83—85).—The effect of various small additions to Al of 99.998% purity on its liability to localised corrosion in aq.  $\text{NH}_4\text{Cl}$  has been investigated. All additions caused increased attack, their relative effects being  $\text{Cu} > \text{Fe} > \text{Si} > \text{Zn} > \text{Mg}$ .

C. E. H.

**Physical properties of high-purity aluminium.** W. FELDMANN (Aluminium, 1938, 20, 73—74).—References are given to the most important work on the subject, and the necessity for further investigation in certain directions is pointed out.

C. E. H.

**Use of high-purity aluminium.** G. SAUER (Aluminium, 1938, 20, 107—109).—The purest Al is largely used as a coating applied to commercial Al or alloys. Typical applications are mentioned.

C. E. H.

**Determination of carbon in aluminium.** J. A. KLIATSKHO and M. A. BARKOV (Zavod. Lab., 1938, 7, 148—153).—Moissan's method (B., 1894, 1199) gives results 60% < those given by the dry-combustion method. Dissolution in aq. NaOH in vac., with determination of  $\text{CO}_2$  in the burnt evolved gas, gives the combined C content.

R. T.

**Rapid determination of silicon in aluminium and its alloys.** E. E. GUREVITSCH (Zavod. Lab., 1938, 7, 98—99).—0.3 g. of metal is dissolved in 4.5 ml. of 1:3:6  $\text{HNO}_3$ -HCl- $\text{H}_2\text{SO}_4$  mixture, and 1.5 ml. of 10:1:5  $\text{H}_2\text{SO}_4$ - $\text{HNO}_3$ - $\text{H}_2\text{O}$  mixture are added to the solution, which is then evaporated to evolution of  $\text{SO}_3$ . The residue is boiled with dil. HCl, and  $\text{SiO}_2$  is collected and weighed.

R. T.

**Sensitivity of X-rays in detecting defects in aluminium.** E. A. W. MÜLLER (Giesserei, 1937, 24, 595—597).—A review.

R. B. C.

**X-Ray control of welding of aluminium containing 8% of copper.** M. A. GUREVITSCH (Zavod. Lab., 1938, 7, 100—102).—Detection of defects in Al castings by X-ray methods is illustrated.

R. T.

**Microchemical determination of copper and zinc in aluminium and magnesium alloys.** E. I. NIKITINA (Zavod. Lab., 1938, 7, 162—166).—0.5 g. of Mg alloy is dissolved in  $\text{HNO}_3$  with 3 drops of  $\text{H}_2\text{SO}_4$ , and the solution evaporated until crystallisation commences. Al alloys are dissolved in HCl, with a few drops of  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$ , and the solu-

tion is evaporated to evolution of  $\text{SO}_3$ . The solutions are diluted, and Cu is determined electrolytically by known methods. The residual solution is diluted to 10—20 ml., 3 drops of AcOH and 0.1 ml. of 0.5%  $\text{CuSO}_4$  are added, followed by 10 ml. of a solution of 20 g. of KCNS and 16 g. of  $\text{HgCl}_2$  in 500 ml. of  $\text{H}_2\text{O}$ . The ppt. of  $\text{CuHgZn(CNS)}_6 + \text{CuHg(CNS)}_4$  is washed, dried at  $110^\circ$ , and weighed. 7.81 times the wt. of Cu added is subtracted and the difference multiplied by 0.1312 to give the amount of Zn present in the sample.

R. T.

**Accelerated spectrum analysis of aluminium alloys in the visible region of the spectrum.** K. A. SUCHENKO (Zavod. Lab., 1938, 7, 104—106).—An emission spark method is described.

R. T.

**Effect of melting and casting conditions on gas content and structure of aluminium alloys.** G. GÜRTLER (Giesserei, 1938, 25, 88—95).—The gas content of Al alloys was determined either by casting a button in a C mould and examining the surface, or by casting a bar and examining a section radiographically. The methods were employed to investigate gas absorption, e.g., from furnace atm., by Al and Alpac, and gas removal on setting aside before casting.

R. B. C.

**Aluminium-magnesium alloys of low magnesium content.** J. HÉRENGUEL (Mét. et Corros., 1937, 12, 227—233).—The properties, e.g., ease of welding and max. deformation possible before cracking, of alloys containing 1—8% of Mg are summarised.

R. B. C.

**Recrystallisation of technical magnesium-aluminium alloy.** W. BUNGARDT and F. BOLLENRATH (Z. Metallk., 1938, 30, 28—29).—Recrystallisation diagrams are given for 7 and 9% Mg-Al alloys. Min. grain size after annealing for 1 hr. at all degrees of reduction >30% is obtained by annealing at  $400^\circ$ . Grain growth is at higher temp. > at lower temp. and with low degrees of reduction > with high reductions.

A. R. P.

**Corrosion-resistance of some aluminium-magnesium alloys.** F. BOLLENRATH (Metallwirts., 1938, 17, 343—353).—Alloys containing respectively Mg 8.5, Mg 8 + Cr 0.2, and Mg 7.5 + Zn 1% were subjected, after various heat-treatments, to corrosion by spraying with and intermittent immersion in 3% aq. NaCl. The change in mechanical properties was then determined. After quenching in  $\text{H}_2\text{O}$  and subsequent annealing, all alloys were considerably corroded, the attack on the different alloys decreasing in the above order. After slow cooling and subsequent annealing, the order of merit of the alloys was the same, but the last was almost unaffected. The results of the corrosion tests, together with metallographic, X-ray, and dilatometric investigations, suggest that the effect of Zn and Cr is due to their influence on diffusion and the formation of nuclei.

C. E. H.

**Influence of temperature on thermal effects associated with ageing [of alloys].** H. CAEUS and R. SMOLUCHOWSKI (Przemysł Chem., 1938, 22, 32—37).—The processes of hardening of duralumin blocks quenched from  $450$ — $510^\circ$  to  $20$ — $26^\circ$  are



associated with evolution of heat, and their progress is more rapid at higher than at lower temp. It is concluded that the fundamental process involved is one of diffusion. R. T.

**Influence of orientation of the test-piece on mechanical properties of light-metal sheets.** K. BUNGARDT (*Metallwirts.*, 1938, 17, 481—482).—The tensile properties of Al-base Al-Cu-Mg and Al-Mg alloys and Mg-base Mg-Al and Mg-Mn alloys were practically the same in directions both parallel and perpendicular to the direction of rolling. A notched-bar impact test gave vals. differing by 0—60% according to the orientation of the test-piece. C. E. H.

**Deep-drawing tests on light metals by the wedge-drawing test (G.P. 611,658).** A. J. STELLER and O. WEILER (*Aluminium*, 1938, 20, 109—117).—The test is applied to a series of Al alloys and found to be suitable for these materials. C. E. H.

**New problems in electrometallurgy, with special reference to the Four-Year Plan.** F. MÜLLER (*Angew. Chem.*, 1938, 51, 221—227).—A review. Developments in the methods of production of, *e.g.*, Al, Mg, Be, and in electrolytic refining, and the effect of purity on, *e.g.*, conductivity and corrosion-resistance, are discussed, particularly from the viewpoint of German self-sufficiency. I. C. R.

**Surface corrosion and its avoidance by plating with 99.99% aluminium.** E. RUPPEL (*Aluminium*, 1938, 20, 94—106).—The behaviour of various clad light metals on corrosion, principally in aq.  $H_2O_2$ , is illustrated by a large no. of photographs and diagrams. Plating with Al of 99.99% purity affords considerably greater protection than the more usual plating with 99.5% Al or an Al-Mg-Si alloy. The effects of visible defects in the clad sheets are shown. C. E. H.

**Protection of aluminium-base alloys against outside atmospheric exposure.** E. ARMSTRONG (*Metallurgia*, 1938, 17, 219—222).—Methods of surface cleaning and prep. are discussed and various types of known finishing operations are dealt with in detail. L. N.

**Oxide film on rustless steels and anomalies in their use as cathode materials.** F. HALLA and H. TOMPA (*Korros. u. Metallschutz*, 1938, 14, 109—111).—The electrodeposition of Fe on stainless-steel cathodes has been studied, and the properties of the coating are related to the pretreatment of the surface. Sticking and porosity of the deposit are due to imperfections in the oxide film on the steel. Gas evolution, causing porosity and streaks in the coating, was traced to the presence of free  $Fe_3C$  particles, which destroy film continuity. C. E. H.

**Chromium-plating with special reference to black chromium.** K. ARNDT and H. ENDRASS (*Z. Metallk.*, 1938, 30, 21—24).—Adherent black deposits of Cr may be obtained from a bath containing  $CrO_3$  250—400 g. and  $AcOH$  5 c.c./l., using a c.d. of 80—100 amp./sq. dm. and keeping the temp. below 25°. The deposit contains 25% of  $Cr_2O_3$ , to which it owes its black colour. A. R. P.

**Examination of metal coatings for porosity.**

II. N. S. HALL (*Platers' Guide*, 1936, 32, 13—14).—An outline is given of the  $CuSO_4$  and the dimethylglyoxime tests for Cr-plate, and the ferroxyl test for Sn and other coatings on Fe and steel.

CH. ABS. (e)

**Anodic behaviour in cyanide copper-plating baths.** H. J. READ and A. K. GRAHAM (*Trans. Electrochem. Soc.*, 1938, 74, Preprint 1, 1—13).—Two points of inflexion in the anodic polarisation-anodic c.d. curves are attributed respectively to cuprous and cupric reactions at the anode. Unless the  $CO_3^{2-}$  content of the bath is very high, increase in  $p_H$  from 10.3 to 12.8 is without effect on the normal anodic reactions. Above  $p_H$  13.3 the anode becomes passive. The effect on the anodic processes of variation in the concns. of free cyanide, of Cu, and of tartrate additions are considered. J. W. C.

**Rochelle salt copper-plating bath.** III. Further data on anode behaviour, with special reference to insoluble anodes. IV. Effect of bath composition and  $p_H$  on current efficiencies. A. K. GRAHAM and H. J. READ (*Metal Ind.*, N.Y., 1938, 36, 15—18, 77—80; cf. B., 1938, 534).—III. Data showing the variation of anode polarisation with anode c.d. are recorded graphically for anodes of Fe, Ni, Cu, Cu + Fe in parallel, Cu + Fe, and Cu + Ni. Cu anodes polarise excessively at comparatively low c.d. Insol. anodes of Fe and Ni do not polarise excessively even at high c.d. Insol. anodes used in conjunction with sol. Cu anodes depolarise them and permit higher c.d. to be employed.

IV. Data for the effect of various concns. of  $CuCN$ , Rochelle salt,  $Na_2CO_3$ , and free  $CN'$ , within the  $p_H$  range 10.7—12.8 at 55°, on the current efficiencies are recorded. L. S. T.

**Rapid determination of copper in cyanide electrolytes.** I. I. STRISHEVSKI and M. D. TSCHECHEVITSCH (*Zavod. Lab.*, 1938, 7, 222—223).—10 ml. of solution are boiled for 2—3 min. with 20 ml. of 10%  $H_2SO_4$ , 10 ml. of 3%  $H_2O_2$  are added, followed by 15—20 ml. of  $H_2O$ , boiling is continued for 10 min., and residual  $H_2O_2$  decomposed by  $KMnO_4$ . The solution is diluted to 50 ml., 2 g. of KI and a few crystals of KF are added, and the I liberated by  $Cu^{II}$  is titrated. R. T.

**Determination of copper by internal electrolysis.** N. N. EBERG (*Zavod. Lab.*, 1938, 7, 239).—0.1—0.2 g. of ore is dissolved in  $HNO_3$ - $H_2SO_4$ -HCl mixture, and Cu pptd. on a Pt cathode, connected by Cu with an Al anode. The Cu is dissolved in  $HNO_3$ , a few drops of  $H_2SO_4$  are added, and the solution is evaporated to dryness. The residue is dissolved in  $H_2O$ , 1 ml. of 30% Na phosphate is added, and Cu is determined iodometrically. R. T.

**Fungus in acid copper-plating baths.** N. PORCES (*Metal Ind.*, N.Y., 1938, 36, 19—20).—The occurrence in such baths of fungi which prevent the deposition of an adherent plate is reported. The fungus grows and produces medusa-like colonies throughout a solution saturated with  $CuSO_4$  and containing 6.8%  $H_2SO_4$ . L. S. T.



**Quantitative electrodeposition of cobalt.** M. M. FINE (U.S. Bur. Mines, 1938, Rept. Invest. 3370, 59—67).—The ore is dissolved in HCl and the solution evaporated with  $\text{H}_2\text{SO}_4$  to fumes, Cu is removed as usual with  $\text{H}_2\text{S}$ ,  $\text{Fe}^{3+}$  and Ca are eliminated by double or treble pptn. with aq.  $\text{NH}_3$  and  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  (the basic acetate method should not be used), and the solution is then evaporated to 100 c.c., treated with 25—30 g. of  $(\text{NH}_4)_2\text{SO}_4$ , 50—60 c.c. of aq.  $\text{NH}_3$ , and 2 g. of  $\text{NH}_4\text{HF}_2$ , diluted to 200 c.c., and electrolysed overnight with 0.5—0.8 amp./sq. dm. to deposit the Co + Ni. After weighing, the deposit is dissolved and the Ni determined with glyoxime. A. R. P.

**Anodic corrosion of commercial manganese during electrolysis.** A. E. EDWARDS and W. E. BRADT (Trans. Electrochem. Soc., 1938, 73, Preprint 34, 457—471).—The anodic reaction of 95% Mn in aq.  $\text{MnSO}_4 + (\text{NH}_4)_2\text{SO}_4$ , with or without  $\text{NH}_4\text{CNS}$ , depends on the c.d. Three c.-d. ranges are distinguished: in the high range, stripping of the anode occurs with formation of colloidal Mn; in the intermediate range,  $\text{MnO}_4^-$  is formed and subsequently reduced to  $\text{MnO}_2$ ; in the low range,  $\text{Mn}^{2+}$  is formed. The limits of the c.-d. ranges have been determined; they are lowered by addition of  $\text{NH}_4\text{CNS}$ . During electrolysis the  $p_{\text{H}}$  of the bath rises, causing pptn. of  $\text{Mn}(\text{OH})_2$  above  $p_{\text{H}}$  7.3. The low c.-d. range appears most promising for the successful electrodeposition of Mn. E. S. H.

**Tin-plating aluminium-alloy automobile pistons by immersion.** D. BROWN, V. SHULBERG, and G. BELL (Metal Ind., N.Y., 1938, 36, 11—14).—The operations involved and the essential conditions are described. L. S. T.

**$p_{\text{H}}$  of alkaline plating solutions.** G. B. HOGABOOM (Metal Ind., N.Y., 1938, 36, 116—119, 170—173).—The necessity for  $p_{\text{H}}$  control in plating operations is emphasised and illustrated by experiments with cyanide solutions of Cu, Zn, Ag, Cd, and brass. L. S. T.

**Recent developments in electroplating.** M. DE K. THOMPSON (Metal Clean. Finish., 1936, 8, 13—16, 65—66, 70).—A review of developments for Cr, Ni, Cd, Zn, Ag, Au, Rh, Cu, W, Sn, and alloys. CH. ABS. (e)

**Thermo-elements. Protecting chemical plant. Tinned refrigerator parts.**—See I. Immersion gas burner. Welding etc. and flames. Blowpipes, torches, etc. Bitumen and metal. Determining  $\text{H}_2\text{O}$  in Mn or Fe ores. Steel-mill lubricants.—See II. Corrosion of Fe by viscose. Preventing corrosion in pulp mills. Steels for paper mills.—See V. Pt Alloys. Al from clays. Peroxidation.—See VII. Enamelling Fe. Copperheads [in steel enamelling]. Enamel chipping. Slagging test for refractories.—See VIII. Induction furnaces for steel. Electrostatic charges in flowing gases.—See XI. Polishing pastes.—See XII. Paints for foundries. Painted Fe. Protecting metal surfaces. Anticorrosives. Lacquering light metals.—See XIII. Determining industrial poisons [in air].—See XXIII.

See also A., I, 305, Mn-Bi and Ni-Pt alloys. System Cu-Au. Solubility of Ag and Au in Hg, and of Cu-Zn alloy in acid. 319, Prep. of pure metals. 321, Prep. of spectroscopically pure Fe. 323, Determining Ag from KCN solution. Analysis of Be [compounds]. 324, Determination of Pb. 325, Spectrochemical analysis [of Al alloys]. II, 224, Au mirrors.

#### PATENTS.

**Roasting of ores.** C. P. DEBUCH and E. MARKWORTH, Assrs. to AMER. LURGI CORP. (U.S.P. 2,069,875, 9.2.37. Appl., 11.9.34. Ger., 10.3.34).—In order to avoid overheating in exothermic roasting operations carried out in rotary tube furnaces, heat is withdrawn by circulating cold air in jackets surrounding the inlets for the roasting air. L. C. M.

**Production of malleable iron.** R. A. EDMUNDS, Assr. to NAT. MALLEABLE & STEEL CASTINGS CO. (U.S.P. 2,069,717, 2.2.37. Appl., 2.3.35. Can., 4.2.35).—Alloys containing C 1—1.8 (1.35), Si 0.9—1.95 (1.6), Mn 0.4—1.4 (0.5), P 0.01—0.15 (0.04), and S 0.01—0.04 (0.03)% are claimed. L. C. M.

**Production of [pure] metal [iron for bearings].** C. F. SHERWOOD, Assr. to J. A. DIENNER and HANSEN RUBBER PRODUCTS CO. (U.S.P. 2,065,618, 29.12.36. Appl., 28.12.33).—Porous Fe bearings are produced by moulding a mixture of finely-divided  $\text{Fe}_2\text{O}_3$  (made by calcining  $\text{FeSO}_4$  or by grinding mill-scale) with C 50 and binder (a 1:1 mixture of petroleum jelly and turpentine rosin) 5 wt.-%, reducing in  $\text{H}_2$  or other reducing atm. at  $980^\circ$ , and finally sintering at  $1190^\circ$ . L. C. M.

**Manufacture of enamelled sheet metal [iron].** R. PORTER and R. B. SAYLOR, Assrs. to AMER. SHEET & TIN PLATE CO. (U.S.P. 2,065,392, 22.12.36. Appl., 27.11.35).—Fe containing C  $\geq 0.08$  (0.03), Mn  $\geq 0.25$  (0.12), P 0.01, S 0.02, and Si 0.015% is deoxidised, cast, hot-rolled to strip, pickled, cold-rolled to  $\leq 30$  (85)% reduction, and annealed; the product is claimed to be free from bubbles and blemishes when vitreous-enamelled. L. C. M.

**Ferrous alloy.** H. A. SCHWARTZ, Assr. to NAT. MALLEABLE & STEEL CASTINGS CO. (U.S.P. 2,069,423, 2.2.37. Appl., 5.3.32).—The alloy contains C (of which approx.  $\frac{1}{3}$  is in a nodular form) 1—1.5 (1.2—1.4) and Si 2—4 (2—3.5), with or without Mn 0.18—0.38%. L. C. M.

**Production of (A, B) rustless iron, (C) iron-chromium alloys of appreciable nitrogen content.** W. B. ARNESS, Assr. to RUSTLESS IRON & STEEL CORP. (U.S.P. 2,069,203—5, 2.2.37. Appl., [A, B] 20.7.33, [C] 4.1.34).—(A) Fine-grain metal is produced by melting a charge of rustless scrap (Cr 17, C 0.1%) 126, low-C steel 32.5, Cr ore ( $\text{Cr}_2\text{O}_3$  48, FeO 19%) 28.5, and roll scale 10 pts. in an arc furnace at  $1590$ — $1780^\circ$  until the C content falls to 0.05%; after partial cooling, 75% Fe-Si 14 and CaO 45 pts. are added to reduce the slag, which is removed, and a basic slag of, e.g., CaO +  $\text{CaF}_2$  is substituted. The N content is now raised by addition of steel (I) containing Cr 63, C 0.2, and N 2% 7 pts. and Fe-Si and/or Fe-Mn to yield the desired composition, e.g., Cr 18, Mn 0.4, Si 0.35, and N 0.08%. (B) The



metal (I) is added to the initial charge. (c) Steel containing, *e.g.*, Cr 17.3, C 0.1, and N 0.09% is prepared by treating the molten metal with at. N, produced by passing  $N_2$  through an arc. L. C. M.

**Steel-roll composition.** W. J. MERTEN, Assr. to NITRALLOY CORP. (U.S.P. 2,069,260, 2.2.37. Appl., 18.5.33. Renewed 24.3.36).—Rolls are forged from steel containing C 0.5—0.85 (0.7), Cr 3.5—8 (5.5), V 0.3—8 (0.6), Mo 0.8—1.2 (1.1), Si 0.1—0.2, P  $\geq$  0.04, and S  $\geq$  0.04%, which is annealed at 870—910°, quenched in oil to 150—315°, tempered for 2 hr. at 430—590°, and nitrided in  $NH_3$  for 15 hr. at 450—480°. L. C. M.

**Turbine blade.** A. L. FEILD, Assr. to RUSTLESS IRON & STEEL CORP. (U.S.P. 2,069,718, 2.2.37. Appl., 29.9.33).—The use of alloy steels containing C 0.05—1, Cr 12—30 (15—20), and Mo 0.2—1 (0.3—0.7)% is claimed. L. C. M.

**Coating of strip steel.** R. F. RENKIN, Assr. to H. A. ROEMER and J. M. HUGHES (U.S.P. 2,069,658, 2.2.37. Appl., 9.12.33).—The metal is passed through a bath of Zn—Sn alloy (10—30% Sn) at 414—440° (427°) and the excess coating wiped off; the coating is ductile and adheres well. L. C. M.

**Hardening furnace [for high-speed steel].** W. B. STURGES, Assr. to H. G. THOMPSON & SON CO. (U.S.P. 2,070,416, 9.2.37. Appl., 13.8.36).—A construction of gas-fired furnace for heat-treating hack-saw blades *etc.* is claimed. L. C. M.

**Melting and casting high-purity metal [copper].** J. O. BETTERTON, Assr. to AMER. SMELTING & REFINING CO. (U.S.P. 2,065,207, 22.12.36. Appl., 4.2.33).—Cathode Cu is melted in a muffle-type furnace filled with an inert atm. free from  $H_2$ ,  $SO_2$ , and  $H_2O$ ; the metal is covered by a thin layer of fluosilicate slag, and envelopes of inert gas are provided over the spout and moulds when the metal is poured. L. C. M.

**Surface-alloyed castings.** W. J. PRIESTLEY, Assr. to UNION CARBIDE & CARBON CORP. (U.S.P. 2,066,054, 29.12.36. Appl., 20.1.34).—High-conductivity metal (*e.g.*, Cu) is coated with wear- and corrosion-resistant alloy by pouring into moulds coated with a powdered (30—80-mesh) Fe alloy containing Cr 12—40, Si 10—30, Cu 20—40, and C  $\geq$  5%, mixed with 80—100 wt.-% of aq. Na silicate as binder. L. C. M.

(A) Flotation of cement copper. (B) Preparation and use of iron as a precipitant. H. E. KEYES (U.S.P. 2,070,133—4, 9.2.37. Appl., [A] 30.6.34, [B] 6.10.34. Renewed [A] 3.7.36).—(A) Oxidised Cu ore (containing, approx., CuO 1 and CuS 1%) slurry, after flotation to remove CuS, is thickened to 50% of solids, leached with dil.  $H_2SO_4$ , and the solution agitated with Fe sponge or scrap; flotation agents are then added, and a concentrate containing Cu 55—80% is floated off. Intermediate concentrates containing Cu 15—30% are agitated with dil.  $H_2SO_4$  to remove oxide from the surface, and returned to the flotation plant, the solution being treated with Fe and the pptd. Cu being returned to the first stage. (B) Fe pellets (0.1—0.5 in.) for use in the pptn. of Cu are produced by pouring the molten

metal into  $H_2O$ , the stream being broken up by steam jets and/or splash plates. L. C. M.

**Zinc alloy.** A. DACCÓ (U.S.P. 2,070,474, 9.2.37. Appl., 13.10.36. It., 12.11.35).—Bearing-bush alloys containing Al 9—16 (12), Pb 3—30 (10), and Cu 0.5—3 (1.5)% are claimed. L. C. M.

**Treatment of galvanised coatings.** J. L. SCHUELER and C. L. HENINGER, Assrs. to CONTINENTAL STEEL CORP. (U.S.P. 2,070,554, 9.2.37. Appl., 6.5.35).—The ductility of Zn coatings on wire is improved by passing the wire from the Zn bath through a zone at approx. 500°, and then chilling it by a spray of  $H_2O$ . L. C. M.

**Treatment of [auriferous] pyritic materials.** C. R. ARNOLD and F. N. MOERK (U.S.P. 2,065,547, 29.12.36. Appl., 20.10.34).—Low-grade ore, containing, *e.g.*,  $FeS_2$  65% and Au 0.46 oz./ton, is ground and then roasted with 17 wt.-% of coal in a continuous, rotating, tube furnace at 760—820°; the calcine is mixed to a slurry with  $H_2O$  and digested with hot aq.  $H_2SO_4$ . After filtering the suspension, the residue contains approx. 1.2 oz. of Au per ton and  $FeSO_4 \cdot 7H_2O$  is recovered from the filtrate. L. C. M.

**Recovery of precious metal from ore.** F. C. AXTELL, Assr. to H. WHEALTON (U.S.P. 2,069,206, 2.2.37. Appl., 16.8.33).—Au-bearing slurry is passed over corrugated C plates, electroplated with 0.001—0.005 in. of Cu, Zn, or Ag (Zn), and amalgamated; the plates are negatively charged, and an anode is suspended above them. The deposit is removed by treatment with dil. HCl, when the coating and vals. fall away, and the cathodes are replated for further use. L. C. M.

**Gold-washing apparatus.** R. B. MORDEN, Assr. to R. R. MORDEN (U.S.P. 2,065,321, 22.12.36. Appl., 29.5.33).—A rotating, inclined cylinder with spiral riffles is employed. L. C. M.

**Amalgamator for recovery of gold.** A. J. CLARK and W. H. TODD (U.S.P. 2,065,967, 29.12.36. Appl., 28.3.35).—The apparatus comprises a series (4) of launders arranged at right-angles. L. C. M.

**Recovery of flour gold.** G. O. MARRS (U.S.P. 2,065,818, 29.12.36. Appl., 10.8.35).—Placer sand is agitated with an equal wt. of  $H_2O$  and the slurry separated from heavy material is treated with  $FeSO_4$  and then with  $CaO$ ,  $NH_4Cl$ , and  $NaHCO_3$ ; the ppt. of Fe compounds containing the coagulated slimes is settled, and the vals. are recovered by the cyanide process. L. C. M.

**Apparatus for (A) screening, (B) roasting, ore.** C. A. GALLAGHER and C. M. ALLEN, Assrs. to GEN. CHEM. CO. (U.S.P. 2,070,530—1, 9.2.37. Appl., [A] 24.5.33, [B] 13.8.34).—Apparatus for treating sulphide ores in gaseous suspension is claimed. L. C. M.

**Flotation agent [for ores].** R. S. HANDY (U.S.P. 2,069,365, 2.2.37. Appl., 20.9.35).—A conditioning and frothing agent for the flotation of oxide ores (2 lb./ton) is prepared by adding 10% aq.  $Na_2CO_3$  71 to a mixture of oleic acid 57.1 and cresylic acid 28.7, and treating the emulsion with 10% aq. Na silicate 71 pts. L. C. M.



**Classification of minerals.** A. C. MUNRO (U.S.P. 2,065,722, 29.12.36. Appl., 15.6.34).—An apparatus for producing a flotation concentrate from ore pulp and subsequently separating unfloated slimes from coarse material is claimed. L. C. M.

**Metal cleaning.** G. LUTZ, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,070,487, 9.2.37. Appl., 24.12.34).—A rust-removing and rust-proofing composition comprises a mixture of aq. 15–45%  $H_3PO_4$  with 2–10 wt.-% of  $C_{2n}H_{4n+1}O\cdot SO_3Na$  (where  $n = 6-9$ ), obtained by sulphation of a mixture of aliphatic alcohols for 2–6 hr. at 38–60°. L. C. M.

**Material for arc-welding.** W. E. STINE, Assr. to LINCOLN ELECTRIC Co. (U.S.P. 2,065,157, 22.12.36. Appl., 20.1.34).—The use of mixtures containing low-m.p. (50–400°) materials, *e.g.*,  $H_3BO_3$  or rosin, wax, etc., 15–35 (20–30), metal oxides, *e.g.*, MnO or  $Fe_2O_3$ , 20–75 (35–50), org. deoxidisers, *e.g.*, starch or flour,  $\geq 15$ , and/or inorg. deoxidisers (Fe–Mn, Fe–Si)  $\geq 10$ , with orthoclase 5–25%, is claimed; they form a layer which becomes deposited in advance of the arc. L. C. M.

**Welding rod.** E. VADERS (U.S.P. 2,069,906, 9.2.37. Appl., 27.7.35. Ger., 17.4.35).—The use of alloys containing Cu  $\leq 95$ , Sb 0.01–2, and deoxidiser (P, Mn, Si, or Li) 0.01–1.5, with or without one or more of the elements Mn, As, or Sn 0.01–2%, in the gas-welding of Cu alloys is claimed. L. C. M.

**Manufacture of metallic glucinum [beryllium] and its alloys.** R. A. GADEAU, Assr. to COMP. DE PROD. CHIM. ET ELECTROMETALL. ALAIS, FROGES ET CAMARGUE (U.S.P. 2,069,705, 2.2.37. Appl., 25.4.35. Ger., 30.4.34).—Be alloys containing Cu, Al, or Zn are obtained by melting  $BeF_2$ , NaF (I) in a graphite crucible at 1000° and adding Mg–M alloy (where M = Cu, Al, or Zn); after stirring for 20 min., the slag is poured off and the residual Mg–Be–M alloy melted with a further quantity of (I) to remove the remaining Mg. The slag from this second melting is employed again with a fresh batch of Mg–M alloy, and the metal then contains Mg  $< 0.3\%$ . Pure Be may be prepared by volatilising the Zn from a Be–Zn alloy by heating in a graphite or  $BeO$  crucible at 1280°, using a 1:1 mixture of  $BaCl_2$  and  $BaF_2$  as flux. L. C. M.

**Apparatus for condensation of magnesium.** F. R. KEMMER, Assr. to AMER. MAGNESIUM METALS CORP. (U.S.P. 2,065,709, 29.12.36. Appl., 20.11.34).—Mg + CO mixture at  $> 1100^\circ$  is cooled rapidly by directing it against a vertical,  $H_2O$ -jacketed plate; a thin film of kerosene at 8° is sprayed on the top of the plate, and carries away the condensed Mg, which is recovered by filtration. L. C. M.

**Improvement of aluminium alloy.** A. J. LYON (U.S.P. 2,065,534, 29.12.36. Appl., 5.7.34).—The mechanical properties and soundness of castings are improved by heating at 700° molten Al alloy containing Cu 3–15, with or without Fe 0.5 and Si 0.7%, with 0.25% of dehydrated  $SnCl_2$ . L. C. M.

**Nickel-plating solutions and processes.** R. L. TUTTLE, Assr. to ZIALITE CORP. (U.S.P. 2,069,566, 2.2.37. Appl., 11.7.31. Renewed 14.7.34).—Baths specially suitable for plating on Zn and containing

$NiSO_4 \cdot 7H_2O$  16,  $Na_2P_2O_7 \cdot 10H_2O$  8.5, Na citrate 8, citric acid 2, NaCl 4,  $NaHSO_3$  0.25, and aq.  $NH_3$  (28%) 4–8 oz./U.S. gal. are employed with a c.d. of 7–10 amp./sq. ft. at 20–26°. L. C. M.

**Electrodeposition of metals [copper].** B. F. LEWIS, Assr. to NORTHWEST CHEM. Co., INC. (U.S.P. 2,065,082, 22.12.36. Appl., 19.7.34).—The use of an electrolyte containing Cu 0.1–0.5 (0.35), NaCN or KCN 0–0.4 (0.25), Na citrate 0.5–2 (0.9), Al 0.003–0.5 (0.007), “sulphate compounds” 0–1 (0.25), and NaOH (or its equiv. in other alkali) 0.25–1 (0.5) oz./U.S. gal. at 49–60° is claimed to produce a dense, semi-lustrous deposit. L. C. M.

**Apparatus for electrolytic production of lead and oxides of lead.** E. O. CUMMINGS (U.S.P. 2,070,513, 9.2.37. Appl., 22.9.34).—A process of treating scrap accumulator plates is claimed; a divided cell with porous partition is used with Pb electrodes and aq.  $Na_2SO_4$  or  $H_2SO_4$  as electrolyte. The  $PbO_2$  from the positive plates is placed in the anode and the sulphated negatives are in the cathode compartment, both in contact with the electrodes; after electrolysis at 2.5 v. pure  $PbO_2$  is deposited on the anode and spongy Pb on the cathode. L. C. M.

**Temp. control [for molten Na and Pb].** Oxidising molten Pb. Exhausting acid vapours from pickling plants.—See I. Glass-metal seal.—See VIII. Litharge. Rust-inhibiting coating. Lacquered metal.—See XIII.

## XI.—ELECTROTECHNICS.

**Large coreless induction furnaces in the steel industry.** M. KAUCHTSCHISCHVILI (Stahl u. Eisen, 1938, 58, 520–523).—The plant and processes in use in the Cogne Steelworks at Aosta, where all processes are carried out electrically, are briefly described with special reference to the two furnaces (6 and 8 tons capacity) used mainly for production of high-quality steels. Tables of operating data are given and photographs of the plant are reproduced. The power consumption per ton of steel is in each case 670–680 kw. C. M. A.

**Estimating life of electrical heating elements.** F. E. BASH (Met. Prog., 1938, 33, 143–147).—A linear relation exists between the life of Cr–Ni alloy heating elements and the temp. employed. The life at any temp. can be determined from that found at a given temp. provided the conditions are the same. R. B. C.

**Substitutes for raw materials in electrical engineering.** ANON. (Siemens Z., 1937, 18, 21–25).—Attempts being made in Germany to find substitutes for rubber, cotton, Cu, Pb, and Sn for use in cable manufacture are reviewed. R. B. C.

**Electrical conductivity [of metallic and non-metallic substances].** G. A. PERCIVAL (Beama J., 1938, 42, 84–86).—Recent work is reviewed. R. B. C.

**Insulation with bituminous substances.** H. MALLISON (Vedag-Buch, 1937, 10, 47–56).—A review. R. B. C.



**Conditions of electrolytic oxidation and their practical interest.** L. DELAVENNA (*Chim. et Ind.*, 1938, 39, 441—444; cf. A., 1936, 1076).—By working at about  $-3^{\circ}$  with a circulating stream of very slightly acid, saturated aq. NaCl containing about 15 g. of  $\text{Na}_2\text{Cr}_2\text{O}_7$  per l., anodic oxidation may be carried out at Pt or graphite electrodes without loss of  $\text{Cl}_2$  to give high yields of  $\text{NaClO}_3$ . This method permits the use of lower c.d. than usual, thus preventing loss of anode material. The  $\text{H}_2$  evolved can be collected safely, since it is free from  $\text{Cl}_2$  and  $\text{O}_2$ . Similar electrolysis of saturated aq.  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{NaClO}_3$ , and arsenites affords 90% yields of  $(\text{NH}_4)_2\text{S}_2\text{O}_8$ ,  $\text{NaClO}_4$ , and arsenates, respectively, but in these cases Pt electrodes must be used. The uses of the products and the adaptation of the process to the industrial scale are discussed.

J. W. S.

**Manufacture of sodium chlorate for weed-killing: a possible electrochemical industry for New Zealand.** S. H. WILSON (*New Zealand J. Sci. Tech.*, 1937, 19, 273—295).—A scheme for the electrolytic production of 300 tons of  $\text{NaClO}_3$  per year is outlined and its economics are discussed. It is suggested that the liquor from the cells, instead of being evaporated, should be used for slaking  $\text{CaO}$  to produce a dusting powder having a fertiliser as well as a weed-killing val. Evaporation cost would be saved but transport costs higher.

A. R. P.

**Catalytic decomposition of cassiterite-containing tin ores by cathodal reduction.** A. G. KARABASCH (*Zavod. Lab.*, 1938, 7, 158—161).—The ore is fused with  $\text{NaOH}$  in an Fe crucible (cathode) at  $500\text{--}550^{\circ}$ , and the melt electrolysed (c.d. at cathode 0.15—0.25 amp./sq. cm., at 2.5 v.); the Sn separating dissolves in the  $\text{NaOH}$  with evolution of  $\text{H}_2$ , which reduces further amounts of  $\text{SnO}_2$ .

R. T.

**Behaviour of lead anodes in a [zinc] sulphate electrolyte with particular reference to the influence of cobalt salts.** M. REY, P. COHEUR, and H. HERBIET (*Trans. Electrochem. Soc.*, 1938, 73, Preprint 29, 401—410).—The contamination of the electrolyte and of the cathode Zn by Pb derived from insol. Pb anodes has been investigated. Pure Pb anodes dissolve comparatively rapidly, but the rate of dissolution is reduced if the anode surface is rendered more or less passive by a covering of  $\text{PbO}_2$ . "Sulphated" anodes lead to rapid contamination. In presence of Co salts electrochemical attack of a pure Pb anode is materially reduced and the formation of suspended  $\text{PbO}_2$  in the electrolyte retarded. The rate of anodic dissolution of 99% Pb—1% Ag alloy is  $\ll$  that of pure Pb.

J. W. C.

**Construction and operation of an  $\text{H}_c$ -type, alternating-current, laboratory magnetic separator.** A. L. ENGEL (*U.S. Bur. Mines*, 1937, Rept. Invest. 3370, 71—74).—The machine comprises a series of 18 a.-c. magnets operated on 110 v., 60-cycle current and mounted in a wooden frame sloping transversely; the magnets are covered by a thin glass plate over which a rubber belt passes slowly. The material to be separated is fed on to the belt by means of a vibrating trough and the magnetic particles are caused by the magnets to acquire a dancing motion which carries them off the belt while the non-magnetic particles are

carried along to the discharge end. The magnets are wired so that they can be coupled in parallel circuits of 3 branches of 6 magnets in series, or of 2 branches of 9 magnets in series, each magnet coil has a resistance of 0.67  $\Omega$ , and the current in the circuit may be regulated by means of a  $\text{H}_2\text{O}$ -rheostat and ammeter. The results obtained on an ilmenite sand and on an Fe-bearing carbonaceous shale are recorded in tables.

A. R. P.

**Separation by magnetic methods.** S. G. FRANTZ (*Chem. Met. Eng.*, 1938, 45, 274—276).—Using exceptionally high-intensity magnetic fields, separation of feebly diamagnetic materials is technically possible, whilst it may be difficult to separate mixed materials each ingredient of which has a high magnetic susceptibility. Wet separators are generally more efficient than the dry types and are the only possible application for material  $< 150$ -mesh.

F. J. B.

**Electrostatic solid separations.** H. M. SUTTON and G. W. JARMAN, jun. (*Chem. Met. Eng.*, 1938, 45, 277—278).—Differences in electrical susceptibility are used to separate materials which do not otherwise lend themselves to separating processes. A suitable plant consists of a horizontal, rotating, earthed drum over which is run a thin stream of the mixed material. A high-potential charge supplied by way of a needle-point electrode causes the whole of the material to stick to the drum until it passes a discharging electrode consisting of a glass tube filled with a conducting gas. The voltages are adjusted until one of the materials is just discharged at this point while the other remains attached for a further portion of a revolution and is thus dropped into another hopper.

F. J. B.

**Modern [electrostatic] precipitator practice.** O. U. LAWRENCE (*Chem. Met. Eng.*, 1938, 45, 279—280).—Electrical pptn. is used for the removal of finely-divided fumes and liquids dispersed in air streams. Where the pptd. material is too fluffy to be retained by the collecting electrodes at normal gas velocities the electrical plant is used to produce agglomerates which are subsequently separated in cyclones. Various applications of the process are indicated.

F. J. B.

**Electrostatic charges in flowing gases.** W. RIMARSKI and FRIEDRICH (*Proc. XII Internat. Congr. Acetylene*, 1936, 4, 893—932).—With a view of finding suitable measures for most effectively preventing the dangers accompanying electrostatic charging in the application of technical gases, an apparatus was constructed which was an extensive copy of the parts used in practice. In the tests carried out, phenomena appeared which exhibit a certain similarity to the "bubble" effect and Lenard's theory. The spray tests on gauzes, which in a manner represented the usual valves or other parts employed in practice, have shown that high electrostatic charges, on the parts swept by the gases, have to be taken into account. The latter parts are charged positively or negatively according to their distance from the gas container. If the gas container is insulated a negative charge appears on it. Charging of the gas is not prevented by earthing the container,



but it is reduced to an important extent by a suitable selection of the shape of the nozzle and by local heating of the gas stream before it reaches those parts which cause charging. Curves are given which show the effects of the liquid content of the gas, and the size of the surface of and materials composing the objects swept by the gas, on the charging of the gas stream. P. G. McC.

**Electrostatic dust weight sampler.** E. C. BARNES and G. W. PENNEY (J. Ind. Hyg., 1938, 20, 259—265).—The pptg. unit has a grounded cylindrical Al tube as collecting electrode, and a central electrode on an insulator as ionising and pptg. electrode. Air is drawn through by a blower, the rate being measured by a manometer beneath the pptn. unit. Precautions are described to prevent changes in wt. of the unit during use; for greater accuracy a glass tube with a conducting glaze is used, with a Pt-Rh wire as central electrode. At 3 cu. ft./min. efficiency is 100% of all particulate matter. After weighing, the deposit can be washed out and used for a particle count. (Cf. A., 1936, 582.) E. M. K.

**Gases from carbon arcs.** R. W. COLTMAN (J. Ind. Hyg., 1938, 20, 289—296).—The amounts of  $\text{CO}_2$ , CO, NO, and  $\text{NO}_2$  produced by different types of C arc are tabulated. With any one type of C, the amount of N fixation is approx.  $\propto$  the arc current whether a.c. or d.c. Unimpregnated carbons and those containing metals give more fixed N than those containing rare earths. In an unventilated room of 1000 cu. ft. in the most extreme case, 11 min. burning raises the [NO] to the danger level of 125 p.p.m. The [CO] remains below the danger level in all cases. E. M. W.

**Determining NaCl in steam condensate. Electronic smoke indicator.**—See I. Coal carbonisation. [Electrode C from] pitch.—See II. Electrolytic  $\text{Cl}_2$  in making cellulose.—See V. At. H flame.  $\text{H}_2$  by electrolysis. Liquid  $\text{Cl}_2$ .—See VII. Determining  $\text{SiO}_2$  in ores. Luminescence of glasses. Determining enamelware whiteness. Applications of electrophoresis and electro-osmosis.—See VIII. Determining cement fineness.—See IX. Magnetic after-effect of carbonyl Fe. Determining Cu and Bi in Pb-Zn ores. Zn and  $\text{V}_2\text{O}_5$ . In-treated bearing metals. Progress reports [on electrolytic Mn]. Welds and welding. Refining Al. Detecting defects in Al. Welding Al-Cu. Determining Cu and Zn in Al and Mg alloys. Electrometallurgical problems. Rustless steels as cathodes. Cr- and Cu-plating. Porosity of coatings. Determining Cu in electrolytes. Co electrodeposits. Mn by electrolysis. Electroplating.  $p_{\text{H}}$  of plating solutions.—See X. Preserving insulation rubber.—See XIV. Saccharimeter.—See XVII. Flavouring sherries.—See XVIII.

See also A., I, 314, Thermodynamics of gas cells and Pb accumulators. 323, Determination of Ag from KCN solution. 324, Determination of Pb. 327, Applications of high frequency. 328, Purification of graphite electrodes.

**PATENTS.**  
**Low-frequency induction furnace.** HIRSCH KUPFER- u. MESSINGWERKE A.-G. (B.P. 482,560, 26.6.37. Ger., 27.6.36).—The crucible has an opening below the heating channels through which the latter may be easily cleaned, and a closure is described. B. M. V.

**Apparatus for electrostatic separation.** G. GRAVE and E. OPPEN, Assrs. to AMER. LURGI CORP. (U.S.P. 2,072,501, 2.3.37. Appl., 1.3.35. Ger., 16.1.35).—The apparatus comprises (1) a large, grounded carrier drum, (2) a smaller excited drum, and (3, 4) upper and lower, still smaller, grounded drums on either side of the plane including the axes of (1) and (2). All the drums rotate and the feed material passes between (3) and (1) on the surface of the latter; the tailing drops off between (4) and (1) and the lifted material is diverted to pass between (4) and (2). B. M. V.

**Electrolytic condensers.** RADIOWERK E. SCHRACK A.-G. (B.P. 482,856, 28.6.37. Austr., 1.7. and 28.11.36).—The anode (and cathode, if desired) is/are composed of etched Al containing  $<0.2$  ( $<0.02$ )% of impurities and having crystal grains  $<1 \mu$ . The film is formed at 650 v. and the capacity is  $<0.08 \mu\text{F}/\text{sq. cm.}$ , calc. on the surface before etching. The spongy structure should extend through the foil and be such as to lift  $\text{H}_2\text{O}$   $<8 \text{ cm.}$  by capillarity. B. M. V.

**Wet electrolytic cells such as electrolytic condensers.** N. V. PHILIPS' GLOELAMPENFABR. (B.P. 482,244, 17.7.37. Ger., 20.7.36).—The containing vessel (forming one conductor) is of easily-worked base metal and is provided with a cathode of more expensive metal, e.g., Cr alloy or Fe-Cr, in electrical contact with it. B. M. V.

**Production of insulating material having a high dielectric constant.** W. SOYCK (U.S.P. 2,069,903, 9.2.37. Appl., 27.12.35. Ger., 14.12.34).—Claim is made for ceramic material ( $\epsilon$  50) of very low dielectric loss at low frequency, which contains  $\text{TiO}_2$  70,  $\text{ZrO}_2$  20, clay 5, and alkaline-earth (Mg) carbonate 2 pts. and is fired at 1350—1600°. L. C. M.

**Dry-plate rectifiers.** BRIT. THOMSON-HOUSTON Co., LTD. (B.P. 482,239, 18.6.37. Ger., 22.6.36).—To a conducting base are applied successively  $<2$  layers of semi-conducting material, each (with the base and previous layers) being separately treated by heat and pressure to produce a valve effect. The first layer is preferably Se + I applied by melting, and the subsequent one(s) is/are of pure Se applied by vaporising. B. M. V.

**Electric-discharge devices.** BRIT. THOMSON-HOUSTON Co., LTD. (B.P. 482,111, 7.9.37. Ger., 7.9.36).—In an apparatus having a pool-type cathode, the starting electrode dipping therein is partly covered with insulating oxide or enamel to prevent short-circuits. B. M. V.

**Metal-vapour discharge tubes.** N. V. PHILIPS' GLOELAMPENFABR. (B.P. 482,036, 25.8.37. Ger., 28.8.36).—When, e.g., Mg or Tl is the volatile metal it is found that the glass of the tube is more attacked by



the liquid metal than by its vapour; the lower part of the tube is therefore kept as cool as possible and lined with a more resistant, not necessarily transparent, material (*e.g.*, Zr foil) at those parts where the excess of metal collects. B. M. V.

**Electric lamp for producing short-wave-length radiation.** C. H. BRASELTON, Assr. to SIRIAN LAMP CO. (U.S.P. 2,069,713, 2.2.37. Appl., 23.9.32).—The lamp, which has a bulb of glass transparent to ultra-violet light, contains an 84:16 mixture of A and N<sub>2</sub> under atm. pressure at the working temp., and is fitted with a filament of W wire coated with Ta by applying an alcoholic suspension of TaCl<sub>3</sub>, drying, and heating at 2850° in H<sub>2</sub>. L. C. M.

**Manufacture of filaments for electric incandescence lamps.** M. H. CARPMAEL. From ALLGEM. GLÜHLAMPENFABR. A.-G. (B.P. 481,964, 17.8.36).—Coiled W filaments (which are liable to form long crystals) are heated by a surge of current for >0.5 sec. (<0.1 sec.) at a temp. between 2800° and the m.p. of W (substantially <3200°). A pretreatment at <1000° while on a refractory mandrel is advisable. The sag in use will be <5% and the crystal size 1–10  $\mu$ . B. M. V.

**Manufacture of electrode for luminous tube.** R. NAUTH, Assr. to FLEXLUME CORP. (U.S.P. 2,065,947, 29.12.36. Appl., 8.1.35).—Electrodes for luminous signs are prepared by heating momentarily Cu tubes in a blowpipe flame at approx. 1000° so as to form a Cu<sub>2</sub>O–CuO film, which is then coated with alkali or alkaline-earth salt. L. C. M.

**Barrier plane rectifying cells and photoelectric cells.** F. ROTHER (B.P. 483,088, 13.10.36).—Seven methods of treatment for the base metal (*e.g.*, Cu) prior to or after formation of a semi-conducting coat (*e.g.*, Cu<sub>2</sub>O) are claimed. B. M. V.

**Method of introducing an alkali or alkaline-earth metal into an exhausted receptacle.** N. V. PHILIPS' GLOEILAMPENFABR. (B.P. 482,022, 6.4.37. Holl., 9.4.36).—A mixture of (1) a compound of the active metal (Cs dichromate or BaO<sub>2</sub>), (2, 3) two reducing agents (Zr and Al), and (4) a diluent (Cr oxide) is introduced into the evacuated space and a reaction started by heating. (2) is an effective reducer of (1), and (3) and (4) gives rise to a highly exothermic reaction. B. M. V.

**Production of [piezo-electric] crystals.** TELEFUNKEN GES. F. DRAHTL. TELEGRAPHIE M.B.H. (B.P. 482,096, 14.7.37. Ger., 14.7.36).—Rochelle salt or other piezo-electric crystal is grown in the cooler of two vessels maintained at a predetermined temp. difference, the solution being circulated continually between the two and that in the warmer one being kept substantially saturated. B. M. V.

**Preparation of [thorium] product for use in röntgenography.** T. O. MENEES and J. D. MILLER, Assrs. to UNION BENEVOLENT ASSOC. (U.S.P. 2,065,718, 29.12.36. Appl., 16.7.34).—Peptised suspensions of ThO<sub>2</sub> of low  $\eta$  and  $p_H$  6–7 (6.2), suitable for use in radiological delineation of the gastrointestinal tract etc., are prepared by pptn. of Th(OH)<sub>4</sub>

from  $\approx 1\%$  aq. Th(NO<sub>3</sub>)<sub>4</sub> by (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>, washing by decantation, peptising the ppt. by addition of 1–2 wt.-% of Th(NO<sub>3</sub>)<sub>4</sub>, and adjusting to ThO<sub>2</sub> 20–40%. L. C. M.

**Thermionic cathode and activation thereof.** G. R. FONDA, Assr. to GEN. ELECTRIC CO. (U.S.P. 2,069,407, 2.2.37. Appl., 29.7.30).—W cathodes containing ThO<sub>2</sub> are heated for 1 min. at 3000° in an atm. of H<sub>2</sub>, A, or N<sub>2</sub> at 1 atm., prior to flashing a second time in vac. L. C. M.

**Electrically insulating gastight seals, more particularly for metal-vapour electric converters.** GEN. ELECTRIC CO., LTD., and E. GALLIZIA (B.P. 483,931, 23.11.36).

**Electrode arrangements for use in electrical-conductivity measurements.** K. SCHIERJOTT (B.P. 483,460, 4.11.37. Ger., 4.11.36).

**Refrigeration. Softening H<sub>2</sub>O. Vac. gauges.**—See I. Treating bitumina. Voltolised mineral oils.—See II. Alkali sulphides. Luminescent material. Pb from battery plates.—See VII. Glass-metal seal.—See VIII. Pb and its oxides [from accumulator plates]. Precious metal from ore. Arc-welding. Electrodepositing Cu. Ni-plating.—See X.

## XII.—FATS; OILS; WAXES.

[Alleged] biological synthesis of fats. F. FIEDLER (*Fette u. Seifen*, 1938, 45, 183–185).—The apparent increase in the fat content of seeds which have been macerated with carbohydrate solutions according to the Lüdecke patent (G.P. 647,219) is due, not to synthesis of fat, but to the "opening-up" (solubilisation) of the seed constituents and the liberation (exosmosis) in the free state of substances which are sol. in light petroleum but differ considerably in composition from the true fat originally present in the seed. E. L.

**Glycerides of fats. XV. Glycerides of babassu fat.** A. BÖMER and H. HÜTTIG (*Z. Unters. Lebensm.*, 1938, 75, 1–33; cf. B., 1936, 1106).—The kernel contained H<sub>2</sub>O 4.43, protein 7.63, N-free extractives 13.11, crude fibre 4.41, ash 1.56, and fat 68.86% of m.p. 25°, sap. val. 251.1, I val. 15.6, acid val. 2.0, Reichert–Meissl val. 5.9, Polenske val. 11.6, PrCO<sub>2</sub>H val. 0.4, refraction at 30° 40.5, at 40° 35.0, and unsaponifiable matter 0.3%. By distillation in high vac., as for coconut oil, three fractions were obtained (up to 150°, 150–295°, and a residue) which were further examined by fractional pptn. with COMe<sub>2</sub>. Contrary to Krafft's statement, oleic acid was present in the glycerides of the distillates so obtained. The bulk of these consisted of myristodilaurin (m.p. 34.9°) with some laurodimyristin (m.p. 36.1°) and a little palmitodimyristin (m.p. 45.7°). The more-sol. glycerides of the residue contained oleic, stearic, myristic, lauric, and octoic acids, whilst the least-sol. was steardipalmitin (m.p. 55.9°). The content of this in the fat is, however, low. E. C. S.

**Normal and abnormal impurities in glycerin lyes.** J. P. LEHALLEUR (*Compt. rend. XVII Cong. Chim. Ind.*, 1937, 44–46).—Owing to the modern



employment of hydrosulphites for bleaching fats and soaps, dynamite and pharmaceutical glycerins may be contaminated with  $S_2O_3^{2-}$  and it is proposed that limits for this impurity should be included in the International Specification for glycerin. E. L.

**High-power [-capacity] emulsifier and its utilisation in treatment of fats.** J. AUMARÉCHAL (Compt. rend. XVII Cong. Chim. Ind., 1937, 1035—1040).—The emulsifier comprises a chamber within which two cog-wheels are mounted, the one above the other on parallel axes, the teeth being cut so as to enmesh without making actual contact as the wheels are driven (at >2850 r.p.m.) by co-axial, co-acting gear-wheels of ordinary type; emulsification occurs rapidly (even with fluids of high  $\eta$ ) as the fluids are drawn through the narrow peripheral clearance (a few hundredths of a mm.) between the emulsifying wheels and the casing on their way to the discharge orifice. No foaming occurs unless gas is deliberately introduced into the fluids. The use of the machine for, *inter alia*, emulsifying the ingredients for the cold saponification, hydrogenation, or bleaching of fats, for the hydrolysis of fats by the enzyme process, etc. is described. E. L.

(A) Effect of neutralising and decolorising processes on content of lecithin and of unsaponifiable matter of fats. (B) Possible corrective additions to be made to edible fats which have been impoverished in lecithin content by neutralisation and decolorisation. G. WOLFF and H. GUELLERIN (Compt. rend. XVII Congr. Chim. Ind., 1937, 919—923, 1122—1124).—(A) For 15 filtered, unrefined vegetable and animal fats and oils, the content of lecithin (I) (calc. from the P content as determined by a described modification of the Lorenz-Scheffer method) ranged from 0.45 to 3.2 g./kg., being greater in oils prepared by heating than in cold-extracted oils, and also greater in the more unsaturated oils (*e.g.*, linseed or maize oil), than in, *e.g.*, lard or palm-kernel oil. Alkaline deacidification may remove >50%, and bleaching with absorbents >80%, of the (I) present in the crude oils, but similar amounts of (I) can readily be reincorporated in the refined oils. In certain cases, the refining treatments slightly reduce the amount of unsaponifiable matter in the oils.

(B) In view of the physiological importance of (I), unnecessary refining [which may remove 90% of the (I) present in the crude oil] of virgin oils etc. is deprecated, and the fortifying of refined edible oils with (I) is mooted. E. L.

(A) Detection of foreign fat in cacao butter. (B) Simplified and more sensitive method for carrying out the detection. B. PASCHKE (Z. Unters. Lebensm., 1938, 75, 316—317, 318—320).—(A) The  $n$ , and sap., I, and acid vals. of samples of beef-, mutton-, pork-, and horse-fat are recorded. Addition of these fats to cacao butter may be detected by determination of the A, B, and R vals. as described previously (B., 1933, 314; 1934, 368).

(B) The sap. val. of the saturated acids in fraction B is calc. by deducting from the total KOH that required for saponification of oleic acid, the amount of which is calc. from the I val. The animal fats

give vals. from 203 to 220, whereas cacao butter gives 195.5; hence adulteration is more readily detectable.

E. C. S.

**Fat chemistry. LIX. Viscosimetry of fats.** H. P. KAUFMANN and S. FUNKE (Fette u. Seifen, 1938, 45, 255—262; cf. B., 1938, 681).—Walther's empirical formula  $\log \log (\eta + 0.8) = m(\log T_1 - \log T) + \log \log (\eta_1 + 0.8)$ , relating the dynamic or kinetic  $\eta$  of mineral oils with temp. (abs.) is shown to hold also for fatty oils. Individual oils may be characterised by the val. of  $\eta$  at any given temp. (*e.g.*, at 20°) in conjunction with the val. of  $m$  in the above equation. The val. of  $\eta$  cannot be calc. accurately from the I and sap. vals. of the oil.  $\eta$  at various temp. of oleic, elaidic, erucic, linoleic, and ricinoleic acids (12.3, 15.6, 27.8, 9.25, and 110.9 centipoises at 50°, respectively) have been determined: the  $\eta$  of the *trans*- (elaidic) is > that of the corresponding *cis*-isomerides, whilst the  $\eta$  of elaidic acid is < that of stearic acid (18.09 centipoises at 50°). Technical hydrogenation or polymerisation of oils is accompanied by a regular change in  $\eta$ , which therefore offers a better index of the progress of the reaction than does the I val. E. L.

**Causes of analytical differences between refractometric and gravimetric methods of determining fat content.** K. SCHARRER and H. LAMEL (Fette u. Seifen, 1938, 45, 262—266).—The figure for the oil content of seeds as determined by the gravimetric method (exhaustive extraction with light petroleum, b.p. 45—55°) is found to be 0.2—0.4 higher than that obtained by the Leithe refractometric method (employing cold light petroleum, b.p. about 95°; cf. B., 1937, 938), the difference being apparently due to the extraction of more adventitious substances (phosphatides, sterols) by the first method. Oils extracted from soya beans contained by the gravimetric and refractometric methods, respectively, 0.0534 and 0.00508% of total P, about 0.12 and 0.012% of phosphatides (only about 10% of the total P is present as phosphatides), and 0.81 and 0.66% of unsaponifiable matter, including 0.62 and 0.42% (on the oil), respectively, of sitosterol (I). The usefulness of chromatographic analysis for the examination of the unsaponifiable matter of oils is illustrated; the quant. results for (I) content by this method agree well with the amounts obtained by pptn. with digitonin. E. L.

**Refractometric determination of fat in oil seeds by the benzine method.** K. SCHARRER and H. LAMEL (Landw. Versuchs-Stat., 1938, 129, 164—170).—The method of Leithe and Lamel (B., 1937, 938) is suitable for agricultural control work and for plant-breeding practice. A. G. P.

**Application of capillary analysis to study of certain fatty substances.** A. FAURE and PALLU (Ann. Falsif., 1938, 31, 13—18).—Aq.  $Na_2CO_3$  falls at const. rate from a burette into a solution of the oil or fat in  $C_6H_6$ . The vol. of 50 drops is noted. With increasing acidity of the oil this vol. diminishes. *E.g.*, with fresh arachis oil the vol. of 50 drops was 0.5 c.c. (rancid oil 0.007 c.c.), with olive oil 0.6 and 0.34 c.c., and with butter 0.37 and 0.008 c.c., respec-



tively. High vals. are correlated with low acidity in the oil, and vice versa.

E. C. S.

**Natural and commercial chlorophyll in edible oils.** E. F. H. TÜRK (Anal. Asoc. Quím. Argentina, 1937, 25, 132—143).—Fluorescence of olive oil is suppressed by  $\text{PhNO}_2$ , but that of chlorophyll and its derivatives is not affected. When olive oil containing 5% of  $\text{PhNO}_2$  is illuminated with ultra-violet light a feeble greenish-blue fluorescence from the meniscus indicates the presence of Cu phæophytin (cf. Schertz, B., 1927, 891); if the fluorescence is red or orange, two samples of the oil (each 3 c.c.) are further examined, (A) by treating with 3 drops of a 1% solution of  $\text{Cu}(\text{OAc})_2$  in  $\text{AcOH}$ , (B) by heating with 3 drops of  $\text{AcOH}$ ; on adding 2 drops of  $\text{PhNO}_2$  to both A and B, a bluish-green, ultra-violet fluorescence in A and a red one in B indicates a natural chlorophyll, whilst a red or a violet fluorescence in both A and B is due to Zn phæophytin.

F. R. G.

**Influence of bleaching adsorbents on stability of edible oils.** J. W. HASSLER and R. A. HAGBERG (Oil & Soap, 1938, 15, 115—120).—Acceleration in rate of oxidation of cottonseed oil observed during early stages of the induction period is not due to formation of catalytic substances, but may be due to destruction of antioxidant colour compounds. The effect of commercial adsorbents on oxidation of cottonseed oil was tested. Lowering the  $p_H$  of an adsorbent gives a lower initial peroxide val., but this does not of itself improve subsequent stability. Greater initial peroxide removal was frequently followed by instability. The most effective  $p_H$  for colour removal by carbons was  $> 6$  and by activated clays 3.5—4.0. In experiments similar to plant practice a fuller's earth-C mixture (3:0.5%) and an activated clay-C mixture both gave better results as regards bleaching and stability than did standard fuller's earth (3.5%) or activated clay alone.

F. M. F.

**Polymerisation of linseed oil in presence of small quantities of sulphur or selenium.** H. I. WATERMAN, C. VAN VLODRUP, and F. ALTHUISIS (J.S.C.I., 1938, 57, 87—89).—Tests were carried out at  $290^\circ$  with 0.3% of S or Se. Both elements had a thickening action, whilst the activity of the Se was independent of the modification used, and the thickened oils obtained in the S experiments had a relatively high S content. The thickened oils obtained from both S and Se treatment had normal sap. vals.; those with low acid vals. were pale in colour, and at room temp. several of them showed no turbidity, whilst some of the S-treated ones showed only traces at  $-2^\circ$ . In the sp. refractivity-I val. curves, the products obtained by treatment with 0.3% of S or Se lie very close to oils formed by polymerisation in a stream of  $\text{N}_2$ . In the S trials the  $\eta$  of the thickened oil and the % of residue, after mol. distillation, at a particular I val., are in approx. agreement with analogous consts. for stand oils obtained by thermal polymerisation. Et stearate and tristearin were heated for 4 hr. at  $290^\circ$  with 0.3% of S, but no important change in either was observed; hence it is concluded that the observed effect of S and Se must be

connected with the unsaturated constituents of the glyceride mols.

W. J. B.

**Older drying oils.** J. VAN LOON (Verfkronek, 1938, 11, 69—70).—A lecture and discussion on linseed, perilla, tung, and oiticica oils.

D. R. D.

**Newer drying oils.** R. PRIESTER (Verfkronek, 1938, 11, 70—71).—Methods for increasing the rate of drying of oils are reviewed, including the prep. of drying oils from castor oil, the improvement of linseed oil stand oil by vac. distillation, solvent extraction, etc., the removal of saturated components from semi-drying oils, e.g., by freezing etc. Many of these operations are best performed on the free oil acids, which are subsequently re-esterified with glycerol, since the presence of mixed glycerides in the oils reduces the efficiency of separation of the saturated and unsaturated components.

D. R. D.

**Catalytic oxidation of fatty oils.** W. NAGEL and R. VON HAVE (Wiss. Veröff. Siemens-Werken, 1938, 17, 48—58).—The readiness of oxidation of linseed, tung, soya-bean, and olive oils, linolenic, linoleic,  $\alpha$ - and  $\beta$ -clæostearic and elaidic acids, and Me oleate has been compared by the Evers-Schmidt method (B., 1930, 801; 1931, 749).  $\text{CuO}$ ,  $\text{NiO}$ ,  $\text{CoO}$ ,  $\text{Pt}$ , and  $\text{Ag}_2\text{O}$  catalysts are compared in the oxidation of mineral oils;  $\text{CuO}$  catalysts prepared from  $(\text{HCO}_2)_2\text{Cu}$  are the most active.

J. W. S.

**Coconut oil. II. Method for conversion into solids.** J. BAZON (Philippine Agric., 1937, 26, 399—402; cf. B., 1938, 681).—Distillation of the oil with  $\text{Fe}_2\text{O}_3$  or finely-divided Fe yields a semi-solid mass which after washing with EtOH gives a white cryst. solid, m.p.  $55^\circ$ , unaffected by boiling with 3N-KOH in EtOH or  $\text{HNO}_3$  and HCl. Yield 50—60%. The product resembles paraffin and may be of val. in candle manufacture.

A. G. P.

**Soya-bean oil foots. II. Isolation of free amino-acids.** K. OKANO and I. BEPPU (J. Agric. Chem. Soc. Japan, 1938, 14, 248—250; cf. B., 1936, 1105).—Arginine, and glutamic, aspartic, and hydroxyglutamic acids have been isolated from the crude stachyose fraction. A lactonic  $\text{NH}_2$ -acid,  $\text{C}_7\text{H}_{19}\text{O}_7\text{N}_3$ , m.p.  $245^\circ$ , was also isolated. This contains 2  $\text{NH}_2$  and titration of the hot dil. alkaline solution as well as formol titration indicate 2  $\text{CO}_2\text{H}$ . The ninhydrin and biuret reactions are positive.

J. N. A.

**Refractometric determination of oil in Aleurites seeds.** E. D. G. FRAHM and D. R. KOOLHAAS (Rec. trav. chim., 1938, 57, 395—398).—A modified Leithe method has been successfully applied to the montana and, with a slight correction, moluccana varieties.

C. R. H.

**Analysis of chaulmoogra oils. I. Carpo-troche brasiliensis (sapucainha) oil. II. Oncoba echinata (gorli) oil.** H. I. COLE and H. T. CARDOSO (J. Amer. Chem. Soc., 1938, 60, 614—617, 617—619).—I. Chaulmoogra oils are analysed by fractionating (Podbielniak) separately the Et esters of the solid and liquid fatty acids. The former give a sharp separation of Et palmitate and hydnocarpate from Et chaulmoograte. The latter give a much less sharp separation. The composition of the fractions



is determined by application of the vals. for b.p., I val., and [α]. *C. brasiliensis* oil yields 74.8% of solid (palmitic 8.6, hydnoearpic 56.8, chaulmoogric 30.8, and oleic acid 1.5%) and 25.2% of liquid acids (palmitic 0.8, hydnoearpic 10.1, chaulmoogric 5, oleic 20.6, and gorlic acid 61.1%). This oil keeps well (1 year), but the seeds deteriorate rapidly, giving, when old, a very irritating oil. The irritation is probably due to decomp. products of the gorlic glycerides.

II. *O. echinata* oil gives 79.2% of solid and 20.8% of liquid acids, composed of palmitic 7.8, oleic 2.2, gorlic 14.7, and chaulmoogric acid 74.9%.

R. S. C.

**Continuous hardening of oils and fats.** L. H. MANDERSTAM (*Fette u. Seifen*, 1938, 45, 251—255).—The Bolton-Lush continuous-hydrogenation plant and process are described.

E. L.

**Relation of composition of liver oil fatty acid to fishing season of the cod.** M. YOSIDA (*J. Agric. Chem. Soc. Japan*, 1938, 14, 277—283).—The oil with pronounced vitamin-A content prepared during and immediately after spawning is lower in highly unsaturated acid content than that with low -A content prior to spawning. There is no noticeable difference as regards saturated acids, but average oils have more highly unsaturated and less saturated acids. The highly unsaturated acids in the liver fat of rats maintained on the oil decrease rapidly during fasting.

J. N. A.

**Measurement of the oxygen absorption of fish oils by means of the manometer.** J. JANY (*J. Soc. Leather Trades' Chem.*, 1938, 22, 110—116).—The  $O_2$  absorption of herring and sardine oils when distributed on cotton wool and on delimed lamb skin, respectively, have been determined by means of the Barcroft manometer. The  $O_2$  absorption by oil distributed on skin is much more rapid than by the same oil distributed on cotton wool. No direct relation between the I and CNS vals. of 9 fish oils and their capacity to absorb  $O_2$  could be observed.

D. P.

**Aluminium stearate greases.** F. J. LICATA (*Ind. Eng. Chem.*, 1938, 30, 550—553).—The effects on grease consistency of using different types of petroleum oil, of the presence of moisture, of the time of compounding, and of the rate of cooling are discussed.

E. L.

**Binding media for polishing pastes.** A. POL-LACK (*Oberflächentech.*, 1938, 15, 79—80).—The liquid components which are added to polishing pastes to control the hardness, m.p., ease of spread, and cost of the product are discussed. A simple, high-gloss paste for, e.g., Ni-plated surfaces may be prepared from stearic acid and CaO; its hardness is increased by adding beeswax, ceresine, carnauba or paraffin wax. The last-named has the disadvantages that it does not saponify, is not so easily emulsified, and excess has an embrittling effect. Softening agents, e.g., vaseline, tallow,  $N(C_2H_4 \cdot OH)_3$  (I), render possible the incorporation of larger proportions of solids; a more active product results and they are therefore added to preparatory rather than to finishing polishes. A soft paste may be prepared alternatively from (I) and montan wax. Recipes are given for

polishes for general use, steel, brass, light metals, etc.

S. M.

**Air oxidation of oils. Lubricants. Determining S in lubricating oils.**—See II. **Gas in chemical industry. Fatty alcohols.**—See III. **Silk-cocoon wax.** [Wax from] raw silk. **Grease-proof paper.**—See V. **Determining fat in bakery products.**—See XIX.

See also A., II, 216, **Synthesis of polyene fatty acids.** III, 498, **Fat of green turtle.** 503—7, **Vitamins.**

#### PATENTS.

**Hydrolysis of fats and greases.** J. R. MOORE (Assee.) and E. K. WALLACE (U.S.P. 2,065,145, 22.12.36. Appl., 28.6.34. Cf. U.S.P. 1,967,319; B., 1935, 417).—Acid salts, e.g.,  $NaHSO_4$  and  $NaH_2PO_4$ , are used as catalysts (in place of acids) for the hydrolysis of fats in presence of  $H_2O$ -miscible fat solvents according to the prior patent; hydrolysis is slower than with acids, but the catalyst can be recovered by crystallisation.

E. L.

**Manufacture of pure soaps.** G. W. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 474,476, 2.7.36).—Crude fatty acids, e.g., those obtained by oxidation of paraffin wax or from sperm oil, are saponified with alkalis and the crude soap is first distilled under vac. (with or without steam) in order to remove part of the unsaponifiable matter, the remainder being extracted with suitable solvents after cooling and finely dividing the residue.

E. L.

**Soap composition.** J. B. LEWIS and J. C. BIRD, Assrs. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 2,066,208, 29.12.36. Appl., 21.4.32).—A composition containing alkali-metal soap (e.g., the K soap of soya-bean or linseed oil) 65—95, hydrocarbon oil (kerosene) 5—25, and sulphonic acids from petroleum acid sludge 0.5—10% is claimed.

L. C. M.

**Floating tablets of milled soap.** PROCTER & GAMBLE Co., Assecs. of T. S. EAGEN (B.P. 484,341, 17.2.37. U.S., 21.2.36).

**Lubricants.**—See II.

#### XIII.—PLASTICS; RESINS; PAINTS; COATING COMPOSITIONS.

**Raw materials of the plastics industry.** G. J. ESSELEN and F. S. BACON (*Ind. Eng. Chem.*, 1938, 30, 125—130).—The dependence of the future of the industry on the availability of the raw materials, when these are by-products of other industries, is examined. Production figures illustrating the points are given.

K. W. P.

**Present possibilities of celluloid.** J. BADET (*Rev. Gén. Mat. Plast.*, 1938, 14, 63—68).

F. McK.

**Manufacture of linoleum.** ANON. (*Rev. Gén. Mat. Plast.*, 1937, 13, 371—373; 1938, 14, 20—23, 78—80).—A detailed review.

F. McK.

**Plastic moulding.** G. DRING (*Automobile Eng.*, 1938, 28, 95—96, 114).—The properties and applications of various types of plastics, e.g., urea- $CH_2O$  resin and casein, are summarised.

R. B. C.



**Determining the brittleness of moulded plastics.** R. NITSCHÉ and W. ZEBROWSKI (*Kunstharze, Plast. Massen*, 1938, 8, 33—37, 65—66, 68—70).—Various tests are reviewed and results for phenolic and urea resins containing various fillers given. F. McK.

**Polishing of plastic materials.** J. BEL (*Rev. Gén. Mat. Plast.*, 1938, 14, 58—59s).—Various processes are examined. F. McK.

**Suitability of plastics for aeroplane dopes.** G. M. KLINE and C. G. MALMBERG (*Ind. Eng. Chem.*, 1938, 30, 542—549).—Cotton fabrics were doped with solutions of cellulose esters and ethers which were plasticised mainly with 10% of  $\text{Ph}_3\text{PO}_4$  and the tautness was measured at intervals during exposure. The data (tabulated) show that the most important single factor is the composition of the solvents and not that of the non-volatile portion. For max. tautness the min. quantity of active solvent should be retained during the final drying stage. The solvents used appear to control also the development of brittleness. Max. initial tautness was obtained with tri-esters, e.g., cellulose triacetate, and a completely acylated acetobutyrate (I); varying the acyl or OEt content of partly hydrolysed derivatives and the size of the mol. (as shown by  $\eta$ ) had little effect. Cellulose nitrate and (I) behaved similarly on exposure and generally showed slight decrease in tautness during rainy weather; max. slackening under such conditions was given by cellulose acetate. S. M.

**New non-crystallising gum rosin.** S. PALKIN and W. C. SMITH (*Oil & Soap*, 1938, 15, 120—122).—Pine gum is allowed to drip through light-wt. muslin bags or, preferably, filter cloth spread over Al-wire screen (4—6-mesh). Longleaf pine gum (18 lb. 4 oz.) filtered for 25 hr. at 30—33° gave 30.5% of filtrate which is non-crystallising rosin. In accelerated tests for determining the tendency of rosin to crystallise, a stoppered test-tube containing rosin and  $\text{COMe}_2$  is set aside. Of 14 samples of rosin prepared by the new method, 8 failed to crystallise in this test, whilst the remainder developed but few crystals. None showed crystals in quantity comparable with that developed by normal rosins. F. M. F.

**Decolorisation of natural extractive resins.** K. HOŁOWIECKI (*Przemysł Chem.*, 1938, 22, 66—71).—Colophony dissolved in petrol containing 15% of  $\text{C}_5\text{H}_{12}$  is decolorised with a 19:1 activated bentonite-charcoal mixture, at 65—90°. The adsorbent is regenerated by extraction with hot EtOH. R. T.

**Determination of m.p. of solid resins.** E. FONROBERT and K. BRÜCKEL (*Farben-Ztg.*, 1938, 43, 497—499).—The m.p. (tabulated) of 36 natural and synthetic resins were 1—22° higher by the falling-Hg (Krämer-Sarnow) method and 13—33° higher when using the ring-and-ball method than with the capillary tube. The last method is recommended; both sintering and liquefaction temp. should be stated. S. M.

**Composition and fractionation of American steam-distilled wood turpentine.** S. PALKIN, T. C. CHADWICK, and M. B. MATLACK (*U.S. Dept. Agric., Tech. Bull.* 596, 1937, 30 pp.).—Steam-

distilled wood turpentine was subjected to systematic fractional distillation; the  $d$ ,  $n$ , and  $[\alpha]$  of each fraction are tabulated. Chemical examination showed that the original liquid consists mainly of  $\alpha$ -pinene; only small amounts of  $\beta$ -pinene, camphene, and monocyclic hydrocarbons (dipentene, limonene, terpinene, terpinolene) are present. Non-hydrocarbons account for <2% of the whole and include *sec.* (borneol, fenchyl) and *tert.* ( $\alpha$ -terpineol) terpene alcohols, aldehydes (PhCHO, furfuraldehyde), phenols, and phenolic ethers (anethole). Small quantities of low-b.p. paraffin hydrocarbons also were observed, but these may have their origin in the process of extraction. The composition of turpentine obtained from the oleoresin is compared. Vac. fractional-distillation apparatus and an improved pressure-control device are described. S. M.

**Plastic form of glyptal resins.** G. WRIGHT (*Rev. Gén. Mat. Plast.*, 1937, 13, 263—265).—Glyptal resins may be converted into a state suitable for moulding by addition of definite proportions of glycol succinate or adipate. Properties and applications of the products are reviewed. F. McK.

**Glass-clear synthetic resins for models.** A. ROEDTER (*Kunstharze, Plast. Massen*, 1938, 8, 104—105). F. McK.

**Determination of the hardening properties of synthetic resins.** T. DOMAŃSKI and W. KWINTA (*Przemysł Chem.*, 1938, 22, 107—110).—Minor improvements in known methods of determining change in plasticity of heated resins are described. R. T.

**Foam-promoting substances from synthetic resins.** T. DOMAŃSKI and W. POKLEWSKI KOZIEŁŁ (*Przemysł Chem.*, 1938, 22, 82—85).—The sulphonated PhOH- and cresol- $\text{CH}_2\text{O}$  resins obtained from suspensions of the resins in  $\text{CCl}_4$  and  $\text{ClSO}_3\text{H}$  are active foam promoters, and may be applied in solutions of  $\rho_H$  about 1. The most active products are obtained from resins of m.p. 71—75°. R. T.

**Determination of lead dioxide in red lead.** R. SALMONI (*Annali Chim. Appl.*, 1938, 28, 47—57).—Comparison of the various analytical methods indicates that Lux's method (A., 1880, 585) gives accurate results if addition of excessive amounts of  $\text{H}_2\text{C}_2\text{O}_4$  is avoided. A modified method, in which  $\text{HClO}_4$  is substituted for  $\text{HNO}_3$ , is described. F. O. H.

**Aluminium paste pigment.** J. K. PARKINSON (*Oil and Col. Tr. J.*, 1938, 93, 962—968).—A lecture on the manufacture, properties, and uses of Al powder and paint. D. R. D.

**Surface chemistry of pigments and paints.** W. KRUMBHAAR (*J. New Zealand Inst. Chem.*, 1937, 2, 22—28).—A general discussion (with particular reference to the action of synthetic resins) of emulsions, protective envelopes surrounding pigment particles, wetting agents, and thixotropy. S. M.

**Quick-drying stamp-pad inks.** C. E. WATERS (*J. Res. Nat. Bur. Stand.*, 1938, 20, 543—547).—Addition of the Bu ether of  $\text{O}[\text{C}_2\text{H}_4\cdot\text{OH}]_2$  to glycerol- $\text{H}_2\text{O}$  ink makes the ink sink rapidly into paper, enabling a quick-drying impression to be made. The substance is non-volatile and permanent. D. F. R.



**Setting and drying of printing inks.** J. D. COHEN (Paint Manuf., 1938, 8, 82—84).—The terminology used in describing the drying properties of inks and the methods of modifying these properties are discussed.

D. R. D.

**Paints for tropical countries.** ANON. (Paint Manuf., 1938, 8, 47).—In hot, dry climates, alkyd resin finishes are found to be most successful; in hot, wet climates, phenolic resin finishes are to be preferred.

D. R. D.

**Drying of linseed oil paint. Effect of artificial visible light.** D. G. NICHOLSON and C. E. HOLLEY, jun. (Ind. Eng. Chem., 1938, 30, 563—565).—Drying curves of linseed oil paints containing Co as drier and white-Pb, ZnO, and  $\text{TiO}_2$  indicate that, although the rate of  $\text{O}_2$  absorption was not  $\propto$  the light intensity, the initial induction period varied inversely with it. The effect is least in presence of highly opaque pigments, e.g.,  $\text{TiO}_2$ , which probably retard the catalytic effect of the light in destroying natural antioxidants.

S. M.

**Relation between pigment, vehicle, and durability of aluminium paint films.** ANON. (Oil and Col. Tr. J., 1938, 93, 881—882).—The Al particles should be as uniform as possible in size and shape and have a max. ratio of area to thickness. A suitable medium is an oil varnish of drying time 6—10 hr., slow drying being necessary to ensure leafing of the pigment. The presence of high acidity and of Pb driers in the medium should be avoided.

D. R. D.

**Adhesiveness of bitumen and tar pitch paints to concrete.** W. RIEDEL (Vedag-Buch, 1937, 10, 77—81).—Concrete of 0.2—0.6 mm. size coated with blown or high-vac. bitumen or bituminous coal-tar pitch was treated with boiling  $\text{H}_2\text{O}$  or various concns. of aq. salts, e.g.,  $\text{Na}_2\text{CO}_3$ , NaCl, and  $\text{Na}_2\text{SO}_4$ . The stability of a film of pitch was  $\gg$  that of one of bitumen.

R. B. C.

**Method of determining the yellowing of interior wall paints.** F. SCOFFIELD (Sci. Sect. Nat. Paint, Var. Assoc., April, 1938, Circ. 552, 79—82).—A Hunter Multipurpose Reflectometer was used to determine reflectances, hue, and saturation of 31 paints of various compositions at intervals during exposure to light and darkness. Resistance to yellowing decreased generally in the order: casein, flat wall, and semi-gloss paints. Reflectance losses were small and caused mostly by collection of dirt.

S. M.

**Paints for gasworks, foundries, etc.** H. FRENKEL (Farben-Ztg., 1938, 43, 523—526).—Paints prepared with a medium of a suitably blown linseed oil or alkyd resin are recommended for general use. For surfaces in contact with destructive gases and for gasometers chlorinated rubber is superior; it also withstands alkali. Greater resistance to alkali is provided by benzylcellulose. Vinyl and phenolic resins are satisfactory for resistance to benzene and other solvents, and bitumen for under- $\text{H}_2\text{O}$  and subterranean exposures. Suitable pigments, the prep. of the surfaces, and methods of application are discussed.

S. M.

**New methods for protection of iron by paints.** E. ASSER (Farben-Ztg., 1938, 43, 553—555).—Suggestions are made to meet the shortage of materials in Germany. It is not necessary to use  $\text{Pb}_3\text{O}_4$  by itself in priming coats as only a limited amount reacts with the oil to form the soap on which its protective action depends. Up to 40% can be replaced by barytes, Fe oxide pigments, or finely-divided SiC ("Silcar"); the last-named has the advantage that it is not attacked by  $\text{SO}_2$  and it may also be used, admixed with white-Pb and ZnO, in grey top-coats and to replace ZnO partly in enamels where the colour is not a drawback. The use of stand oil with addition in some cases of 20% of tung oil is advantageous with many pigments; comparative rusting data after 8 years' exposure are tabulated. Other recommendations are to use "Bisoi" (B., 1936, 1165) and to exploit the crit. oil proportions.

S. M.

**Results obtained by the regular inspection of painted iron structures and test panels.** C. A. L. DE BRUYN (Verfkronek, 1938, 11, 49—52).—The work of the Dutch Corrosie Commissie IV on the anti-corrosive action of paints for Fe is reviewed.

D. R. D.

**Laboratory testing of [anticorrosive] paints by the Corrosie Commissie IV.** C. P. A. KAPPELMEIER (Verfkronek, 1938, 11, 52—54).—Details of the methods in use by the Commission are given.

D. R. D.

**Directions in which the research work of the Corrosie Commissie IV is being continued.** H. VAN DER WEEN (Verfkronek, 1938, 11, 54—55).—Recent work by the Commission is discussed. The marked improvement in anticorrosive protection of Fe on employing two paint coats instead of one is stressed.

D. R. D.

**Rapid comparative tests of rust-preventive paints.** H. NITZSCHE (Vedag-Buch, 1937, 10, 57—76).—Steel plates treated on both sides with various types of rust-preventive paints were exposed for periods up to 40 days to the action of  $\text{H}_2\text{S}$ ,  $\text{SO}_2$ , aq.  $\text{Na}_2\text{CO}_3$ , aq. NaCl, aq.  $\text{NH}_3$ ,  $\text{H}_2\text{SO}_4$ , etc. Photographs showing the resulting corrosion are given. Paints with a bitumen or tar base gave the best protection.

R. B. C.

**Influence of time of drying of anticorrosives on efficiency of certain antifouling compositions.** H. A. GARDNER (Sci. Sect. Nat. Paint, Var. Assoc., April, 1938, Circ. 556, 104—107).—Sea- $\text{H}_2\text{O}$  exposure tests for 6 months show that application within one day of two thin coats of anticorrosive primers and one coat of antifouling composition on steel panels gave inferior protection to that obtained by applying the coatings on successive days.

S. M.

**Synthetic-resin enamel finishes [for automobiles].** J. L. MCCLOUD (Automobile Eng., 1938, 28, 148—152).—The types of enamel employed by the Ford Motor Co., and the technique adopted in their application, are described.

R. B. C.

**Analysis of pigment-oil paints and enamels.** A. RUFF and A. KRYNICKI (Przemysł Chem., 1938, 22, 110—112).—1 pt. of 3 : 7  $\text{BuOAc-C}_6\text{H}_6$  mixture and 1 pt. of 25% cellulose nitrate (I) in the same



solvent are added to 2 pts. of the paint, followed by excess of  $C_6H_6$  or of 1:1 petrol- $C_6H_6$  mixture, when the ppt. of (I) occludes the pigment particles. The mixture is filtered and the residue washed. The filtrate is distilled, to eliminate solvents, and the residue analysed by the usual methods. R. T.

**Gas-bulging of paints cans.** G. G. SWARD (Sci. Sect. Nat. Paint, Var. Assoc., April, 1938, Circ. 553, 83—90).—Development of gases in paints may be due to (a) presence of metal powders, *e.g.*, Zn, but these do not give trouble in linseed oil paints; (b) gradual release of air from a high- $\eta$  blown oil or formation therefrom of acids which may react with, *e.g.*, whiting; (c) electrolytic action between a  $H_2O$ -paint and a tinplate container,  $H_2$  being formed. Two cases of (c) are described. S. M.

**Strength of nitrocellulose solvents.** Comparative toluene dilution ratios of pure solvents and solvent-coupler mixtures. A. K. DOOLITTLE (Ind. Eng. Chem., 1938, 30, 189—195).—The solvent strength of pure acetic esters, ketones, and ether-alcohols has been determined by the PhMe dilution-ratio method. Dilution ratios of ketones steadily decrease as mol. size decreases, whilst those of esters and ether-alcohols show maxima. The same empirical equation between this ratio and mol. vol. holds if appropriate consts. are used, for each series and also for binary mixtures with normal alcohols.

K. W. P.

**New cellulose nitrate lacquers.** I. R. MOROZOV, N. S. TSCHERVINSKAJA, and E. F. GUTKOVITSCH (Prom. Org. Chim., 1938, 5, 246—248).—A lacquer containing ammoniacal pyroxylin 12,  $o$ - $C_6H_4(CO_2Bu)_2$  3, castor oil 4, colophony 6, lithopone 30, BuOAc 15, and BuOH 30% is recommended as a substitute for oil paint. R. T.

**Protecting metal surfaces with modern lacquers and enamels.** G. KLINKENSTEIN (Met. & Alloys, 1938, 9, 95—99).—The use of decorative and protective coatings of lacquers, enamels, and synthetic resins is reviewed. S. J. K.

**Lacquering of light metals.** H. F. SARX (Metallwirts., 1938, 17, 482—485).—A general review. C. E. H.

**Efficacy of mineral oil varnishes in practice?** H. WERNER (Farbe u. Lack, 1938, 221—223).—Mineral oil products which dry on exposure owe their oxidising power to the coumarone resin content; they have found restricted use in dark lacquers as they possess some compatibility with nitrocellulose and chlorinated rubber. They cannot, however, be used with linseed oil because drying is retarded and sweating from the film ensues. Mineral oil films have restricted durability on outside exposure; they tend to be brittle, and after-yellowing occurs with white pigments. Also they do not provide protection against rust. S. M.

**Properties of chlorinated diphenyl in oleo-resinous varnishes.** H. A. GARDNER and G. G. SWARD (Sci. Sect. Nat. Paint, Var. Assoc., April, 1938, Circ. 555, 100—102).—Exterior exposure tests indicate that incorporation of  $Ph_2$  was advantageous with pure phenolic resins, but not with rosin (I), ester

gum, and modified phenolic resins (II); hence its presence does not permit replacement of (II) by (I). For interior exposure its use in limited proportions improves drying and other properties. S. M.

**Oil varnishes containing rubber.** C. KRAUZ and I. FRANTA (Rubber Tech. Conf., 1938, Preprint 13, 7 pp.).—When a rubber solution is added to an oil varnish the rubber undergoes oxidation and the  $\eta$  of the varnish rapidly falls. Metallic resins accelerate this effect, the order of activity being the same as for their effectiveness as driers. Antioxidants inhibit the change, which is favoured by light and air, but their presence unduly prolongs the drying time. D. F. T.

**Determination of non-volatile matter in varnishes.** G. G. SWARD and H. S. KLUND (Sci. Sect. Nat. Paint, Var. Assoc., April, 1938, Circ. 554, 91—99).—Parallel determinations with 8 varnishes by (a) evaporation in  $\frac{1}{8}$  shallow pan, (b) as (a) with admixture of sand, (c) drawing an inert gas through the heated material deposited on glass-wool were in good agreement, but (c) were slightly lower and presumably more accurate. Spirit varnishes appeared to be more solvent-retentive than oil varnishes. S. M.

**Rust-protecting chemical plant.** Sinterite jointing.—See I. C blacks. Gas in varnish industry.—See II. Polymerising vinyl acetate. V.p. of solvents.—See III. Evaporation of cellulose ester solutions. Oil-penetration rate of paper.—See V. Plastics in textile industry.—See VI. Hydrated CaO. Acicular ZnO.—See VII. Extraction of wood. Gluing plywood.—See IX. Furnace dust as insulator. Protecting Al-base alloys.—See X. Drying oils.—See XII. Brewery-plant materials.—See XVIII.

See also A., I, 319,  $PbTiO_3$ . II, 238, Jalap resin and convolvulin.

#### PATENTS.

**Manufacture of plates, sheets, or other shaped or moulded articles.** RÖHM & HAAS A.-G. (B.P. 482,836, 5.10.36. Ger., 5.10.35).—A raw, moulded article of polymerides of unsaturated compounds (several types are claimed) is coated by dipping or painting with partly polymerised substances and the whole is enclosed in a highly finished mould and cooked. B. M. V.

**Manufacture of resins soluble in spirit.** G. W. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 484,619, 13.2.37).—Colophony or the rosin acids contained therein are esterified with *xxx*-trimethylolpropane (I) obtained by condensing  $Pr^cCHO$  (1 mol.) with  $CH_2O$  (3 mols.) in aq.  $Ca(OH)_2$ ; *e.g.*, American colophony "WW" (900) with (I) (390 pts.) at 250—260° for 5 hr. gives a pale brown resin of 20% solubility in spirit. N. H. H.

**Manufacture of metallic [oxide]fume [litharge].** C. F. GARESCHE, Assr. to NAT. LEAD CO. (U.S.P. 2,065,218, 22.12.36. Appl., 13.5.31).—Molten Pb is atomised with preheated air at 480° and sprayed into a revolving, horizontal combustion chamber; the  $PbO$ , which is obtained in a very finely-powdered form, is passed through cooling coils, and fume recovered from a baghouse. L. C. M.



**Rust-inhibiting coating.** A. T. SAUNDERS, Assr. to TRUSCON LABS. (U.S.P. 2,069,660, 2.2.37. Appl., 15.10.34).—A priming composition for application before painting and consisting of an emulsion containing tung oil 25, linseed oil 25, naphtha 85 (*d* 0.78, 20 and *d* 0.79—0.80, 65),  $N(C_2H_4\cdot OH)_3$  9.5,  $K_2Cr_2O_7$ , 6,  $H_2O$  40, and aq.  $NH_3$  (*d* 0.98) 3 pts. is claimed.

L. C. M.

**Manufacture of [lacquer-]coated object [metal etc. articles].** E. H. TRUSSELL, Assr. to BECKWITH-CHANDLER Co. (U.S.P. 2,065,769, 29.12.36. Appl., 6.3.34).—A quick-drying, glossy lacquer finish is obtained on articles of metal etc. by application of an undercoat with a drying oil or resin base, an intermediate coat of nitrocellulose or cellulose ester, and a finishing coat of cellulose ether lacquer.

L. C. M.

**Treating bitumina.**—See II. **Alcohols of high mol. wt.**—See III. **Artificial fibres etc.**—See V. **ZnO.**—See VII. **Laminated and safety glass.**—See VIII. **Constructing roads etc.**—See IX.

#### XIV.—INDIA-RUBBER; GUTTA-PERCHA.

**Constitution of [rubber] latices in relation to the life of plants.** E. DE WILDEMAN (Rubber Tech. Conf., 1938, Preprint 1, 4 pp.).—A plea for an extension of research to include other rubber trees than *Hevea* and other latices containing gutta-percha and related substances.

D. F. T.

**Purified latex and rubber.** R. J. NOBLE (Rubber Tech. Conf., 1938, Preprint 25, 17 pp.).—Experiments on the purification of rubber by various treatments of latex show that treatment with NaOH is the most effective, but that the product is easily oxidised. Centrifuging is more effective than creaming and, with several repetitions, gives a product similar to the alkali-treated rubber.  $H_2O$ -absorbing capacity is  $\propto$  the protein content in unvulcanised rubber and to the  $H_2O$ -sol. content in vulcanised rubber. Rate of vulcanisation, tensile strength, and ageing-resistance of purified rubbers decrease with reduced content of non-rubber substances, this effect being the more marked with rubber from centrifuged and creamed latex.

D. F. T.

**Variability of raw rubber.** V. CAYLA (Rubber Tech. Conf., 1938, Preprint 11, 4 pp.).—The causes of variation are divided into two groups depending, respectively, on the quality of the latex and the process of conversion of the latex into rubber. The differences between "fine hard Para" rubber and plantation rubber are allocated to the latter group.

D. F. T.

**Extraction of raw rubber with acetone.** H. P. STEVENS and J. W. ROWE (Rubber Tech. Conf., 1938, Preprint 8, 6 pp.).—If raw rubber is exposed to light during extraction with  $CO_2$ , erroneous results are obtained, a steadily progressive increase being observed in the amount of the extract.

D. F. T.

**Natural and artificial rubber: elasticity of long-chain molecules.** H. MARK (Nature, 1938, 141, 670—672).—The elasticity of rubber and analogous substances is discussed.

L. S. T.

**Application of thermodynamics to the chemistry of rubber.** N. BEKKEDAHL (Rubber Tech.

Conf., 1938, Preprint 6, 15 pp.).—The thermodynamic data on rubber and isoprene are considered from the viewpoint of their bearing on the chemical reactions of these substances. An equilibrium point between rubber and isoprene occurs at  $800^\circ K.$ , formation of rubber being favoured at lower temp. and its depolymerisation at higher temp.

D. F. T.

**Behaviour of raw rubber under isothermal extension.** H. HINTENBERGER and W. NEUMANN (Kautschuk, 1938, 14, 77—79).—Measurement is made of the stretch, and the relation of this to the time and temp. (under const. load), of unvulcanised rubber obtained from electrophoretically purified latex, ordinary latex, and "smoked sheet." Small loads cause continuous stretch (without development of an X-ray fibre diagram), but at  $\approx$  approx. 45 g./sq. mm. the extension is rapid and soon attains a const. val., the rubber then giving marked cryst. interference. The rate of extension increases with temp. Latex-rubber shows especial proneness to rupture within a crit. range of small loading which corresponds approx. with a range of loading for which a max. extension is observed. These results are correlated with the two portions of the typical stress-strain curve for raw rubber, the earlier part of which represents flow against the van der Waals forces and the later part an entropy effect connected with the crystallisation process.

D. F. T.

**Plasticity and colour of sheet rubber.** J. D. HASTINGS (Rubber Tech. Conf., 1938, Preprint 28, 13 pp.).—Investigation of smoked sheet rubber of various depths of colour indicates that there is no relation between colour and hardness, whether this be judged by the initial plasticity or by the amount of mastication required to produce a uniform degree of plasticity. There is evidence, however, that amongst samples made from the same latex the darker samples are the more plastic. Sheet dried in hot air nevertheless may show definite plasticity.

D. F. T.

**Structure of stretched rubber.** C. J. B. CLEWS and F. SCHOSZERGER (Proc. Roy. Soc., 1938, A, 164, 491—496).—Existing theories of the structure of rubber are briefly discussed. Thin films of rubber, prepared by pouring dil. solutions on to a glass or Hg surface, were examined (by X-rays) while stretched 700%. All the films show "higher orientation." It is concluded that the micelles are of lath-shaped form, probably not closed on all sides, possessing a definite individuality although the "Hauptvalenzketten" extend beyond the spheres of single micelles.

G. D. P.

**Film-bursting apparatus [for testing rubber].** C. F. FLINT and W. J. S. NAUNTON (India-Rubber J., 1938, 95, Suppl., 58—59, 62; cf. B., 1937, 702).—The apparatus has been modified so as to increase its speed and convenience; its principle is unaltered. A method is now described for obtaining "modulus" figures with this apparatus. Curves are given showing results obtained for the progress of vulcanisation by tensile strength/time measurements with latex-rubber accelerated with  $NEt_2\cdot CS\cdot S\cdot NH_2Et_2$  (with, and without,  $OPR^2\cdot CS\cdot SNa$ ) and with  $(NBu_2\cdot CS\cdot S)_2Zn$ , the former combination (I) being the faster. On the other hand, the last-named accelerator has a much



greater tendency than (I) to cause prevulcanisation in the latex itself.

D. F. T.

**Values of the physical constants of rubber.** L. A. WOOD (Rubber Tech. Conf., 1938, Preprint 22, 21 pp.).—A crit. survey is made of the published vals. of 16 principal physical const. (mechanical, thermal, optical, and electrical) for raw rubber (commercial and purified), soft vulcanised rubber, and ebonite. The most trustworthy val. is indicated in each case and the temp. effect considered.

D. F. T.

**Effect of light on unvulcanised rubber.** J. T. BLAKE and P. L. BRUCE (Rubber Tech. Conf., 1938, Preprint 21, 11 pp.).—The tackiness developed in rubber when exposed to light requires the presence of air. The nature of the light is unimportant, and merely influences the rate of the change; ultra-violet light is not necessary, nor is  $O_3$ , but peroxides are frequently formed during the oxidation process. Substances commonly used as antioxidants actually accelerate the development of tackiness; many of the substances which retard the development of tackiness are capable of suppressing the positive action of commercial antioxidants. The results may have an important bearing on theories of antioxidant effect.

D. F. T.

**Dielectric measurements in the study of carbon black and zinc oxide dispersion in rubber.** A. R. KEMP and D. B. HERRMANN (Rubber Tech. Conf., 1938, Preprint 17, 17 pp.).—Measurements are recorded of the  $\epsilon$ , power factor, conductivity, and d.-c. resistivity of rubber "compounds" containing various types and proportions of ZnO and C blacks. With high % of ZnO the dielectric properties depend on the particle size and purity of the ZnO, the French-process oxides with smallest particle size being superior to other grades. The dielectric properties of rubber containing "soft" blacks are superior to those of corresponding mixtures containing "channel" blacks. The smaller is the particle size and the better is the dispersion of C blacks in rubber the higher are the  $\epsilon$ , conductivity, and decrease in resistivity. Dielectric measurements on mixtures with rubber can be used to differentiate between various "channel" blacks.

D. F. T.

**Dielectric losses in rubber.** C. ZWIKKER (Rubber Tech. Conf., 1938, Preprint 19, 5 pp.).—Measurement of the dielectric losses of various rubber compositions reveals the occurrence of two maxima in the power-loss vals., one at comparatively low frequencies and the other at radio-frequencies. The former appears to be due to the compounding ingredients and the latter to the combined S.

D. F. T.

**Mathematics of water absorption by rubber.** J. T. BLAKE and H. A. MORSS, jun. (Rubber Tech. Conf., 1938, Preprint 20, 17 pp.).—Absorption of  $H_2O$  by rubber is of two types, one leading to an equilibrium and the other proceeding indefinitely; it is consequently difficult to represent the course of absorption by a single expression. With a modified form of Fick's law it is possible to clarify the reasons for the divergence between experiment and theory for absorption of the first type. A new, empirical re-

3 K (B.)

lation is found for  $H_2O$ -absorptions leading to an equilibrium.

D. F. T.

**Electrostatic considerations on compounding ingredients for the rubber industry.** H. J. MÜLLER (Gummi-Ztg., 1938, 52, 515—516).—The occurrence of static electric charges in the mastication of rubber and in the sieving of powdered S is well known. A theory is advanced that the presence of an electric charge in powders, e.g., S, ZnO,  $CaCO_3$ ,  $MgCO_3$ , is beneficial to the uniform dispersion of these in rubber and that occasional faulty mixing resulting in small agglomerates is caused by the absence of such electric charges. The tendency of moisture to lead to such "specks" in compounded rubber is attributed to its action in discharging static electricity.

D. F. T.

**Mastication of rubber: oxidation processes involved.** W. F. BUSSE and E. N. CUNNINGHAM (Rubber Tech. Conf., 1938, Preprint 23, 13 pp.).—Experiments in a small internal-mixing machine show that the "breakdown" of rubber is a min. at approx.  $116^\circ$  and that the rate may be increased 4- or 5-fold by raising or lowering the temp. by  $45^\circ$ . The high-temp. effect (above  $116^\circ$ ) is probably similar to the thermal oxidation of rubber heated in air, both being raised by increased  $[O_2]$  and reduced by antioxidants. The low-temp. effect may involve mechanical activation of the rubber as in milling. Some NO-compounds are powerful stiffeners of rubber. The effect of most softening agents is small compared with that of a change of  $22^\circ$  in the mastication temp. Exceptions are certain vulcanisation accelerators (at high temp.) and org. hydrazines and thiophenols which appear to be true mastication accelerators or oxidation catalysts.

D. F. T.

**Analysis of rubber. III. Determination of copper in crude rubber, mixtures, and compounding ingredients.** P. DEKKER (Kautschuk, 1938, 14, 80—84; cf. B., 1937, 949).—Conditions are described for the separation of Cu from other metals with  $H_2S$ . In certain cases, e.g., with Fe or Cr compounds or  $Sb_2S_3$ , additional necessary precautions are indicated. In all cases the Cu is finally determined by the  $NEt_3 \cdot CS_2 \cdot Na$  method. The Cu results are influenced by the method of extraction applied to the ashed material; a mixture of  $HNO_3$  (d 1.4) and  $H_2SO_4$  (50 vol.-%) is believed to extract all the harmful Cu.

D. F. T.

**Tackiness and consistency of rubber after treatment by alkali.** O. DE VRIES (Rubber Tech. Conf., 1938, Preprint 4, 6 pp.).—Rubber from latex that has been treated with (>1% of) NaOH deteriorates on keeping, as does coagulated rubber after similar treatment. Experiment shows that the deterioration is caused by a decomp. product formed from one of the latex constituents; this product, which is presumably an oxidation catalyst, can be removed by soaking in  $H_2O$ . The rubber hydrocarbon in *Hevea* latex appears to need no protective covering or agent to prevent its oxidation.

D. F. T.

**Rubber in factory plant.** E. W. MULCAHY (Auto. Eng., 1938, 28, 177—179).—The applications of rubber and Vulcoferan in the lining of acid-storage tanks etc. are reviewed.

R. B. C.



**M.-p. curve of caoutchouc and gutta-percha.** K. H. MEYER (Naturwiss., 1938, 26, 199—200).—The variation of the m.p. of gutta-percha with load has been determined. Thermodynamic considerations give  $\lambda = 0/(dK/d\theta)$  ( $\lambda$  = heat of fusion,  $l$  = length,  $K$  = stretching force,  $\theta$  = m.p.). The val. of  $\lambda$  obtained from the experimental m.p. curve is  $8 \pm 2$  g.-cal./g., a val. not very different from that for caoutchouc. A. J. M.

**Vulcanisation of oxidised rubbers.** H. P. STEVENS and F. J. W. POPHAM (Rubber Tech. Conf., 1938, Preprint 9, 5 pp.).—Oxidised rubber ("rub-bone") can be vulcanised to ebonite-like products, the max. proportion of combined S being the lower the greater is the degree of oxidation; the products are harder and less thermoplastic than is ebonite. The unchanged fraction of the material can be extracted, e.g., with  $\text{COMe}_2$ , from the insol. vulcanised fraction. Considerable discrepancy is observed between vals. for the degree of unsaturation of various grades of oxidised product as indicated by their O content, I absorption, and S-combining power. D. F. T.

**Temperature coefficient [of vulcanisation of rubber].** F. FOITIK (Gummi-Ztg., 1938, 52, 517—519).—An account is given of the calculation and use of the temp. coeff. of vulcanisation, together with a no. of illustrative examples. D. F. T.

**Distribution of combined sulphur in vulcanised rubber and its bearing on the sulphide linkage theory of vulcanisation.** I. WILLIAMS (Rubber Tech. Conf., 1938, Preprint 24, 10 pp.).—Rubber vulcanised by S (with and without org. accelerators) and by  $(\text{NMe}_2\text{-CS})_2\text{S}_2$  was dissolved in PhMe containing 5% of piperidine as "peptising" agent. The solutions were submitted to controlled pptn. with EtOH and the various fractions were examined as to S content, physical nature, and solubility. The results indicate that dissolution of the vulcanised rubber does not rupture a S linking, that no direct relation exists between the physical properties and the ease of peptisation or the % of combined S, that combined S appears to assist solvation of the rubber, that rubber with the best physical properties is also the most heterogeneous with respect to S (as revealed by the composition of its fractions), and that certain fractions of the peptised vulcanisates give insol. films on evaporation. These observations indicate that linking by primary forces is not necessary to vulcanisation and constitute evidence against the sulphide-linking theory of vulcanisation. D. F. T.

**Gough-Joule effect after vulcanisation.** S. GLEICHENTHEIL and W. NEUMANN (Österr. Chem.-Ztg., 1938, 41, 199).—The heat evolved during the extension of vulcanised latex (S 2%) has a max. val. of 3.8 g.-cal./g. (at an extension of 700—800%), indicating a crystallisation of approx. 60%. The heat-extension curve indicates the entropy effect at extensions of approx. 350—450%. F. O. H.

**Properties of two vulcanised pure gum [rubber] compounds at low temperatures.** A. A. SOMERVILLE (Rubber Tech. Conf., 1938, Preprint 15, 13 pp.).—Two mixtures containing rubber 100, stearic

acid 1, ZnO 10, and (A) S 10 pts. + mercaptobenzthiazole 0.2 pt., and (B) S  $2\frac{1}{2}$ , antioxidant 2, and mercaptobenzthiazole  $1\frac{1}{2}$  pts., became hard and brittle at  $-60^\circ$  although tensile tests at this temp. showed an elongation  $>500\%$  and strength  $>5000$  lb./sq. in. With falling temp. both mixtures gave increased tensile strength and reduced elongation. Relatively high combined S, i.e.,  $>8\%$  on the rubber, was accompanied by marked increase in hardness even at  $-30^\circ$ . With deproteinised rubber in place of smoked sheet in mixture B the resistance to hardening down to  $-40^\circ$  was increased. Unvulcanised, unmilled, smoked sheet rubber showed a greater resistance to hardening on rapid cooling, the change being much slower than for the vulcanised mixtures A and B at all temp. This phenomenon is distinct from the ordinary freezing of rubber in which raw rubber at moderately low temp. slowly becomes opaque and leather-like; in the freezing test at  $-60^\circ$  the raw rubber remained transparent but lost its brittleness when the temp. rose to  $-30^\circ$ . D. F. T.

**Measurement of absorption of oxygen by vulcanised rubber in air.** A. E. MILLIGAN and J. E. SHAW (Rubber Tech. Conf., 1938, Preprint 2, 8 pp.).—Apparatus is described for measuring the absorption of  $\text{O}_2$  by vulcanised rubber in air at any temp. By this means the ageing qualities can be determined more quickly than by tensile measurements. The results of the two methods correlate satisfactorily and  $\text{O}_2$  absorption is regarded as the more fundamental index of general decay. Special test-pieces are unnecessary and disintegrated rubber can be used. In order to prevent complications from  $\text{H}_2\text{O}$  formed during oxidation a small quantity of  $\text{P}_2\text{O}_5$  is enclosed with the rubber. D. F. T.

**Direct determination of oxygen in rubber. Adaptation of the ter Meulen method to rubber and its application to the study of ageing.** H. I. CRAMER, I. J. SJOTHUN, and L. E. ONEACRE (Rubber Tech. Conf., 1938, Preprint 26, 15 pp.).—The ter Meulen method for direct determination of O has been adapted to the analysis of raw and vulcanised rubbers and applied to a study of the ageing of rubber. A small increase in O content of rubber occurs during mastication. Vulcanised rubbers containing various accelerators and antioxidants (and occasionally Cu oleate), for an equal deterioration in tensile properties, show a greater increase in combined O in the  $\text{O}_2$  bomb than in the Geer oven. Deterioration in the latter, however, involves not only oxidation but also thermal decomp. followed by volatilisation of oxidation products. The degree of effectiveness of an antioxidant in retarding  $\text{O}_2$  absorption in the bomb agrees with its ability to retard tensile deterioration. During the early stages of bomb-ageing, tensile deterioration is a linear function of the  $\text{O}_2$  absorption; for stocks containing diphenylguanidine and antioxidants, a 50% fall in tensile strength corresponds with absorption of approx. 1.2% of  $\text{O}_2$ ; this relation, however, varies with different accelerators. D. F. T.

**Ketone-amine products as rubber antioxidants.** R. L. SIBLEY (Rubber Tech. Conf., 1938, Preprint 27, 11 pp.).—Examination of the effect of 74 ketone-



amine condensation products on the tensile strength and flexing-resistance of C-black compounded rubber before and after oven-ageing shows 16 of them to be good antioxidants, 24 moderate, and 34 ineffective. No obvious relationship exists between their antioxidant effect and their chemical structure. The products from *o*-substituted amines and various ketones, or from aryl ketones and various amines, have little antioxidant val.; also amines or ketones containing acidic groups give ineffective products. The greatest antioxidant effect and protection against flex-cracking are observed with condensation products of  $\text{COMe}_2$  and a primary arylamine, preferably  $\text{NH}_2\text{Ph}$  or this substituted with an alkyl, alkoxy, or aryl group only. It is believed that the ketone-amines of greatest effect as antioxidants are dihydroquinoline derivatives, whereas those of less val. are of the anil structure.

D. F. T.

**Proposed new method of retarding the ageing of vulcanised rubber by means of peroxides and nitro-compounds.** S. MINATOYA and T. ANDO (Rubber Tech. Conf., 1938, Preprint 5, 8 pp.).—Small proportions ( $\approx 1\%$ ) of  $m\text{-C}_6\text{H}_4(\text{NO}_2)_2$  (I) assist the control of the vulcanisation of rubber with S, ZnO, and diphenylguanidine (II) and give products with remarkably good ageing qualities. The effect is attributed to the stabilising action of (II) on (I). With mercaptobenzthiazole in place of (II), the presence of (I) leads to bad ageing unless the latter is protected by an additional stabilising agent, e.g.,  $\text{NHPH}_2$ , in which case the ageing-resistance is again good.

D. F. T.

**Modern principles of preserving manufactured rubber.** M. COMBET and C. VILQUIN (Rubber Tech. Conf., 1938, Preprint 10, 9 pp.).—The methods for testing and improving the durability of rubber are reviewed. Experiments on the  $\text{O}_2$ -bomb ageing of black and white rubbers containing a wide range of antioxidants are reported. The "protection coeffs." calc. for the latter are higher for the white rubbers than for the black, but in both cases the min. and max. vals. occur with the same antioxidants.

D. F. T.

**Preservation of insulation rubber on electric wires and cables.** J. C. BONGRAND (Compt. rend. XVII Cong. Chim. Ind., 1937, 1109—1114).—The relative advantages and disadvantages of unvulcanised and vulcanised rubber and the beneficial effect of antioxidants on the latter are discussed, together with tests specified for the determination of quality of the rubber sheathing. The permanent-set test is criticised.

D. F. T.

**Butadiene rubber.** Y. MAYOR (Rev. Gén. Mat. Plast., 1937, 13, 275—278, 305—307).—A review of the relevant patent literature. The economic possibilities of the product in Germany, the U.S.S.R., and other countries are also examined.

F. McK.

**Applications of neoprene.** G. DUMONTIER and P. OTTENHOFF (Compt. rend. XVII Cong. Chim. Ind., 1937, 2014—2018).—A general account, indicating the advantages of Neoprene relative to natural rubber and the similarity of the methods of processing.

D. F. T.

**Cyclised rubber**—particularly halide transformations. H. P. STEVENS and C. J. MILLER (Rubber Tech. Conf., 1938, Preprint 7, 13 pp.).—The methods of cyclising rubber and the properties of the products are reviewed. Experiments on the use of  $\text{BF}_3$  solutions in  $\text{AcOH}$  for cyclising purposes are described together with the characteristics of the product. Unlike chlorinated rubber, the product is permeable to aq. solutions.

D. F. T.

**Evaluating C blacks.**—See II. Org. syntheses. —See III. Rubbered textiles. —See VI. Oil varnishes containing rubber. —See XIII. Fertilising rubber trees. —See XVI.

## PATENTS.

**Lubricated rubber joint.** F. B. DEHN. From THOMPSON PRODUCTS, INC. (B.P. 482,800, 21.7.37).—A joint including a metal stud bushed with rubber (or other resilient material) is provided with a closed sump of lubricant (e.g., castor oil) at the head of the stud, mainly to prevent vulcanisation of the stud to the bush.

B. M. V.

ZnO.—See VII.

## XV.—LEATHER; GLUE.

**Lipins of goat skins. Effect of liming and bating thereon.** R. M. KOPPENHOEFER (J. Amer. Leather Chem. Assoc., 1938, 33, 79—91; cf. B., 1938, 302).—A detailed analysis of lipins present in stained and unstained dry-salted Patna goatskins after liming and bating has been carried out. 50% of the total lipin and total skin constituents are removed in the liming and bating. Const. amounts of lipin were removed from both stained and unstained skins. Phospholipins were almost completely removed. Free fatty acids and a portion of the glycerides were converted into Ca soaps during liming. Large amounts of soaps were decomposed during bating, with the production of fatty acids, due to acidification in fresh bate liquor and not to any lipolytic activity of the bate. Only small amounts of lipin were removed by scudding after bating.

D. P.

**Spoilage of stored salted calfskins.** L. S. STUART and R. W. FREY (J. Amer. Leather Chem. Assoc., 1938, 33, 198—203).—14 duplicate ground samples of green salted calfskin were brought to  $\text{H}_2\text{O}$  contents varying from 2.8% to 55.8% with sterile distilled  $\text{H}_2\text{O}$  and incubated at  $30^\circ$  for 30 days. The  $\text{H}_2\text{O}$  and  $\text{NaCl}$  content, increase in bacterial count, sol.  $\text{NH}_3$ , and no. of free  $\text{CO}_2\text{H}$  groups in sol. degradation products have been determined. Skins having  $<49.2\%$  of  $\text{H}_2\text{O}$  and  $>13.9\%$  of  $\text{NaCl}$  showed no significant decomp. With alteration in  $\text{H}_2\text{O}$  content from 49.2 to 55.8% and of  $\text{NaCl}$  content from 13.9 to 12.0% an increase in bacterial population of  $>35$ -fold, the formation of 19 times as much  $\text{NH}_3$ , and  $>3$  times as many free  $\text{CO}_2\text{H}$  groups, as compared with the corresponding vals. for the original skin, resulted.

D. P.

**Progress report on hide and skin conservation 1927—37.** W. HAUSAM (Collegium, 1938, 55—68).—A review.

D. W.



**Ultra-violet light and photomicrograph; studies of animal skin.** E. R. THEIS and E. J. SERFASS (J. Amer. Leather Chem. Assoc., 1938, 33, 67—79).—Greater resolution of structural detail is obtained in photomicrographs obtained by transmitted ultra-violet light. Primary fluorescence of oils is utilised in studying the distribution of fat, using dark-field illumination. The changes in the epidermal layer during soaking, liming, and bating have been studied by means of secondary fluorescence in ultra-violet light. The decomp. of the stratum germinatum of calfskin during the liming and bating processes and the presence of the hyaline layer and its decomp. during bating are demonstrated. The secondary fluorescence produced by various tissues in calfskin when stained with certain fluorescent dyes is recorded. D. P.

**Extraction of tannin from avaram bark (*Cassia auriculata*, L.).** A. V. V. IYENGAR and C. T. KRISHNASWAMI (J. Soc. Leather Trades' Chem., 1938, 22, 116—117).—The analyses of liquors obtained when the powder and fibre, obtained by sieving the ground bark, are extracted 3 times, with and without addition of AcOH, respectively, (a) in an autoclave at 75 lb./sq. in. and (b) in a vac., are recorded. D. P.

**Analysis of sulphited [vegetable tanning] extracts. Sulphited quebracho. I. Determination of free sulphur dioxide, bisulphite or sulphite, and ester type of bisulphite-quebracho compounds.** H. G. TURLEY, I. C. SOMERVILLE, and F. P. CRONIN (J. Amer. Leather Chem. Assoc., 1938, 33, 58—64).—The Monier-Williams method (cf. B., 1935, 739) was found to yield results varying with the concn. of acid used and the duration of heating. Free  $\text{SO}_2$  is determined by boiling the sample with  $\text{H}_2\text{O}$  for 1 hr. in a current of  $\text{N}_2$  and collecting the  $\text{SO}_2$  evolved in  $\text{H}_2\text{O}_2$ .  $\text{HSO}_3^-$  and  $\text{SO}_3^{2-}$  are determined by adjusting the residual tanning solution to  $p_{\text{H}}$  3 with HCl and boiling for 1 hr. Sulphited quebracho is also supposed to contain a sulphite ester which is completely hydrolysed by boiling for 3 hr. in  $\text{N-HCl}$ . The sulphite ester may be formed by esterification of the *tert.* alcohol group of the pinacol linking. D. P.

**Quantitative analysis of mixtures of strong and weak acids, buffer and neutral salts, with special reference to leather and [vegetable] tanning extracts. II.** W. F. BARKER and E. H. ROHWER. III. W. F. BARKER (J. Soc. Leather Trades' Chem., 1938, 22, 78—92, 92—96; cf. B., 1938, 416).—II. HCl and NaOH conductivity titration curves of AcOH, mono- and di-nitrophenols, alone and mixed with HCl, NaOH, and neutral salts, are recorded. The amounts of various constituents calc. from the conductivity curves agree well with the theoretical. Dissociation consts. determined are low. From conductivity curves of the  $\text{H}_2\text{O}$ -sol. extracts from vegetable-tanned leathers and sol. quebracho extract the amounts of strong and weak acids, and neutral and buffer salts, are determined. NaOH conductivity curves of certain vegetable tan liquors did not give const. conductivities, possibly due to the presence of a pseudo-acid.

III. The interpretations of conductimetric titration curves by Righellato and Davies (A., 1933, 242) and Davies and Innes (B., 1933, 160) are criticised. The anionic mobility of 30 assumed for org. substances is considered to be too low. Anion mobilities of  $\text{H}_2\text{O}$ -sol. extracts of South African sole leather vary from 33 to 38; that for quebracho tanning extract is 48. D. P.

**Actual acidity, titratable acidity, and buffer index of tanning extracts.** G. PARSY (J. Soc. Leather Trades' Chem., 1938, 22, 124—135).—The results of the use of different indicators in titrating strong and weak acids are explained. The variation of  $p_{\text{H}}$  vals. with concn. and NaOH-titration curves of various vegetable tanning extracts are recorded and the no. of c.c. of  $\text{N-NaOH}$  required to adjust a 1% total solids solution of tanning extract to  $p_{\text{H}}$  7.07 have been calc. The titration curves resemble curves of mixtures of acids having different dissociation consts. Pyrocatechol tannins are found to be capable of neutralising much less NaOH than are pyrogallol tannins. The buffer index, defined as the slope of the tangent of the neutralisation- $p_{\text{H}}$  curve, has been calc. and plotted against the  $p_{\text{H}}$  for AcOH and the tanning extracts. The buffer index- $p_{\text{H}}$  curves of the tanning extracts show characteristic max., depending on the acids present. D. P.

**Origin of acidity in [vegetable] tannin extracts.** A. PONTE (J. Soc. Leather Trades' Chem., 1938, 22, 172—181).—The action of distilled  $\text{H}_2\text{O}$  at different temp. on vegetable tanning materials has been investigated. The lignocellulose (I) was hydrolysed by autoclaving at  $120^\circ$ , whereby AcOH was formed. More AcOH was produced at  $130^\circ$  but the (I) was simultaneously decomposed. The acids in a vegetable tan liquor include those pre-existent in the tanning material together with AcOH formed as above. D. W.

**Diagrammatic representation of the processes of tanning extract manufacture.** J. A. SAGOSCHEN (Collegium, 1937, 715—723).—A scale diagram is described which illustrates the sequence of processes in extract manufacture, the input of raw material,  $\text{H}_2\text{O}$ , and air, the output of solid extract, excess of warm  $\text{H}_2\text{O}$ , and excess of leached tanning material, and the proportion of steam utilised by various units. A large proportion of the leached tanning material is utilised to provide all steam and energy requirements. The  $\text{H}_2\text{O}$  requirements are represented collectively; most of the  $\text{H}_2\text{O}$  is used again to conserve heat. Leached oakwood and chestnut wood are more easily burned than is pine bark. The latter may be burned alone, but the  $\text{H}_2\text{O}$  content must first be reduced. Special furnace grates are used. The importance of conserving heat is emphasised. D. P.

**Vegetable tannage.** L. HOUBEN and V. PAS-SECHNIKOF (J. Soc. Leather Trades' Chem., 1938, 22, 117—124).—Various methods of, and factors influencing, tanning are described. Citric acid is recommended for plumping pelt in the early stages of tanning, it having no tendency to cause drawn grain. Rapid tannage may be carried out by (a) immersing fully delimed pelt in a new conc. liquor adjusted to



$p_H$  5.5, for 24 hr., then transferring to a more dil. tan liquor at its natural  $p_H$  val., (b) pretanning completely delimed pelt with  $Na_2S_2O_3$  and  $CH_2O$  and then transferring straight to a conc. vegetable tan liquor at its natural  $p_H$ . D. P.

**Tanning action of aromatic chromium compounds.** E. IMMENDORFER (Collegium, 1937, 689—693).—Strong tanning and filling properties are possessed by complex alkali Cr salts of aromatic polycarboxylic acids, e.g.,  $\sigma$ - $C_6H_4(CO_2H)_2$  and its  $Cl_4$ -derivative. Leather so tanned may contain >10% of  $Cr_2O_3$  and nearly 3 times as much org. component as  $Cr_2O_3$ , may show a 30% vol. increase, a milder feel, and less spring than normal, and will retain its mechanical properties and resistance to boiling after several days' electrolysis. A ratio of  $\frac{1}{4}$ — $\frac{1}{3}$  and  $\frac{1}{3}$ — $\frac{2}{3}$  mol. of aromatic acid per mol. of Cr salt, for box calf and glove leathers, respectively, is recommended. Cr tanning is carried out in the usual way, the aromatic acid being added towards the end of the tannage; the final  $p_H$  should be 4.1. The effect of ageing on the  $p_H$  of equimol. mixtures of Cr alum, NaOH, and Na phthalate and tetrachlorophthalate is recorded. Similar complex Fe salts have good tanning properties. D. P.

**Effect of ageing chrome alum solution on non-tannin determination.** L. A. CUTHBERT, D. WILLIAMS, and J. E. McNUTT (J. Amer. Leather Chem. Assoc., 1938, 33, 91—94).—The age of Cr alum solutions up to 6 months is found to have no appreciable effect on the results of the non-tannin determination. D. P.

**Principles of tanning with lignin (sulphite-cellulose) [waste] extracts.** E. BELAVSKY (J. Soc. Leather Trades' Chem., 1938, 22, 162—172).—The pelt must first be completely delimed, given a prolonged strong pickle, and drum-tanned in sulphite-cellulose waste liquors of  $d$  1.056,  $p_H$  2.5, and containing some neutral salts. The tan liquors must be frequently changed and the leather thoroughly washed after the tannage. D. W.

**Factors influencing tannage with lignin sulphite-cellulose [waste] extracts.** L. MASNER and V. SAMEC (J. Soc. Leather Trades' Chem., 1938, 22, 154—161).—These extracts can be used alone or in combination with other materials for tanning purposes. A high degree of tannage cannot be obtained if they are used alone, but it is increased by Cr pretannage. This extract can be used to solubilise untreated quebracho extract. 30% of the tanning extract can be replaced by the sulphite-cellulose waste if 50% of quebracho is used. The non-tans must not be allowed to accumulate in the tan liquors, and careful control thereof is essential. This extract can be most usefully employed in filling vegetable-tanned sole leather. D. W.

**Effect of the chemical and bacteriological properties of water on tannage.** L. POLLAK (Gerber, 1938, 64, 33—35, 44—45).—The composition of several thermal waters is given. An Aussig  $H_2O$  containing dry residue 780, CaO 48.6, MgO 15.7, and  $Na_2O$  299.4 p.p.m. has been successfully used in dyeing. Another thermal  $H_2O$  containing dry residue

372.3, CaO 63.3, MgO 11.9, and  $Na_2O$  92.1 p.p.m. has been used without detriment in tannin-extract manufacture. Tannery waters should have a temp. range of 12—22°. Bacterial growth is favoured above 22°. The effects of the different constituents of natural waters are reviewed. D. W.

**Determination of buffer salts and acidity in leather extracts.** C. W. DAVIES (J. Soc. Leather Trades' Chem., 1938, 22, 181—185).—The modifications of the author's method by Barker *et al.* (B., 1938, 416) are criticised as unsound. D. W.

**Examination of leather quality based on specific weights and the results of chemical analysis.** J. JÁNY (Collegium, 1937, 693—700).—Only negative information as to leather quality can be obtained from chemical analyses. The apparent  $d$  gives information only as regards cutting val. The products of the apparent  $d$  and (a) the hide substance ( $Q_H$ ) and (b) the pure leather substance ( $Q_L$ ) are considered to be measures of leather quality and the density of the fibre structure. Vals. are recorded for different leathers. Higher vals. are obtained from the butt than from the offal, and naturally loose skins or stock made loose in tanning give lower vals. than well-tanned tight stock. For 4 samples of belting leather,  $Q_H$  increases directly with increasing price and tensile strength.  $Q_H$  and  $Q_L$  are independent of the  $H_2O$  content of the leather. D. P.

**Washing in the leather industry. II.** A. FRITSCH and N. JAMBOR. **III.** A. FRITSCH (Collegium, 1937, 700—711, 711—715).—II. The Nernst-Schönflies differential equation for the diffusion of ideal solutions has been applied to the diffusion of sol. matter from leather. Chrome-tanned calf skins which have been soaked in solutions of glucose, basic  $Cr^{III}$  sulphate, or NaCl were washed in  $H_2O$  and the concn. of sol. matter in the wash-liquor at different time intervals was determined. Vals. of the diffusion const. and of the const. depending on experimental conditions have been determined and the amounts of material found in the wash-liquors at different time intervals have been compared with the theoretical. The small differences found were attributed to the inhomogeneity of the leather.

III. The removal of NaCl and excess Cr compounds, respectively, from leather by washing either with agitation in one lot of  $H_2O$  or in running  $H_2O$  has been studied mathematically. It is concluded that for efficient removal of sol. matter from the centre of leather it is necessary to use several changes of  $H_2O$ , giving time for each wash-liquor to reach equilibrium. D. P.

**Enzymes in leather manufacture.** R. STERN (Gerber, 1938, 64, 31—33).—A lecture. D. W.

**Methods of measuring the swelling of hide powder and gelatin. II.** V. KUBELKA and G. KNÖDEL (Collegium, 1938, 49—54; cf. B., 1937, 816).—Hide powder is hydrolysed by alkalis according to their concn. and duration of action. The effect of NaOH is > that of  $Ca(OH)_2$ , except for saturated  $Ca(OH)_2$ , the effect of which is > the equiv. of NaOH. At low concns. of these reagents hide powder is



decomposed after several days' contact by micro-organisms, but  $\text{Ca}(\text{OH})_2$  has the greater sterilising effect. Hydrolysis must not be ignored in measurements of alkaline swelling of hide powder. The loss of hide powder in solutions of  $>0.4N$ - $\text{NaOH}$  disturbs any physical measurements. Only low  $\text{Ca}(\text{OH})_2$  concns. are possible and therefore fairly long periods can be given before swelling measurements of hide powder in aq.  $\text{Ca}(\text{OH})_2$  are made. D. W.

Hydrated  $\text{CaO}$ .—See VII. Gluing plywood.—See IX.  $\text{O}_2$  absorption of fish oils.—See XII. Tannery effluents.—See XXIII.

See also A., III, 498, Lipins of sheep skins.

#### PATENTS.

Preparation of adhesive strips or sheets. MINNESOTA MINING & MANUFACTURING CO., ASSEES. OF R. G. DREW (B.P. 482,575, 27.6.36. U.S., 29.6.35).—Unwoven fibrous material (paper) is securely bonded by  $\text{H}_2\text{O}$ -sol. material (e.g., having a protein or glue base) with, if desired, a hygroscopic flexibiliser, and tanned or the like to render it insol. The whole is coated with a  $\text{H}_2\text{O}$ -insol. adhesive (e.g., having a rubber base) preferably normally tacky and pressure-sensitive.

B. M. V.

Application of skin of calf's head [for fur wraps etc.]. S. A. PETERSON (B.P. 485,271, 19.10.37).

Polysulphonamido-compounds.—See III. Adhesive surfaces.—See V.

#### XVI.—AGRICULTURE.

Soil survey of part of the Denmark estate, Western Australia. J. S. HOSKING and G. H. BURVILL (Counc. Sci. Ind. Res. Australia, Bull., 1938, No. 115, 80 pp.).—Descriptions, classification, and analyses of the soils are recorded. Relations between soil type, production, and the occurrence of enzootic marasmus are discussed. A. G. P.

Abnormal acid soil. V. S. OSUGI and M. AOKI (J. Agric. Chem. Soc. Japan, 1938, 14, 251—262; cf. B., 1937, 949).—The abnormal behaviour of the soil is due to presence of  $\text{AcOH}$  and  $\text{H}_2\text{C}_2\text{O}_4$ . Most of the Fe dissolved from the soil in paddy-field conditions is derived from  $\text{Fe}_2\text{O}_3$ ,  $\text{Fe}(\text{OH})_3$ , and  $\text{FePO}_4$ . At the same  $p_H$  more Fe is extracted by aq.  $\text{KCl}$  than by  $\text{HCl}$  from the soil. J. N. A.

Reclamation of Dutch saline soils (solonchak) and their further weathering under the humid climatic conditions of Holland. D. J. HISSINK (Soil Sci., 1938, 45, 83—94).—The mechanism of the transformation of coastal sea muds (mainly  $\text{Mg}$ - $\text{Na}$  clays) into cultivatable soils is described. A. G. P.

Soluble salts in New Zealand soils. I. Semi-arid areas. J. K. DIXON and A. C. HARRIS (New Zealand J. Sci. Tech., 1938, 19, 465—473).—Analytical data for 3 saline types of soils are recorded. The importance of examining the whole profile, the nature as well as the total amount of sol. salts present, and the base-exchange status of the soils before reclamation is emphasised. A. G. P.

Physical and chemical characteristics of some Maquiling soils. I. J. ARISTORENAS (Philippine Agric., 1937, 26, 542—552).—A detailed examination of these soils is recorded. A. G. P.

Chemical composition of soils and colloids of the Norfolk and related soil series. R. S. HOLMES, W. E. HEARN, and H. G. BYERS (U.S. Dept. Agric. Tech. Bull., 1938, No. 594, 33 pp.).—The soils examined were formed from the same parent material but under different conditions of drainage. Analytical data and profile characteristics are recorded. The  $p_H$  of better-drained profiles was  $>$  that of the poorly-drained ones (5.1—3.8). The extent of eluviation increases but the degree of leaching and base removal diminishes with better drainage. Uni- and bi-valent bases, including  $\text{Mn}$ , were least in poorly-drained soils, in which accumulation of bases accompanies base depletion.  $\text{SiO}_2/\text{R}_2\text{O}_3$  ratios varied from 1.2 in well-drained to 2.4 in poorly-drained areas. Presence of decomp. org. matter in poorly-drained soils favours depletion of Fe in colloids. The  $\text{Fe}/\text{Al}$  ratio was the higher in the better-drained soils. In all types the dominant colloid is a highly debased aluminosilicic acid of the halloysite type. A. G. P.

"Non-toxic" seleniferous soils. H. W. LARKIN, K. T. WILLIAMS, and H. G. BYERS (Ind. Eng. Chem., 1938, 30, 599—600).—Soils rich in Se do not necessarily produce toxic vegetation. Analysis of 26 plants from a Puerto Rico silt loam containing 2—12 p.p.m. of Se shows that in no case does the Se content reach 1 p.p.m. L. D. G.

Soil climate. A. DEMOLON (Ann. Agron., 1937, 7, 625—640).—A lecture on soil atm., temp., and humidity is reported. A. W. M.

Bioclimatology and agronomic research. H. GESLIN (Ann. Agron., 1937, 7, 728—773).—Statistical methods of examining the influence of climatic conditions on plant growth are reviewed. A bibliography of 131 references is included. A. W. M.

Results obtained by subterranean irrigation in Provence [France]. G. MATHIEU (Compt. rend. Acad. Agric. France, 1938, 24, 86—91; cf. B., 1938, 305).—With subterranean, as against superficial, watering earlier and better-quality crops are obtained due to the good condition of the soil. A. W. M.

Fundamental hydrodynamic properties of soils and their utilisation in water economy. BLANC (Compt. rend. Acad. Agric. France, 1938, 24, 139—152).—The permeability of soil is correlated with the  $\text{H}_2\text{O}$  supply in well, irrigation, and drainage. A. W. M.

"Single-value" soil properties: moisture relationships, loss on ignition, sticky point, and amount of clay. D. I. AQUINO and T. KOMKRISS (Philippine Agric., 1937, 26, 568—584).—"Single-val." properties of the soils examined were mainly dependent on the clay content and "loss on ignition." Under the conditions of experiment the air-dry moisture content was frequently  $>$  the  $\text{H}_2\text{O}$  content at 50% R.H., but the two vals. varied in parallel from soil to soil. Soils with higher % of clay exhibited greater ignition losses,  $\text{H}_2\text{O}$  contents, and sticky-point vals. The last-named was more closely associ-



ated with the org. than with the inorg. colloid content. The org. matter content largely influenced the  $H_2O$ -absorbing capacity. Treatment of soil with  $H_2O_2$  decreased the sticky-point val. and loss on ignition. A. G. P.

(A) Structural analysis of soils. (B) Statics and dynamics of the soil-water. F. SEKERA (Bodenk. Pflanzenernähr., 1938, 6, 259—288, 288—312).—(A) Distinction is drawn between "dynamically active" (i.e., permitting capillary movement of  $H_2O$ ) and "inactive" (i.e., occupied by immobile  $H_2O$  of hydration of swarm-ions associated with colloids) pore space in soil. Application of progressively increased suction to  $H_2O$ -saturated soils removes successively larger amounts of  $H_2O$ , the amounts being controlled by the relative sizes of the pore spaces. A vac. capillarimeter suited to measurements of this kind is described, and the reproducibility of data for several soils is shown. The data are utilised in expressing the structural condition of soils.

(B) Structural analyses thus obtained are correlated with transpiration rates of plants grown in them. The total  $H_2O$  content of a soil comprises (i) readily mobile  $H_2O$  in large capillaries ( $>30 \mu$ ), circulating on application of a suction force of 0.1 atm., and readily available to plants; (ii) normally mobile  $H_2O$  in medium capillaries ( $3-30 \mu$ ), movable by a suction force of 1 atm., and only slowly utilisable by plants; and (iii) inert  $H_2O$ , i.e., film  $H_2O$  and that in fine capillaries ( $<3 \mu$ ), movable only in the vapour phase, and not utilisable by plants. (i) and (ii) constitute the "dynamically active" and (iii) the "inactive"  $H_2O$ . The significance of the crit.  $H_2O$  content, i.e., the limiting val. between the active and inactive forms, is discussed. A. G. P.

Adaptation of the hydrometer method to the aggregate analysis of soils. R. W. GERDEL (J. Amer. Soc. Agron., 1938, 30, 107—110).—Bouyoucos' method (B., 1936, 1170) is utilised in examining aggregate stability and % of clay in aggregates. A. G. P.

Graphical representation of the mechanical analyses of soils. E. B. CAMPBELL (Proc. Amer. Soc. Civil Eng., 1937, 63, 1861—1866).—An attempt is made to correlate various existing methods for the graphical representation of grain-size distribution. A semi-logarithmic co-ordinate system is used with the grain sizes plotted as abscissae on a log scale and cumulative wt.-% vals. as ordinates. With curves so plotted the grain-size distribution curves have been conventionalised by introducing straight lines. Such lines can be designated briefly by their slopes and intercepts so that data from various soils may be tabulated or plotted on drawings for purposes of comparison. The val. of mechanical analysis is discussed, and recommendations are made for the nomenclature of soil fractions. R. B. C.

Evaporating the water with burning alcohol as a rapid means of determining moisture content of soils and of moulding sands. G. J. BOUYOUCOS (J. Amer. Ceram. Soc., 1938, 17, 203—206).—The method described previously (B., 1938, 420) was applied successfully to sands, loams, and clays containing  $<11\%$  of org. matter. J. A. S.

Determination of unsaturation in soils. L. KOTZMANN (Mezőg. Kutat., 1938, 11, 3—12).—Soil is shaken with excess of standard alkali (1 hr.),  $N-NH_4Cl$  then added, and the mixture distilled. The  $NH_3$  recovered is a measure of the excess of alkali, allowance being made for  $NH_3$  obtained by distilling the untreated soil with a similar amount of  $N-NH_4Cl$ . Vals. obtained vary with the initial concn. of alkali in accordance with the laws of absorption. Concn.-absorption curves show max. vals. which agree with those obtained by direct absorption of  $NH_3$ , and are independent of the alkali used [ $NaOH$ ,  $KOH$ ,  $Ca(OH)_2$ ,  $Ba(OH)_2$ ]. A. G. P.

Soil "damping" and vegetation. T. MARTINEC (Planta, 1937, 27, 334—351).—Soil "damping" (i.e., drift of  $p_H$  with time during electrometric titration) serves as a soil characteristic in ecological studies. A. G. P.

Variations in soil with respect to the disposition of natural precipitation. R. S. STAUFFER and R. S. SMITH (J. Amer. Soc. Agron., 1937, 29, 917—923).—The construction and operation of erosion lysimeters are described. Run-off and percolation data for several soils are recorded and discussed. A. G. P.

Physico-chemical properties of colloidal solutions of clay. A. BOUTARIC and S. THEVENET (Ann. Agron., 1937, 7, 389—409; cf. B., 1938, 305).—The effect on the  $\eta$  of the solution of varying the concn. of colloidal clay and of adding  $EtOH$ ,  $COMe_2$ , and electrolytes is studied. Consideration of these properties, the effect of flocculation, and of the optical properties of the solution suggest that clay colloids are more hydrophobic than hydrophilic. A. W. M.

Optical properties of colloidal solutions of clay. A. BOUTARIC and L. BERNARD (Ann. Agron., 1937, 7, 508—514).—Magnetic dichroism, depolarisation of transmitted light, and polarisation of diffused light by suspensions of colloidal clay in  $H_2O$ , alkali, aq.  $EtOH$ , and  $COMe_2$  are reported (cf. preceding abstract). A. W. M.

Particle size in relation to base exchange and hydration properties of Putnam clay. D. M. WHITT and L. D. BAYER (J. Amer. Soc. Agron., 1937, 29, 905—916).—The swelling,  $PhMe$  absorption, and base-exchange capacities of clay particles show a well-defined change as the particle size reaches approx.  $1 \mu$ . This size is suggested as the upper limit of the colloidal fraction in clay. A. G. P.

Organic composts. J. H. DENNETT (Malay. Agric. J., 1938, 26, 104—112).—Processes are described for composting waste vegetable matter (including pineapple waste), fertiliser materials, and dung. Analyses of the products are recorded. A. G. P.

Soil humus. II. Potentiometric study of the formation of humic acid and humates. A. N. PURI and A. SARUP (Soil Sci., 1938, 45, 165—174; cf. B., 1938, 200).—Titration curves of humic acid with alkali and alkaline-earth hydroxides and of  $Na$  humate with  $HCl$  and various chlorides are recorded. The absence of stoichiometric proportions in humates is discussed. A. G. P.



**Present status of methods of examination of humus with special reference to the separation, determination, and characterisation of humic acid types and their use in characterising forms of humus.** U. SPRINGER (Bodenk. Pflanzenernähr., 1938, 6, 312—373).—The amount of humus extracted from soil by aq. NaF or  $\text{Na}_2\text{C}_2\text{O}_4$ , using narrow ratios of soil:extractant, is markedly affected by  $p_{\text{H}}$ . Higher vals. are obtained by use of boiling aq.  $\text{Na}_2\text{C}_2\text{O}_4$ , with a ratio of 1:100. In soils highly saturated with bases extraction of humus by solutions of either of these salts may be incomplete. In podsols the extraction is more effective. Best results are obtained with 0.5% NaOH after pretreatment of soil with HCl. Grey and brown humic acid types are differentiated. The proportion of the former is high in degraded black earths and prairie soils, smaller in chestnut-coloured soils, small in podsols, and usually absent from acid org. soils. The use of this and other characteristic data for humus extracts in soil classification is discussed. A. G. P.

**Organic residues and nitrogen fertilisers in relation to the productivity and humus content of Palouse silt loam.** H. F. HOLTZ and S. C. VANDECAVEYE (Soil Sci., 1938, 45, 143—163).—Under semi-arid conditions alternation of summer fallow and wheat cropping favours liberation of available N, but results in steady loss of humus from the soil. The decomp. of humus during fallow cannot be counteracted by incorporating org. matter consistent with field practice. Application of org. residues and/or N fertilisers did not effect appreciable increases in crop yields on the alternate fallow-wheat system. With annual wheat cropping N became the limiting factor and yields increased roughly in proportion to the amounts of N applied. Org. residues also improved yields, which, however, gradually declined in successive years. The C/N ratio of the humus in these soils was approx. 12, irrespective of manurial treatment or cropping system. Straw-manuring improved the mechanical condition of the soil, but led ultimately to nett loss of humus unless adequate N was given. A. G. P.

**Influence of manure, irrigation, and cropping practices on soil-microbiological activities.** K. R. STEVENS (Soil Sci., 1938, 45, 95—109).—Irrigation and also the annual application of farmyard manure on fallow or cropped (maize) soils increased the total N and org. C contents, the no. of micro-organisms, the ability to decompose org. matter and to fix N, and the nitrifying power. With increasing amounts of irrigation  $\text{H}_2\text{O}$  applied to cropped soils the nos. of bacteria and actinomyces increased, as also did the nitrifying and N-fixing power and the ability to decompose glucose; nos. of filamentous fungi, and the rate of evolution of  $\text{CO}_2$  from original soil and that treated with cellulose, were unchanged. The influence on the total and org. C contents was relatively small. In fallowed soils changes were similar except that the nos. of filamentous fungi and production of  $\text{CO}_2$  from cellulose decreased somewhat with heavier irrigations. Nos. of bacteria and actinomyces and rates of N fixation in fallow were  $>$ , and nitrification was  $<$ , in cropped soils receiving similar treatment. The

beneficial effect of farmyard manure or irrigation on  $\text{CO}_2$  production was more marked in fallow soils.

A. G. P.

**Fungal mycelium in soil.** C. THOM and M. BETZNER (J. Bact., 1937, 33, 77—78).—Decomp. of plant and animal remains and the further decomp. of the residual products by soil fungi are examined. A no. of fungi produce "humus" *in vitro* from the residues. The relation between the root-rot fungus and the host root system is considered. A. G. P.

**Effects of applications of certain fertilisers and soil amendments on the number of micro-organisms in Nanhaya clay, a local alluvial soil.** D. I. AQUINO and F. B. MANGAHAS (Philippine Agric., 1937, 26, 411—424).—Various fertiliser mixtures and  $\text{CaCO}_3$  increased the no. of micro-organisms in the soil, max. effects being obtained with  $\text{CaCO}_3$  and  $(\text{NH}_4)_2\text{SO}_4$ . A relation was apparent between nos. of bacteria and of actinomyces, but not between bacteria and moulds, or between the nos. of micro-organisms and the  $\text{H}_2\text{O}$  content or  $p_{\text{H}}$  of the soil. Yields of palay rice (especially of grain) were correlated with the no. of actinomyces in the soil. An increase in bacterial nos. was usually accompanied by increased yields of straw. A. G. P.

**Oxidation-reduction potentials in orchard soils.** R. E. STEPHENSON, C. E. SCHUSTER, and J. SPULNIK (J. Amer. Soc. Agron., 1938, 30, 91—96).—The redox potential varies to a relatively small extent in soils of different type or in different horizons of the same type. Vals. are not lowered by fresh org. matter in soil unless the soil is waterlogged, when a rapid decrease occurs. The redox potential is not a reliable index of anaerobic conditions in soil.

A. G. P.

**Weathering of Bordeaux mixture.** F. WILCOXON and S. E. A. MCCALLAN (Contr. Boyce Thompson Inst., 1938, 9, 149—159; cf. B., 1936, 899).—When glass plates were sprayed with 4.4–50 Bordeaux mixture and exposed outdoors, the sprayed film under the influence of rain and dew becomes relatively richer in Cu. This change in composition is accompanied by a gradual increase in sol. Cu. Carbonation of the excess of CaO was completed in a few hr., but the appearance of sol. Cu required much longer. The results could be duplicated in the laboratory by using artificial rain on sprayed, dried films of Bordeaux mixture. The sprayed film behaves like an adsorption complex or a solid solution of CuO, CaO, and sulphate, the solubility of the Cu depending on the composition. This gradual change in composition must be considered as a factor in foliage injury and in fungicidal action, in addition to the effect of spore excretions.

AUTHOR.

**Changes in composition of granular and powdered fertilisers in the soil.** C. B. SAYRE and A. W. CLARK (J. Amer. Soc. Agron., 1938, 30, 30—37).—Dissolution of P from mixed-fertiliser granules in soil was much slower than that of K and inorg. N, approx. 90% of the available P remaining in the granules after 14 weeks. Granulated fertilisers retained K somewhat longer than did powdered forms. Granulation did not affect the availability of P in fertilisers, but residues from granules in soil



contained amounts of insol. P which increased with the size of the granules. A. G. P.

**Effect of climatic conditions on ammoniacal nitrogen fertilisers during winter.** J. SARAZIN (Compt. rend. Acad. Agric. France, 1937, 23, 943—946).—November-sown  $(\text{NH}_4)_2\text{SO}_4$  on fallow soil, was converted into  $\text{NO}_3^-$  by April, 63% of the  $\text{NO}_3^-$  being lost in the drainage  $\text{H}_2\text{O}$ . The temp. varied from  $3.3^\circ$  to  $7.6^\circ$ , and the total rainfall was 8.5 in.

A. W. M.

**Mixing of phosphatic fertilisers with calcium cyanamide.** H. KAPPEN (Bodenk. Pflanzenernähr., 1938, 6, 383—388).—Admixture of Rhenania phosphate, basic slag, or superphosphate (I) with  $\text{CaCN}_2$  before application to soil did not lower the manurial efficiency of the P or N provided the mixtures were not stored before use. Interaction and heat evolution occurring in (I)— $\text{CaCN}_2$  mixtures are largely due to neutralisation of the free CaO in the latter followed by transformation of  $\text{Ca}(\text{H}_2\text{PO}_4)_2$  into more basic but still readily utilisable phosphates. Prolonged storage of the mixture involves more deep-seated changes, including formation of dicyanodiamide which is valueless to plants.

A. G. P.

**Root-assimilability of soil phosphate in relation to temperature.** S. KÜHN (Bodenk. Pflanzenernähr., 1938, 6, 373—383).—The satisfactory character of the  $(\text{NH}_4)_2\text{CO}_3$  extraction method for determining available P in soils is confirmed. With rising temp. vals. obtained tend to increase, whereas absorption of P by plants diminishes.

A. G. P.

**Action of boron alone and in conjunction with iodine in fertilisers.** K. SCHARRER and W. SCHROPP (Phytopath. Z., 1937, 10, 57—78).—Comparison is made of the efficiency of Chili saltpetre and synthetic  $\text{NaNO}_3$  alone and with supplementary proportions of B and I in pot and  $\text{H}_2\text{O}$  cultures with sugar beet and mangolds. Highest yields of sugar beetroots on a neutral loam were obtained with  $\text{NaNO}_3 + \text{B}$  equiv. to that present in saltpetre, although the B content of roots and leaves was higher when saltpetre was used. On an alkaline soil yields (root and leaf) of mangolds, sugar content, and freedom from crown rot were in the order: saltpetre  $>$   $\text{NaNO}_3 + \text{B} >$   $\text{NaNO}_3$ . In  $\text{H}_2\text{O}$  cultures saltpetre produced greater yields of sugar beet (root and leaf) than did  $\text{NaNO}_3 + \text{B} + \text{I}$  equiv. to that in saltpetre. The B content of roots increased with the amount of B supplied. The I content of leaves was  $>$  that of roots. With mangolds yields were in the order:  $\text{NaNO}_3 + \text{B} + \text{I} >$   $\text{NaNO}_3 + \text{B} >$  saltpetre. Incidence of heart rot was greatest when  $\text{NaNO}_3$ , with or without I, was given. The I content of leaves was increased by fertilisers containing I. In soil and  $\text{H}_2\text{O}$  cultures the B content of leaves was  $>$  that of roots.

A. G. P.

**New material for supplying readily available magnesium in fertilisers.** W. H. MCINTIRE (Amer. Fertiliser, 1938, 88, No. 5, 11, 26).—Selectively calcined dolomite ( $\text{CaCO}_3:\text{MgO}$  approx. 3:1), mixed with superphosphate or  $\text{NH}_4\text{H}_2\text{PO}_4$  gives a fertiliser which produces readily available Mg, as measured by the solubilities in citric acid and aq.  $\text{CO}_2$ .

A. W. M.

**Correlation between water [contents] and fertilising elements in some Moroccan soil types.** E. MIEGE (Ann. Agron., 1937, 7, 370—388).—Moisture contents at 4 different depths and lysimetric figures are given for 4 soils over a 2-year period. Sandy soil allowed the greatest percolation of rain- $\text{H}_2\text{O}$  and nutrients, and the clay retained the most. Addition of org.-mineral fertiliser aided percolation and leaching, but the presence of a crop decreased the amount of drainage  $\text{H}_2\text{O}$ . Distribution of  $\text{H}_2\text{O}$  in the clay soil was fairly uniform, but the sandy soil contained far more in the lower horizons.

A. W. M.

**Effect of various grades of fertilisers on the salt content of soil solution.** L. M. WHITE and W. H. ROSS (Amer. Fertiliser, 1938, 88, No. 5, 11).—Fertiliser and moist soil were mixed and kept at  $50^\circ$  for 5 days, the soil solution being obtained by the Burd and Martin displacement method (B., 1923, 845A). Present-day as against prewar fertilisers have less effect on the soil solution salt concn. due to their higher grade and the use of  $\text{NH}_4$  salts and urea in place of  $\text{NaNO}_3$ . (Cf. B., 1937, 1100.)

A. W. M.

**[Statistical] trials in heterogeneous soil.** A. HAMY (Ann. Agron., 1937, 7, 515—519).—A graphical method of examining fertiliser trials in plots of heterogeneous soil is given.

A. W. M.

**Crop production without soil.** W. F. GERICKE (Nature, 1938, 141, 536—540).—The present stage of development of hydroponics is described. Methods and results of large-scale experiments are illustrated.

L. S. T.

**Influence of air temperature and soil moisture subsequent to flowering on the nitrogen content of wheat.** J. W. HOPKINS (Canad. J. Res., 1938, 16, C, 135—142).—At the early "dough" stage the N content of wheat grain grown with a diurnal temp. cycle of  $12.8$ — $26.7^\circ$  was  $>$  in that grown at  $7.2$ — $21.1^\circ$ . Differences in the matured grain were, however, insignificant. At the lower temp. maturation was retarded and respiratory loss of carbohydrate in the maturing grain was correspondingly greater. Differences in the N content of grain due to different levels of  $\text{H}_2\text{O}$  supply were similarly apparent in the "dough" stage but not at maturity.

A. G. P.

**Application of fertilisers as a top-dressing in spring.** J. S. CSIKY (Mezőg. Kutat., 1938, 11, 36—40).—Manurial trials with wheat, rye, and lucerne are recorded.  $\text{CaNH}_4(\text{NO}_3)_3$  used as a top dressing increased yields even when soils were deficient in nutrients other than N.

A. G. P.

**Influence of temperature on germinability of fungus-infected and formaldehyde-treated oats.** O. POHJAKALLIO (Phytopath. Z., 1937, 10, 178—183).—Treatment with  $\text{CH}_2\text{O}$  causes germination of seed to become more sensitive to temp. The effects differ with variety and with the nature of the fungal infection.

A. G. P.

**Effect of fertilisation on composition of a Lufkin fine sandy loam and of oats grown on it.** G. S. FRAPS, J. F. FUDGE, and E. B. REYNOLDS (J. Amer. Soc. Agron., 1937, 29, 990—996).—Over an



8-year period the effects of fertiliser mixtures of varying proportions of  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{K}_2\text{SO}_4$ , and superphosphate are recorded. Of the total N added 50–70% remained in the surface 6 in. of soil and very little penetrated into the subsoil. Of the P applied 36–45% was in active form in the surface layer and penetration into the subsoil was considerable. Penetration of K was < that of P. Additional available K produced by fertiliser treatment was mainly in the exchangeable form. The P and N contents of oats in the vegetative stage were in fair agreement with the amounts of these elements in the soil, but with mature oats the relationship was much less definite. The relation in respect of K was irregular at both stages.

A. G. P.

**Influence of calcium silicate and carbonate and of silicic acid on the utilisation [by plants] of phosphatic fertilisers.** E. BLANCK and R. THEM-LITZ (J. Landw., 1938, 85, 165–179; cf. B., 1937, 479).—Small amounts of Ca silicate (I) used as a supplement to a general fertiliser mixture increased the yield and P intake of oats under conditions in which  $\text{CaCO}_3$  was ineffective. Larger proportions of (I) tended to diminish the effect. Similar increases were produced by an equiv. mixture of  $\text{CaCO}_3$  and  $\text{SiO}_2$  gel. With acid soils on which basic slag is normally more effective than superphosphate (II), application of (I) increases the efficiency of (II) to the level of that of slag. With soils pretreated with  $\text{KH}_2\text{PO}_4$  and washed, shaking with  $\text{H}_2\text{O}$  and (I) brought into solution amounts of  $\text{PO}_4'''$  which increased with the quantity of (I) used to a max. beyond which further additions of (I) restricted the dissolution of  $\text{PO}_4'''$ .

A. G. P.

**Mutual relation of protein and starch contents of malting barley.** C. KRÜGEL, C. DREYSPRING, and F. HEINRICH (Landw. Versuchs-Stat., 1938, 129, 157–163).—The supposed constancy of the starch/protein ratio in barley (Wimmer and Lüdecke, B., 1936, 611) is not confirmed. The ratio is influenced by manual treatment and by growth conditions, and may differ among varieties grown in the same season or in the same variety grown in different seasons.

A. G. P.

**Carbohydrate composition of maize and sorghum roots.** J. P. CONRAD (J. Amer. Soc. Agron., 1937, 29, 1014–1021).—The total sugar content of roots of sorghum varieties was 15–55% of the dry org. matter. For maize the vals. were 1–4.5%. During maturation sugar in maize but not in sorghum plants migrates to the ear. The bearing of the data on the ill-effects of sorghum residues on the subsequent crop is discussed.

A. G. P.

**Value of cover crops in continuous maize culture.** T. E. OPLAND and H. C. KNOBLAUCH (J. Amer. Soc. Agron., 1938, 30, 22–29).—Beneficial effects of cover crops, especially of leguminous plants, on the yield of maize and the N and  $\text{H}_2\text{O}$  conservation of soil are recorded.

A. G. P.

**Interaction of factors in crop growth.** F. CROWTHER, A. TOMFORDE, and A. MAHMOUD (Roy. Agric. Soc. Egypt, Bull., 1937, No. 28, 64 pp.).—The response of wheat and maize to varying applications of N and to differences in spacing of plants are

examined. Yields of wheat were closely correlated with the N content of the whole plants. Lodging is also related to the N content. Effects on barley of residual N from manuring of the previous crop were small by comparison with applications of N made directly to the barley crop. With increasing applications of N to maize the ratio grain : whole plant (wt.) increased. No cobs were produced unless a fairly high min. supply of N was available.

A. G. P.

**Effects on dry matter and ash content of rice plants of varying amounts of ammonium sulphate.** V. T. ALMEDA (Philippine Agric., 1937, 26, 446–474).—In pot cultures the total dry matter and ash of the plants increased (within limits) with the amount of  $(\text{NH}_4)_2\text{SO}_4$  given. The % of ash, however, decreased under these conditions. Tillering was influenced by the age of the plants, the quantity of  $(\text{NH}_4)_2\text{SO}_4$  applied, and by the time of planting. Delayed maturation and irregular ripening caused by the fertiliser treatment are attributed to disturbed balance of carbohydrate, N, and mineral matter in the plants.

A. G. P.

**Use of potash fertilisers for corn, vegetable, and potato crops.** V. A. SERDIUKOV (Kali, 1937, No. 9, 28–34).—The results of a no. of agricultural experiments, carried out on different soils, showing the effects of N-P-K fertilisers on yields of winter rye, spring wheat, barley, various vegetables, and potatoes are discussed and the importance of K fertilisers is stressed.

D. G.

**Effect of ethylene thiocyanohydrin, ethyl-carbarylamine, and indoleacetic acid on the sprouting of potato tubers.** J. D. GUTHRIE (Contr. Boyce Thompson Inst., 1938, 9, 265–272).—A substance believed to be *ethylene thiocyanohydrin* (from  $\text{CH}_2\text{Br}\cdot\text{CH}_2\cdot\text{OH}$  and  $\text{KCNS}$ ) was effective in breaking the dormancy of potato tubers.  $\text{EtNC}$  also showed marked dormancy-breaking action. Neutralised indolylacetic acid (I) inhibited the sprouting of pieces of non-dormant potato tubers when the bases of the pieces were soaked in solutions ranging from 25 to 100 mg. per 100 c.c. for 1–7 days at  $10^\circ$ . These treatments with neutralised (I) also induced rooting at the cut surface of the pieces.

AUTHOR.

**South Carolina potato fertiliser experiments.** J. M. JENKINS and J. J. MIKELL (Amer. Fertiliser, 1938, 88, No. 7, 5–6, 24).—Applications of a 5-7-5 N-P-K fertiliser at doses >2000 lb./acre do not give correspondingly increased yields. There is no difference in yield if the N is applied as  $\text{H}_2\text{O}$ -sol. inorg. salts or as org. manure (cottonseed meal).

A. W. M.

**Influence of acid and neutral fertiliser mixtures on yield of potatoes on limed plats at Onley, Virginia.** J. B. HESTER (Amer. Potato J., 1938, 15, 35–37).—Non-acid-forming fertilisers increased yields of potatoes on unlimed ( $p_{\text{H}}$  4.5) but not appreciably on limed ( $p_{\text{H}}$  5.0) soils. Neutral and acid-forming fertilisers had no effect on the severity of scab.

A. G. P.

**Effect of [calcium] cyanamide on club-root in cabbages.** VINCENT, HERVIAUX, and Coïc (Compt. rend. Acad. Agric. France, 1938, 24, 83–86).—By



treating soil with  $\text{CaCN}_2$  before planting cabbage, infection due to *Plasmadiophora brassicae* is lessened.

A. W. M.

**Relation between vitamin-C content and increased growth of crops from fertiliser applications.** B. ISGUR and C. R. FELLERS (J. Amer. Soc. Agron., 1937, 29, 890—893).—Fertiliser treatment increased the yield and vitamin-C content of Swiss chard, max. vals. being obtained with high-N fertilisers. With New Zealand spinach the increased yields were not accompanied by increases in -C content per g. of dry matter.

A. G. P.

**Comparison of legume growth in different soil types at varying acidity levels.** H. L. HYLAND (J. Amer. Soc. Agron., 1938, 30, 111—121).—Relations between soil- $p_H$  and growth of lespedeza, sericia, zig-zag clover, and crown vetch are examined. Soil- $p_H$  is not a satisfactory index of the adaptation of legume crops to particular soils.

A. G. P.

**Effect of applications [to soil] of fine limestone.** I. Yield and nitrogen content of sweet clover and lucerne grown on Shelby loam and Clinton silt loam. II. Yield and nitrogen content of lucerne grown on Tama silt loam from different areas. III. Yield and nitrogen content of inoculated and non-inoculated lucerne grown on Shelby loam. A. A. KLINGEBIEL and P. E. BROWN (J. Amer. Soc. Agron., 1937, 29, 944—959, 978—989; 1938, 30, 1—9).—I. Application of limestone to the full extent of the  $\text{CaO}$  requirement of the soil increased nodulation, dry-matter yields, and the % and total N content of the crops. Light dustings of fine limestone in the row and, less consistently, beside the row produced similar but smaller effects. No movement of limestone in the soil sufficient to affect  $p_H$  was apparent in 120 days. Light applications improved dry-matter yields > the N content of the crop.

II. Similar results are obtained in the different soils. Applications of  $\frac{1}{2}$  and of  $\frac{1}{4}$  of the  $\text{CaO}$  requirement in the row produced equal changes. No relation was apparent between the effect of any given amount of limestone applied in the row and the ratio of that amount to the  $\text{CaO}$  requirement. The total N content of lucerne increased with the amount of limestone applied in the row, but the val. obtained on a fully limed soil was reached only when the amount of limestone in the row closely approached the  $\text{CaO}$  requirement.

III. The relative effects of various applications of limestone were similar in inoculated and uninoculated lucerne, but the abs. yields and N contents were consistently higher in the inoculated series. Applications in the row of limestone in amounts < the  $\text{CaO}$  requirement produced dry-matter yields approaching, but N contents  $\ll$ , those obtained in fully-limed soils.

A. G. P.

**Response of lucerne to borax.** L. G. WILLIS and J. R. PILAND (J. Amer. Soc. Agron., 1938, 30, 63—67; cf. B., 1937, 1252).—The yellowed condition of lucerne in certain soils was corr. by applications of borax if given in March, but not if withheld until late May. A combination of Mn, Zn, and Cu sulphates

produced results similar to those obtained with borax. The yellowed condition was accentuated by liming or by high-Ca fertilisers, and was associated with an abnormal infestation of sucking insects.

A. G. P.

**Effect of low concentrations of sulphur dioxide on yield of alfalfa [lucerne] and Cruciferae.** C. SETTERSTROM, P. W. ZIMMERMAN, and W. CROCKER (Contr. Boyce Thompson Inst., 1938, 9, 179—198).—The effects of prolonged exposure to low, non-marking concns. of  $\text{SO}_2$  have been studied, using lucerne and Cruciferae grown under differing conditions.  $\text{H}_2\text{O}$  and nutrient supplies, S content of nutrient supply, and age of plants were systematically varied to enable comparison of the effects of  $\text{SO}_2$  to be made under the several conditions and to permit statistical analysis of the yield data. Under none of the conditions studied did  $\text{SO}_2$  treatment decrease the yield of lucerne; under most of the conditions it had no significant effect on yield, and under some it brought about significant yield increases. The data indicate that deficiencies in S content of nutrient supply were made up by absorption of  $\text{SO}_2$  from the air. Age of plants and the amount of supplied nutrients had no effect on the yield response to gas treatment. Lucerne grown with a deficient supply of  $\text{H}_2\text{O}$  seemed to respond more readily to the stimulating effect of the  $\text{SO}_2$  than did plants grown with an ample  $\text{H}_2\text{O}$  supply. Lucerne growing rapidly under favourable light conditions responded more readily to the growth effect of  $\text{SO}_2$  than did that growing slowly under less favourable light conditions. Treatment with  $\text{SO}_2$  had no significant effect on yield of Cruciferae.

AUTHOR.

**Manuring watercress.** G. BARBIER and M. MARCEL (Compt. rend. Acad. Agric. France, 1938, 24, 193—200).—Watercress obtains sufficient N and K, but insufficient P, from the  $\text{H}_2\text{O}$  running through the beds. P should be added to the soil before planting, or applied as an almost insol. phosphate during growth.

A. W. M.

**Environmental conditions influencing the development of tomato pockets or puffs.** A. C. FOSTER and E. C. TATMAN (Plant Physiol., 1937, 12, 875—880).—Formation of "pockets" is restricted by use of fertilisers containing large proportions of superphosphate and moderate amounts of N, thus favouring normal seed development. Adverse nutritional conditions lead to disturbed metabolism and a condition of sub-oxidation causing necrosis of vascular and placental tissue.

A. G. P.

**Wound dressings for fruit trees.** J. D. ATKINSON (New Zealand J. Sci. Tech., 1937, 19, 313—316).—Bitumistic paint with a low content of tar acids or their salts is the most satisfactory wound dressing since it forms an adherent, pliable film on the wound, whereas white-Pb paint tends to flake off and both creosote and coal tar seriously damage the wood and frequently give rise to conditions inducing silver-leaf disease.

A. R. P.

**Seeds and germination.** W. CROCKER (Hort. Soc. New York, 1938, Mar.—Apr., 267—271; Boyce Thompson Inst. Prof. Paper, 1938, 1, No. 29).—Factors affecting germination and methods of acceler-



ating the germination of hard-coated seeds are discussed. A. G. P.

**Differential nutrition of the sunflower with the principal elements.** T. DEMIDENKO (Compt. rend. Acad. Sci. U.R.S.S., 1938, 18, 367—368).—Intake of N by the sunflower occurs principally in stages preceding flower-head formation, and deprivation of N at later stages does not greatly affect yields. Considerable amounts of K and P are accumulated during vegetative growth, and if the supply of N, P, and K is maintained these accumulations may exceed normal requirements. The utilisation of the principal nutrients is not definitely influenced by the period of their application to soil. A. G. P.

**Manurial requirements of cotton varieties.** F. CROWTHER (Empire Cotton Growing Rev., 1938, 15, 21—29).—The response of cotton varieties to N manuring shows considerable differences. A. G. P.

**Potash requirements of cotton in relation to acid and neutral fertilisers.** E. R. COLLINS, R. P. BLEDSOE, J. J. SKINNER, and J. H. HUNTER (Amer. Fertiliser, 1938, 88, No. 5, 11).—Neutral mixed fertilisers tend to give greater yields than do acid fertilisers. Increasing applications of the latter decrease, and those of neutral fertilisers increase, the Ca content of the plant. When acid fertilisers are applied the increase in K content of the plant is  $\propto$  the K added and is more marked than with neutral fertilisers. A. W. M.

**Potash starvation and the cotton plant. II.** R. C. WOOD (Empire Cotton Growing Rev., 1938, 15, 30—34).—Deficiency of K markedly decreased yields of cotton, but had little effect on the quality of the lint; seeds were smaller and showed germinative capacity < normal. A. G. P.

**Decomposition [in soil] of *Crotalaria juncea* under field conditions.** B. N. SINGH and S. N. SINGH (J. Amer. Soc. Agron., 1937, 29, 885—889).—Leaves, roots, and stems of *C. juncea* were decomposed in soil at rates which decreased in the order named. Leaves contributed the major portion of total and available N to the soil, max. vals in the upper 6 in. of soil being reached 4 weeks after ploughing-in. The bearing of these observations on green-manuring practice is discussed. A. G. P.

**Physical, chemical, and physiological experiments on clay [flower-]pots.** K. BRESCHKE (Gartenbauwiss., 1937, 11, 335—390).—Permeability of pots to air and H<sub>2</sub>O varied with temp. of kilning and with method and origin of manufacture. Differences in growth due to permeability were detectable in some plants but not in others. The permeability did not appreciably affect the  $p_H$  of soil extracts. The reaction of the pot material was alkaline even when the original clay was acid. Favourable effect of ground pot material in growth of various plants is due to its K and P contents. A. G. P.

**Manurial experiments with ammonium sulphate and sodium nitrate on sugar cane.** W. SAYER and S. SEN (Agric. Live-Stock India, 1938, 8, 165—166).—NaNO<sub>3</sub> produced very slightly higher

yields of cane than did (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. Application of the fertilisers in two doses was more effective than in one dose. A. G. P.

**Use of formaldehyde for disinfecting beet seeds.** R. FOURMONT (Compt. rend. Acad. Agric. France, 1937, 23, 981—984).—Treatment of seed with aq. CH<sub>2</sub>O decreases infection by *Phoma betæ*, Fr. Susceptibility of the seeds to injury by this fungicide varies with the variety. A. W. M.

**Influence of the nutrition of the mother beet on the quantity and properties of the seed.** W. KRÜGER, G. WIMMER, K. E. BECKER, H. LÜDECKE, and K. SAMMET (Z. Wirts. Zuckerind., 1937, 87, 511—536).—General deficiency of nutrients, or deficiency of an individual nutrient (notably of P), adversely affects the yield, size, and wt. of the seed. A. G. P.

**"Bolting" of sugar beet and failure of mother beet to produce seed.** W. KRÜGER, G. WIMMER, and H. LÜDECKE (Z. Wirts. Zuckerind., 1937, 87, 537—546).—"Bolting" is favoured by generous supplies of available N in soil. Failure to produce seed in the second year is associated with deficiency of N. K and P deficiency has little or no influence in this respect. A. G. P.

**Effect of climatic factors on growth of sugar beet.** M. GODARD (Ann. Agron., 1937, 7, 696—727).—Relationships are deduced between (a) the total radiation received by the crops, (b) moisture, and (c) temp. and the growth of the whole plant and the beet. A. W. M.

**Crops grown in the Santerre region. III. Sugar beet.** G. JORET and H. MALTERRE (Ann. Agron., 1937, 7, 520—546; cf. B., 1937, 598).—Data for 12 years show that meteorological conditions, N fertilisers, and plant variety are more important soil than conditions or K and P fertilisers in obtaining good sugar-beet yields in this district. A. W. M.

**Effect of applications of common salt on yield and quality of sugar beet and on composition of the ash.** J. G. LILL, S. BYALL, and L. A. HURST (J. Amer. Soc. Agron., 1938, 30, 97—106).—Under widely differing growth conditions, application of NaCl increased the yield of roots but lowered the apparent purity of the juice. The % of ash in roots and of Na, Cl, and possibly K in the ash was increased. A. G. P.

**Sand-culture method as a basis for examination of sugar-beet varieties.** G. WIMMER and H. LÜDECKE [with O. UNVERDORFEN, K. SAMMET, G. STORCK, G. SPIELMEYER, and A. BOLLMANN] (Z. Wirts. Zuckerind., 1938, 88, 1—57).—The suitability of sand-culture trials (technique described) in comparisons of beet varieties is demonstrated. Differences in crop yield, and notably in root:leaf ratio, produced by unit applications of N, P, or K to different varieties are shown. A. G. P.

**Effect of potash fertilisers on sugar-beet crops.** M. S. JAKOVENKO and A. D. AVETASIAN (Kalii, 1937, No. 9, 35—36).—The yield of beet is considerably increased if K fertilisers are used in addition to the usual N-P fertilisers. The experiments show that less conc. K fertilisers should be applied; thus, a



30% KCl mixture doubled or trebled the yield compared with that given by 100% KCl. D. G.

**Importance of growth-substance in vegetative propagation of vines, especially in selecting varieties.** H. KORDS (Gartenbauwiss., 1937, 11, 545—554).—Successful results of applications of  $\beta$ -indolylacetic acid in accelerating rooting of vine cuttings are recorded. A. G. P.

**[Effect of] climate on the vineyards in the Mediterranean Languedoc region.** L. CHAPTAL (Ann. Agron., 1937, 7, 641—695).—The effect of climatic conditions on the production of vines is discussed. A. W. M.

**Remarks on the production of the vineyards in the Mediterranean Languedoc region in 1937.** L. CHAPTAL (Compt. rend. Acad. Agric. France, 1937, 23, 1060—1063; cf. preceding abstract).—The effects of the climate on the vine harvest and resultant wines are discussed. A. W. M.

**Substitutes for arsenical insecticides in vineyards.** F. STELLWAAG (Gartenbauwiss., 1937, 11, 537—544).—A review of unsuccessful attempts to find a substitute for As in spraying practice. A. G. P.

**Chemical fertilising of mature rubber trees.** C. F. FLINT (India-Rubber J., 1938, 95, 19—23).—A review, with especial reference to the essential fertiliser constituents, the response of the trees to manuring, the choice and cost of fertilisers, and the reconditioning effect of cover-plants on the soil. D. F. T.

**Effect of locust trees on available mineral nutrients of the soil.** W. H. GARMAN and F. G. MERKLE (J. Amer. Soc. Agron., 1938, 30, 122—124).—Accumulation of locust leaves in the soil surface effects a gradual transference of basic nutrients from subsoil to surface layers. A. G. P.

**Chemistry of the action of lime-sulphur.** P. RECKENDORFER (Phytopath. Z., 1937, 10, 306—331).—Passage of air, with or without the normal  $\text{CO}_2$  content, through aq.  $\text{CaO-S}$  (1 in 20) results in a progressive increase in  $\text{S}_2\text{O}_3^{--}$  and diminution of polysulphide, and monosulphide-S and total sol. S, the presence of  $\text{CO}_2$  introducing only a relatively small difference in the course of the changes. Pure  $\text{CO}_2$  effects a much more rapid decomp. of  $\text{CaO-S}$  than does pure  $\text{O}_2$  and causes almost complete removal of all sol. S (including  $\text{S}_2\text{O}_3^{--}$ ) from the solution.  $\text{H}_2\text{S}$  is formed in large amounts during  $\text{CO}_2$  treatment, but not during oxidation with  $\text{O}_2$ . The mol. course of these changes is discussed. A. G. P.

**Response to copper on a south Australian soil.** D. S. RICEAN, C. M. DONALD, and C. S. PIPER (J. Austral. Inst. Agric. Sci., 1938, 4, 41).—Application of  $\text{CuSO}_4$  allowed normal vegetative development to take place on blown calcareous sand (60%  $\text{CaCO}_3$ ,  $\text{pH}$  8.5 on the surface) where crops previously exhibited "reclamation disease." H. G. R.

**Copper content of residues from sprays containing adjuvants.** E. L. GREEN and M. C. GOLD-WORTHY (Phytopath., 1937, 27, 957—960).—Comparison is made of the influence of an aromatic

sulphonate, a resin prep., fish oil soap, and cottonseed oil on amount and persistence of the Cu deposit from Cu phosphate sprays. Results differed in two successive seasons of different rainfall. In the drier season the fish oil soap increased the initial deposit and its adhesion to leaves. A. G. P.

**Quantitative injection and effects of nicotine in insects.** N. E. MCINDOO (J. Agric. Res., 1937, 55, 909—921).—The susceptibility of insects to injected nicotine varied considerably with species. Age was an important factor, susceptibility decreasing during the first few days but subsequently increasing very considerably. Toxicity of free nicotine was approx. 8 times that of nicotine sulphate. Addition to the latter of KOH sufficient to liberate the base increased the toxicity to that of the free base solution. A. G. P.

**Determination of fluorine in insecticide products.** H. BÉGUÉ (Ann. Agron., 1937, 7, 431—439).—The gravimetric method of Bonis (B., 1936, 36) and the volumetric  $\text{Yt}(\text{NO}_3)_3$  method of Frère (A., 1933, 242) are the most satisfactory. A. W. M.

**Insecticides based on rotenone.** F. LEVALLOIS (Compt. rend. XVII Cong. Chim. Ind., 1937, 559—561).—A review. R. S. C.

**Colorimetric determination of rotenone.** S. SCHONBERG (Compt. rend. XVII Cong. Chim. Ind., 1938, 947—952).—Rotenone is best determined by extracting (Soxhlet) the root with  $\text{COMe}_2$  and applying Goodhue's colour test to the extract. The results accord with biological efficiency. Some other ingredients of the root give the test. R. S. C.

**Possible new means for controlling insect pests.** T. G. MASON and E. PHILLIS (Trop. Agric., 1938, 15, 45; Int. Sugar J., 1938, 40, 197).—Working with cotton plants, the authors found that various insect pests could be killed or their damage reduced by supplying Se to the soil. Animals feeding on plants thus treated may be poisoned; hence the method should be applied with caution, and preferably in the growing of crops designed to trap the pests. J. P. O.

**Review of phytopharmacy. IV.** M. RAUCOURT (Ann. Agron., 1937, 7, 817—849; cf. B., 1933, 839; 1936, 71).—Research on modern parasiticides and their uses is reviewed. A. W. M.

**Laboratory comparisons of copper fungicides.** S. E. A. MCCALLAN and F. WILCOXON (Contr. Boyce Thompson Inst., 1938, 9, 249—263).—A laboratory comparison was made of Bordeaux mixture (I) and nine other proposed Cu-containing substitutes with respect to toxicity, adherence, and foliage injury, at equal Cu concns. (I) was superior in toxicity to all other preps. tested, both before and after rain, using spores of *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, *Uromyces caryophyllinus*, and *Gymnoconia peckiana*. Cuprocide, (I), and  $\text{CuOCl}_2$  were the three most adherent preps. tested. The differences in phytocidal action were less marked than those in fungicidal action, since several preps. caused injury as great as that of (I), without the superior fungicidal action of the latter. It is concluded that none of the



preps. was superior to (I), considering both fungicidal and phytocidal action. AUTHOR.

Foot and root rot of wheat. V. Relation of phosphorus, potassium, nitrogen, and calcium nutrition to the disease caused by *Helminthosporium sativum*, P.K. and B. W. C. BROADFOOT and L. E. TYNER (Canad. J. Res., 1938, 16, C, 125—134).—In sand-cultured wheat, sub-optimal concns. of N, Ca, and K in the nutrient increased the incidence of foot rot. Concns. > the optimum had no appreciable effect. Deficiency of P had no influence on the disease. A. G. P.

Sulphuric acid spraying [of crops]. G. B. HONY (Fert. Feed. Stuffs J., 1938, 23, 159—160).—Use of aq.  $\text{H}_2\text{SO}_4$  in control of charlock and *Cercospora herpotrichoides* in cereals and for destroying haulms and blight in potatoes is reported. A. W. M.

Negative correlation between occurrence of polyphenol oxidase and diastase and the degree of incidence of "blackheart" of potato. B. N. SINGH and P. B. MATHUR (Phytopath., 1937, 27, 992—1000).—A negative correlation is established between the activity of the enzymes and the appearance of the disease. During summer storage of potatoes respiration is sufficiently active to raise the temp. and increase the  $[\text{CO}_2]$  of the air surrounding the tubers. Oxidase and diastase are partly destroyed by the raised temp., and  $\text{CO}_2$  accumulation favours development of the disease. A. G. P.

Cabbage aphid (*Brevicoryne brassicae*, L.). F. R. PETHERBRIDGE and D. W. WRIGHT (J. Min. Agric., 1938, 45, 140—148).—Overwintering aphids on old *Brassica* plants should be cleared by burning the plants or applying nicotine (I) (spray or dust) before mid-May. Young plants should be similarly treated. On older sprout and broccoli plants, neither (I) nor pyrethrum kills heart colonies of aphids. A. G. P.

Composition of soya-bean nodules and root-nodule bacteria. W. W. UMBREIT and R. H. BURRIS (Soil Sci., 1938, 45, 111—126).—Differences in the N distribution of 4 strains of nodule organisms were small. In all cases vals. for basic N were low. The N fractions of the entire tissue and of the sol. portion of soya-bean plants were similar throughout the plant. With the possible exception of non- $\text{NH}_2$ -basic N no unique constituents exist in nodules. Differences in composition between nodules and the remainder of the plants are quant. rather than qual. In dried nodular tissue 20% of the total N and a considerable portion of the sol. N is arginine. The non- $\text{NH}_2$ -non-basic ("other") N fraction of the tissue, the proportion of which increases with advancing maturity, is probably proline. A. G. P.

Translocation of derris constituents in bean plants. R. A. FULTON and H. C. MASON (J. Agric. Res., 1937, 55, 903—907).—New leaves produced on bean plants subsequent to spraying the plants with derris were less palatable to Mexican bean-beetle larvae than were those produced on unsprayed plants. Extracts of such leaves were toxic to goldfish and yielded a cryst. substance possessing the properties of

rotenone. The latter is probably translocated from older sprayed leaves to those formed later. A. G. P.

Reduction of soil populations of the root-knot nematode during decomposition of organic matter [in soil]. M. B. LINFORD, F. YAP, and J. M. OLIVEIRA (Soil Sci., 1938, 45, 127—141).—Decomp. of org. matter (chopped pineapple plants, grass, sugar) in soil diminished the no. of root-knot galls on cow-peas to extents which increased with the amount of org. matter applied and with the shortness of the interval before planting. The efficiency of the org. matter in this respect was not greatly influenced by fineness of chopping, but was increased by oven-drying and re-melting. The decomp. causes a marked increase in the total nematode population of the soil, which in turn supports a larger population of predacious fungi, mites, and nematodes resulting in subsequent destruction of larvae and free-living forms of *Heterodera marioni*. A. G. P.

Water-soaking of leaves in relation to development of blackfire disease of tobacco. E. E. CLAYTON (J. Agric. Res., 1937, 55, 883—889).—The tendency of *Bact. angulatum* to produce large spreading lesions instead of the normal localised effect arises through soaking of leaves with  $\text{H}_2\text{O}$ , e.g., in storms. Resistance to  $\text{H}_2\text{O}$ -soaking is increased by high topping and by low-N-high-K manuring. A. G. P.

Control of downy mildew of tobacco by vapours of benzene and other organic substances. R. MCLEAN, F. A. WOLF, F. R. DARKIS, and P. M. GROSS (Phytopath., 1937, 27, 982—991).—Vapour of  $\text{C}_6\text{H}_6$  (and also of  $\text{PhCl}$ ) controls *Peronospora tobacina*. High concns. of vapour are toxic to the tobacco plants; admixture of lubricating oil retards evaporation of  $\text{C}_6\text{H}_6$ . Methods of application are described. A. G. P.

Acid-arsenical method in weed control. A. S. CRAFTS (J. Amer. Soc. Agron., 1937, 29, 934—943).—Effects of varying the conditions of application of these herbicides are examined. The val. of combining acid-As treatments with applications of  $\text{NaClO}_3$  or  $\text{CS}_2$  is discussed. A. G. P.

Characteristics of the life cycle of the codling moth in the Lyonnais region [France]. Methods of control. A. PAILLOT (Compt. rend. Acad. Agric. France, 1937, 23, 991—995).—As well as the spring applications (B., 1937, 714), a 1% vegetable oil-arsenate emulsion is recommended as an insecticide against the moth late in June. Band-traps treated with  $\beta\text{-C}_{10}\text{H}_7\text{-OH}$  or  $\alpha\text{-C}_{10}\text{H}_7\text{-NH}_2$  in paraffin oil are helpful as control measures. A. W. M.

Practical value of late treatments in control of codling moth or *Laspeyresia pomonella*, L. A. BALACHOWSKY and G. VIENNOT-BOURGIN (Compt. rend. Acad. Agric. France, 1938, 24, 35—45).—Infection of apple and pear trees in central France does not occur before June, and is most severe between mid-June and mid-July. The Cu-arsenate application at petal-fall is therefore replaced by 4 treatments with a spray ( $\text{H}_2\text{O}$  100 l., Pb arsenate about 1 kg., 90% white oil emulsion 1 l.) at 3-week intervals commencing at the beginning of June. On treated



trees, fruit infection was <3% as against 30–60% on the untreated controls. When the last application is >2 months before the fruit is picked there is <2 mg. of As per kg. of fresh fruit. A. W. M.

**Incidence of various serological types of *Str. agalactiae* in herds of cows in Great Britain.** A. W. STABLEFORTH (J. Path. Bact., 1938, 46, 21–29).—Serological types were isolated from 1546 quarters of 782 cows in 52 herds and in most cases only one sub-type was found. In herds with low or average incidence, of the 5 strains found only one was infective. The distribution of the strains in the herds is described and the relation of hæmolytic activity to serological type is described. W. L. D.

**Comparative suitability of straw, peat, and peat-straw mixtures as litter for milch cows.** O. SOMMER and A. RIPPEN [with H. BERGMANN and K. PIETSCHMANN] (J. Landw., 1938, 85, 230–242).—The superiority is shown of peat over straw in respect of absorptive capacity, freedom of milk from sediment, and val. of manure obtained. Bacterial counts and reductase tests slightly favoured the use of straw.

A. G. P.

**Value of cobalt salts for pasture top-dressing in treatment of stock ailment at Glenhope, Nelson, and Morton Mains, Southwold.** H. O. ASKEW and J. K. DIXON (New Zealand J. Sci. Tech., 1938, 19, 317–325).—The onset of sheep ailments in certain New Zealand pastures is entirely prevented and sick sheep are cured by dressing the pastures with superphosphate which has been sprayed with  $\text{CoCl}_2$  (I). At Glenhope 2 lb., and at Morton Mains 10 lb., of (I) per acre were required. A. R. P.

**Value of nickel salts in treatment of Morton Mains ailment.** J. K. DIXON (New Zealand J. Sci. Tech., 1937, 19, 326–329).—Addition of 20% of  $\text{NiCl}_2$  to the  $\text{CoCl}_2$  used for top-dressing pastures improves the response of sheep to the Co treatment for Morton Mains disease. A. R. P.

**Erratum.**—B., 1938, 200, col. 2, line 21, for SARAP read SARUP.

**Superphosphate. Decomp. of crude phosphates.**—See VII.  $\text{NaClO}_3$ .—See XI. Composition of sugar canes.—See XVII. Wheat quality and fertilisation.—See XIX.

See also A., III, 540, Nutrients for excised tomato roots.

#### PATENTS.

**Phosphate fertiliser. Mixtures containing  $\text{NH}_4\text{NO}_3$ .** S.—See VII.

### XVII.—SUGARS; STARCHES; GUMS.

**Composition of whole [sugar] canes.** C. A. FORT and R. L. HOLMES (Int. Sugar J., 1938, 40, 195).—Material examined consisted of duplicate composted field samples of varieties Co 281 and Co 290 from experimental plots, in the ash of which the mineral salts were determined. The amount of N,  $\text{P}_2\text{O}_5$ , and CaO was more in Co 281 than in Co 290, and of  $\text{K}_2\text{O}$ , MgO, and  $\text{SiO}_2$  about the same. The latter variety, however, yields 30 tons/acre, and the former 20 tons. Nearly  $\frac{2}{3}$  of the N in an acre of cane are in

the tops. Better distribution of the defecation muds would return all of the P to the soil and about  $\frac{1}{2}$  of that originally present in the mill cane. J. P. O.

**Extraction of certain non-sugars during milling.** C. A. FORT and R. L. HOLMES (Int. Sugar J., 1938, 40, 197).—Milling experiments made in Louisiana with Co 281 and Co 290 showed that none of the non-sugar constituents was extracted to the same extent as the sucrose; total ash,  $\text{K}_2\text{O}$ ,  $\text{PO}_4'''$ , and combined org. acids came next, then CaO, MgO, and  $\text{SO}_4''$ , and lastly N, Fe, and  $\text{SiO}_2$ . The ash extraction was greater in the case of Co 290, and the proportions of the constituents in the two juices were quite different. Whilst differences in extraction are dependent mostly on varietal characteristics, there is also the possibility that soil types as well as cultural practices may exert a definite influence. J. P. O.

**Conditions of beet storage and final quality of sugar.** H. GEARHEART (Int. Sugar J., 1938, 40, 198).—Recent experience shows that wet dirt is actually a benefit to the beets while in storage, regardless of the height of the pile. At one plant during the past season the beets were placed in 20-ft. piles containing as much as 40% of dirt, and when removed 60 days later were in almost perfect condition. A height of pile of 22 ft. is desirable, especially if all other good storage conditions are observed.

J. P. O.

**Assay of beet by aqueous digestion.** D. SIDERSKY (Bull. Assoc. Chim. Sucr., 1938, 55, 355–361).—Methods for the assay of sugar in beet pulp and cossettes are reviewed. The standard method used in Germany and Czechoslovakia is detailed, and modifications of this are described designed to avoid the necessity for special automatic pipettes and capable of use with various normal wts. according to the saccharimeter scale used. I. A. P.

**Measurements of  $p_H$  and  $p_{OH}$  in [beet]-sugar factory juices at high temperatures.** II. O. SPENGLER, S. BÖTTGER, and G. SEELIGER (Z. Wirts. Zuckerind., 1938, 88, 295–347; cf. B., 1937, 1110).—Apparatus and procedure for measuring  $p_H$  at temp. up to 100° are described. Experiments with sugar juices show that there is a considerable difference in the temp. coeff. of  $p_H$  for the original juice and for the acidified juice, depending on the nature of the buffer. The determination of  $p_H$  by the indirect method (relation between inversion and  $[\text{H}^+]$ ) leads to erroneous results. E. S. H.

**Clarification of refractory [sugar] juices, using the fractional-liming and double-heating process.** H. B. SPRINGER (Int. Sugar J., 1938, 40, 189–191).—Factory experience with this process (cf. B., 1937, 379) at Caymanas, Jamaica, showed that subsidation was completed in  $\frac{1}{2}$  hr.; that the appearance of the juice was satisfactory, even when grinding a large proportion of POJ 2878 cane; that the filtration rate and filter-cake hardness were considerably improved, as compared with the effect of ordinary cold-liming and single heating; that it was unnecessary to use any  $\text{H}_3\text{PO}_4$  or filter-aid; and that the grinding rate was raised to 27 tons/hr., as compared with 16.8 in the old method of working. There was a



notable reduction in the mud vol. in spite of a lower CaO dose, due possibly to the double dehydration of the colloids in the two stages of the heating. The lower CaO consumption is due probably to the pptn. of impurities by heat before interaction with the alkaline earth could take place. J. P. O.

**Automatic pan control [in sugar boiling].** A. FABIUS (Int. Sugar J., 1938, 40, 184—185).—Devices are described which, based on the b.-p. elevation or the conductivity of the massecuite, control automatically the whole course of boiling in the vac. pan. Every variable factor, e.g., pressure,  $d$ , feed, and rate of evaporation, is thus held in check, and fully satisfactory results in respect of uniformity of grain are achieved. The various instruments used are described in detail, as is also a level indicator giving the no. of "tank-feet" necessary to fill the pan. J. P. O.

**Sugar boiling with the true "A" massecuite.** J. V. HAYDEN (Int. Sugar J., 1938, 40, 200).—The following straight boiling system using 4 massecuites is advocated: (1) magma seed and syrup only; (2) 70—80% of magma seed and syrup finished on first molasses; (3) 40—50% of magma seed and syrup finished on second molasses; and (4) 30—40% of seed made by graining first molasses with icing sugar finished on third molasses. Advantages claimed are: greater output per unit of time, higher sugar recovery, better quality of sugar, easier working in pans and centrifugals, less final molasses, and a lower purity of the final molasses. J. P. O.

**B.-p. elevation of sugar solutions at different pressures.** P. S. BUCAROV (Nauk. Zapiski, 1934, 1, 13—17; Int. Sugar J., 1938, 40, 192—193).—B.-p. determinations were made on sugar solutions of different purities from 60 to 100 and at pressures from 92.5 to 760 mm., when the vals. obtained with pure sugar solutions were found to follow with fair accuracy the experimental law of Babs:  $P_{\text{solution}}/P_{\text{H}_2\text{O}} = \text{const.}$  In solutions of lower purity the relationship is less regular. J. P. O.

**Velocity of crystallisation of sucrose.** I. A. KUCHARENKO and O. I. ARGATENKO (Nauk. Zapiski, 1937, 4, 22—23; Int. Sugar J., 1938, 40, 194).—The velocity of crystallisation was determined at 8 coeffs. of supersaturation up to 1.20 at 35°, and calc. in terms of mg./sq. m./hr. J. P. O.

**Horizontal and vertical mixing in the crystallisation of low [sugar-content] products.** R. DUTILLOY (Bull. Assoc. Chim. Sucr., 1938, 55, 362—372).—A discussion of working methods, with especial reference to yield and economic considerations and to CaO utilisation. I. A. P.

**Influence of  $p_{\text{H}}$  on oxidation of sodium sulphite, sucrose, and glucose by iodine solution.** O. SPENGLER, F. TÖDT, and R. ISMER (Z. Wirts. Zuckerind., 1937, 87, 559—584).—In alkaline solutions invert sugars react with I and the accuracy of sulphite determinations in beet juice increases with falling  $p_{\text{H}}$ . At  $p_{\text{H}}$  2.0 the reaction between I and  $\text{SO}_2$  proceeds rapidly to completion, the interference of reducing sugars being min. under these conditions. Cold oxidation of glucose to gluconic acid is controlled by  $p_{\text{H}}$  and [I]. Small amounts of glucose in presence

of 1000 times the wt. of sucrose are oxidised in 5 min. by I and may thus be determined with sufficient accuracy for assessing the quality of sugar-factory products. A. G. P.

**Occurrence of lactoflavin in by-products from lactose manufacture.** W. G. WHITTLESTON (J. New Zealand Inst. Chem., 1937, 2, 35—38).—An extract containing 30  $\mu\text{g.}$  of lactoflavin (I) per ml. was obtained by boiling whey paste containing 21  $\mu\text{g.}$  per g. with EtOH in an atm. of  $\text{CO}_2$ , filtering, concentrating at 22—25° in a specially devised evaporator, and then treating with fuller's earth. Green refined lactose [(I) content = 5.4  $\mu\text{g.}$  per g.] was extracted with EtOH- $\text{H}_2\text{O}$  (1:1) and press-cake from lactose filters with  $\text{C}_6\text{H}_5\text{N-MeOH-H}_2\text{O}$ . Conens. of (I) solutions may be determined approx. either colorimetrically or by comparing their fluorescence. S. M.

**Determination of invert sugar with Müller's solution in fresh beets and different sugar products.** O. SPENGLER, K. ZABLINSKY, and A. WOLF (Z. Wirts. Zuckerind., 1938, 88, 280—294).—The procedure (B., 1936, 1225) is satisfactory when applied to fresh beets, raw sugar juice (without the necessity of removing the turbidity), and molasses. Special directions are given for products containing large amounts of CaO or  $\text{SO}_2$ . E. S. H.

**Methods of analysis [of molasses] used in the fermentation industries.** W. A. DAVIS (Res. Labs. of Distillers Co., Ltd.; Int. Sugar J., 1938, 40, 186—182).—Present methods for the analysis of molasses give figures for invert sugar and sucrose which from the distiller's viewpoint do not accurately represent the amounts of these sugars, and the essential criterion is the yield of spirit obtainable under the best conditions in relation to the theoretical quantity corresponding with the sugars supposed to be present. Reducing sugars are determined without defecation and without decalcification by the Brown, Morris, and Millar gravimetric method, and after inversion by the Lane-Eynon titration procedure. Full details are given for the determination of reducing sugars, sucrose, unfermentable reducing sugars, pentoses, pentosans, and the spirit yield. The fermentation val. of a molasses containing  $a\%$  of total sugars as hexose, and giving  $b$  gals. of EtOH per cwt., is expressed by  $10,000b/12.64a$ . This figure may vary between 80 and 90, thus proving that the sugars as found by analysis are not a real index of the val. of a molasses in the distillery. J. P. O.

**Photoelectric saccharimeter. New physical instrument for the polarimetric determination of cane sugar.** B. N. SINGH and N. K. A. RAO (Science, 1938, 6, 506—507).—Apparatus and method are described. L. S. T.

**Modification of the French normal saccharimetric weight.** M. E. ROUX (Bull. Assoc. Chim. Sucr., 1938, 55, 404—405).—The French normal sugar wt. of 16.29 g. (20°) must be amended to 16.269 g. in order to give agreement between the analytical results obtained with French saccharimeters and those of other countries. I. A. P.



**Determination of phosphoric acid in starch products.** G. STEINHOFF (Z. Unters. Lebensm., 1938, 75, 39—43).—Org. matter is oxidised with  $\text{KMnO}_4$  and  $\text{HNO}_3$ , and  $\text{H}_3\text{PO}_4$  determined by the  $(\text{NH}_4)_2\text{MoO}_4$  method. In potato-starch products the free  $\text{H}_3\text{PO}_4$  is  $\propto$  the solubility in cold  $\text{H}_2\text{O}$ .

E. C. S.

**Materials manufactured by micro-organisms.** J. R. SANBORN (J. Bact., 1937, 33, 97—98).—Production of industrially useful gum by *Oidium*, *Mucor*, and *Trichoderma* spp. on carbohydrate media (including potato and starch wastes) is examined. Nitrogenous substances did not increase gum production by *Oidium*.

A. G. P.

**Compound evaporator.**—See I. **Determining fibre in cane.**—See V. **Sugar cane and beet.** **Action of B in fertilisers.**—See XVI. **Sugar extraction for cider distillation etc.**—See XVIII. **Vitamin-C in honey.** Use of the dilatometer.—See XIX.

See also A., I, 328, New type of polarimeter.

PATENT.

**Fossil gum from lignite.**—See II.

### XVIII.—FERMENTATION INDUSTRIES.

**Preservative power of hops.** C. W. McHUGO (J. Inst. Brew., 1938, 44, 294—301).—Methods for the assessment of preservative power are critically reviewed. Preference is expressed for biological methods as being more generally usefully applicable, though with cured hops up to 1 year of age satisfactory agreement is found between biological and chemical methods. With green or with old hops the former method gives the higher vals.

I. A. P.

**New Congress sieves [for malt analysis].** F. M. WIENINGER (Woch. Brau., 1938, 55, 169—171).—The characters of a new set of sieves designed for assessing the grinding of malt are described. The use of the apparatus is described and its performance compared with those of earlier sets.

I. A. P.

**Analytical determination of modification of malt.** II. C. ENDERS and B. D. HARTONG [with F. SCHNEEBAUER] (Woch. Brau., 1938, 55, 137—140).—The methods discussed previously (B., 1938, 572) are further treated from the viewpoints of specificity and of secondary and varietal influences. The limits of error are considered mathematically and a conception "utility no." is introduced, being the difference between highest and lowest possible result for an individual method  $\div$  limit of practical error. This represents the no. of groups into which the method can divide malts modified to differing extents, and for the results to be of practical val. must be  $<3$ . Considered thus, e.g., the sinker test in  $\text{H}_2\text{O}$  fails, whilst the most reliable methods would include hectolitre-wt. and degree of protein modification.

I. A. P.

**Distillery fermentation methods [yeast recovery].** F. BOINOT (Bull. Assoc. Chim. Suer., 1938, 55, 373—387).—The technical val. of the process for fermentation of various types of molasses, apple worts, etc. is supported against certain criticisms.

3 L (B.)

The process is simple and flexible and does not lead to infection of the yeast, and it makes possible the interruption of working when necessary without fresh yeast being required. Glycerin does not accumulate even with heavy returns of spent washes to the operation cycle, but EtOH yields are increased.

I. A. P.

**Acidity and protein turbidity in beer.** H. LÜERS and C. ENDERS (Woch. Brau., 1938, 55, 141—142).—The differing  $p_H$  optima for haze developing on shaking (approx. 6) and for chill-haze development (approx. 4.3) support the view that protein haze in beer is due to two independent groups of potentially pptg. material, viz., pure protein and protein-tannin, respectively.

I. A. P.

**Air and carbon dioxide in beer.** P. P. GRAY (Comm. Sci. Pract. Brewing, 1938, No. 2, 21—32).—The necessity for the ready determination of  $\text{CO}_2$  in beer and the effects of air on beer quality are discussed. A method is outlined whereby the  $\text{CO}_2$  and air content of bottled or canned beer can be simultaneously determined with sufficient accuracy by a combined pressure and absorption procedure.  $\text{CO}_2$  can be read directly from the air content as % of head space, and the gauge pressure on the container by means of a chart provided.

I. A. P.

**Evaluation of beer as a food.** B. L. OSER (Comm. Sci. Pract. Brewing, 1938, No. 2, 5—9).—The physiological effects of beer, its calorific val. and mineral contribution to nutrition, and the physiological behaviour of EtOH (more especially in the dilution found in beer) are critically discussed, and desirable points for further study are indicated.

I. A. P.

**Characteristics of bacteria.** II. **Effect of environment.** M. A. POZEN (Comm. Sci. Pract. Brewing, 1938, No. 2, 11—20).—A review, with especial reference to possible development in beer.

I. A. P.

**Practical control of moulds in the brewery.** M. TOCH (Comm. Sci. Pract. Brewing, 1938, No. 2, 33—38).—Beer itself is normally an unfavourable medium for mould growth, but moulds in plant and buildings may lead to flavour deterioration and may harbour harmful bacteria. Control methods include attention to building and plant design and to casks, control of atm. moisture by air conditioning, and scrupulous cleanliness involving the use of suitable antiseptics.

I. A. P.

**Tests on substitute [piping and plant] materials for the brewery.** H. FINK and W. KLEBER (Woch. Brau., 1938, 55, 145—149).—Bleached or natural "Mipolam," a vinyl polymeride, is a suitable material for beer-piping. "Elektronmetall" Mg alloys are unsuitable for brewery use.

I. A. P.

**Attempt to employ ethylene oxide in wine technology.** B. ANGLA (Ann. Falsif., 1938, 31, 29—32).—In two fermentations  $(\text{CH}_2)_2\text{O}$  was successfully substituted for  $\text{SO}_2$ . Satisfactory control was obtained with 200 mg./l., and fermentation was stopped with 1 g./l.

E. C. S.

**Acetaldehyde and alcoholic fermentation of grape juice.** A. FERNBACH, M. FLANZY, and M. BANOS (Compt. rend. Acad. Agric. France, 1938, 24,



95—102).—Addition of MeCHO to grape juice (1 in 10<sup>5</sup>) halved the time of alcoholic fermentation and, especially in cold conditions, gives better results than when the usual PO<sub>4</sub>''' salts are used. A. W. M.

**Determination of copper and iron in certain Argentine grape juices and wines.** L. DE PRADO (Ind. Quím., 1937, 2, 76—81).—Cu determined by the method of Lasausse and Frocain (A., 1936, 536) forms 0.002—0.057 g./l. of grape juice and 0.25—2 mg./l. of wine; Fe (by KCNS) forms an average of 24.4 g. and 25 mg., respectively. Loss during fermentation is due to pptn. [EtOH] and [SO<sub>4</sub>'] are also recorded for each sample. The Cu and Fe content of 1 l. of wine approximates to the daily dietary of man. F. R. G.

**Determination of sulphurous acid in sweet musts.** M. FISCHLER and H. KRETZDORN (Z. Unters. Lebensm., 1938, 75, 38—39).—Rothenfusser's method (B., 1930, 81) is modified by absorbing the SO<sub>2</sub> produced by distillation with acid in aq. KOH, acidifying, and titrating with I. The results agree satisfactorily with those of the original method. E. C. S.

**Electrolytic production of rancio flavour in sherries.** M. A. JOSLYN (Ind. Eng. Chem., 1938, 30, 568—577).—The production of sherry flavour in Spanish Jerez and in Californian sherry-type wines is discussed. The rancio flavour is partly due to MeCHO or its derivatives, the production of which is dependent on O<sub>2</sub> additional to that dissolved in the wine. Electrolysis rapidly increases the MeCHO content and also accelerates the blending of brandy and wine, but has little effect on the other factors concerned in flavour. The addition of SO<sub>2</sub>, by reducing the free [MeCHO] of harsh wines, gives improved flavour and stability to clouding. The practical application of the process is discussed. I. A. P.

**Rums of Guadeloupe.** L. AUFFRET (Ann. Falsif., 1938, 31, 19—24).—The % of EtOH, extract, total and volatile acidity, acids, aldehydes, furfuraldehyde, esters, and higher alcohols of 35 specimens are tabulated. E. C. S.

**Cherry water [kirschwasser]. VI. Characteristics of kirschwasser from sweetened wort and properties of commercial samples.** H. MOHLER and W. HÄMMERLE (Z. Unters. Lebensm., 1938, 75, 433—437; cf. B., 1937, 607).—The wax fraction of kirschwasser from sweetened wort has an equiv. wt. < 400, and that from normal wort 350 ± 30. The pure bouquet substance from the former may have an equiv. wt. < 190, and from the latter 250—280. Total CH<sub>2</sub>Ph·OH < 20 mg./l. is a certain indication of the use of sweetened wort. Examination of commercial samples indicates that sweetening of wort is not an infrequent practice. E. C. S.

**Production of mild cider in barrels.** A. FERNBACH and G. WARCOLLIER (Compt. rend. Acad. Agric. France, 1937, 23, 934—943).—Apple juice is fermented until the *d* falls to 1.035—1.040. Pectic materials are coagulated by enzymes and the yeast is removed by centrifuging or filtering. If stored in a cold place, fermentation then proceeds very slowly to give a mild, sweet cider. A. W. M.

**Methods of sugar extraction for cider distillation and from apples.** P. BETTINGER (Bull. Assoc. Chim. Sucr., 1938, 55, 388—403).—The sugar-extraction methods described include diffusion methods, applicable only in large plant, and pressure methods which are generally preferable and are gaining increasing application. The large access of air in diffusion leads to important losses of sugar. I. A. P.

**Preservation of cider in bottles.** G. WARCOLLIER (Pommes et Cidre, 1938, 1, 19—21).—To produce a very sparkling cider the *d* at bottling should be 1.015—1.020; less sparkling ciders have *d* 1.005—1.010. The latter ciders can be made more sparkling by adding sugar syrup before bottling in absence of air. A. W. M.

**Influence of formaldehyde on fermentation.** B. LAMPE and E. ROEHRICH (Z. Spiritusind., 1938, 61, 161—162).—Parallel fermentations of potato mash with 0, 0.01, and 0.02% of added CH<sub>2</sub>O gave very similar EtOH yields, though the final attenuations differed somewhat. Attenuation figures alone, therefore, may not give an accurate representation of the utilisation of the fermentable material. I. A. P.

**Butyl-fermentation.** W. GROSS (Z. Spiritusind., 1938, 61, 146, 148—149).—The development of butyl-bacterial fermentation processes and the probable chemical reactions involved are reviewed, with especial reference to the production of BuOH, C<sub>4</sub>Me<sub>2</sub>, and PrCO<sub>2</sub>H. In absence of cheap fermentable carbohydrate raw materials, a competitive synthetic process for BuOH and PrCO<sub>2</sub>H has been developed in Germany via CaC<sub>2</sub> and PrCHO. I. A. P.

**Can the technical value of [ethyl] alcohol change during storage?** L. KOWALCZYK (Przemysł Chem., 1938, 22, 85—88).—The probability of change in the concn. or quality of rectified spirit or abs. EtOH during years of storage is negligible. R. T.

**Examination of lower-grade vinegar.** E. SCHMIDT and K. MUHA (Österr. Chem.-Ztg., 1938, 41, 161—166).—The effect of conditions of storage on the acidity of vinegar of different sources and concns. has been determined. Evaporation causes vinegar to become more acid. Any biological attack on dil. vinegar, as used in Austria, is shown by turbidity, and the use of more conc. vinegar would be the best protection against deterioration. K. W. P.

**Vines and vineyards.**—See XVI. Analysis of molasses.—See XVII. H<sub>2</sub>O containing MgO.—See XXIII.

See also A., III, 534, Production of succinic acid by *Bact. succinicum*.

#### PATENT.

**Purification and ageing of spirituous liquors.** L. A. YOCUM (U.S.P. 2,064,330, 15.12.36. Appl., 14.7.34).—Raw spirit is agitated in contact with freely circulating, warmed air and in contact with charred wood surfaces, the agitators also being of charred wood. Removal of noxious vapours is thus facilitated. The necessary charring is achieved by means



of electrically heated metal spikes, which are adapted for penetration of the wood to the desired depth.

I. A. P.

## XIX.—FOODS.

**Quality studies in the wheat-breeding programme at the Minnesota Agricultural Experiment Station.** E. R. AUSEMUS, M. C. MARKLEY, C. H. BAILEY, and H. K. HAYES (*J. Agric. Res.*, 1938, 56, 453—464).—Milling and baking-quality tests show the varietal characteristics of wheat to be largely masked by environmental effects. The val. of a new variety can be determined only after testing crops grown under different conditions. Variation in results might be reduced by a more satisfactory baking test. There is a significant but low correlation between the various factors of quality.

E. A. F.

**Wheat quality and influence of environment and fertilisation.** G. COUTÈRE (*Compt. rend. XVII Cong. Chim. Ind.*, 1937, 752—758).—There is no generally satisfactory definition of wheat quality, nor any one test for it. Quality depends on variety and on soil, climate, and fertilisation. Interaction of these factors may account for conflicting opinions regarding the effects of N fertilisers.

E. A. F.

**Modern [flour] milling—its possibilities.** P. AYBARD (*Compt. rend. XVII Congr. Chim. Ind.*, 1937, 1184—1188).—Both yield and quality of flour depend on the quality of the wheat, its cleanliness and humidity, and the milling diagram. Improved methods may give purer flour in spite of higher extraction.

E. A. F.

**Influence of degree of extraction and milling method on flour properties.** L. H. PULKKI (*Mühlenlab.*, 1938, 8, 49—52).—One wheat blend, milled commercially and experimentally to different extractions, gave very similar farinograms and flour colour, ash and gluten figures, but gassing power as measured by the fermentograph varied markedly with extraction and with the milling method.

E. A. F.

**Baking quality of rye.** J. LEMMERZAHN (*Mehl u. Brot*, 1938, 38, No. 16, 1—5).—Study of the baking quality of rye is complicated by the wide variety of methods used for making rye bread. Rye suitable for the sour-dough process may fail with yeast alone. Preliminary investigations indicate that protein is of less, and starch (particularly in its pasting properties) of much greater, importance than in wheat. The amylograph may furnish valuable information.

E. A. F.

**Behaviour of sugar and butter during baking of cakes.** J. GROSSFELD and H. DAMM (*Z. Unters. Lebensm.*, 1938, 75, 137—150).—In cakes rich in sugar, total sugar corresponds approx. with that added to the dough, but when none is added, total sugar is > the calc. val. owing to hydrolysis of starch during fermentation. This hydrolysis amounts to approx. 20% of the starch, but during baking no further hydrolysis occurs. The apparent increase in starch during baking is due to loss of CO<sub>2</sub>. Determination of NaCl before and after baking shows that this averages 2.7%. The PrCO<sub>2</sub>H and lower fatty

3 L\* (B.)

acids are not appreciably affected by baking, nor is the isooleic acid content affected.

E. C. S.

**Effect and efficiency of germicides and fumigants on micro-organisms associated with the baking industry.** G. K. ASHBY, C. C. HEDGES, and E. H. GIBBONS (*J. Bact.*, 1937, 33, 96—97).—Hypochlorite solutions were more effective than those of AcOH or CH<sub>2</sub>O in controlling organisms producing "rope" in bread. As a fumigant CH<sub>2</sub>O was more effective than OCl'. Organisms were not protected against fumigants by coatings of flour, but were considerably protected by melted shortening.

A. G. P.

**Determination of fat content of bakery products.** M. VUK and A. GÖMÖRY (*Z. Unters. Lebensm.*, 1938, 75, 430—432).—The non-fatty substances are dissolved by warming with 12.2% aq. HCl and H<sub>2</sub>O<sub>2</sub>, the suspension is almost neutralised with NaOH, and the fat filtered, dried, and taken up in light petroleum-Et<sub>2</sub>O. An aliquot part of the extract is evaporated and the fat weighed. Results are slightly > those by the usual Soxhlet extraction method.

E. C. S.

**Examination of milk rolls.** H. MÜLLER (*Z. Unters. Lebensm.*, 1938, 75, 150—156).—Milk is detected in bakery products by determination of Ca and of milk fat, the latter by means of the PrCO<sub>2</sub>H val., which is determined by Grossfeld's method after pretreatment with boiling aq. HCl.

E. C. S.

**Industrial chemistry of Brazilian manioc.** F. GUMARÃES (*Rev. Soc. Brasil. Quim.*, 1937, 6, 160—172).—Moisture, protein, fibre, starch, ash, and Et<sub>2</sub>O extract have been determined for a no. of kinds of manioc and manioc meal.

F. R. G.

**Influence of climate on intensive milk production [in Uruguay].** E. F. C. GÓMEZ and J. A. PLOTTIER (*Proc. XIth World's Dairy Cong.*, Berlin, 1937, 4, 342—345).—The monthly variation in yield of 100 cows over a period of 4 years was statistically treated in relation to average temp., rainfall, atm. pressure, and R.H. Generally, a rise in temp. increased yield owing to increased grass growth. Rainfall had a positive effect in the hot months, but a decreasing effect over the whole period. Yield showed a negative correlation with temp. and atm. pressure at const. R.H., and also a negative correlation with atm. pressure and R.H. at const. temp. R.H. has the greatest and most variable effect. It is possible to deduce the optimum climatic conditions for each season for max. milk production.

W. L. D.

**Effectiveness of different methods of milk control [in Uruguay].** J. S. DEL CAMPO and H. D. TOBLER (*Proc. XIth World's Dairy Cong.*, Berlin, 1937, 4, 339—341).—The effects of factors such as inheritance, development, soil, climate, and methods of production under local conditions on milk and fat yields are discussed from the viewpoint of the daily variations in milk composition. Yields over varying periods are statistically treated with a view of forecasting production under different conditions.

W. L. D.

**Value of fat records in choosing milch cows.** F. ROLFO and J. A. BERTA (*Proc. XIth World's Dairy Cong.*, Berlin, 1937, 4, 351—353).—High milk yield is



associated with decreased fat content, but the actual fat yield shows a positive correlation with milk yield. Milk yield should be the first factor in selection and % fat a secondary one. W. L. D.

**Milk yields of individual udder quarters.** J. KRENN (Milch. Forsch., 1938, 19, 221—227).—The right hindquarter yields most milk (36%) and the left forequarter the least milk (24%). The two right quarters yield 51% and the left 49% of the total yield. In 27% of cases, 2 or 3 quarters give equal yields. W. L. D.

**Electrical conductivity of milks from individual udder quarters.** J. KRENN (Milch. Forsch., 1938, 19, 228—240).—Milk from the right hindquarter showed most frequently the highest  $\kappa$ , and that from the left forequarter the lowest. As a rule the milk of the quarter giving the highest yield showed the lowest  $\kappa$ . Vals of  $\kappa$  varied between  $42$  and  $51 \times 10^{-1}$  reciprocal ohm in the samples studied.  $\kappa$  for mixed milks showed a greater range, 68% of the samples being  $<47$ , 24% between 47 and 54, and 8%  $>54 \times 10^{-1}$ . The  $\kappa$  of milk of quarter yields  $>2$  l. averaged 46.2; between 1 and 2 l., under 54; and  $<1$  l. over  $54 \times 10^{-1}$ . The product of normal secretion seldom shows  $\kappa <46 \times 10^{-1}$ . W. L. D.

**Bacteria in milk from healthy udders.** E. MESSNER (Proc. XIth World's Dairy Cong., Berlin, 1937, 4, 345—347).—Milk from 968 healthy udder quarters was studied. It was found that  $<10^5$  bacteria per ml. occurred in 75% and  $<5 \times 10^5$  in 96% of cases, the mode val. of distribution being  $1.5 \times 10^5$  per ml. The bacteria were conc. in the teat milk. W. L. D.

**Bang's disease or undulant fever [conveyed by raw milk].** R. KERN (Milk Plant Month., 1937, 26, No. 12, 58—62).—11.2% of American dairy cows reacted to tests for *Brucella abortus*. Undulant fever in man, due to the same organism conveyed in raw milk, occurs in small communities where the milk is consumed raw; no case has been traced to effectively pasteurised milk. The variable virulence of the organism is discussed. Children rarely contract the disease, which is mostly confined to the sexually mature individual. Methods of eradicating the disease are described. W. L. D.

**Composition and properties of milk from fractional milkings.** J. SCHOLZ (Milch. Forsch., 1938, 19, 203—220).—The composition and some physical properties of the four consecutive fractions of the yield of one milking of 3 individual cows were determined. Fat, solids-not-fat, and  $\eta$  increased, whilst  $d$ , Cl and protein contents, and f.p. decreased. Titratable acidity, solids in fat-free serum, and amylase and catalase contents remained const. Differences between successive fractions were very small for most constituents except fat. Fat influenced  $d$  to a great extent.  $\kappa$  is  $\propto$  Cl content, and a greater depression of f.p. in the last-drawn sample was due to the higher lactose content. W. L. D.

**Carotene and vitamin-A contents of cows' milk and its mixtures.** J. H. DE HAAS and O. MEULEMANS (Z. Vitaminforsch., 1938, 7, 1—10; cf. Indian J. Pediat., 1936, 3, 133).—The vitamin-A (66—75) +

carotene (I) (33—25%) contents of cows' milk in Batavia is  $<$  that of human milk. The xanthophyll content of the cows' milk is 10% of the total carotenoid content. Infant foods made from the cows' milk [without addition of products containing -A or (I)] have -A and (I) contents corresponding with their content of the milk; these contents do not decrease when the foods are stored in the ordinary way for  $>24$  hr. The -A content of buttermilk is very low. Cod-liver oil added to cows' milk does not increase its (I) content, and hence the oil contains no (I). W. McC.

**Variations of vitamin- $B_2$  in milk.** A. I. VIRTANEN and T. HOLMBERG (Suomen Kem., 1938, 11, B, 1—2).—The vitamin- $B_2$  content of milk varies with the food of the cow, showing a large decrease when fresh grass is replaced by hay and cattle cake, but a smaller one if ensilage is used for winter feeding. Probably cows are to some extent independent of external supplies of  $-B_2$ . M. H. M. A.

**Relative flavin [vitamin- $B_2$ ] content of dried skim milk, dried whey, and dried buttermilk.** V. HEIMAN and J. S. CARVER (Poultry Sci., 1937, 16, 434—441).—The relative  $-B_2$  potencies of the dried products were: sweet cream  $>$  whey  $>$  skim milk. A. G. P.

**Distinctive characters of skim-milk powder.** J. PIEN (Lait, 1938, 18, 347—353).—Roller-dried powders usually contain more Fe and Cu than spray-dried. The former are nearly sterile and require 6—7 days to curdle when mixed with sterile milk, whilst the latter gives a curd in 24 hr. at  $37^\circ$ . A 5% reconstituted spray-dried sample will decolorise methylene-blue in about 3 days, whilst the roller-dried samples show no bleaching with indefinite keeping. The latter product will show a solubility of 50—90%. Microscopical evidence is also of val., the roller-dried product being a broken-up thin film and the spray-dried small circular exploded globules. Mixtures of the two types can be detected microscopically. W. L. D.

**Manufacture of flake buttermilk.** E. H. PARFITT (Milk Plant Month., 1938, 27, No. 3, 27, 34).—Skim milk is pasteurised for 30 min. at  $85^\circ$ , cooled to  $21^\circ$ , and inoculated with a good starter. Inoculation for 12—15 hr. develops an acidity of 0.75%. Butter of good quality is heated to  $50^\circ$ , well coloured with artificial colouring matter, and  $\frac{1}{3}$  vol. of  $H_2O$  added, the whole being pasteurised at  $85^\circ$ . The cooled fat- $H_2O$  mixture is sprayed on to the rapidly stirred cultured milk, until the fat content reaches 1%. The product compares favourably in flavour and body with churned cream buttermilk. W. L. D.

**Relation of colour and ascorbic acid to flavour in milk from individual cows.** O. F. GARRETT, H. H. TUCKER, and F. C. BUTTON (J. Dairy Sci., 1938, 21, 121—126).—A close relation exists between fat % and yellow colour, and a significant relation between yellow colour and ascorbic acid (I). High carotene and (I) contents are associated with, and help to preserve, good flavour in milk. The feeding of cows and treatment of milk should be such as to provide max. amounts of these two constituents in milk. W. L. D.



**Homogenisation [of milk products].** A. H. BAYER (Dairy Ind., 1938, 3, 194—196).—Methods of checking the efficiency of homogenisation by microscopical methods are described. For good homogenisation  $\leq 90\%$  of the fat globules should be  $< 2 \mu$ . in diameter. Inefficient working due to valve damage occurs when  $> 25\%$  of the globules are  $> 2 \mu$ . in diameter. Methods of improving the efficiency of the process are described. W. L. D.

**Pasteurisation of milk.** G. S. WILSON (Nature, 1938, 141, 579—581).—A review of evidence showing that compulsory pasteurisation of milk should be introduced for the abolition of milk-borne disease. L. S. T.

**Pasteurisation of market milk. I. Choice of culture medium for counting of micro-organisms.** G. GUITTONNEAU, G. MOCQUOT, and A. EYRARD (Lait, 1938, 18, 225—233).—Media made from tryptic-digested skim milk gave equal results in bacterial counts to other peptone-lactose media suggested by others. Tryptone-milk media are well suited for the variety of saprophytic organisms in milk incubated at  $30^\circ$ . Results for different media are treated statistically. W. L. D.

**Phosphatase test for pasteurisation [of milk].** W. VON D. TIEDEMAN (Amer. J. Publ. Health, 1938, 28, 316—324).—A modification of the test is used for detecting faulty commercial pasteurised milk. Experience shows that the test is valuable under American conditions. W. L. D.

**Phosphatase test for determining efficacy of [milk] pasteurisation.** E. H. PARFITT (Milk Plant Month., 1938, 27, No. 1, 34—40).—Modifications of the Kay and Graham test for use under American conditions are described. One method involves the use of colour standards in tubes corresponding with known amounts of PhOH, made from stock solutions of  $\text{CuSO}_4$  and  $\text{NiSO}_4$ . The use of 2:6-dibromo-quinonechloroimine for determining PhOH liberated by phosphatase in borate buffer is another modification. Experience with the test under commercial conditions shows it to be reliable and valuable. W. L. D.

**Recontamination of pasteurised milk and its products.** L. C. BULMER (Milk Dealer, 1938, 27, No. 6, 76—82).—A discussion. W. L. D.

**Milk containers.** F. W. TANNER (Dairy Ind., 1938, 3, 125—128).—The hygiene of the glass milk bottle is discussed. The bacterial contents of bottle caps, rims, and of the bottle itself, and the cleaning and washing of bottles, are described. A standard of cleanliness is that the bottles should not contribute  $> 1$  cell or colony per ml. capacity. W. L. D.

**Use of chlorine disinfectant in sterilisation of dairy equipment.** L. SHERE (Milk Plant Month., 1938, 27, No. 1, 42—44, 49).—Tests show that sterilisation by  $\text{Cl}_2$  is superior to that by heat or live steam. The active  $\text{Cl}_2$  should be  $> 50$  p.p.m. in concn., and sterilisation is best carried out just previous to using the plant. Dairy utensils should be treated with solutions containing  $\leq 100$  p.p.m. For spray methods the concn. should  $\leq 250$  p.p.m. W. L. D.

**Milk stone; its prevention and elimination.** H. A. RUEHE (Milk Plant Month., 1938, 27, No. 4, 30—31).—Milk stone is formed by the mutual cementation of milk protein, fat, and pptd. Ca phosphate on hot areas of milk-processing plant. The occurrence is increased by using hard  $\text{H}_2\text{O}$  for rinsing and by hard powders which form cryst. ppts. with hard  $\text{H}_2\text{O}$ . Film can be prevented by narrowing the temp. difference between heating medium and milk and by the use of detergents which leave metallic surfaces in a rinsable condition. Milk stone can be removed by  $\text{H}_2\text{O}$ -soaking and dissolution with 1% tartaric acid. W. L. D.

**Preventing oxidised flavour in milk and milk products.** C. D. DAHLE (Milk Dealer, 1938, 27, No. 5, 68—76).—The incidence and cause of the taint are described. The milk of cows fed on molasses-lucerne silage does not give the taint. It is more prevalent in milk of low bacterial count and its development is favoured by traces of heavy metals, especially Cu, and exposure to sunlight. Pasteurisation accelerates its development and homogenisation causes milk to be more susceptible to the action of sunlight. The effect of various antioxidants is discussed. Ascorbic acid prevents the taint developing, but is itself oxidised by the same factors which cause oxidised flavour. Cereal extracts have been found to possess antioxygenic properties. W. L. D.

**Unbreakable minimum[-reading] lactometer without graduations or thermometer.** H. HAUTOG (Milch. Forsch., 1938, 19, 271—272).—A simplified lactometer with a coloured mark on the stem corresponding with  $d 1.029$ , used for rapid sorting of milk samples, is described. On floating the instrument in milk, the sample is passed if the coloured mark is visible, but if the mark is immersed, the sample is subjected to further analysis to detect adulteration. W. L. D.

**Behaviour of stimulators of contagious pathogenes (*B. abortus*, Bang) in milk and some milk products.** G. P. LIECHTENSTEIN (Milch. Forsch., 1938, 19, 241—259).—Animals with negative blood-serum titre rarely shed stimulating factors in their milk, and such milk can be used as control in serological work. Proper pasteurisation almost completely destroys them. A titratable acidity of 0.45% destroys much of the stimulators, whilst acidities  $> 0.90\%$  kill most of the *abortus* organisms in 48 hr. Cream is the principal source of infection and the possibilities are less with other milk products. Churning of cream had no effect on the amount or vitality of the factors. Artificially infected milk gave good growth of *abortus* organisms, temp. and acidity being the controlling factors. Centrifuging gave a deposit which gave a strong agglutinating reaction with *abortus* cultures. W. L. D.

**Use of different milk sera for examination of milk.** R. TURNAU (Chem. and Ind., 1938, 380—381).—Methods of preparing various sera by using pptg. and adsorptive reagents are enumerated. Measurements of  $n$  of the sera for the purpose of determining albumin content and % of added  $\text{H}_2\text{O}$  are described. W. L. D.



**Refraction of lead sera of milk.** E. TELLMANN (Österr. Chem.-Ztg., 1938, 41, 123—125).— $\text{CaCl}_2$  sera from milk of high acidity are turbid, but Pb acetate sera are clear; the latter also give the higher  $n$  and do not diverge so much with abnormal milks.

W. L. D.

**Factors affecting the accuracy of the Babcock test on composite milk samples.** C. W. ENGLAND and G. D. D'AMBROGI (Milk Plant Month., 1938, 27, No. 4, 38—42).—Regardless of length of time of keeping, temp. of storage, or amount of preservative used, fat tests were lower for preserved than for fresh samples. With composite samples the sampling period should be  $\geq 10$  days, the temp. of storage  $\geq 15^\circ$ , and the amount of  $\text{HgCl}_2 \geq 0.20\%$ .

W. L. D.

**Determining the action of certain organisms on nitrogen distribution in milk.** G. H. McFADDEN and H. H. WEISER (Amer. J. Pharm., 1938, 110, 154—158).—In investigations on milk-protein degradation by *Lactobacillus acidophilus*, protein was pptd. by  $\text{CCl}_3\cdot\text{CO}_2\text{H}$  in a final concn. of 1%.  $\text{NH}_2\text{-N}$  was determined in the conc. filtrate before and after hydrolysis with aq.  $\text{HCl}$ . In 8 weeks, non-protein-N of milk cultures increased from 0.10 to 0.14%, of which  $\text{NH}_2\text{-N}$  accounted for 40%. Increase in the incubation period increased non-protein- and  $\text{NH}_2\text{-N}$  but decreased the  $\text{NH}_2\text{-N}$  in the non-protein fraction after hydrolysis.

W. L. D.

**Counting viable bacteria in milk by means of the microscope.** G. KNAYS and M. FORD (J. Dairy Sci., 1938, 21, 129—141).—Based on the principles of vital staining, a direct microscopical method is reported. The dye mixture contains 0.1% of methylene-blue, 0.1% of Nile-blue sulphate, and 0.5 ml. of a mixture containing 8% of gelatin and 2% of agar. One ml. of milk is mixed with 0.5 ml. of mixture and 0.01 ml. used for the direct count. Dead cells are thus stained and counted. On adding one drop of 0.8N- $\text{NaOH}$  to a similar mixture all cells are stained and the total count is made. The difference gives the count of viable bacteria. Fat may be removed by shaking with  $\text{C}_5\text{H}_{12}$  and centrifuging. Examples of counts are given and the effect of pasturisation on the stainability of bacteria is discussed.

W. L. D.

**Modern camera-microscope. Application in the dairy industries.** A. SALMONY (Dairy Ind., 1938, 3, 129—133).—The apparatus and its use in the direct examination of milk, cream, acid milk drinks, and cheese are described. The use of polarised and ultra-violet light in conjunction with the apparatus and the working of kinemicroscopes are discussed.

W. L. D.

**Detecting addition of cow's milk to goat's milk.** G. MANTOVANI (Lait, 1938, 18, 240—243).—A reaction depending on the presence of the Schardinger enzyme in cow's milk is used. The fat of the milk is assisted in rising by shaking with petroleum spirit, pipetting off a portion after keeping for 5 min., and heating slowly to  $70^\circ$  after addition of 3 drops of Schardinger reagent. The presence of 10% of cow's milk will cause quick bleaching of the reagent.

W. L. D.

**"Iodine value" of milk. Differentiation of ewe's and goat's milk from cow's milk.** G.

BUOGO and E. K. ZONNO (Annali Chim. Appl., 1938, 28, 78—82).—The I val. (Hübl) is sp. for milk from different species of animals and can be used for detecting mixtures of one milk with another. The vals. for cow's, goat's, and ewe's milk are approx. 2.5, 3.5, and 4.4, respectively.

F. O. H.

**Mercurimetric determination of chlorine in milk. II. Chloride content as a means of determining added alkaline substances.** D. RAFFAELLI (Annali Chim. Appl., 1938, 28, 83—86; cf. B., 1938, 579).—Tabulated data give the "chloride const." [c.c. of 0.1N- $\text{Hg}(\text{NO}_3)_2$  required to titrate ash from 11 c.c. of milk serum] of pure milk and of milk to which known amounts of  $\text{H}_2\text{O}$  or alkali have been added.

F. O. H.

**Test for traces of oxidising agents in milk.** R. C. WRIGHT and E. B. ANDERSON (Analyst, 1938, 63, 252—256).—Traces of  $\text{NaOCl}$  solution contaminating milk are detected by addition of 78.4% aq.  $\text{H}_2\text{SO}_4$  with cooling in ice, to the milk. A greenish-yellow colour develops if  $\text{ClO}_3^-$ , which is always present in the  $\text{NaOCl}$  used for sterilising plant, is present. By this means 12 p.p.m. of  $\text{Cl}$  (added as "hypochlorite") in milk, or 17 p.p.m. in cream, may be detected. In ultra-violet light a strong yellow fluorescence is emitted, enabling the sensitivity of the test to be increased.

E. C. S.

**Determination of reduced ascorbic acid in milk.** P. F. SHARP (J. Dairy Sci., 1938, 21, 85—88).—Details of the 2:6-dichlorophenol-indophenol method are given for underproteinised milk to which aq.  $\text{H}_2\text{SO}_4$  is added, a blank val. for milk containing no ascorbic acid (I) being subtracted from the titration val. Precautions to prevent oxidation of (I) by other factors are enumerated.

W. L. D.

**Ice-cream making.** A. POMPA (Dairy Ind., 1938, 3, 151—152, 197—198).—Two types of ice cream are recognised, viz., the Italian or custard, and the American or standardised. The simple methods used for the manufacture of the former are described. High overrun follows only the use of a large no. of eggs and a high % of cream. Eggs alone supply the protective colloid. Recipes and processes are described. Annatto and cochineal can be used as colour for ice-cream mixes not containing egg products. The compositions of dry ice-cream powders containing starch products are given. With ices made from cream, 0.6% of gelatin or 0.15% of gellozone is used as a stabiliser. The latter must be dissolved in boiling  $\text{H}_2\text{O}$ . The incorporation of synthetic and natural fruit flavours and of whole and pulped fruit into the mix is described.

W. L. D.

**Ice-cream defects.** P. H. TRACY (Canad. Dairy and Ice Cream J., 1938, 17, No. 4, 71—77).—Common defects are associated with flavour, behaviour on the palate, and body. Criticisms of vanilla, strawberry, and chocolate ices were mostly due to coarseness, iciness, and dry-powderiness. The functions of serum solids, sugar, egg yolk, and flavouring materials are described and defects in these which lead to faults in ice creams are detailed. Sandiness, shrinkage, metallic flavour in fruit products, and defects in chocolate ice cream are discussed.

W. L. D.



**Comparison of fresh and frozen condensed skim milk as a source of serum solids in ice cream.** E. L. REICHAERT and R. T. CORLEY (J. Dairy Sci., 1938, 21, 109—119).—Storage of condensed skim milk in the frozen state for periods  $> 6$  months is not advisable. After 4 months' storage at  $-18^{\circ}$  the product gelled, and wheyed-off after 8 months' storage. Ice-cream mixes made with the frozen and the unfrozen product showed no difference in  $p_H$ , but that from the former showed inferior whipping properties, required a longer whipping time to reach a desired % of overrun, and gave an inferior body and texture in the frozen ice cream and inferior flavour. With const. gelatin content, ice cream from the frozen material melted twice as fast as that from the unfrozen material. W. L. D.

**Use of the dilatometer in measuring the extent of freezing in ice cream and related products.** W. C. COLE (J. Agric. Res., 1938, 56, 137—153).—A suitable form of dilatometer is described. Data are recorded for various ice-cream mixtures and for the f.p. of sucrose solutions (0—73%). A. G. P.

**Water-ices.** ANON. (Dairy Ind., 1938, 3, 199—200).—The composition of such ices is: sugar 25, gelatin 0.3, pectin 0.3 (or gum arabic 0.8%, or agar 0.2 and gelatin 0.4), citric or tartaric acid 0.33%, with small amounts of synthetic or natural essences as flavours. Sugar and stabilisers are dissolved in hot  $H_2O$ , but acid and flavours are added when cold. The overrun should be  $\geq 25\%$ . W. L. D.

**Manufacturing choice butter from inferior cream.** L. P. SHARPLES (Nat. Butter and Cheese J., 1938, 29, No. 6, 7—10).—The separation of "plastic cream" of 80% fat content from milk of inferior quality is suggested as an alternative to actual butter-making. The milk is neutralised and centrifuged, and dirt and slime are eliminated. Alternatively, the cream can be standardised to 35% fat content and churned into butter. The uses of plastic cream instead of butter are discussed. The keeping quality is good. W. L. D.

**Neutralisation of cream for buttermaking.** V. Reaction of sodium bicarbonate on milk and cream and effect of pasteurisation on the reaction. F. H. McDOWALL and A. K. R. McDOWELL (New Zealand J. Sci. Tech., 1937, 19, 296—312; cf. B., 1937, 1261).—With fresh skim-milk or cream the reduction in acidity due to loss of natural  $CO_2$  during pasteurisation after neutralisation with  $NaHCO_3$  causes the apparent reduction in acidity due to the  $NaHCO_3$  to be  $>$  the theoretical, and therefore Valentine's factor (1.2 lb. of lactic acid neutralised by 1 lb. of  $NaHCO_3$ ) gives better results than the theoretical factor (1.07). With high acid creams of low  $CO_2$  content the theoretical factor should be used since  $NaHCO_3$  acts stoichiometrically on cream provided that the final acidity is  $\leq 0.1$  and the cream is heated to a sufficiently high temp. with adequate agitation. The  $CO_2$  loss in the vacreator is  $>$  in the tandem flash pasteuriser. Acidity determinations on creams neutralised to  $< 0.05$  are unsatisfactory. A. R. P.

**Problems in the manufacture of butter.** F. W. CREWS (Nat. Butter and Cheese J., 1938, 29, No. 4, 18—19).—Quality of cream, keeping quality, surface and tallowy flavours,  $p_H$  of curd serum, and mould growth in butter are discussed. W. L. D.

**Improvement of quality in buttermaking.** V. M. RENNER (Nat. Butter and Cheese J., 1938, 29, No. 5, 26—28).—Improvements consist in more rigid grading of cream by trained judges, more rigid laboratory control of plant operations, improved cooling equipment, faster handling of cream in factories with larger output, and the more general use of the sediment test. W. L. D.

**Factors affecting body and texture of butter.** S. T. COULTER (Canad. Dairy and Ice Cream J., 1938, 17, No. 4, 85—89).—Hardness is influenced by temp. of cooling the cream and variation in rate of cooling, churning temp., and variation in temp. of the wash- $H_2O$ . Typical results for summer cream showed that fairly rapid cooling to  $7^{\circ}$ , holding for 16 hr. at  $7^{\circ}$ , and churning at  $10^{\circ}$  gave the best results. This combination also gave butter of max. "standing-up" properties. Crumbly butter should be cooled to  $10^{\circ}$  only and churned in churns one third full. The speed of rolls in butter working should be  $\geq 40$  r.p.m. W. L. D.

**Texture and body of butter.** S. T. COULTER and W. B. COMBS (Dairy Ind., 1938, 3, 174—176).—Sticky and crumbly butter is a winter defect and can be avoided by suitable treatment of cream. Various cooling processes used for summer cream are not applicable to winter cream, and setting, churning, and wash- $H_2O$  temp. above those used in summer are advisable. Both temp. and rate of cooling of cream influence firmness and spreadability. Hardness of butter varies with both I val. and Reichert-Meisssl no. of the butter fat. W. L. D.

**Butter texture and effect of blending operations.** W. L. DAVIES (Dairy Ind., 1938, 3, 171—173).—Body and texture are defined. Detailed textural properties are influenced by butter-fat composition, presence of free fat, churning and working conditions, and state of  $H_2O$  in butter. Butter grain and special faults are described.  $NaHCO_3$  used for cream neutralisation instead of  $Ca(OH)_2$  gives butter of better texture. Blending causes deterioration of texture and the best conditions for the operation are discussed. W. L. D.

**Mealy and grainy-bodied butters.** A. F. NEILSON (Dairy Ind., 1938, 3, 177, 180).—The faults are due to variation in physical properties of the fat globules of cream and to "oiling off" during processing. The resulting butter contains free cryst. butter fat in excess, which is increased on prolonged cold storage. Grainy-bodied butter in winter is due to fat of high m.p. W. L. D.

**Use of antioxidants to prevent tallowiness in butter.** W. J. CORBETT and P. H. TRACY (Nat. Butter and Cheese J., 1933, 28, No. 24, 10—14).—The development of tallowiness in butter is described and the effect of contaminants discussed. The effect of oat flour preps. on retarding the onset of tallowiness is discussed. An aq. extract was as effective as oat



flour in preventing oxidation even when 3 p.p.m. of Cu, as salt, were added to the butter. Vegetable parchment treated with oat-flour paste prevented the development of surface flavours in packed butter.

W. L. D.

**Determining the keeping quality of butter.** C. H. PARSONS (Nat. Butter and Cheese J., 1938, 29, No. 7, 6—7).—Tests for keeping quality are those for efficiency of cream pasteurisation, yeast and mould count, and grading by judges. A test consisting of holding at 15° for 14 days is suggested. The butter is again judged for quality. Accurate temp. control of the incubator is necessary. This test is claimed to be more reliable than that of holding butter at 20° for 7 days.

W. L. D.

**Determination of carotene in butter fat by the photoelectric scopometer.** H. K. MURER (Proc. 21st Ann. Meet. West. Div. Amer. Dairy Sci. Assoc., 1935, 82—85).—The fat is rapidly saponified and the carotene (I) is quickly extracted with Et<sub>2</sub>O. The solvent is evaporated in vac., at low temp. in darkness. Xanthophyll is removed by >90% MeOH [back-extraction of (I) in washings recommended], and the purified (I) is determined by the scopometer. With (I) solutions containing 0.001—0.008 mg. per litre differences in concn. of 0.000025 mg. of (I) per litre are detectable.

CH. ABS. (p)

**Detection of artificial colouring of butter by means of chromatographic adsorption analysis.** H. THALER (Z. Unters. Lebensm., 1938, 75, 130—137).—Pure butter gives with Al<sub>2</sub>O<sub>3</sub> or "Clarit" a faint but distinctive chromatogram; artificial fat and butter pigments give quite different chromatograms, as also do carotenoid pigments allied to the natural pigments of butter. Comparatively small additions of artificial pigment can be detected with certainty by this method.

E. C. S.

**Routine determination of lipolytic organisms in butter.** W. C. T. MAJOR (J. Austral. Inst. Agric. Sci., 1938, 4, 44—46).—The Nile-blue method was more readily applicable than any other examined.

H. G. R.

**Action of air under pressure in oxidation of acetylmethylcarbinol in butter cultures.** C. R. BREWER, M. B. MICHAELIAN, C. H. WERKMAN, and B. W. HAMMER (J. Bact., 1937, 33, 92).—Air under pressure (up to 60 lb. per sq. in.) bubbled through cultures of citric acid-fermenting streptococci or butter cultures markedly increased the Ac<sub>2</sub> content, and slightly increased that of CHAcMe-OH. Neither pressure alone nor saturation with O<sub>2</sub> at atm. pressure produced this effect. Butter from cream to which pressure-aerated cultures were added showed a consistent improvement in flavour and aroma. A. G. P.

**Vitamin-A study of ghee.** VII. Pro- and anti-bodies. B. N. BANERJEE. VIII. Acidity. B. N. BANERJEE and N. S. DOCTOR (Agric. Livestock India, 1938, 8, 153—157, 158—164; cf. B., 1938, 581).—VII. Loss of vitamin-A from ghee at 96° was rapid in presence of oleic acid or PrCO<sub>2</sub>H, but was retarded by quinol, Na tartrate or citrate, carotene, or N<sub>2</sub>. CO<sub>2</sub> was without effect. H<sub>2</sub> had no action at first, but after about 20 min. restored the loss and maintained the val. for some time.

VIII. Effects of acidity of cream on the quality and storage properties of ghee are examined. For practical purposes cream having 0.44% acidity is the most satisfactory. The technique of ghee manufacture is discussed from this viewpoint. A. G. P.

**Problems of cheesemaking.** E. M. BLACKBURN (Dairy Ind., 1938, 3, 137—139).—Technical problems are discussed. The major problem rests on the quality and behaviour of raw milk and variations brought in by inclusion of some alkaline milk and the presence of undesirable bacteria. Of importance are temp. control, acidity, and H<sub>2</sub>O content of the curd. Problems of storage and ripening are discussed.

W. L. D.

**Problems in cheese manufacture.** C. R. BARKER (Nat. Butter and Cheese J., 1938, 29, No. 4, 8).—The part played by lactic acid bacteria in ripening is described. The physico-chemical behaviour of casein and Ca phosphates in curd is discussed. The effects of temp. of ripening and of the type of cheese on the quality of processed cheese are examined.

W. L. D.

**Pasteurised milk for cheesemaking.** H. A. RUEHE (Nat. Butter and Cheese J., 1938, 29, No. 2, 28).—Pasteurisation of milk yields cheese of improved and more uniform texture and flavour which retains these qualities better during storage. The yield is increased, due to better H<sub>2</sub>O-holding capacity, and a more mellow-bodied product is given.

W. L. D.

**Inexpensive pasteurising units for cheese factories.** W. V. PRICE and L. GERMAINE (Nat. Butter and Cheese J., 1938, 29, No. 7, 14—16).—The improvement of cheese quality following milk pasteurisation is stressed. Inexpensive tube, vat, and flash-pasteurisers with heat-regenerating and -exchanging devices are described. Flash-pasteurisation at 72° is recommended for rapidity. Examples are given of improvement of quality of cheese made from heated milk when compared with that made from raw milk of the same batch.

W. L. D.

**Blending in processed cheesemaking.** C. R. BARKER (Nat. Butter and Cheese J., 1938, 29, No. 6, 30).—The importance of blending is stressed. The base of the blend should be immature cheese from 1 to 3 months old which with storage cheese of a non-acid type should make up 70% of the batch. Acid cheese should be >12% and about 15% of tough young cheese free from curd lumps should be used. The composition of the blend defines the cooking temp. and the amount and mixture of emulsifying salts.

W. L. D.

**Identification of Roquefort cheese.** G. GÉNIN (Lait, 1938, 18, 372—378).—The cheese is manufactured from sheep's milk and the characteristics of sheep-milk fat are used to detect the genuine product. Cow's milk fat contains 2 and 3%, respectively, of octoic and decoic acids, whilst sheep-milk fat contains 6 and 10%. The important characteristic is the Polenske val.; for fat of genuine Roquefort it should be <3.0. The fat should be coloured a pale green. Roquefort made from cow's milk or sheep milk mixed with it show a slight tinge of yellow in the fat, with a Polenske val. <3.

W. L. D.



**Preservation of carotene and vitamin-A in Emmenthal cheese.** A. I. VIRTANEN and M. KREULA (Suomen Kem., 1938, 11, B, 18).—Vitamin-A and carotene are not lost or destroyed during cheesemaking. M. H. M. A.

**Copper in creams and butters made from whey [obtained] from Gruyère and Emmenthal cheese factories.** J. KELLING (Compt. rend. Acad. Agric. France, 1937, 23, 913–921).—During the manufacture of the cheese the Cu content of the whey increases by dissolution from containers. When the whey is centrifuged to obtain the residual fat, the Cu is removed with the fat. A. W. M.

**Manufacture of brick cheese.** ANON. (Nat. Butter and Cheese J., 1937, 28, No. 23, 8).—Important points in the manufacture are the % of starter added and the setting temp. of the curd. 0.25–0.60% of starter may be added, but setting at 37° gives a more acid product than at 43°. Dipping into moulds is best at 2.5 hr. after renneting. The cheese should have  $p_H$  5.1 at 3 days and contain approx. 38% of  $H_2O$ . W. L. D.

**Manufacture of cottage cheese.** H. A. RUEHE (Milk Plant. Month., 1938, 27, No. 3, 53–60).—Pasteurised milk gives the more uniform product of high quality. Milk is holder-pasteurised at 62.5° for 30 min. and cooled to 21°. 1% of starter and 1 ml. of rennet are added per 100 gals. of milk and the curd is cut at 0.55–0.60% acidity and cooked at 46° for 1 hr. The acid is drained and cooled with  $H_2O$  at 20°, and then further drained, creamed, salted up to 1.5% NaCl, and packed. Another rapid method is described and methods of packing are enumerated. W. L. D.

**Effect of ripening process on vitamin-A content of Cheddar cheese.** N. B. GUERRANT and R. A. DUTCHER (J. Dairy Sci., 1938, 21, 69–72).—No serious destruction of -A occurs during ripening and the small decrease is balanced by the loss of  $H_2O$ . One lb. of ripe cheese thus contains the same amount of -A as did 1 lb. of the freshly pressed curd in spite of some destruction of the vitamin. W. L. D.

**Standardisation of rennet casein.** R. DRU (Compt. rend. XVII Cong. Chim. Ind., 1937, 1142–1159).—Methods for the determination of  $H_2O$ , mineral and fatty matter, and Fe and discoloration when the product is heated are discussed and a procedure is recommended in each case. Determination of the  $p_H$  with a quinhydrone electrode is described. S. M.

**Formulation in the preparation of objects from hardened casein.** G. F. MANGEAT (Rev. Gén. Mat. Plast., 1938, 14, 35–37).—Factors to be considered include: vol. and concn. of the bath, acidity, temp., duration of operation, agitation of bath, addition of electrolyte. F. MoK.

**Dissolving action of micro-organisms on milk-wool.** J. SMIT and B. VAN DER HEIDE (Nature, 1938, 141, 647–648).—Most casein-splitting micro-organisms, isolated from soil or manure, or gathered by infection from the atm., attack milk-wool. They act by an exo-enzyme, which is inactivated by boiling. L. S. T.

**Preparation and composition of Bulgarian kaschkawal, cheese, pastarma, etc.** N. PETKOV (Z. Unters. Lebensm., 1938, 75, 421–428).—Kaschkawal (in Italy, Caccicuvallò) is prepared from coagulated sheep's milk, and pastarma by pickling ox, buffalo, and sheep flesh in sea-salt. A characteristic index of volatile fatty acids of a fat, the Petkov val., is proposed, defined as the no. of mg. of KOH required (as KOH in EtOH) to neutralise the  $H_2O$ -insol. volatile fatty acids from 5 g. of fat treated as for determination of the Reichert–Meissl val. Physical and chemical properties of the indigenous foods of Bulgaria are tabulated. E. C. S.

**Relation between specific conductivity and age of hen's eggs.** W. RUDOLPH (Z. Unters. Lebensm., 1938, 75, 428–430).—The sp. conductivity ( $\kappa$ ) of hen's egg-white is  $\propto$  the total phosphoric acid (I) and can therefore be used as an index of age. The increase in inorg.  $PO_4'''$  has no determining effect on  $\kappa$ . The increase in (I) is presumably due to hydrolysis of lecithin with production of glycerophosphoric acid. E. C. S.

**Occurrence and causes of hair cracks in hen egg-shells. II.** R. COLES (J. Min. Agric., 1938, 44, 1204–1213; cf. B., 1938, 721).—Mottling due to presence of  $H_2O$  in the shells varies with the R.H. of the surrounding atm. and is frequently associated with poor keeping quality. Varied forms of mottling are distinguished. Hair cracks are more numerous in thinner shells with certain types of mottling. Possible relations between mottling, thickness, distribution of protein, and the occurrence of hair cracks in shells are discussed in relation to environmental and nutritional conditions. Adequate supplies of vitamin-A, -D, and -E to hens contribute to improvement in shell quality. A. G. P.

**Proteins of meat. III. Carbohydrate-protein symplexes in meat proteins.** K. BECK and J. SCHORMÜLLER (Z. Unters. Lebensm., 1938, 75, 119–129; cf. B., 1938, 721).—Horse, sheep, goose, and cod muscle were fractionated with aq. urea as described previously. Of the extracted protein, that sol. after dialysis contained the most carbohydrate. The fibre proteins gave a strong Molisch's reaction, that from the horse containing 2.5% of carbohydrate (as glucose). Only glycogen and traces of glucosamine could be identified as the source of the reaction for carbohydrate. E. C. S.

**Effect of foreign substances on step-photometric determination of creatinine.** J. SCHORMÜLLER and H. MOHR (Z. Unters. Lebensm., 1938, 75, 97–118).—An exhaustive survey of the substances reputed to interfere in the Jaffé reaction shows that for the most part their effect has been over-estimated. In presence of a great excess of alkali,  $COMe_2$ , histidine, furfuraldehyde, and  $NH_2OH$  give much too low results, as also do neutral salts in certain circumstances. Other  $NH_2$ -acids do not interfere.  $CH_3CO-OME$  causes at first too high, and later too low, results. In the examination of mixtures of meat and yeast extract these sources of error do not arise.  $C_6H_3(NO_2)_2CO_2H$  is not so suitable for step-photometry as picric acid. E. C. S.



**Artificial sausage skin, "Naturin."** J. LENFELD and J. HÖKL (Z. Unters. Lebensm., 1938, 75, 457—462).—The technical advantages of the material are discussed. E. C. S.

**Changes in food consumption since the pre-war period.** H. VON DER DECKEN (Ernährung, 1937, 2, 113—123).—Statistical data relating to consumption of numerous foodstuffs, notably of meats and fats, are discussed. A. G. P.

**Lead and preserves of sardines.** C. LEPIERRE [with (MLES.) E. RODRIGUES, L. BRITO, and F. LEMOS] (Compt. rend. XVII Cong. Chim. Ind., 1937, 811—831).—Sardines in oil, prepared under the best conditions, are estimated to contain  $\geq 3$  p.p.m. of Pb. Rabbits, guinea-pigs, rats, cats, and hens were fed for 1 year on diets to which, thrice weekly, 0.015 mg. of Pb per kg. body-wt. was added, an amount = the Pb in 4 such sardines. No difference whatever was observed in the general health, growth, reproduction, or mortality of these animals as compared with controls not receiving Pb. It is concluded that 3 p.p.m. of Pb can be tolerated in such preserves. E. C. S.

**Herrings in cream. Definition of "Sahnetunke."** B. RANK (Z. Unters. Lebensm., 1938, 75, 342). E. C. S.

**Use of sea-mussels in human nutrition.** A. SCHEUNERT (Ernährung, 1937, 2, 128—131).—The food val. and notably the vitamin-A content of mussels is discussed. A. G. P.

**"Iodine test" for seed value of potatoes.** H. WARTENBERG and M. KLINKOWSKI (Phytopath. Z., 1937, 10, 107—109).—The test, based on the greater reducing power (I-starch) of the press-juice of degenerated than of healthy tubers, is discussed. A. G. P.

**Cause of "rust or iron spotting" on heart-celery and its elimination during preservation.** F. GIESECKE and W. SCHUPHAN (Z. Unters. Lebensm., 1938, 75, 157—167).—Rust-coloured marks on celery are not due to oxidation of Fe, but are the result of enzymic, oxidative resinification of essential oil, which is held in excretory organs in certain parts of the plant. The rate of discoloration increases with rise of temp. The enzyme, a peroxidase, is destroyed by heating to  $>87^\circ$  and is inhibited, but not destroyed, by cooling to  $\geq 4^\circ$ . Discoloration is avoided in commercial practice by cutting up in ice-cold  $H_2O$  and transferring to boiling  $H_2O$  for blanching. E. C. S.

**Roots and root products as staple articles of diet [in Dutch East Indies].** A. G. VAN VEEN (Med. Dienst Volks. Ned.-Indië, 1938, 27, 177—182).—A discussion of the cassava problem in Java. The root contains very little protein or fat and as a foodstuff it must be supplemented by other foods. S. C.

**Microscopical examination of spring herbs.** III. V. MOUCKA (Z. Unters. Lebensm., 1938, 75, 330—339; cf. B., 1938, 444).—The distinctive characters of *Potentilla verna* and *P. heptaphylla* are described. E. C. S.

**Estimation of the maturity of dessert grapes.** G. MATHIEU (Ann. Agron., 1937, 7, 249—256).—

The determination of either total sugars or acidity as tartaric acid does not indicate the maturity of grapes. Ripe grapes should have a sugar : acid ratio  $>25$ , and a juice of  $d_{15}^{20} \leq 1.070$ . A. W. M.

**Effects of carbon dioxide storage on Bartlett pears under simulated transit conditions.** F. GERHARDT and B. D. EZELL (J. Agric. Res., 1938, 56, 121—136).—Freshly harvested fruit kept at  $7.2^\circ$  for 20 days in an atm. containing 20% of  $CO_2$ , or for 30 days with 35% of  $CO_2$ , may be transferred subsequently to cold storage at  $0^\circ$  and ripened at  $18.3^\circ$  without loss of quality.  $CO_2$  reduces surface scald in the stored fruit. The degree of ripeness in pears is directly related to the sol. pectin content, which increases 30-fold during ripening and decreases again in senescence.  $CO_2$  retards ripening by restricting the hydrolysis of protopectin. A. G. P.

**Apricot pulp containing fluorine and deleterious to health.** C. GRIEBEL, A. SCHLOEMER, and H. ZEGLIN (Z. Unters. Lebensm., 1938, 75, 305—311).—Repeated outbreaks of F poisoning in recent years have been caused by apricot preserves. In one case an average of 66 mg. of F was ingested. F is determined by ashing with CaO and  $Cu(OAc)_2$ , dissolving in HCl, and titrating with  $ZrCl_4$  in presence of purpurin to an end-point judged by comparison with standard aq.  $FeNH_4(SO_4)_2$  (cf. Kolthoff and Stansby, A., 1934, 500). E. C. S.

**Effect of varying amounts of sugar added to pineapple pulp mash on acidity and yield of "Nata de piña."** L. J. VILLANVEVA (Philippine Agric., 1937, 26, 508—514).—The yield of "Nata de piña" (an edible gelatine-like growth, probably of *Leuconostoc* spp.) on pineapple pulp residues is increased by addition of sugar (optimum 6—10%). The acidity of the pulp increases with, but is not  $\propto$ , the amount of sugar added. The organism probably requires a definite  $p_H$  range for development, but is capable of modifying the condition of the substrate to favour its normal growth. A. G. P.

**Composition of Libyan date pulp.** S. COPER-TINI (Agricoltura colon., 1937, 31, 321—322).—Chemical compositions are reported. A. W. M.

**Storage-temperature requirement of fruits of *atis*, *Anona squamosa*.** L. [sugar-apple or sweet sop]. P. SMITANOSA (Philippine Agric., 1937, 26, 425—445).—The best storage temp. for ripe fruit was  $5^\circ$  and for unripe  $15^\circ$ . Respiration rate of unripe fruit increases steadily with temp. ( $0$ — $27^\circ$ ). As the fruit ripens, respiration gradually increases irrespective of the temp. of storage. A. G. P.

**Ripeness of tomatoes.** KLING and J. DEMESSE (Ann. Falsif., 1938, 31, 24—26; cf. B., 1936, 810).—Statements by Chevalier and Suisse (B., 1938, 220) are contested. Although tomatoes change colour after picking, no change occurs in the % of sugars or acidity. The coeff. of maturity is of val. if due regard is paid to the area in which the fruit is grown and the character of the season, as is done, e.g., in the case of wines. E. C. S.

**Prevention of rots in tomatoes with special reference to the mould's attack.** B. N. SINGH and G. P. JAKHANWAL (Proc. Nat. Acad. Sci., India,



1937, 7, 39—44).—Iodised wood shavings and iodised cork dust used as packing are more effective in controlling storage rots than are iodised paper wrappers. The % of rotting in fruit stored at 10° was < in that stored at 0° or 20°. Evolution of CO<sub>2</sub> from fruit in wraps was < from that packed in shavings or cork dust.

A. G. P.

**Variations in composition of blackcurrants.** J. F. BROWN (Analyst, 1938, 63, 262—264).—The % of sol. and insol. solids, sugars, and free and combined acids (as anhyd. citric acid) of Dutch, French, and English blackcurrants for the seasons 1932—7, and of Canadian blackcurrant pulp for 1936, are recorded.

E. C. S.

**Sulphur dioxide and sulphuric acid in food products.** U. HORDH (Ind. Quim., 1937, 2, 73—74; cf. B., 1937, 1126).—Loss of SO<sub>2</sub> and increase in SO<sub>4</sub> after storage for 1—16 months are recorded for raisins, cored peaches, and redcurrant pulp.

F. R. G.

**Hydrogen swells in canned fruits.** F. HIRST and W. B. ADAM (Univ. Bristol Res. Sta., Campden, 1937, Monog. 1, 96 pp.).—Recent work on the conditions which lead to the swelling of cans of food through production of H<sub>2</sub> due to corrosion is summarised. Factors considered are: nature and acidity of the contents, composition of basis steel for tinplate, porosity of the Sn coating, use of internal lacquers, mechanical aspects of the can, conditions of processing and of storage, and addition of corrosion inhibitors and accelerators.

E. S. H.

**Carob-(locust-)bean meal as thickening agent for fruit preparation and other foodstuffs.** C. GRIEBEL (Z. Unters. Lebensm., 1938, 75, 35—37).—After staining with I, the characteristic forms of the endosperm structures are easily recognisable.

E. C. S.

**Jam manufacture.** S. V. POULTNEY (Food Manuf., 1938, 13, 151—153, 157).—Modern developments, including the use of invert sugar, control of colour of pulp preserved with SO<sub>2</sub>, the controlled use of pectin, establishment of standards, methods of packing, and the use of variable and tropical fruit, are described.

W. L. D.

**Scientific control of jam.** C. L. HINTON (Food Manuf., 1938, 13, 154—157).—Analytical control is described. Determinations of sol. solids refractometrically, invert sugar by a rapid Cu-reduction method,  $p_H$  by the quinhydrone electrode, Cu contamination, insol. matter, pectin, acidity, and Pb no. are described.

W. L. D.

**Vitamin-C in honey.** C. GRIEBEL (Z. Unters. Lebensm., 1938, 75, 417—420).—Samples of honey collected mainly from species of *Mentha* strongly reduced I and were found to contain 1.6—2.8 mg. of -C per g. A few other samples, from buckwheat etc., contained 0.07—0.22 mg. It is pointed out that this I-absorbing capacity must be taken into account in carrying out the diastase test.

E. C. S.

**Natural caffeine-free coffee.** J. PRITZKER and R. JUNGKUNZ (Z. Unters. Lebensm., 1938, 75, 34—35).—Samples of the beans of wild coffee, *Coffea Perrieri*, and *C. Dubardi* were completely caffeine-free.

The extract contents were 26.1 and 36.7%, respectively.

E. C. S.

**Quality of coffee.** R. D. ANSTEAD (Agric. Live-Stock India, 1938, 8, 148—152).—Attempts to establish standards of quality in coffee are discussed.

A. G. P.

**Detection of laticiferous vessels in coffee substitutes.** W. PLAHL (Z. Unters. Lebensm., 1938, 75, 324—329).—Figs and chicory roots are detected and distinguished in the roasted material by clearing with H<sub>2</sub>O<sub>2</sub>-aq. NH<sub>3</sub> and staining with Sudan III in 1:1 EtOH-glycerol, whereby the laticiferous vessels are differentially stained red and are readily identified.

E. C. S.

**Detection of addition of lecithin to cacao products.** G. FINCKE and P. NIEMEYER (Z. Unters. Lebensm., 1938, 75, 320—324).—Meurice's method (extraction with 4:1 C<sub>6</sub>H<sub>6</sub>-EtOH, evaporation to dryness, and determination of Et<sub>2</sub>O-sol. P<sub>2</sub>O<sub>5</sub> in the residue; cf. Bull. off. de l'Office internat. du Cacao et du Chocolat, 1936, 6, 91) is trustworthy for the detection of added lecithin (I), but is not quant., since known amounts of (I) added to cacao paste are not completely recovered.

E. C. S.

**Chopping lucerne hay at the time of storage.** J. B. SHEPHERD and T. E. WOODWARD (J. Dairy Sci., 1938, 21, 89—96).—Good-quality hay containing 15.8% of H<sub>2</sub>O was stored for 150 days in the long and the chopped forms. The long hay occupied 2.5 times as much space and attained a temp. of 27° by heating in stack, whilst the chopped hay reached 41°. The carotene (I) contents, originally 76, dropped to 32 for the long and to 21 p.p.m. for the chopped hay; the green colours were, respectively, 56 and 48% of the original, the green colour in both cases being lost at a slower rate than the (I). Hay of 25% of H<sub>2</sub>O lost colour and (I) at a quicker rate. Loss of dry matter was small and equal for both hays and there was no difference in palatability. Hay for chopping should have a low H<sub>2</sub>O content and not be finely chopped.

W. L. D.

**Mineral deficiency in fodder in Combraille Bourbonnaise [France].** L. MAUME and L. MONTEIL (Compt. rend. Acad. Agric. France, 1938, 24, 45—52).—Analyses of 69 hays show many to be deficient in P<sub>2</sub>O<sub>5</sub> and some in CaO.

A. W. M.

**Changes that occur in the proteins of soya-bean meal as a result of storage.** D. B. JONES and C. E. F. GERSDORFF (J. Amer. Chem. Soc., 1938, 60, 723—724).—The protein-N, solubility in 10% NaOH, and digestibility *in vitro* of the meal decrease during storage for 1—6 months, the changes at 24° being > at 0° and in bags > in sealed jars.

R. S. C.

**Digestibility and biological value for pigs of the protein of the grain of a new sweet lupin "Weiko": influence of crushing on digestibility.** E. MANGOLD and A. COMBUBUS (Landw. Versuchs-Stat., 1938, 129, 110—123).—The digestibility of the crushed grain was 10% > that of older varieties of yellow lupin. Crushing markedly increased the digestibility of the total org. matter and of the protein. The biological val. of crushed grain was 65.6% for maintenance and 71.9% for maintenance + growth.

A. G. P.



**Starch value of dry [beet] slices.** G. FINGERLING (Landw. Versuchs-Stat., 1938, 129, 177—307).—Pigs digested all constituents of the slices (except fat) more efficiently than did ruminants. Soaking the slices did not increase their digestibility to oxen. The starch equiv. of slices averaged 56.5 for oxen and 69.4 for pigs. A. G. P.

**Determination of crude fibre [in feeding-stuffs].** K. NAUMANN (Landw. Versuchs-Stat., 1938, 129, 171—176).—Lepper's (1933) method is modified by heating with acid and with alkali under reflux. After alkali treatment, filtration should be carried out without cooling since swelling of cellulose in cold alkali tends to retard filtration. A. G. P.

**Industrial foodstuffs and physiological control.** R. JACQUOT (Chim. et Ind., 1938, 39, 433—440).—Characteristic vals. of foods determined by feeding-trials are explained, and their application to the evaluation of foodstuffs, e.g., industrial wastes, is considered. A. G. P.

**Hay consumption of Holstein calves.** H. S. WILLARD (J. Dairy Sci., 1938, 21, 153—160).—An increase in hay consumption was obtained by increasing the allowance of lucerne hay at the expense of cereal grains. Calves make desirable growth when fed good-quality lucerne hay alone as early as 9 months of age. W. L. D.

**Use of yeast in calf meals and pellets.** P. E. NEWMAN and E. S. SAVAGE (J. Dairy Sci., 1938, 21, 161—167).—Calves can be successfully reared by supplementing whole milk up to the tenth week, the total milk consumption being only 350 lb. per calf. Supplements contained blood meal, dried milk, linseed bran, and cereal grains. The inclusion of dried yeast in the supplements improved growth and skeletal development and gave rise to a lower total digestible nutrient requirement per unit gain in wt. The level of dried milk can be lowered from 20 to 10% when yeast and soya-bean meal are used. W. L. D.

**Pig husbandry and preliminary feeding-trials at the stock farm, Serdang.** T. D. MARSH and N. KANAGARATNAM (Malay. Agric. J., 1938, 26, 94—103).—Comparative trials using soya-bean cake, whey powder, and whale meat as protein supplements for weaner pigs are recorded. Partial substitution of soya-bean cake by whey was not advantageous. Whale meat was unsuitable as principal protein source and appeared to lack an essential constituent. A. G. P.

**Feeding large proportions of potato flakes to working farm horses.** B. NIESEL-LESSETHIN (J. Landw., 1938, 85, 180—229).—Satisfactory results of feeding-trials are recorded and suitable methods and quantities for feeding flakes are discussed. The starch equiv. of the flakes averaged 82.9% and the digestible protein content 4.2—4.6%. Digestibility coeffs. were: N-free extract 93, crude protein 80, crude ash 88, org. matter 87%. A. G. P.

**Effect of yolk colour of various ingredients in poultry feeds.** L. A. WILHELM and V. HEIMAN (Poultry Sci., 1937, 16, 416—418).—Cereals (notably maize and barley) and lucerne meal contained considerable amounts of yolk-colouring materials. A. G. P.

**Comparative effects of various mash mixtures for layers in battery laying cages.** F. P. OLIVARES (Philippine Agric., 1937, 26, 403—410).—Among mixtures of fish meal, maize meal, copra meal, and rice bran, the proportions 2:5:1:2 gave best results. 2% of cod-liver oil prevented leg weakness. A. G. P.

**Effect of fattening at different ages on composition of cockerels.** H. M. HORSHAW (Poultry Sci., 1938, 17, 163—169).—The abs. gain in wt. during fattening and the feed consumed per unit gain increased, but the relative gain decreased, as the age at commencement of fattening advanced. (Cf. A., 1937, III, 16.) A. G. P.

**Casein wool.**—See V. Edible fats. Capillary analysis of fats. Cacao butter. Edible oils.—See XII. Beer as food.—See XVIII. Cold-sterilisation [of glasses etc.].—See XXIII.

See also A., III, 503—7, Vitamins. 522, Oat hay poisoning.

#### PATENTS.

**Bakers' products and sugar coatings therefor.** INTERNAT. PATENTS DEVELOPMENT CO. (B.P. 474,957, 16.4.37. U.S., 28.5.36).—Cakes, biscuits, etc. are sugar-coated by covering them with saturated sucrose solution, and subsequently causing this to dry by sprinkling the cakes with anhyd. glucose. E. B. H.

**Cooling of bread and bakery products.** M. H. DUVAL (U.S.P. 2,072,737, 2.3.37. Appl., 17.6.35).—The baked article is held at atm. pressure partly to cool the crust, then subjected to a vac. graduated so that the air pressure is > the v.p. in the crust according to its falling temp., and finally placed in a vac. > that determined by the above criterion. B. M. V.

**Methods of pasteurisation.** CHERRY-BURRELL CORP., Assees. of R. J. WIGHTMAN (B.P. 482,759, 11.11.36. U.S., 1.4.36).—The liquid is heated for a very short time at a temp. sufficient to produce pasteurisation if the heating were prolonged, then cooled slightly but quickly, and reheated at a slightly higher temp. for not so short a period. E.g., for cow's milk the temp. is raised from 38° up to 68° or 70° during >4 min., and without any delay the milk is quickly cooled to 62° and reheated at 71° for 15 sec. B. M. V.

**Honey and butter process and product.** J. A. MACFEETERS (B.P. 475,020, 6.4.37).—Pasteurised honey is caused to crystallise by addition of fine-grained cryst. honey. 10—50% of butter may be mixed with the honey and the mixture homogenised. E. B. H.

**Preservation of egg whites.** INDUSTRIAL PATENTS CORP., Assees. of L. D. MINK (B.P. 475,352, 11.5.36. U.S., 22.8.35).—The whites are beaten to a foam, dried in the form of thin ribbons at 43°, and powdered. The product can be reconstructed instantaneously and may be added to cake mixes in powder form. E. B. H.

**Curing of pork, more particularly pork cuts.** H. J. JERNE (B.P. 474,905, 9.4.36).—When (about 0.1% of) lactic acid is added either to the pickle or to the dry salt mixture it is claimed that curing is



effected in the partial or complete absence of saltpetre, by converting the sugars. E. B. H.

[Ripening] treatment of fruits. H. R. RUTLEDGE (U.S.P. 2,063,628, 8.12.36. Appl., 28.7.33).—Citrus fruits are ripened and coloured by subjecting them at normal temp. to a mixture of  $C_2H_4$  and air (1 in 300 to 1 in 800) with or without  $NH_3$  as an accelerator. E. B. H.

Preservation of citrus fruits. R. G. TOMKINS (B.P. 474,666, 30.3.36).—The wrappers or containers used for storing the fruit are treated with  $Ph_2$ , pure or in solution in wax or mineral oil. E. B. H.

Treatment of figs. C. F. LOVE, Assr. to CALIFORNIA PRUNE & APRICOT GROWERS ASSOC. (U.S.P. 2,072,309, 2.3.37. Appl., 25.5.35).—The colour is restored to dried, light figs by treatment with 2%  $H_2O_2$  solution by spraying or dipping, setting them aside for 12–14 hr., and then immersing them in  $H_2O$  at 93–99° for 2–7 min. Further treatment may comprise pressing into bricks and re-treating with  $H_2O_2$ . B. M. V.

Manufacture of pectin-containing extracts. F. J. CLEVELAND. From PFEIFER & LANGEN (B.P. 474,475, 26.6.36).—Pectin extract is prepared from sugar beets or turnips by (a) lixiviation with  $H_2O$  (which may contain  $H_2SO_3$ ) at 30–80°, (b) extraction of the residue under pressure with  $H_2O$  containing  $H_2SO_3$ . The pectin extract is filtered and conc. in vac. in the normal manner. E. B. H.

Apparatus for extracting oils, juices, and the like from fruits. W. C. HILL (B.P. 483,036, 7.7.36).—In apparatus as described in B.P. 481,356 (B., 1938, 728) the shredder is placed above a cylindrical screen which is immersed in a vessel for collecting the pulp. B. M. V.

Treatment of juices in centrifugal machines. RAMESOHL & SCHMIDT A.-G. (B.P. 481,711, 18.6.37. Ger., 22.6.36).—The juice is centrifuged and discharged by paring,  $CO_2$  being admitted by means embodied in the paring device; the juice is then stored under gas pressure. B. M. V.

Protection of vegetable and animal goods during storage. PRESERVATORS, LTD., and A. RYNER (B.P. 483,003, 2.10.36 and 24.3.37).—The wrappings are impregnated with a substance adapted to evolve an alkaline gas when exposed to air or, more particularly, to  $CO_2$  evolved from the goods. Lactic acid or other substance to repel flies may be present. The substance may comprise  $NH_4$  tartrate, salicylate, benzoate, lactate, formate, borate, or carbonate. B. M. V.

Digesters for treatment of animal carcasses, slaughterhouse offal, and the like. A. SOMMERMEYER (B.P. 482,891, 6.10.36. Ger., 11.10.35 and 13.5.36).—Continuous wet digestion is effected in a horizontal, slowly rotating, cylindrical drum by means of internal steam. The feed is supplied from each end (through devices embodying a steam lock) to some distance within a cylindrical screen extending the whole length of the drum, the discharge being at the centre of the length. B. M. V.

Drying of grasses. C. GOODALL (B.P. 482,312, 14.10.36).—Fresh-cut grass is heated in a liquid bath

(e.g., juices from a previous batch with addition of molasses or preservative if desired), or in a closed chamber with a very moist atm., at 82–100°, and afterwards squeezed. B. M. V.

Apparatus for siloing of green fodder. F. SCHMIDT (B.P. 481,998, 4.12.36. Ger., 17.12.35).—Downward pressure is maintained at 0.15–0.30 kg./sq. cm. Sugar or sugar-like substances are added in solid or liquid form (according to the poorness of the sap) and acid only to  $pH$  5.0–4.5. B. M. V.

[Machine for] dressing of grain and seeds. L. R. STRICKLAND (B.P. 483,859, 7.12.36).

Grading machines [for fruit etc.]. H. I. STRINGER (B.P. 481,757, 10.10.36).

Bakers' ovens. Spraying milk on to drying machines. Cream separators.—See I.

## XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Preparation of sterile solutions. E. CHERICI (Boll. Chim. farm., 1938, 77, 177–186, 189–192; cf. B., 1935, 572).—The sterilisation of various pharmaceutical preps. (in aq. and oily solution) by filtration or heat is described with special reference to the stability of the preps. F. O. H.

Factors influencing the stability of liquor magnesi citratis, U.S.P. XI. G. E. CROSSEN and C. H. ROGERS (J. Amer. Pharm. Assoc., 1938, 27, 119–124).—Tabulated data indicating the influence of sucrose, K citrate,  $CO_2$ , and variation in concn. of  $Mg^{++}$  or citric acid on the stability of Mg citrate preps. are given. The stability is dependent on the amount of MgO used in the prep. The prep. of stable, official preps. is discussed. F. O. H.

Reactions which distinguish bourbonal from vanillin. F. HOEKE (Chem. Weekblad, 1938, 35, 316–319).—The reactions of bourbonal (I) and vanillin are discussed. (I) is best characterized microchemically as the phototropic phenylhydrazono. A saturated aq. solution (5 ml.) is treated with 1 ml. of Denigès' solution ( $NHPh \cdot NH_2$ ) and warmed until the ppt. is cryst. The colourless product is exposed to sunlight until it becomes bright red, filtered, washed with  $H_2O$ , and dried at 100°, when it again becomes colourless. The dry powder becomes red on exposure to light. The phototropic change is reversible at >80°. S. C.

Drug extraction. XV. Fractional percolation. XVI. Effect of form of percolator on efficiency of extraction. XVII. Modified repetition diacolation. W. J. HUSA and C. L. HUYCK (J. Amer. Pharm. Assoc., 1938, 27, 105–113, 205–207, 211–217; cf. B., 1936, 858).—XV. Fractional percolation of belladonna root by  $EtOH-H_2O$  (4 : 1 vols.) yields a fluid extract containing the same proportion of alkaloids, but a lower proportion of total extractive matter, than does ordinary percolation. Methods of packing and economy of time are discussed. The use of a smaller proportion of moistening fluid gives a final extract much richer in total extractives. Data from the percolation of belladonna, nux vomica, and cinchona are used as criteria of the efficacy of U.S.P. methods of preparing extracts.



XVI. With powdered belladonna root, more efficient percolation is given by the Oldberg and funnel types than by narrow glass-tube percolators, but the latter give a greater yield of total extractives.

XVII. A modified repetition diacollection of powdered belladonna root is simpler and more economic than are the fractional percolation methods of the U.S.P. XI and N.F. VI. Comparative results by various methods are tabulated. F. O. H.

Constituents in *Cascara sagrada* extract. III. Lipins and glucosides. M. W. GREEN, C. G. KING, and G. D. BEAL (J. Amer. Pharm. Assoc., 1938, 27, 95—100; cf. B., 1936, 475).—The extract contains 2:4:6-trimethoxybenzophenone, *isoemodin*, and rhamnosterol. Rhamnose and glucose are present in equal amounts and probably occur as true glucosides. Dialysis gives a residue containing most of the inert and little of the active constituents. The lipin fraction and *isoemodin* are only slightly active. Bubbling air through the extract for 3 hr. at 100° causes a loss of approx. 50% of the activity. The activity of the extract is unchanged by hydrolysis of the glucosides present or by extraction of the free anthraquinones. F. O. H.

Extraction of *nux vomica* in the making of tinctures. N. P. WATTS (J. Amer. Pharm. Assoc., 1938, 27, 138—139).—The use of HCl in the prep. of extracts of *nux vomica* (e.g., U.S.P. XI method) gives red tinctures, possibly due to hydrolysis of loganin present in the seeds. F. O. H.

U.S.P. XI standard for tincture of digitalis. L. W. ROWE and H. W. PFEIFLE (J. Amer. Pharm. Assoc., 1938, 27, 182—189).—The frog method of assay indicates that the U.S.P. XI standard is approx. 50 and 25% stronger than the U.S.P. X and International digitalis standard, respectively. The Canadian standard is between the U.S.P. XI and International standards. Both the 1- and 12-hr. frog methods give comparable results for the relative activities of digitalis preps. F. O. H.

Assay of colombo root and its preparations. H. NEUGEBAUER and K. BRUNNER (Arch. Pharm., 1938, 276, 199—206).—Determination of the total alkaloids by pptn. of the primary tincture with KI is unsatisfactory. The most suitable process consists in determining palmatine (I), which can be separated from jatrorrhizine (II) and columbamine by extraction of the strongly alkaline (NaOH) solution with Et<sub>2</sub>O, as picrolonate; the remaining alkaloids are determined by reduction of the quaternary to the *tert.* bases, which are readily extracted with NH<sub>3</sub> and Et<sub>2</sub>O and easily titrated. It is preferable to determine the total alkaloid after reduction of the bases and then to titrate the dihydrodeoxypalmatine obtained by extracting the alkaline (NaOH) solution with Et<sub>2</sub>O. The most suitable reducing agent is Zn powder or amalgamated Zn turnings. The great variation of the ratio of (I) : (II) in the various preps. is confirmed. H. W.

Indian hemp. S. COUTIERE (Bull. Sci. Pharmacol., 1938, 45, 15—18).—Physiological action, tests for alkaloids, solubility in alkalis, and reducing action indicate a close resemblance between hemp preps. and morphine. F. O. H.

#### Distribution of nutrient substances in tobacco.

I. Dry substance and total nitrogen. III. Nicotine. I. D. VLĂDESCU (Z. Unters. Lebensm., 1938, 75, 167—178, 450—457; cf. A., 1938, III, 541).—I. The % of dry substance and total N increase from the lower to the upper leaves of the plant. The total N of the topmost leaves may be > fourfold that of the lowest. The distribution of total N in the whole plant in full flower (two varieties) was: leaves 53—54, stem 24—25, flowers 14, root 8—9%. As the leaves wither, their N is transferred to the flowers.

III. The % of nicotine in the dry substance of the leaves varies with the position of the leaf on the stem, but the variation is not the same with different types of tobacco. In 3 types examined a max. occurs between the third and seventh leaf. The distribution between the various organs at different stages of development is recorded. E. C. S.

Changes in activity of oxidising enzymes (catalase, peroxidase, phenolase) during so-called fermentation of tobacco. L. BARTA (Z. Unters. Lebensm., 1938, 75, 437—449).—The activity of the enzymes disappears during fermentation, in the order named. Only phenolase remains long enough to play a part in the fermentation process. Oxidases are apparently not responsible for the CO<sub>2</sub> produced. E. C. S.

Effect of coarseness of cut on nicotine carried over in the main smoke stream. A. WENUSCH (Z. Unters. Lebensm., 1938, 75, 182—184).—With increasing coarseness of cut both the nicotine and the resinous substances of the main smoke stream increase to a max. Both the flavour and the physiological effect of tobacco depend, therefore, on the coarseness of cut. E. C. S.

Composition and properties of the gaseous fraction (dispersing phase) of tobacco smoke. A. WENUSCH and R. SCHÖLLER (Z. Unters. Lebensm., 1938, 75, 346—353).—Apparatus for collecting smoke without admixture with air is described. In smoking dry, loosely-packed tobacco a smaller vol. of smoke is formed than with moist and tightly-packed tobacco; consequently the concn. in the smoke of semi-liquid constituents and the uptake of nicotine by the organism are greater in the former instance. The reaction of the gaseous phase is acid with tobaccos of the acid type, alkaline with those of the alkaline type. The former has an agreeable sharp smell, the latter an odour of H<sub>2</sub>S. The total O (as CO<sub>2</sub>, CO, and O<sub>2</sub>) is slightly > that drawn through the glowing region, owing to decomp. therein of org. acids. Since smoking is not a process of dry distillation, the semi-liquid smoke constituents cannot rightly be described as tar, especially as these are mainly preformed in the tobacco. E. C. S.

Connexion between heat of combustion of tobacco and its glowing capacity. A. WENUSCH (Z. Unters. Lebensm., 1938, 75, 178—182).—The glowing capacity is related, not to the total heat of combustion, but to the heat of combustion of the components not volatilised in the glowing region less the heat of volatilisation of the volatilised components. This, the "actual heat val." and the ash content of the tobacco together determine its glowing capacity.



A method of determining the actual heat val., based on heating in vac., is described. E. C. S.

**Assay of orange peel and the galenical preparations obtained therefrom.** H. BÖHME and J. WAGNER (Arch. Pharm., 1938, 276, 242—251).—The assay is based on the halogen consumption of the essential oil volatile with EtOH. The results agree well with those obtained by other methods. Determination of the I val. is performed according to the Hübl or Kaufmann method, the latter being probably preferable. H. W.

**Fatty alcohols.**—See III. Detecting CO in medicinal O<sub>2</sub>. Assay of N<sub>2</sub>O.—See VII. Dental cements.—See IX. Impurities in glycerin lyes. Chaulmoogra oils.—See XII. Tobacco. Phytopharmacy.—See XVI. Bang's disease from raw milk. Determination of reduced ascorbic acid in milk.—See XIX. Testing disinfectants.—See XXIII.

See also A., I, 307, Behaviour of essential oils towards clay etc. II, 231, Production of an antirachitic provitamin from cholesterol. 233, New anæsthetic. Homologues of salol. 236, Substances with female hormone effect. 246, Medicinal preps. from acridine compounds. 249, N-Aralkylmorpholines. 250, Antimalarials. Alkaloids. III, 486, Prep. of gonad-stimulating hormones. 503—7, Vitamins. 517, Standardisation of ergot. New hypnotic. 523, Prep. of globulin. 544, Cardioactive substances in Magnoliaceæ.

#### PATENTS.

**Preparation of local anæsthetic bases.** NOVO-COL CHEM. MFG. CO., INC., Assees. of S. D. GOLDBERG (B.P. 482,886, 1.9.36. U.S., 5.10.35).—It is claimed that  $\beta$ -monoalkylaminoethyl *p*-aminobenzoates have a higher chemotherapeutic ratio than procaine salts and may be used in conjunction with less vasoconstrictor (or none). The corresponding *p*-nitrobenzoates are prepared by interaction of the aminoethanol (I) with  $p$ -NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·COCl and NaOH in H<sub>2</sub>O at 30—40°; the prep. of (I) by interaction of (CH<sub>2</sub>)<sub>2</sub>O with an alkylaniline, nitrosation, and alkaline fission is specifically claimed. The following are described:  $\beta$ -*n*-propyl-, b.p. 181°,  $\beta$ -*n*-butyl-, b.p. 198° [*p*-nitrobenzoate; *p*-aminobenzoate, m.p. 74—74.5° (hydrochloride, m.p. 146°)],  $\beta$ -isobutyl-, b.p. 186° (*p*-aminobenzoate hydrochloride, m.p. 192—194°),  $\beta$ -*n*-amyl-, b.p. 216° [*p*-aminobenzoate, m.p. 64—65° (hydrochloride, m.p. 152—153°)], and  $\beta$ -isoamyl-aminoethyl alcohol (*p*-aminobenzoate hydrochloride, m.p. 148—149°). H. A. P.

**Manufacture of sulphonic acid amide compounds [medicinals].** A. CARMAEL. From I. G. FARBENIND. A.-G. (B.P. 482,576, 26.8.36).—The prep. is claimed by standard methods of 4-*p*-aminobenzenesulphonamidobenzenesulphonamides in which the  $p$ -NH<sub>2</sub> and the ring carrying it are (otherwise) unsubstituted, in which the SO<sub>2</sub>NH may be alkylated or carboxyalkylated, and in which the remaining C<sub>6</sub>H<sub>4</sub> may carry CO<sub>2</sub>H or SO<sub>3</sub>H; they are claimed to have sp. activity against staphylococci and gonococci. E.g., hydrolysis of its Ac derivative (aq. HCl, *d* 1.08)

gives 4-*p*-aminobenzenesulphonamidobenzenesulphonamide, m.p. 137°, also obtained by reduction of the NO<sub>2</sub>-derivative, m.p. 219° [from  $p$ -NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>Cl and  $p$ -NH<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>NH<sub>2</sub> (I)], or of the azobenzene compound (II), m.p. 238° (from 4-Ph·N<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>Cl and (I)], or of the hydrazo compound obtained from (II) by the action of Na-Hg or Zn dust and alkalis. Interaction of  $p$ -NHAc·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>Cl with  $p$ -NH<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>NHMe gives the *p*-Ac derivative, m.p. 218°, of 4-*p*-aminobenzenesulphonamidobenzenesulphonmethylamide, m.p. 141° (B, HCl is decomposed by hot H<sub>2</sub>O); the corresponding -sulphon-ethyl-, m.p. 190° (Ac derivative, m.p. 183°), -diethyl-, m.p. 164° (Ac derivative, m.p. 225—228°), -dimethyl- (III), m.p. 194°, -butyl-, m.p. 183°, - $\beta$ -hydroxyethyl-, m.p. 145°, and the -bis- $\beta$ -hydroxyethyl-amide, m.p. 124°, 4-*p*-dimethylaminobenzenesulphonamidobenzenesulphonamide, m.p. 213°, and -dimethylamide, m.p. 218°, and 4-*p*-aminobenzenesulphonamidobenzenesulphon-dimethylamide-3-, m.p. 246—247°, and -diethylamide-3-carboxylic acid, m.p. 205—206°, and -amidoacetic acid, m.p. 187°, are similarly prepared. (III) (Ac derivative, m.p. 257°) is also prepared from 4:4'-NHAc·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>NH·C<sub>6</sub>H<sub>4</sub>·SO<sub>3</sub>H by conversion into its chloride, m.p. 143°, and interaction with NHMe<sub>2</sub> and hydrolysis, from  $p$ -NHAc·C<sub>6</sub>H<sub>4</sub>·SO<sub>2</sub>NH<sub>2</sub> and 3:4:1-NO<sub>2</sub>·C<sub>6</sub>H<sub>3</sub>Cl·SO<sub>2</sub>NMe<sub>2</sub> (m.p. 107°), reduction of the resulting 3-nitro-4-*p*-acetamidobenzenesulphonamidobenzenesulphon-dimethylamide, m.p. 275°, and elimination (diazotisation etc.) of the NH<sub>2</sub>, from the azo compound, m.p. 181°, by reduction, from its *p*-(*p*'-nitrobenzylidene) compound, m.p. 271° (prepared from 4-*p*-nitrobenzylideneaminobenzenesulphonyl chloride, m.p. 111°, itself obtained from NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·CH=NPh and ClSO<sub>3</sub>H), by hydrolysis, and from 4-*p*-toluenesulphonamidobenzenesulphon-dimethylamide, m.p. 147°, by oxidation (KMnO<sub>4</sub> in aq. C<sub>6</sub>H<sub>5</sub>N) to the *p*-CO<sub>2</sub>H-derivative and application of the Hofmann or Curtius reaction (acid chloride, m.p. 112°; amide, m.p. 143°; hydrazide, m.p. 128°). Interaction of 4-*p*-bromobenzenesulphonamidobenzenesulphonamide, m.p. 209°, -methylamide, m.p. 188°, and -dimethylamide, m.p. 152°, with NH<sub>3</sub> or the appropriate amine gives the corresponding NH<sub>2</sub>-derivative (already described). H. A. P.

**Vaporising apparatus [for drugs].** J. J. NOWAK (B.P. 481,650, 22.6.37).

#### XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

**Influence of the nature of the gelatin on photographic properties of emulsions.** N. V. MAKAROV, A. V. POBEDINSKAJA, and S. A. PULINA (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 6, 22—25).—A comprehensive review. CH. ABS. (e)

**Influence of substances added to the emulsion before coating on the surface tension and foaming of gelatin solutions.** K. N. KUZMINSKY and B. N. KOROSTILEV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 5, 27—39).—Saponin, Alborit, and "Petrov's Contact" (I) acted as spreading agents. All of these materials produced foaming, which was diminished by addition of isoamyl alcohol (II).



0.7% of a 1:1 mixture of a 2% solution of (I) and (II) is recommended for addition to the emulsion.

CH. ABS. (e)

**Examination of glycerin for photographic emulsions.** A. POLSTER (Phot. Ind., 1938, 36, 552—554).—The usual methods of testing glycerin ( $p_H$ ,  $d$ , reduction of  $\text{AgNO}_3$ , etc.) are not sufficiently sensitive to detect differences which are discovered on preparing emulsions containing glycerin. This is because the aldehyde and fatty acid impurities show only low reducing powers at the usual  $p_H$  of glycerin ( $p_H$  5—7); in acid or alkaline media the reducing power is much greater. Different samples may therefore be differentiated by mixing 10 c.c. of glycerin (buffered with  $\text{AcOH}$ ,  $\text{NaOH}$ , and  $\text{NaOAc}$  mixtures to different  $p_H$  vals.) with 1 c.c. of 10%  $\text{AgNO}_3$  solution [or  $\text{NH}_4\text{Ag}(\text{NO}_3)_2$  (I) solution] on a water-bath at  $40^\circ$ , and noting the time that elapses before the first brown coloration appears; white light must be excluded (e.g., by a Wratten OA filter). Curves plotted from the results then show clear differences. Alternatively, the times may be determined at fixed  $p_H$ , with varying amounts of  $\text{AgNO}_3$ ; the reaction speed increases with increasing amount of  $\text{AgNO}_3$ . The reaction is somewhat faster with (I). The results are claimed as characteristic of the sample. J. L.

**Influence of the laboratory operations on the m.p. of emulsion coatings.** D. SCHTSCHERBOV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 5, 60—62).—The temp. of the processing solutions and wash- $\text{H}_2\text{O}$  has no appreciable influence on the m.p. of the emulsion.

CH. ABS. (e)

**Sensitometric testing of photographic emulsions by the use of narrow light-filters.** N. P. TARASOV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 6, 67—75).

CH. ABS. (e)

**Acid sulphites versus normal sulphites in developers.** J. SOUTHWORTH (Brit. J. Phot., 1938, 85, 262—264).—The use of  $\text{Na}_2\text{S}_2\text{O}_5$  (I) in place of  $\text{Na}_2\text{SO}_3$  requires an increase in the amount of alkali in a developer; contrary to former statements (e.g., Brit. J. Phot. Almanac, 1930, p. 460), 4—7 times the amount of  $\text{Na}_2\text{CO}_3$ , by wt., is required to "neutralise" for developing purposes the (I). A previous single-solution  $p\text{-NH}_2\cdot\text{C}_6\text{H}_4\cdot\text{OH}$  (II)—quinol formula (Brit. J. Phot., 1930, 77, 549) may be prepared in two-solution form, the (II) being kept in solution by (I);  $\frac{1}{4}$  oz. of (I) is used in place of  $1\frac{1}{2}$  oz. of  $\text{Na}_2\text{SO}_3$ , and 3 oz. of  $\text{Na}_2\text{CO}_3$  instead of  $1\frac{1}{2}$  oz. must be used. Similar results were obtained on modifying a pyro-soda formula. The results are due to the formation of  $\text{NaHCO}_3$ , which lowers the  $p_H$  of the solution and restrains development. J. L.

**Deterioration of sulphite-quinol solutions and the behaviour of aged solutions as [photographic] developers.** J. PINNOW (Z. wiss. Phot., 1938, 37, 76—86).—Quinol-sulphite solutions form on ageing (oxidation) monosulphonates and then quinol- $\alpha$ -,  $\beta$ -, and  $\gamma$ -disulphonates, and probably a trisulphonate, but the last-named is decomposed to disulphonate on further oxidation in alkaline solution. The disulphonates have been prepared by heating quinol with fuming  $\text{H}_2\text{SO}_4$ , and were isolated as cryst. K salts (cf. Kauffmann, A., 1907, ii, 214); the  $\alpha$ -salt (+ $\text{H}_2\text{O}$ )

(cf. Beilstein, 3rd Ed., 2, 952) and  $\beta$ -salt (+ $4\text{H}_2\text{O}$ ) are described. Oxidation of the  $\alpha$ - or  $\beta$ -disulphonates with  $\text{KMnO}_4$  and  $\text{H}_2\text{SO}_4$  (or  $\text{HNO}_3$ ) removes only one  $\text{SO}_3$  group with 5 O (highest actual yield is 42% of total S), and more intensive oxidation gives lower yields; thus 2 O more are used than are required for formation of dihydroxyquinonedisulphonate. The latter yields  $\text{SO}_2$  rapidly on heating, but only very slowly in the cold, even when extracted with  $\text{Et}_2\text{O}$ ; aged developer solutions cannot therefore be regarded as reservoirs for sulphite. Further oxidation products formed may be bisulphite additive products of aldehydes (ketones?) formed by breaking of the ring.  $\text{Na}_2\text{SO}_3$  solutions show no alteration (to  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{S}_2\text{O}_3$ , and  $\text{NaOH}$ ) on keeping out of air, when slightly alkaline, and the good properties of aged developer are probably due to the presence of quinol-monosulphonate. J. L.

**Fine-grain developers and a method of determining the graininess of photographic plates.** W. REINDERS and M. C. F. BEUKERS (Phot. J., 1938, 78, 192—196).—A DIN wedge was photographed with three different degrees of reduction on one plate, and enlarged positives were prepared from these to give equal-sized prints (8.7, 12.5, and 18 times the negatives). Strips printed from negatives developed with different fine-grain developers were compared with a standard series from negatives developed with a metol-borax developer, stages of equal density and graininess (visual observation) being noted; the ratio of the degrees of enlargement is then = the ratio of graininess; the graininess of the standard negatives being taken as 10, the graininess of the other negatives is = 10 times the graininess ratio. Average vals. for other developers are then: metol-quinol 13, "Kodak D 76" 11, Kodak Ultrafine 7.5, Agfa Atomal 7.5, Ultrafin S.F. Tetenal 8,  $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$  (Seyewetz) 8. Definitely finer grain is thus obtained with the last four developers, but only Agfa Atomal has a usefully short duration of development (7.5 min.). J. L.

**Keeping of panchromatic films.** V. E. BILININ (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 6, 35—39).—Photographic materials can be tested for keeping properties by keeping them at  $55^\circ$  and 90—95% R.H. (2, 6, and 12 hr.). Panchromatic film sensitised by bathing shows a considerable loss of sensitivity on keeping, which depends on the  $p_H$  of the substratum. The use of buffers in the emulsion at the time of sensitising is recommended. CH. ABS. (e)

**Measurements on dark-room illumination.** A. VAN KREVELD and J. A. M. VAN LIEMPT (Physica, 1938, 5, 345—373).—The sensitivity of the eye to contrast has been studied from green to dark red, and of various photographic emulsions for the whole visible spectrum. Hence the optimum light for orthochromatic and panchromatic emulsions has been deduced. The "quality" of a dark-room lamp can be calc. from the decrease of photographic contrast resulting from its use. T. H. G.

**Colloid-chemical influences on photographic development.** LÜPPO-CRAMER (Phot. Ind., 1938, 36, 479—480).—Staudé's work (A., 1938, II, 95), showing that developer freed from oxidation products has its latent period of action greatly increased, is



discussed in relation to previous work by Lüppler-Cramer (especially *Phot. Korr.*, 1930, 66, 253), wherein the greatly increased action of developers free from sulphite (*i.e.*, those containing oxidation products) or with addition of Pinacryptol-green or other dyes was demonstrated. The increased effect of aged developers is hence due to the presence of these oxidation products, by isolation (adsorption displacement) of latent-image nuclei. J. L.

**"Burning" of [photographic] images on hot-drying.** WEYDE (*Phot. Ind.*, 1938, 36, 528, 530).—The use of aged fixing baths to obviate "burning" on hot-drying leads to decreased stability of the images. The problem has, however, long been solved by processes such as those of Gevaert (addition of suitable substances to the fixing bath) and of I.G. Farbenind. A.-G. (incorporation of stabilising substances in the emulsions). The patent literature is quoted. (Cf. Kieser, B., 1938, 459.) J. L.

**Colour prints by dye-toning.** G. L. WAKEFIELD (*Brit. J. Phot.*, 1938, 85, 259—260).—Dye-toning methods can be applied successfully to the production of 3-colour prints on paper. Since paper supports absorb dye and thus render inspection difficult, the colour-separation prints are made on stripping films, of which collodion stripping films have been found to be best. The images are stripped after development, bleached and dye-toned, washed until the high-lights are clean, and mordant is removed if necessary by fixing and rapid short washing. Colour balance can be checked by placing the films on a sheet of opal. The images are finally united by squeegeeing on to fixed-out matt bromide paper. Processing details are outlined. J. L.

**Darkroom filter for processing infra-red plates.** M. PLOTNIKOV (*Phot. Ind.*, 1938, 36, 503—504, 506).—The use of conc. solutions of  $K_2Cr_2O_7$  with  $CuSO_4$ ,  $FeSO_4$ , or  $NiSO_4$ , or mixtures of these, as filters for infra-red has been tested with various Agfa infra-red plates; absorption spectra are shown.  $NiSO_4$  alone or with  $K_2Cr_2O_7$  is of little use; thick filters (6 cm.) of  $FeSO_4$  with 2 cm. of  $K_2Cr_2O_7$  can be used for 950 and 1050 m $\mu$ . plates.  $K_2Cr_2O_7$  (2 cm.) +  $FeSO_4$  (6) +  $NiSO_4$  (1) is safe for all plates recording 800 m $\mu$ . and upwards. Combinations with commercial filters are also suitable. J. L.

**Limits of infra-red sensitising.** G. KORNFIELD (*J. Chem. Physics*, 1938, 6, 201—202, and *Brit. J. Phot.*, 1938, 85, 231—232).—The competition between the thermal and the photochemical reactions will set a natural limit to the extension of photographic methods into the infra-red. This limit will be approx. 2  $\mu$ .

W. R. A.

**Photographic speed and contrast.** A. P. H. TRIVELLI and W. F. SMITH (*Brit. J. Phot.*, 1938, 85, 307—308).—Southworth's quant. relation between  $\gamma_\infty$  and speed ( $S$ ) (B., 1937, 1274) is in agreement with results obtained previously (cf. B., 1930, 587). It is now shown that the same type of exponential equation,  $\gamma S^b = a$ , also holds for shorter times of development than that of full development ( $\gamma_\infty$ ). For the present emulsions it appears that the const.  $a$  increases and the exponent  $b$  decreases with increasing development time. The use of these consts. as a

means of classifying emulsions commercially is considered of doubtful val. J. L.

**Spontaneous panchromatism and coloured fog.** K. V. CHIBISOV (*Photo-Kino Chem. Ind. U.S.S.R.*, 1935, No. 5, 9—13).—Coloured fog and extension of sensitivity towards the red depend on the gelatin used and are greatly accentuated by the addition of Cl' in such a way that the final emulsion contains a certain proportion of AgCl.

CH. ABS. (e)

**Secondary latent [photographic] fog.** LÜPP- CRAMER (*Phot. Ind.*, 1938, 36, 526—528).—The differences between secondary latent fog produced, on the one hand, by  $H_2O_2$ , acids, persulphates, etc. and, on the other, by many basic dyes are discussed. The latter fogging is removable by  $K_2Cr_2O_7$ - $H_2SO_4$  solution, but not by acid  $p$ - $C_6H_4(NH_2)_2$ -KBr solutions (nor by phenosafranine, though it is partly so by pinaflavol). The effects are related to the author's theory that this type of fogging is due to "adsorption displacement" of the protective colloid (gelatin) and consequent "grain isolation." Ollendorff and Rhodius' results (B., 1936, 620) with colloid-free layers (no fogging with methylene-blue or with  $H_2O_2$ ) are due, not to absence of gelatin, but to the use of a weak alkaline developer in the first case and to absence of ripening nuclei (which are the initial agents in the  $H_2O_2$  reaction) in the second. J. L.

**Motion of fibres in  $H_2O$ . Acetate films. Film bases.**—See V. Camera-microscope.—See XIX.

See also A., I, 318, Action of light on emulsions. Solarisation and development. 328, Rapid photomicrography.

#### PATENTS.

[Preparation of] silver halide emulsions for colour photography. W. W. GROVES. From I. G. FARBEIND. A.-G. (B.P. 483,000, 8.9.36).—The use is claimed as non-diffusible "dye-formers" of azo coupling components containing a carbohydrate residue the diffusibility of which, if of low mol. wt., is reduced by the introduction of higher aliphatic groups or treatment with  $(CH_2)_2NH$ . Examples are the 2:3-hydroxynaphthoic ester of methylcellulose and the products of interaction of 2-hydroxyanthracene-3-carboxylic acid with rice starch, and of  $o$ - $OH \cdot C_6H_4 \cdot CO_2H$  with a product from glucamine and  $(CH_2)_2NH$ . H. A. P.

[Products for] sensitising photographic silver halide emulsions. I. G. FARBEIND. A.-G. (B.P. 482,952, 7.10.36. Ger., 24.10.35).—The use is claimed as photographic sensitisers of dyes obtained by condensing a reactive  $\alpha$ -aldehyde of a methylene base of the indole, quinoline, selenazole, or thiazole series with an aromatic diamine in presence of an acid. (Cf. B.P. 462,238; B., 1937, 764.) H. A. P.

**Manufacture of polymethine dyes and sensitised photographic emulsions.** I. G. FARBEIND. A.-G. (B.P. 483,045, 7.10.36. Ger., 31.10.35).—Alkyl orthoformates are condensed with dialkyl diquaternary salts of the dithiazoles and dioxazoles obtained by condensing a saturated aliphatic dibasic acid with an  $o$ -amino-phenol or -thiophenol. The



products are used as photographic sensitisers. *E.g.*, adipic acid (I) is distilled with  $o\text{-NH}_2\text{-C}_6\text{H}_4\text{-OH}$ , the product is converted into the diethiodide, and this is heated with  $\text{CH}(\text{OEt})_3$  in  $\text{C}_5\text{H}_5\text{N}$  to give a blue-red carbocyanine dye (absorption max.  $\lambda$  535  $\mu$ .; sensitisation max.  $\lambda$  570  $\mu$ .). Similar dyes are described from the dioxazole from pimelic acid (absorption max. 505  $\mu$ .) and the dithiazole from (I) and  $o\text{-NH}_2\text{-C}_6\text{H}_4\text{-SH}$ . H. A. P.

**Sensitisation of rotogravure carbon tissue.** S. B. DAVENPORT and A. SAVIO (B.P. 476,267, 6.8.36).—C tissue is attached to one end of a ferrotype plate, and the whole is fed through rollers in contact, while sensitising solution is applied between the tissue and the plate. Apparatus is claimed. J. L.

**Manufacture of half-tone screen negatives or positives for photo-mechanical printing processes.** KODAK, LTD., Assees. of A. MURRAY (B.P. 474,911, 9.5.36. U.S., 21.5.35).—A latent image of a half-tone screen is formed in the top or bottom stratum of a single emulsion layer or in one of two emulsion layers coated on the same or opposite sides of a support. The emulsion(s) is (are) dyed with a removable yellow dye, or the emulsions are made sensitive to different colours, in order to protect the latent screen image from further exposure. A second image of the subject desired is printed on to the other stratum in continuous tone, and the film is developed. The combined images are used to print half-tone printing plates in the usual manner. J. L.

**Colour photography.** OMNICHROME CORP. (B.P. 474,914, 9.5.36. U.S., 9.5.35).—An emulsion on one plate of a bi-pack is sensitised to different colours (*e.g.*, red and blue) in the top and bottom strata, with the incorporation of a suitable filter dye; the second plate is sensitised to, *e.g.*, green. The bi-pack is exposed (through the support of the first plate, in the usual manner), developed, and then treated in a stop-bath of  $\text{AcOH}$  and  $\text{Cr alum}$ . Prints are then made by reflexion from the three images; the unremoved  $\text{AgBr}$  in the first plate prevents penetration of the light beyond the surface layer. The "red and blue" plate is then fixed, washed, and dried, and a black and white key print is prepared from it by transmitted light. The four component images are then ready for the prep. of photo-mechanical printing plates in the usual manner. J. L.

**Photographic production of colour pictures.** I. G. FARBEIND. A.-G. (B.P. 482,652, 26.8.36. Ger., 30.8.35).—In making coloured pictures with multilayered  $\text{Ag}$  halide emulsions the red and blue images are produced in layers containing colour-formers which are converted into coloured images during development by coupling with an oxidation product of the developer, while the yellow is formed as a residual image by a developing substance present in the layer. The latter substance contains groups which confer substantivity towards the binding agent of the emulsion, *e.g.*,  $\text{Ph}_2$ , stilbene, 2:3- $\text{OH-C}_{10}\text{H}_6\text{-CO}_2\text{H}$ , benzthiazole, diarylureas, etc. In the example, a three-layer film consisting of (i) a non-colour-sensitive top layer containing 4-amino-1-(*p*-stearylaminophenyl)-3-methyl-5-pyrazolone, (ii) an orthochromatically sensitised layer containing *p*-

(2-hydroxy-3-naphthoylamino)-1-phenyl-3-methyl-5-pyrazolone, (iii) a red-sensitive layer containing 1:3:5- $\text{OH-C}_6\text{H}_3(\text{NHPh})_2$ . After exposure development is effected with an alkaline solution of *p*- $\text{NH}_2\text{-C}_6\text{H}_4\text{-NMe}_2$  free from sulphite; the colours produced are (i) yellow, by the action of the alkali, (ii) red, (iii) blue. K. H. S.

## XXII.—EXPLOSIVES; MATCHES.

**Chemical stability of smokeless powders.** J. MĚCÍŘ and F. SILLINGER (Compt. rend. XVII Cong. Chim. Ind., 1937, 832—839).—Five samples of nitroglycerin powder submitted to the 75° stability test gave (a) 213, 66, 78, 324, 37 hr. when the tubes were kept closed, (b) 431, 265, 363, —, 133 hr., when they were kept open for 8 hr., and (c) 451, —, —, 937, — hr. when kept open for 10 hr. and aerated after 1 week. The effect of moisture as indicated by the low results obtained in (a) was investigated by exposing sample 1 at 75° in an atm. at 100% humidity for 48, 113, 113 (stopper removed for 8 hr.), and 113 hr. with addition of  $\text{CaCO}_3$ ; the tests gave 178, 154, 346, and 230 hr., respectively. Sample 1 heated in presence of centralite I,  $\text{NHPh}$ ,  $\text{C}_{10}\text{H}_8$ ,  $\text{NaHCO}_3$ ,  $\text{CaCO}_3$ ,  $\text{CaCl}_2$ , and  $\text{CaO}$  gave 286, 298, 324, 292, 292, 820, and 878 hr., and without stabiliser 213 hr. The first five react with the N oxides, whereas  $\text{CaCl}_2$  and  $\text{CaO}$  fix both moisture and oxides. With  $\text{P}_2\text{O}_5$ , moisture absorption was so energetic that a sample failed to decompose even after 2500 hr. Autocatalytic action is probably caused by the action of H ions, and not by the N oxides, and requires the presence of air and  $\text{H}_2\text{O}$ . A relatively larger superficial area of the powder grains accelerates decomp. A method of conducting the test is described, which ensures the retention of the moisture content of the powder and the catalytic action of the decomp. products. In an attempt to estimate the life of a powder, 3 samples were heated at various temp. from 55° to 105°. The times before decomp. occurred varied from 1254 to 8½, 1735 to 8½, and 212 to 3½ hr., respectively. The curves show most marked differences between the powders at the lower temp., but do not cover the actual temp. for which duration of life is required. This might be obtained approx. by continuing the curves through the 45° point. W. J. W.

**Chlorate explosives of the simplest type.** I. F. BLINOV (Kali, 1937, No. 10, 19—31).—Compositions of simple  $\text{ClO}_3$  explosive mixtures of weak and medium strength for use in the open and underground are discussed. The mixtures are divided into 3 groups, viz., binary (containing 15—20% of wood flour, with brisance up to 5 mm.), ternary (12%; 8 mm.), and ternary (3%; 15 mm., *i.e.*, = that of cheddite). The sensitivity of the mixtures proposed is  $\approx$  that of cheddite. The effects of  $\text{ClO}_3$  crystal size,  $\text{H}_2\text{O}$  content, density, and contents of wood flour and liquid hydrocarbons on the explosive properties of the mixtures are discussed. Graphs and tables are given. D. G.

**Ignition of  $\text{CH}_4$  by explosives.**—See II. Org. syntheses.—See III. Nitrocellulose.—See V. Resistance of steel to trotyl and picric acid.—See X. Impurities in glycerin lyes.—See XII.



## XXIII.—SANITATION; WATER PURIFICATION.

**Air-conditioning factors.** T. CHESTER (J. Inst. Heat. Vent. Eng., 1938, 5, 538—592).—A review.

R. B. C.

**Air purification in inhabited rooms by spraying or atomising hypochlorites.** A. T. MASTERMAN (J. Ind. Hyg., 1938, 20, 278—288).—Atomised hypochlorite is most efficient as an antiseptic agent in rooms. Bacterial counts are considerably reduced by spraying a room with, e.g., NaOCl, whilst spraying with H<sub>2</sub>O causes a smaller reduction. Suitable apparatus is described.

E. M. W.

**Control of the oxygen content of the atmosphere [in ships tanks etc.].** P. SORGDRAGER (Pharm. Tijds. Ned.-Indië, 1937, 14, 365—370).—The effect of the CO<sub>2</sub>:N<sub>2</sub>:O<sub>2</sub> ratios on the extinction of safety lamps and burning tapers is discussed. Tapers give a greater margin of safety than lamps. Even with an atm. supporting combustion there may be a danger from high CO<sub>2</sub> content.

S. C.

**Cyclone dedusting.** E. FEIFEL (Z. Ver. deut. Ing., 1938, 82, 445—446).—The principles underlying the design of cyclone dust separators are discussed mathematically.

R. B. C.

**Engineering problems associated with the improvement of temperature and humidity conditions of the atmosphere in mines at great depths.** J. H. DOBSON and W. J. WALKER (Inst. Mech. Eng. and Inst. Chem. Eng., Advance proof, May, 1938, 16 pp.).—Underground conditions on the Witwatersrand goldfields, where the wet-bulb temp. approaches 32°, are reviewed. Difficulties of heat extraction, pumping, and ventilation at depths of 10,000 ft. are described and the relative merits of H<sub>2</sub>O, brine, and air for cooling discussed.

A. K. G. T.

**Control of dust from blasting by a spray of water mist.** C. E. BROWN and H. H. SCHRENK (U.S. Bur. Mines, 1938, Rept. Invest. 3388, 13 pp.).—Tests conducted in 3 headings in medium-hard to hard rock showed that a spray of H<sub>2</sub>O mist was effective in reducing the concn. of dust generated and thrown into the air during blasting to <1% of the amount present when the spray was not used. Dust dissemination during mucking of material sprayed for several hr. before mucking was begun was << during shovelling of material thoroughly sprinkled just before and during mucking. Data are given showing the variation in the concn. of the dust disseminated into the air by blasting in travelling through the passageways.

H. C. M.

**Dust sampling with the Bureau of Mines midjet impinger, using a new hand-operated pump.** J. B. LITTLEFIELD and H. H. SCHRENK (U.S. Bur. Mines, 1938, Rept. Invest. 3387, 4 pp.).—A simple, compact, positive-acting pump that may be operated by hand, electric motor, or spring motor, for sampling dust with the Bureau of Mines midjet impinger (B., 1938, 330), is described. Results obtained in comparing the regular and the midjet impingers show that the latter may be used instead of the regular impinger for collecting dust samples.

H. C. M.

**Collection and investigation of dusts detrimental to health, with particular reference to silicosis.** J. W. MATTHEWS (Österr. Chem.-Ztg., 1938, 41, 173—179; cf. B., 1937, 852, 1286).—The methods of collecting and analysing dusts are described. It is concluded that definite chemical factors contribute to the development of silicosis, which is attributed to dissolution of SiO<sub>2</sub> in the lungs. The simultaneous presence of alkali hydroxide is dangerous owing to increased solubility of SiO<sub>2</sub> or increased  $p_{\text{H}}$ , or both. Such harmful dusts can be rendered innocuous by mixing with another dust, e.g., cement or Fe, which reduces the solubility of SiO<sub>2</sub>.

J. W. S.

**Determination of hydrogen sulphide in air.** V. P. MAEVSKAJA (Zavod. Lab., 1938, 7, 181—183).—Amounts of <2 mg. of H<sub>2</sub>S per cu.m. of air are determined by a modification of Fischer's method (B., 1884, 109).

R. T.

**Determination of industrial poisons [in air] by colorimetric methods, according to Hahn and Klockmann.** V. P. MAEVSKAJA and N. P. KOMAR (Zavod. Lab., 1938, 7, 36—41).—Minor modifications of the methods proposed by Hahn and Klockmann (A., 1931, 54) and other authors for determination of traces of NH<sub>3</sub>, NO<sub>2</sub>, Pb, and Cd in air are described.

R. T.

**Incubator hygiene. IX. Disinfecting properties of formaldehyde for bacteria associated with avian coryza, and filterable viruses of infectious laryngotracheitis and infectious bronchitis.** R. GRAHAM and C. A. BRANDLY (Poultry Sci., 1937, 16, 428—433).—Satisfactory results of fumigation with CH<sub>2</sub>O are recorded.

A. G. P.

**Efficiency of commercial chlorine-containing compounds used in cold-sterilisation processes.** D. C. LYONS (J. Bact., 1937, 33, 34).—The available Cl content of preps. used for cold sterilisation of glass drinking vessels etc. varied considerably, and in many cases unsatisfactory packaging rendered them practically useless on reaching the consumer.

A. G. P.

**Determination of organic matter in muds and sludges.** R. PROSCHAZKA (Plyn a Voda, 1934, 14, 115, 302, 319, 342).—Org. matter is determined by heating with a K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>-50% H<sub>2</sub>SO<sub>4</sub> mixture and back-titrating the excess of CrO<sub>4</sub><sup>2-</sup> with aq. FeSO<sub>4</sub>. On heating sucrose, wood, PhOH, starch, and humic acids with the chromate mixture, 90—98% of the org. matter was oxidised.

CH. ABS. (e)

**Water containing magnesia.** R. LOUF (Ann. Soc. Brass., Gand, 1938, 47, 13; Woch. Brau., 1938, 55, 142—143).—Various methods for removal of MgO from brewing liquor are described, but apart from the use of aq. Ca(OH)<sub>2</sub>, mineral treatment is not recommended, org. acids being preferred.

I. A. P.

**Bacteriological survey of a swimming pool treated with silver.** W. L. MALLMAN (J. Bact., 1937, 33, 89).—The bactericidal action of Ag (Katadyn process) is slower than that of Cl<sub>2</sub>.

A. G. P.

**Determination of free chlorine in drinking water.** P. SORGDRAGER (Pharm. Tijds. Ned.-Indië, 1937, 14, 263—264).—The sample (100 c.c.) is treated



with 1 c.c. of *o*-tolidine reagent and matched (colorimeter) with a solution equiv. to 0.25 mg. of Cl/l. S. C. I.

**Determining phosphates in water.** H. LIANDER (Iva, 1937, 103—115).—Colour reactions previously suggested for determining  $\text{PO}_4^{3-}$  in  $\text{H}_2\text{O}$  are critically discussed. Accurate results for  $\text{PO}_4^{3-}$  in boiler- $\text{H}_2\text{O}$  were obtained by use of quinine molybdate reagent [prep. described, using aq. solutions of  $(\text{NH}_4)_2\text{MoO}_4$ , quinine sulphate, and  $\text{H}_2\text{SO}_4$ ], provided a correction was applied for  $\text{SiO}_2$ . Colorimeter readings are taken after 2—3 min. R. B. C.

**Purification of phenol-containing effluent ammoniacal liquor.** J. I. TSCHULKOV and V. P. PARINI (Prom. Org. Chim., 1938, 5, 277—282).—The residue after distillation of  $\text{NH}_3$  is saturated with  $\text{Cl}_2$  at 22—25°, the solution filtered (ppt. contains S and chlorophenols), and the filtrate passed through active C. The resulting  $\text{H}_2\text{O}$  does not contain phenols,  $\text{H}_2\text{S}$ ,  $\text{CNS}^+$ ,  $\text{CN}^-$ , or  $\text{NH}_3$ , and is toxic to fish in concns. of  $\geq 1:100$ , as compared with 1:1000 for the untreated  $\text{H}_2\text{O}$ . R. T.

**Tannery effluents.** L. MASNER (Gerber, 1938, 64, 41—44).—Analytical data of the Bata tanneries are given to show the efficiency of settling pits. Anthrax dangers from effluents and sludge are exaggerated. The effluent requires to be acidified with 1 kg. of  $\text{H}_2\text{SO}_4$  per cu. m. before it can be chlorinated, and large quantities of Cl are required. Of other methods of effluent treatment, the "Kremerbrunnen" method of sedimentation is best. Biological purification of tannery effluents has not proved successful. D. W.

**Testing of non-phenolic disinfectants.** W. C. CLARK (J. Amer. Pharm. Assoc., 1938, 27, 130—132).—Wood sticks are inoculated with a culture of *Staph. aureus*, immersed (after 72 hr.) in the disinfectant for 30 sec., and then examined for living *S. aureus*. The method simulates conditions of use for disinfecting sickroom woodwork. F. O. H.

**Determination of *p*-chloro-*m*-xylenol in insecticide solutions.** R. P. MERRITT and T. F. WEST (Analyst, 1938, 63, 257—259).—The solution is made alkaline with NaOH and distilled to remove alcohols. Essential oils are extracted with light petroleum, the extract being washed with  $\text{H}_2\text{O}$  to recover the small amount of the phenol extracted. The washings and aq. liquor are treated with  $\text{CaCl}_2$  to ppt. soap, and the filtrate is then acidified with HCl and extracted with  $\text{Et}_2\text{O}$ . The phenol is purified, weighed, and its identity confirmed by its m.p. after recrystallisation from  $\text{C}_6\text{H}_6$ . E. C. S.

**Biological factors in Peet-Grady results [for liquid insecticide evaluation].** A. C. MILLER and W. A. SIMANTON (Soap, 1938, 14, 103—113, odd nos. only).—Sources of error are: variations in sex ratio (the male fly being the more readily killed), differences in culture susceptibility, composition of the test population. For laboratory-reared houseflies, the proportion of males is 51.4%. L. D. G.

**Modified Peet-Grady method [of liquid insecticide evaluation].** W. A. SIMANTON and A. C. MILLER (Soap, 1938, 14, 115, 117).—Details are given

of a "large-group modification" of the test, which avoids the usual sources of error (cf. preceding abstract) and is quicker to carry out. L. D. G.

**Use of the konimeter.**—See I. Determining  $\text{C}_6\text{H}_6$  in air.—See II. Treating paper mill process- $\text{H}_2\text{O}$ .—See V. Textile waste liquors.—See VI. Hydrated CaO. Liquid  $\text{Cl}_2$  etc. for  $\text{H}_2\text{O}$  plants.—See VII. Failure of Pb pipes.—See X. Gases from C arcs. Dust wt. sampler.—See XI. Tung oil and dermatitis.—See XII. Waters for tanneries.—See XV. Control of moulds in the brewery.—See XVIII. Milk containers. Dairy equipment sterilisation. Apricot pulp containing F.—See XIX.

See also A., I, 326, Determining traces of Mn in natural waters. III, 525, Toxic effects of solvents.

#### PATENTS.

**Air conditioning and ventilation.** CARRIER ENG. CO., LTD. (B.P. 482,210—11, 24.9.36. U.S., 5.6.36).—Units are constructed so that a separate stream of air can be taken from the outside atm., passed over the condenser and compressor, and discharged to an innocuous space while the ventilating air is taken partly from the outside and partly from the room (in variable proportion) and is passed through the conditioner into the room. B. M. V.

**Air cleaner.** F. A. DONALDSON (U.S.P. 2,072,548, 2.3.37. Appl., 17.12.34).—The filter comprises a stack of corrugated discs of fine mesh, kept moist from an oil well at the bottom, on which the air impinges from the axial inlet. B. M. V.

**Air cleaner.** BURGESS BATTERY CO., ASSECS. OF E. W. GRAHAM (B.P. 482,797, 29.6.37. U.S., 14.7.36).—The filter mass is of gimped ribbon or wire and is kept moist by entrainment from a sump of liquid. B. M. V.

**Air cleaners.** GEN. MOTORS CORP. (B.P. 482,249, 13.8.37. U.S., 5.9.36).—Apparatus of the type in which the flowing air picks up a spray of oil and the oil and dirt are trapped on a filter is described. B. M. V.

**Filters for use in respirators and the like.** H. L. GREEN (B.P. 482,137, 25.9.36).—A filter for arresting finely-divided, liquid or solid particles is composed of 5—30% of opened, fine mineral fibres separated and supported by coarser fibrous material of a different character, e.g., 20% of dry white crysotile or blue crocidolite asbestos and 80% of combed merino wools. B. M. V.

**Removal of fluorides from water.** R. H. MCKEE and W. S. JOHNSTON (U.S.P. 2,072,376, 2.3.37. Appl., 14.11.34).—The  $\text{H}_2\text{O}$  is passed through acidified active C obtained from the black ash of alkaline paper-pulp manufacture. The C is regenerated by treatment with 1—5% NaOH solution followed by 0.01% acid, the  $p_H$  during absorption being about 3, and if necessary the  $\text{H}_2\text{O}$  is acidified before and neutralised after treatment. B. M. V.

**Air-purifying devices, particularly air-purifying canisters for use in respirators.** MINES SAFETY APPLIANCES CO. (B.P. 482,768, 19.12.36. U.S., 19.12.35).