# **BRITISH CHEMICAL AND PHYSIOLOGICAL ABSTRACTS**

## B.-APPLIED CHEMISTRY

APRIL, 1938.

## I.-GENERAL; PLANT; MACHINERY.

Apparatus for annealing, fusing, and calcining. E. RYSCHKEWITSCH (Chem. Fabr., 1938, 11, 97—101). —A lecture. The various types of furnaces available to industry, using solid, liquid, or gaseous fuels, or electrical heating, and their special uses, are reviewed. I. C. R.

Special atmospheres for industrial furnaces. W. A. DARBAH (Indust. Heating, 1937, 4, 26-30, 38, 106-110).—A review. R. B. C.

Thermostatical investigation of high-temperature drying. M. TAMURA (Trans. Soc. Mech. Eng. Tokyo, 1936, 2, 138—148).—Results on drying tests with unglazed ceramic spheres are recorded.

CH. ABS. (e)

Drying [materials] by forced [air] draught at low temperatures. E. LEDOUX (Chaleur et Ind., 1937, 18, 159—164).—Methods employed for drying air, e.g., cooling and treatment with  $H_2O$  adsorbents, are discussed. R. B. C.

Effect of tube arrangement on convection heat transfer and flow-resistance in cross-flow of gases over tube banks. O. L. PIERSON (Trans. Amer. Soc. Mech. Eng., 1937, 69, 563-572).--Measurements of the convection heat-transfer rate between gases and tube banks, with corresponding pressure drop for transverse flow, were made to determine the effect of varying the spacing of tubes of identical size. 38 tube arrangements differing in centre-to-centre spacing in the direction of flow and transversely were tested. The spacing for both inline and staggered tube rows varied from the closest practicable to 3 tube diameters. Each bank, with two exceptions, comprised 90 tubes arranged in 10 rows transverse to the air stream, each row containing 9 tubes (0.31 in. diameter, uniformly heated throughout their length) from which heat was transferred to a cool air stream. Heat input to the bank was kept const. at 72,000 B.Th.U./hr. while the air mass flow varied. The tests showed that both convection heat transfer and flow-resistance of tube banks vary markedly with changes in tube arrangements, no simple statement of the variation being possible.

R. B. C.

Effect of equipment size on convection heat transfer and flow-resistance in cross-flow of gases over tube banks. E. C. HUGE (Trans. Amer. Soc. Mech. Eng., 1937, 59, 573-581).—To establish the effect of tube size as a factor in heat transfer and pressure drop for gases flowing transversely over tube banks of a given tube arrangement, experiments were made with several tube sizes. 9 tube arrangements, defined by centre spacings in the direction of flow

and transversely, were used with tubes 1 in. and 16 in. in diameter, the spacing ranging from a min. of  $11 \times$ 14 to a max. of  $2 \times 3$  diameters with 10 rows in the direction of flow both in-line and staggered, and 10 tubes wide except for one case of 8 tubes wide. In addition, 3 arrangements of tubes of 2 in. diameter were used in banks of 10 rows deep and 9-15 tubes wide. For banks of the smaller tubes heat was transferred from hot gases outside to cold H<sub>2</sub>O inside, whilst for those of 2-in. tubes heat was transferred from condensing steam to air outside. Vals. of gas-boundary conductance and pressure drop for several identical tube arrangements and spacing and tube sizes, with heat flow inward and outward, are given. R. B. C.

Data on flow-resistance and heat transfer in cross-flow of gases over tube banks. E. D. GRIMISON (Trans. Amer. Soc. Mech. Eng., 1937, 59, 583—594).—The experimental data obtained by Pierson and by Huge (preceding abstracts) are summarised and discussed. R. B. C.

Heat transmission in air preheaters. W. GUMZ (Feuerungstech., 1937, 25, 327–329).—A review. R. B. C.

Heat-transmission coefficients of heat exchangers. K. SCHIEBL (Z. Ver. deut. Ing. Beih. Verfahrenstech., 1937, 93—97).—Heat exchangers of various designs and applications, e.g., a  $H_2O$  preheater heated by flue gas and an air preheater heated by steam, were investigated. For each apparatus the heat-conductivity (k) coeff. is plotted against the rate of flow of the heated material. In steamheated juice heaters k increases linearly with increase in velocity of the juice. R. B. C.

Celite-type, high-temperature, thermal conductivity apparatus. C. E. WEINLAND (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 269-276).-Recent improvements in the design of apparatus of the hot-plate type are diagrammatically described.

R. B. C.

Measurement of thermal conductivity of insulating material encased in sheet metal. I. S. CAMMERER (Wärme, 1937, 60, 765—767).—Difficulties involved in the measurement *in situ* of the k of lagging material, *e.g.*, on steam piping covered by metal sheathing, are discussed. Tests showed that the differences in the emissivities of dull, polished, and painted sheathings seriously affect the results obtained when using a heat-flow meter of the thermocouple type. Errors may be minimised by wrapping the casing with thin paper in the vicinity of the flow meter. R. B. C. Verification of Rayleigh's criterion. P. VER-NOTTE (Compt. rend., 1938, 206, 46–49).—The val. of the criterion,  $\triangle$ , expressing the limiting conditions for pure conduction of heat through a layer of liquid, is ~ 24 (previously accepted val. 1709).

A. J. E. W.

Conversion tables for thermal units. Discussion of the use of the thermal ohm as a unit of thermal resistance. H. E. WHITE (Bull. Amer. Ceram. Soc., 1938, 17, 17-20).—The thermal ohm is defined as a unit which allows 1 watt of heat energy to flow through 1 cm. cube of substance under a gradient of 1°. Extensive interconversion tables are given. J. A. S.

Mechanical device [slide rule] for rapid calculation of cooling power and air velocity from katathermometer readings. D. F. VINCENT (J. Ind. Hyg., 1937, 19, 571—573).—The straight sliderule principle is employed, in which no visualisation of points on a scale is involved. All the calculations involved are performed with 5 logarithmic scales suitably coupled together. E. M. K.

(A) Waste-Symposium on waste-heat boilers. heat boilers in the steel industry. A. F. WEBBER. (B) Waste-heat boilers. W. GREGSON. (C) Wasteheat recovery using thimble-tube and water-tube boilers. E. F. SPANNER. (D) Waste-heat re-covery in gas-works practice. J. W. REBER (J. Inst. Fuel, 1937, 11, 81-84, 84-89, 89-94, 95-96). -(A) The application of waste-heat boilers, more particularly of the H<sub>2</sub>O-tube type, to open-hearth furnaces is discussed. It is considered that with the increasing tendency in Fe and steel works for centralisation of steam- and power-generating plant, the val. of the waste-heat boiler as a means of enabling mechanical draught to be used is gradually superseding its val. as a steam producer and heat-recovery agent.

(B) The two main factors, viz., gas temp. and draught, normally determining waste-heat boiler practice and design are discussed in detail. The relative merits of the  $H_2O$ -, fire-, and thimble-tube boilers are compared, and typical installations of each are illustrated.

(c) A description is given of the thimble-tube boiler and of its application for waste-heat recovery from, more particularly, Diesel engine exhaust gases. Reference is also made to a composite boiler comprising a thimble-tube boiler with a  $H_2O$ -tube waste-heat unit, which has been recently developed and can be used in conjunction with two-stroke Diesel engines.

(D) The combined thermal efficiency of carbonising plant and steam generator is higher for non-recuperative settings with max. waste-heat recovery in waste-heat boilers than with max. recuperation or regeneration and partial steam generation, if any, by waste-heat boilers. The method of steam generation by a combination of waste-heat recovery and producergas firing combined with re-circulation of waste gases from the induced-draught fan outlet back to the point where combustion of the producer-gas takes place is discussed. H. C. M.

Testing of a steam boiler heated by blastfurnace gas. E. SENFTER (Arch. Eisenhüttenw., 1938, 11, 307—313).—Tests often have to be carried out under conditions differing from those specified in a maker's guarantee, and in the present case there was the additional difficulty that direct measurement of the fuel gas was impossible, and the thermal efficiency had to be deduced from the wall losses and observations of the temp. and composition of the flue gases. The method of obtaining a satisfactory comparison under such conditions and the accuracy attainable are discussed in detail. A. R. PE.

Fuel and power generation. A. STUBBS (J. Inst. Fuel, 1937, 11, 141—144).—Recent developments in central power-station practice are reviewed, reference being made to the Velox and Loeffler boilers. The possible future development of the utilisation of gas for power production is also discussed. H. C. M.

Readily calibrated laboratory apparatus for measuring amount of steam. K. HOŁOWIECKI (Przemysł Chem., 1937, 21, 297).—Apparatus is described. R. T.

Determination of magnetic iron oxide as a measure of corrosion of boiler-superheater elements. R. C. ULMER (Ind. Eng. Chem. [Anal.], 1938, 10, 24).—The Fe<sub>3</sub>O<sub>4</sub> on superheater tubes is determined by measuring their loss in wt. when immersed in a solution containing 100 pts. by wt. of conc. HCl, 2 of Sb oxide, and 5 of SnCl<sub>2</sub>. L. S. T.

Determination of hardness of water by direct titration [with potassium palmitate]. R. T. SHEEN and C. A. NOLL (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 609—614).—A routine method, using 0.02N-K palmitate and phenolphthalein as indicator, is described. Data show that the method is slightly more accurate than Clark's soap method, the accuracy of which is improved by neutralising the sample before titration. Poor end-points are obtained when using K laurate or oleate; K stearate gives erratio results when titrating Mg. R. B. C.

Determination of dissolved oxygen [in boiler feed-water]. T. H. DAUGHERTY (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 615—633).—The various proposed modifications of the Winkler method, particularly the Schwartz-Gurney A and B doubletitration modifications (cf. *ibid.*, 1934, 34, II, 796), are critically discussed from the viewpoints of sensitivity, accuracy, and applicability. An adaptation of method B, claimed to give accurate results, is described. R. B. C.

Drop-titration in boiler feed-water supervision. C. BLACHER (Wärme, 1937, 60, 689—693). —Drop-titration, using a decimal dropping flask, is a compromise between speed and simplicity and reasonable accuracy. The technique employed and methods for obtaining drops of const. size are described. R. B. C.

Acid treatment of cooling water to prevent scale formation. D. W. HAERING (Oil and Gas J., 1938, 36, No. 35, 46, 48).—Treatment with  $H_2SO_4$  is disadvantageous, since it favours pptn. of  $CaSO_4$  and  $SiO_2$ , which have a low heat-transfer coeff. Both CaO and zeolite treatment reduce the solids content of  $H_2O$ , and a combination of the two gives best results. "Chrome-glucosate" should be added to treated  $H_2O$ . J. W.

Applications of the polarising microscope to water-conditioning problems. E. P. PARTRIDGE (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 600-608). --Possible applications, *e.g.*, examination of boiler scale and identification of cryst. substances, are reviewed. R. B. C.

Comparison between the open and closed cycle of dry-grinding in laboratory ball mills. D. N. LIFLYAND and A. G. TUNTZOV (Inst. Mech. Obra. Polez. Iskop. "Mechanobr," 1935, 1, 256— 301).—A charge occupying 12% of the vol. of the mill gave the best results in either type of mill. For the same final grain size the finished product from the open-cycle mill contained more over-ground material than in the case of the closed-cycle mill.

Сн. Abs. (e)

Comparison between the open and closed cycle of wet-grinding in laboratory ball mills. A. G. TUNTZOV (Inst. Mech. Obra. Polez. Iskop. "Mechanobr," 1935, 1, 302—347).—Tests on wetgrinding of Fe ore and quartz in small ball mills showed that a closed-cycle mill has twice the useful capacity of an open-cycle mill of the same size. Optimum results were obtained in each case under the following conditions : rate of mill velocity 85— 90% of the crit. val., N, given by  $N = 300/\sqrt{(R-r)}$ , R and r being the radii in mm. of the ball mill and balls, respectively; ball charge 45—50% of the mill vol.; ore charge 12% of the mill vol.; ratio solid : liquid = 1:1. CH. ABS. (e)

Colloid grinding with a ball mill. A. H. M. ANDREASEN and S. BERG [with E. KJAER] (Kolloid-Z., 1938, 82, 37-42).—Experiments on the wet grinding of two commercial pigments,  $BaSO_4$  and rouge, in a laboratory ball mill show that under favourable conditions 50% of the  $BaSO_4$  and 13% of the rouge is reduced to colloidal size (cube edge <0.1  $\mu$ .) in 3 days. The ratio (increase of surface)/(energy consumption) increases with decreasing particle size. The best results were obtained with steel balls of small size (3.9 mm, diameter). Larger steel balls are less effective, whilst porcelain balls (22 mm.) were very ineffective. F. L. U.

Factors influencing particle size and shape in grinding. L. T. WORK (Bull. Amer. Ceram. Soc., 1938, 17, 1-5).—The measurement of particle size and shape, the effect of the nature of the material and the type of mill on the distribution of particle size, and the process of classification are briefly reviewed. J. A. S.

Apparatus for testing crushing strength of granules. E. F. HARFORD (Ind. Eng. Chem. [Anal.], 1938, 10, 40-41).—Application of the apparatus (described) in the testing of pharmaceutical products, foods, fertilisers, or fuels is indicated.

L. S. T. Theory of sampling granular material for determination of size distribution. A. B. MAN-NING (J. Inst. Fuel, 1937, 11, 153-155).—The theory of coal sampling for ash determination developed previously (B., 1936, 224) has been extended to include sampling for determination of size distribution. The formulæ derived are applicable, not only to coal, but to any granular material. A nomogram is given which can be used to obtain the wt. of gross sample giving a predetermined accuracy when the screen analysis is known approx. H. C. M.

Flow [of liquids and gases] through filter layers. W. BUCHE (Z. Ver. deut. Ing. Beih. Verfahrenstech., 1937, 155—158).—The theory is summarised. R. B. C.

B.-p. elevation of technical solutions. K. KIENZLE (Z. Ver. deut. Ing. Beih. Verfahrenstech., 1937, 135—138).—Data for aq. NaCl, KOH, sugar, etc. show that Raoult's law is not applicable. Dühring's rule is valid for pressures commonly used in evaporation technique. R. B. C.

New economy in evaporation. J. D. COMPAIN (Int. Sugar J., 1937, 39, 465-466).—A new quadrupleeffect evaporator recently installed at Central Senado, Cuba, has a heating surface of 30,000 sq. ft., distributed as follows: 1st and 2nd bodies, 8700 sq. ft. each, tubes 7 ft.  $\times$  13 in.; and 3rd and 4th, 6300 sq. ft. each, tubes 5 ft. 6 in.  $\times 1\frac{3}{4}$  in. Special points relating to its construction are that its bodies are of welded steel and its tubes of arsenical Cu, that there are no valves for the isolation of individual bodies, and that a reversed system of cleaning is used. It has a two-flow calandria system, with one steam inlet and two gas outlets, and feeding is automatic. An all-Cu helical deflexion type of "save-all" and a condenser of special countercurrent type have been specified. Liberally thick material is used throughout. J. P. O.

Evaporator tube cleaning with fermented molasses. A. E. CHAPPELL (Int. Sugar J., 1937, 39, 484).—Details are given of the technique practised in removing scale from evaporator tubes in Queensland, which consists of a boiling-up treatment with "second-grade ferment" at 18° Brix, followed by spraying with "first-grade" or unused fermented wash also at 18° Brix. Spraying for long periods, however, is not recommended, but if used intermittently no serious pitting of the tubes need be expected. The main advantage of the system is the small amount of labour necessary, only one man per 8-hr. shift being required. J. P. O.

Vibration viscosimetry. R. AUERBACH (Kolloid-Z., 1938, 82, 24—25).—The time of flow (t) of viscous suspensions of Portland cement or SiO<sub>2</sub> in H<sub>2</sub>O through an Ostwald viscosimeter decreases when the latter is caused to vibrate 100 times per sec. The diminution of t increases with the amplitude of vibration, and this effect is the more marked the higher is the  $\eta$  of the suspension. The t vals. are reproducible. In the case of dry sand t increases when the sand-glass is vibrated, and also increases with increase of amplitude. F. L. U.

Technical measurement of viscosity. C. G. VERVER and J. J. LEENDERTSE (Chem. Weekblad, 1938, 35, 147—149).—A reply to Engelhard (cf. B., 1937, 1142). S. C. Cryohydric method for determination of moisture. N. V. MIKULINA, A. I. KARELIN, and A. P. SCHACHNO (Koks i Chim., 1934, No. 4, 60—64).—The cryohydric method is as accurate as are direct methods of distillation with  $C_6H_6$  or  $C_6H_3Me_3$ , or drying in N<sub>2</sub>. Abs. EtOH is not necessary and kerosene should be replaced by  $C_6H_6$  in testing highmoisture fuels. CH. Abs. (e)

Bureau of Mines midget impinger for dust sampling. J. B. LITTLEFIELD, F. L. FEICHT, and H. H. SCHRENK (U.S. BUR. Mines, 1937, Rept. Invest. 3360, 4 pp.).—A small impinger for determining the concn. of dust in mine air etc. is described. The instrument is almost identical in principle and design with the Greenburgh–Smith impinger, sampling being effected by drawing the dust-laden air through a tube containing EtOH, and then counting the no. of dust particles remaining in suspension in the liquid. H. C. M.

Range of electrotor meter [for dust sampling] demonstrated by dark-field count. S. C. BLACK-TIN (J. Ind. Hyg., 1937, 19, 579-589).-The recording area of this instrument revolves around an axis parallel to the plane of ingress of the sample. The six stationary ingresses are at different distances from the centre of rotation of the disc; this provides a series of deposits in which the dust particles are spread over areas of varying extent (0.5-90 sq. mm.). By using the areas singly or combined a greater range is obtained; a density of dispersion up to 1,500,000 particles per c.c. is countable. The instrument is small, portable, and gives records suitable for visual estimation of dustiness. Photomicrographs of records are included. E. M. K.

Production and properties of gas colloids. A. WINKEL (Z. Ver. deut. Ing. Verfahrenstech., 1937, 83—86).—Conditions governing the formation of colloidal aërosols by condensation from the vapour phase are discussed. R. B. C.

Solid friction. J. MERCIER and J. DUBOIS (Compt. rend., 1937, 205, 964—966).—Preliminary observations on the friction coeff., K, between two solid surfaces in relative motion are reported. Curves relating K to pressure or velocity become more regular at the higher vals.; irregular results are obtained, especially at low velocities. K decreases rapidly with increasing velocity, generally passing through a sharp min. and thereafter rising. The influence of hardness and degree of polish of the surfaces has also been investigated. E. S. H.

[Furnace for] combustion of bagasse. Grinding wood charcoal. Converting  $\eta$  vals.—See II. Thermal transmission of fabrics. Vac. washers v. diffusers. Colour measurement.—See V. Saturators for making  $(NH_4)_2SO_4$ . Utilisation of thermal energy of the sea.—See VII. Pyrometry and refractories.—See VIII. 9% Cr steel. Metals for plant. Corrosion of tubes in heaters etc. Refrigeration.—See X. Engineering in soap industry.—See XII. Machinery varnishes. Refrigerator enamels.—See XIII. Rubber-lined vessels.—See XIV. Clarifying cane juices.—See XVII. Heat-exchange pasteuriser. Heat economy in dairies. Refrigerating plant for dairying.—See XIX.

See also A., I, 153, Prep. of soft  $H_2O$ . 159, Recorder for heat radiation.

#### PATENTS.

Regenerative furnaces. H. RAPPOLD, H. SAUR-BIER, and ZIMMERMANN & JANSEN GES.M.B.H. (B.P. 477,696, 7.7.36).—Single-purpose valves for reversing are operated in correct sequence to prevent gas and flue valves at one end from being open together. B. M. V.

Furnace with helical hearth. P. FLAJOLIET-BRACQ (U.S.P. 2,067,823, 12.1.37. Appl., 21.6.35. Renewed 21.11.36. Fr., 6.7.34).—A furnace similar in principle to a multihearth roaster but having a single helical hearth is provided with a rabble shaft comprising a rotatable cylindrical chamber guided by a helix and supported on a hydraulic ram. The hydraulic cylinder is allowed to empty during the descent or raking stroke, but on reversal of the motor for rotating the hollow shaft the hydraulic pump is started and the rake arms are rotated 90° to bring the rakes out of contact with the ore. B. M. V.

Furnaces for solid fuels, particularly fuels of inferior quality. H. ZIEGELMEYER (B.P. 478,451, 18.11.36. Austr., 19.11.35).—The fuel is gradually distilled in a fuel shaft by heat transmitted from a combustion shaft through a sloping dividing wall. The evolved gases pass from one shaft to the other through a constriction at the bottom, just before which point primary air is admitted. B. M. V.

Apparatus for treating [casting] materials under reduced pressure. G. MARS (B.P. 477,513, 30.6.37).—A coreless induction furnace, pouring channel, and mould are contained in one vac.-tight casing. B. M. V.

Apparatus for distillation of schists, shales, and other solid materials. Soc. Gén. DE Fours à Coke, Systèmes Lecoco, Soc. Anon. (B.P. 477,491, 23.12.36. Fr., 3.1.36).-Distillation of materials of low caking properties is effected in vertical retorts through which the descent of material is caused to be at a uniform rate over any horizontal crosssection by forming the walls with expansions and contractions so that the formation of arch-like masses is promoted, and provision of an axial hollow agitator fitted with an external worm rotated in such a way as to delay the descent of the central material. The agitator also forms the draw-off for volatile matter, and the bore is divided into two parts by a piston so that CO<sub>2</sub>, H<sub>2</sub>S, etc. emitted at low temp. may be kept separate from oils etc. emitted at higher B. M. V. temp.

Retort and setting. C. E. HAWKE, Assr. to CARBORUNDUM CO. (U.S.P. 2,067,085, 5.1.37. Appl., 30.10.35).—A setting of vertical retorts comprises side walls of conducting refractory material (e.g., SiC) kept gastight by horizontal pressure from the end walls, the pressure being preferably applied (by various devices described) along narrow zones immediately in line with the heat-transmitting walls. B. M. V. Rotary kiln control arrangement. A. SMITH, Assr. to GEN. ELECTRIC Co. (U.S.P. 2,068,574, 19.1.37. Appl., 12.12.34).—The kiln is driven at const. speed and is provided with a closed wind box at the combustion end which is supplied by a fan (motor compressor). The fan and fuel-supply pump are controlled by a photoelectric cell trained on the clinkering zone. The air may be drawn through an air-locked cooling tower. B. M. V.

Means for supporting pottery and other goods during firing processes. W. E. MADDOCK (B.P. 477,486, 13.11.36).—Trays are steadied by pillars passing through them and are supported by distance pieces around the pillars. B. M. V.

Digester. J. FLETCHER, ASST. to BABCOCK & WILCOX Co. (U.S.P. 2,064,901, 22.12.36. Appl., 25.5.35).—The pulp (e.g., for paper) in a digester is caused to move uniformly in one direction (upwards) by means of an external circulation of the liquid through a heater and pump. The draw-offs in the upper part of the digester comprise a no. of arcuate pipes arranged around the shell, the perforated endparts forming the inlets being of equal length and evenly spaced around the circunference. The reheated liquor is returned to the apex of the inverted conical bottom. B. M. V.

Heat-treatment of commodities by heated fluids such as air, gas, or steam. F. SHAW & Co., LTD., R. T. COOKE, and E. MORRIS (B.P. 477,607, 2.6.36).—A pressure-tight vessel for vulcanising or the like is provided with internal heating means, a circulating fan, and dampers to direct the circulation to desired points. B. M. V.

Drying apparatus. R. V. HEUSER (U.S.P. 2,067,920, 19.1.37. Appl., 6.2.35).—In a desiccator, a plate or plates of non-deliquescent absorbing material (SiO<sub>2</sub> gel or activated  $Al_2O_3$  with gypsum binder and fibrous filler) has/have embedded electrical resisters for regeneration purposes; in use, the internal atm. is circulated only by the difference in d of dry and humid air. B. M. V.

Drying apparatus. B. OFFEN (B.P. 477,684, 1.4.36).—Sheet or web material, e.g., inked web, is passed through an enclosure and while therein is subjected to a current of drying air along its surface and also to separate high-pressure jets of air to break down the surface films. A final treatment with cooled compressed air may be given. B. M. V.

Dryer. W. CLEMENS (U.S.P. 2,066,251, 29.12.36. Appl., 25.10.35).—Beans or the like are caused to travel zigzag down inclined perforated baffles by vibrating the whole tower horizontally. The beans fall countercurrent to a gas stream which is hottest at the bottom. B. M. V.

Baking and drying ovens. A. STUDER (B.P. 477,876, 28.5.37).—A furnace for heating oil or other heat-transmitting fluid is disposed below the ovens and the hot oil circulates through pipes around the ovens. B. M. V.

Heating systems for baker's ovens and other heat-treatment chambers. O. SCHMIDT, F. HAUG, and BAKER PERKINS, LTD. (B.P. 478,682, 24.7.36. Ger., 27.7.35).—A main circulation of gaseous heating medium is passed twice longitudinally through the oven and a fan; a part of the gases is tapped off from the outlet of the fan and then mixed with very hot combustion gases in an oil-burning device. The hot mixture is returned to the main circulation at a no. of points within the oven. B. M. V.

Apparatus for effecting contacting actions or chemical transformations in fluids. HOUDRY PROCESS CORP., Assees. of E. J. HOUDRY (B.P. 478,270, 17.7.36. U.S., 27.7.35).—In a catalytic converter the arrangement of return-type heat-exchange tubes, tube sheets, and steadying grid is described. B. M. V.

Contact masses and regeneration thereof. HOUDRY PROCESS CORP., Assees. of E. J. HOUDRY (B.P. 478,216, 20.7.36. U.S., 7.8.35).—In a contact mass comprising a blend of silicious materials in fragments, the SiO<sub>2</sub>: Al<sub>2</sub>O<sub>3</sub> being < 3.5:1, and capable of regeneration by O-containing medium, the temp. of regeneration is lowered by admixture of > 1.5% of a promoter selected from Ni, Cu, Co, Cr, Fe, Mn (preferably), or their oxides. Both on-stream and regeneration temp. are within the range 400— 537° and the latter is usually < 83° higher than the former. B. M. V.

Heat-transfer apparatus. C. W. STANCLIFFE (B.P. 478,282, 21.7.36).—Soldered joints are arranged so that no mechanical strain is taken by the solder, and if either of the parts is incapable of taking solder it is coated with solderable metal by spraying.

Plate heat exchanger. AKTIEB. ROSENBLADS PATENTER (B.P. 477,735, 29.1.37. Swed., 1.2.36). —Sheets of metal, alternately plain and corrugated, are wound spirally together. B. M. V.

Plate heat-exchange apparatus. E. PRESTAGE (B.P. 477,999, 13.7.36).—The intended flow is in the form of a thin film straight across from inlet to outlet over each plate. The claims relate to means for attaining this. B. M. V.

Fluid heat-exchange apparatus. R. SCHELLEN-BERGER, Assr. to BABCOCK & WILCOX CO. (U.S.P. 2,064,954, 22.12.36. Appl., 2.2.34).—Slag- (ash-) tapping arrangements for a pulverised-fuel boiler (or other) furnace are described. B. M. V.

Manufacture of heat- and sound-insulating material. B. NEUHOF (B.P. 477,763, 3.4.36).— Fibrous material, e.g., slag wool, is wetted-out (the solution being a binder if desired), an agent for increasing the vol. is added, and the felt moulded without much pressure. A no. of substances for both purposes are claimed. B. M. V.

Manufacture of heat- and sound-insulating materials from peat. K. BRAMMING and W. HENRIKSEN (B.P. 477,919, 13.7.36).—Humic acids and salts are removed by leaching with a basic aq. solution, and the residue is heated to a temp. (200°) sufficient to cause bituminous matter to flow and impregnate the fibres. B. M. V.

Pyrometers. W. J. CLARK, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 477,365, 28.6.36).—For the measurement of high-temp. radiation, a powergenerating photo-electric ("photo-voltaic") cell is

B. M. V.

operated under such conditions (specified) that it has a negligible temp. coeff., *i.e.*, is unaffected by the temp. of itself and its surroundings. B. M. V.

Cooling apparatus. C. F. RITCHIE, W. A. GALE, and W. H. ALLEN, ASSTS. to AMER. POTASH & CHEM. CORP. (U.S.P. 2,066,577, 5.1.37. Appl., 7.11.32).—A scheme for the pptn. of KCl apart from borax comprises: (1) a vac. evaporator-cooler, (2) forced circulation [through (1)] to which fresh brine is added, (3) a second evaporator of smaller capacity, also under vac., but operated with only single flow, (4) a sludge thickener. The flow in (1), (3), and (4) is guiet. B. M. V.

Cooling or solidifying treatment of liquid, semi-liquid, or plastic substances. W. H. ALLEN (B.P. 477,488, 2.12.36).—Glue or the like is fed continuously on a conveyor band by spaced feedrollers. These may be  $H_2O$ -cooled, the underside of the band may be sprayed with  $H_2O$  (mixed with air), and cooled rollers may be placed above the layer of glue. B. M. V.

Cooling of liquids. H. HOWARD, Assr. to DORR Co., INC. (U.S.P. 2,064,833, 22.12.36. Appl., 10.3.33. Can., 30.3.32).—Slurry, e.g., the exothermic mixture of phosphate rock, dil.  $H_3PO_4$ , and conc.  $H_2SO_4$ , is cooled by evaporation caused by bubbling lowpressure air through the upper part of the slurry only, the depth of immersion of the bubbling device being shallow but sufficient to ensure that all air bubbles make contact with the liquid. B. M. V.

Floating calandria. J. J. MUNSON and C. C. WIGGIN, sen. (U.S.P. 2,065,147, 22.12.36. Appl., 25.5.36).—A calandria is non-rigidly supported in the shell, being mainly located by its steam-inlet pipe. B. M. V.

Apparatus for use in connexion with the treatment of water liable to variations in its rate of flow. CANDY FILTER CO., LTD., F. P. CANDY, and C. E. G. SIMMONS (B.P. 477,520, 25.6.36).—In a proportional dosing system, a control is regulated by the drop in a Venturi throat in the main stream and the pumped fluid works the dosing apparatus.

B. M. V.

Brine-recovery apparatus for water softeners. H. L. BOWERS, Assr. to PERMUTIT Co. (1934) (U.S.P. 2,065,962, 29.12.36. Appl., 17.10.34).—In a baseexchanger, electro-hydraulic controls are described for changing over the flows thus: once-used brine from a container of definite vol. through the softener to waste, and fresh brine through the softener to the container. The liquid level in the container is the primary control. B. M. V.

Purification of wet steam. E. M. FRANKEL (U.S.P. 2,067,080, 5.1.37. Appl., 7.12.35).—The steam is scrubbed with  $H_2O$  produced by subsequent condensation of part of the clean steam by indirect contact with the boiler feed- $H_2O$ , the scrubbing medium being therefore  $\infty$  the steam output.

B. M. V. Conical-type [stone] breakers. F. KRUPP GRUSONWERK A.-G. (B.P. 477,762, 21.10.37. Ger., 4.11.36).—The mass of the crushing cone is centrifugally balanced. B. M. V. Rock crusher. J. RASMUSSEN (U.S.P. 2,065,612, 29.12.36. Appl., 1.2.35).—A crusher in which the swing jaw (pivoted at the bottom) receives thrust substantially directly and horizontally from the eccentric is described. B. M. V.

Lever jaw crusher. C. J. ZILLGITT (U.S.P. 2,065,784, 29.12.36. Appl., 11.12.33).—The swing jaw is on the short arm of a lever and an eccentric operates the long arm. B. M. V.

Gyratory crusher. S. W. TRAYLOR, jun., and E. H. BEYHL, Assrs. to TRAYLOR ENG. & MANUFG. Co. (U.S.P. 2,066,281, 29.12.36. Appl., 11.3.31).— The safety yielding and adjusting means are on the moving part. Lubrication is described. B. M. V.

Crushing and grinding mill. J. J. MOROH (U.S.P. 2,065,821, 29.12.36. Appl., 28.11.32).—An upper crushing zone is operated by loose rings on staggered eccentrics on a vertical shaft and is separated from the lower grinding zone by a space through which the material is forced by a screw on the shaft. The grinding zone is of the coffee-mill type.

B. M. V. Hammer mill. C. E. EVERETT, Assr. to MASSEY-HARRIS Co. (U.S.P. 2,066,615, 5.1.37. Appl., 18.12.33).—A feeding device for roughage or the like is described. B. M. V.

Hammer mill. A. C. LINDGREN and C. R. RANEY, ASSTS. to INTERNAT. HARVESTER Co. (U.S.P. 2,068,383, 19.1.37. Appl., 23.2.33).—The shape and position of the feed opening, screen, and outlet are specified. B. M. V.

Hammer mill. W. J. EHRSAM, Assr. to J. B. EHRSAM & SONS MANUFG. Co. (U.S.P. 2,068,599, 19.1.37. Appl., 9.8.33).—Two rotors are arranged abreast (shown as rotating in the same direction), only one of which receives feed material; the axes are spaced apart only slightly > the diameter of the hammer path and therefore < the diameter of curvature of the casing and cover elements. A pneumatic separator is provided above. B. M. V.

Tube mill. J. L. C. MCKAY-CLEMENTS, Assr. to WABI IRON WORKS, LTD. (U.S.P. 2,066,138, 29.12.36. Appl., 12.2.34).—A renewable lining is described, individual projecting pieces being jammed in channels. B. M. V.

Attrition mill. R. G. QUEHL, ASST to STRONG-SCOTT MANUFG. Co. (U.S.P. 2,068,071, 19.1.37. Appl., 10.6.32).—A pair of grinding discs (with fanblading on their backs) are rotated in opposite directions by electric motors. The ground material is borne away pneumatically by air which has been used to cool the motors. B. M. V.

Mills for grinding, refining, finishing, and other processes. H. E. Cox (B.P. 478,258, 15.7.36). —In a mill comprising a roll with too breast bars and a secondary roll making contact between the bars, the first breast bar may be put out of action.

B. M. V.

Pulveriser. H. R. COLLINS, Assr. to BABCOCK & WILCOX CO. (U.S.P. 2,066,139, 29.12.36. Appl., 4.11.31).—Mills of the ball-race type having 2, 3, or 4 superposed rings of balls are described. B. M. V. Screening apparatus and the like. W. J. PARKS (U.S.P. 2,066,362, 5.1.37. Appl., 22.5.34).—The screen is vibrated in a vertical plane by an eccentric shaft, and the wt. of the former is balanced by masses in flywheels on the latter. B. M. V.

Screening device. H. R. RAFTON, Assr. to RAFTON ENG. CORP. (U.S.P. 2,066,364, 5.1.37. Appl., 2.5.29).—A gyratory, pan-shaped screen is provided with an outlet for oversize in the side wall above the screen surface and with a cover in which the feed aperture is diametrally opposite the oversize outlet and under that aperture is a perforated spreader. B. M. V.

Apparatus for separating materials. C. A. WENDELL (U.S.P. 2,068,783, 26.1.37. Appl., 29.9.32). —An inclined screen is vibrated (200 impulses per min., amplitude 0.1 in.) and a current of air sucked upwards through the screen and material to assist the action and remove dust. B. M. V.

Pneumatic apparatus for separating granular substances. A. B. HELBIG, Assr. to V. B. REICH-WALD (U.S.P. 2,067,321, 12.1.37. Appl., 6.12.33. Ger., 10.12.32).—An air separator with separate motors for the distributing disc and fan is described. B. M. V.

Cyclone dust separators. J. O. BOVING and H. C. REEVES (B.P. 477,621, 14.7.36).—In a cyclone separator a conduit leads to a point of reduced pressure on the axis of the cyclone chamber from a comparatively dust-free zone in the lower dustcollecting chamber, whereby a current of gas is produced from the former to the latter chamber to assist the fall of the dirt. B. M. V.

Classifying apparatus. BRIT. GECO ENG. Co., LTD., M. G. CALLOW, and C. H. RUSSELL (B.P. 478,524, 11.8.36).—A rake classifier in which the slope is widest at the bottom, tapers to an intermediate point, and is parallel at the upper part is described. B. M. V.

Driving means for oscillating apparatus such as screens, separators, or concentrators. Rex-MAN MILL Co., LTD., and E. G. L. ROBERTS (B.P. 477,949, 29.6.36).—The screen is oscillated by rotating masses so situated as to be in balance for the apparatus as a whole. B. M. V.

Determining a degree of fineness of finelydivided material. H. E. T. HAULTAIN (U.S.P. 2,065,695, 29.12.36. Appl., 6.3.33).—A pulp is caused to flow under const. head (lineal) and at const. *d* through a friction tube and the rate of outflow is measured, preferably by the reaction of a jet attached to the flexible end of the tube. B. M. V.

Separation of liquids and solids. M. D. ENGLE (U.S.P. 2,068,099, 19.1.37. Appl., 15.5.35).—Sufficient liquid is withdrawn by decantation to leave a residue having an angle of repose of approx. 90°; this is further drained by vac. (or pressure above) through a porous bottom. Meanwhile the tank and some heavy masses suspended in the residue are subjected to vibration to prevent the formation of cracks, the vibration being automatically started by partial spoiling of the vac. B. M. V. Filter. R. P. ADAMS (U.S.P. 2,068,048, 19.1.37. Appl., 28.6.35).—Air, gas, or steam is caused to swirl outside and then pass inwards through a porous pot. B. M. V.

Filters. A. C. DUNLAP (B.P. 477,740, 1.3.37).—A single filter leaf (both faces being active) for placing near the bottom of a tank of prefilt is described. B. M. V.

Filters. R. C. CAMPBELL (B.P. 478,434, 22.7.36). —In, e.g., the recovery of fine paper fibre from mill  $H_2O$ , the cylindrical surface of a rotary drum is composed of a no. of longitudinal channels covered with filter medium. The drum is partly submerged in prefilt, and when a channel containing filtrate is lifted to the crown it discharges freely by gravity through a stationary conduit, producing barometric suction. B. M. V.

Filter. W. H. PHILLIPS, Assr. to H. PRATT Co. (U.S.P. 2,068,468, 19.1.37. Appl., 31.3.34).—A twin strainer cleaned by a back-wash produced by operation of flap valves is described. B. M. V.

Filter. F. MESURAC (U.S.P. 2,066,793, 5.1.37. Appl., 5.12.35).—A filter for boiler hot-well  $H_2O$  or the like comprises a no. of superposed plates punched by a pointed punch to produce jagged openings. The protuberances, facing the flow, retain lint and stringy materials and prevent passage of rust or the like. B. M. V.

Manufacture of filter material. C. M. IRWIN, Assr. to WHYT-ROX CHEM. Co. (U.S.P. 2,066,271, 29.12.36. Appl., 27.5.35).—A germicidal filter for hard H<sub>2</sub>O comprises partly exhausted (>30% of the normal Na) zeolite impregnated with Ag (>4%). B. M. V.

Filter and heat exchanger. R. N. BURCK-HALTER and J. M. OSBURN, ASSIS. to MICHIANA PRODUCTS CORP. (U.S.P. 2,068,394—5, 19.1.37. Appl., 21.7.32).—Combined filters and coolers for the lubricating oil of internal-combustion engines are described. B. M. V.

Filtering apparatus. D. B. BANKS and P. D. BARTON, Assrs. to SUN OIL CO. (U.S.P. 2,068,257, 19.1.37. Appl., 26.11.34).—A no. of groups of vac. filter leaves are rotated in an annular trough and are lifted over a partition when passing from cakeforming to washing and over a shoot during cakedischarge. A no. of these units are superposed in a tower. B. M. V.

[Rotary vacuum] filter. W. RAISCH, ASST. to MUNICIPAL SANITARY SERVICE CORP. (U.S.P. 2,068,511, 19.1.37. Appl., 15.7.35).—Slotted, corrugated drainage surfaces are described. B. M. V.

Continuous rotary [vacuum] filter. C. S. ROBISON, ASST. to OLIVER UNITED FILTERS, INC. (U.S.P. 2,067,415, 12.1.37. Appl., 14.12.31).—An internal cellular structure preventing run-back of filtrate on to the dried cake and a trough device for feeding prefilt to near the crown of the drum are claimed. B. M. V.

Filter cartridge and cylinder. W. G. BURHANS (U.S.P. 2,068,263, 19.1.37. Appl., 18.2.35).—Arrangement of the parts of a cartridge-type filter for lubricating oil and the like to provide a by-pass is described. B. M. V.

[Revivifying] treatment of [filter] clays. D. G. BRANDT, ASST. to DOHERTY RES. Co. (U.S.P. 2,065,643, 29.12.36. Appl., 17.3.34).—A carrier gas is passed in contact with a controllably heated surface and, at the same place, the foul fuller's earth or the like is sprinkled in; oxidising gas is admitted at a no. of points in a regulable manner. B. M. V.

Centrifuge. H. O. LINDGREN, Assr. to DE LAVAL SEPARATOR CO. (U.S.P. 2,065,229, 22.12.36. Appl., 20.1.33. Swed., 23.1.32).—In a closed centrifuge an outflowing liquid cools the stuffing box, and should the supply of feed liquid fail (with consequent reduction of pressure in the feed pipe) an auxiliary cooling liquid is automatically turned through the stuffing box. B. M. V.

Centrifugal separator. A. U. AYRES, Assr. to SHARPLES SPECIALTY Co. (U.S.P. 2,067,590, 12.1.37. Appl., 12.9.32).—Liquid seals for preventing flow of gases through a centrifuge are described.

B. M. V.

Centrifugal separator bowl. G. J. STREZYNSKI, Assr. to DE LAVAL SEPARATOR CO. (U.S.P. 2,068,520, 19.1.37. Appl., 16.9.33).—An impervious bowl effects the continuous discharge of acid sludge, oil, and (the heaviest of the three) a small quantity of free  $H_2SO_4$ ; the first two pass over circular weirs in the neck, and the last through jets at the bottom extending inwards a fair distance (not as far as either of the necks) and surrounded by tubular and nearly diametral baffles extending nearly to the bowl wall.

B. M. V.

Centrifugal separators provided with (A) paring members projecting into the bowl, (B) a tiltable cover. AKTIEB. SEPARATOR, Assees. of BERGEDORFER EISENWERK A.-G. ASTRA WERKE (B.P. 477,753 and 477,761, [A] 8.6.37, [B] 10.9.37. Ger., [A] 11.6.36, [B] 16.9.36).—(A) A paring device attached to a tiltable cover is described. (B) Means for securing the cover are described. B. M. V.

Perforated basket for centrifugal machines. E. ROBERTS, ASST. to WESTERN STATES MACHINE Co. (U.S.P. 2,068,636, 19.1.37. Appl., 14.12.34).— For the centrifuging of sugar or other grain crystals likely to cause clogging, the perforations are tapered with the large end out, thus permitting the use of thick metal without hoops. B. M. V.

Apparatus for controlling the admixture of different liquids or mixtures of liquids and solids. BRIT. COAL DISTILLATION, LTD., C. MACHEN, and E. H. G. ARAM (B.P. 478,574, 17.7.36).—A crank operates a lever at variable radius, the lever operates a pawl, and the ratchet wheel drives a rotary pump. B. M. V.

Liquid-sterilising apparatus. E. HEITZMANN (U.S.P. 2,065,583, 29.12.36. Appl., 25.5.35. Argentine, 28.1.35).—The main liquid is passed through an injector. The dosing liquid is induced into the throat, and its quantity regulated by dilution with ingoing main liquid. B. M. V.

Extracting liquid mixtures in countercurrent. N. V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 477,567, 12.10.36. Holl., 10.10.35).—In the treatment of a liquid mixture countercurrent with one or two mutually immiscible extracting agents, the temp. is varied gradually so that the concn. of dissolved components in the agents remains substantially const.; the regulation is effected by both the rate of flow of a phase emerging from a settler and the rate of change of that flow. B. M. V.

Liquid diffusion apparatus. A. L. WEBRE, Assr. to UNITED STATES PIPE & FOUNDRY CO. (U.S.P. 2,068,094, 19.1.37. Appl., 26.2.36).—For effecting intimate contact with vapour or gas a column of liquid is projected upwards against baffles having apertures axially in line and progressively smaller; the deflected radial sheets of spray are caught on annular curtain baffles. B. M. V.

Apparatus for treating one liquid with one or more other liquids. H. MOORE (B.P. 477,571, 14.12.36).—Raw main liquid and the treating liquid (of different d) are pumped proportionately into a mixing pot, whence they are withdrawn by a pump and mostly returned to the same pot through an orifice creating a pressure drop so that a minor part may be bled off to a settler. Several units may be arranged in countercurrent series. B. M. V.

Method of fractional distillation. KODAK, LTD. From EASTMAN KODAK Co. (B.P. 477,955, 6.7.36).—The condensate, immediately after forming, is passed concurrently in contact with the vapour; it is then removed from contact, moved backwards, and caused to make contact again in concurrent manner, and so on many times. The contact-making stages are effected by means of liquid films on the underside of inclined annular baffles. B. M. V.

Fractionating tower. L. S. TWOMEY (U.S.P. 2,070,100, 9.2.37. Appl., 26.10.34).—A fractionating tower of the bubble-cap type is provided with a secondary column of the same type placed within it and having the same axis. The secondary column consists of several (3) sections, the diameter of each section being substantially < the one below it. The inner column is provided with an independent vapour outlet at its upper end and independent heat and reflux controls, and may be thermally insulated from the surrounding outer column.

D. M. M.

Flat-type evaporator structure. R. H. MONEY and L. M. CROSLEY, Assrs. to CROSLEY RADIO CORP. (U.S.P. 2,067,643, 12.1.37. Appl., 23.8.34).—A pair of plates are embossed to form, when welded together, headers and connecting tubes to serve as the freezing unit in a refrigerator. B. M. V.

Continuous removal of volatile matter from a liquid. A. U. AYRES and N. BREWER, ASSTS. to SHARPLES SPECIALTY Co. (U.S.P. 2,068,971, 26.1.37. Appl., 29.3.34).—The liquid, e.g., fatty oil to be dehydrated, is sprayed into a vac. chamber through jets which are always operated individually at full (or zero) rate as they are cut out one by one by a float in the supply tank should the supply diminish. B. M. V.

Desiccation of liquids. F. W. ROBISON and G. D. ELMER (U.S.P. 2,067,205, 12.1.37. Appl., 16.12.35).—Heat-sensitive fatty liquids (e.g., whole milk or cream) are evaporated at approx.  $38^{\circ}/>29$  in. of vac., with active ebullition. The vac. is broken by a supply of inert gas which is thoroughly incorporated by agitation, the temp. being lowered to  $3^{\circ}$  "to establish a gas lock"; the vac. is then reestablished and the material heated to  $63^{\circ}$  and allowed to expand on heated rolls or the like and dry while still expanding. It is then chilled and the vac. spoiled by inert gas. B. M. V.

Vacuum crystalliser and method of crystallising. H. B. CALDWELL, Assr. to SWENSON EVAPOR-ATOR CO. (U.S.P. 2,067,043, 5.1.37. Appl., 25.10.33). —The feed liquid is distributed over the walls of the vac. space to keep them free from solute. The vac. is produced by steam in an injector followed by cooling means for the combined vapours, a pump being installed for permanent gases only. Crystal sludge is withdrawn continuously through a barometric column. B. M. V.

Manufacture of finely-divided substances. SUBMARINE SIGNAL Co. (B.P. 477,646, 3.11.36. U.S., 27.12.35).—In the formation of ppts. by interaction, e.g., Ag halide emulsion,  $Ca(OH)_2 + Na_2CO_3$ , burning of Zn to ZnO, the reacting substances, usually solutions, are subjected to intense compressional vibrations from the first instant of their mingling until the reaction is completed. B. M. V.

Viscosimeter. E. H. ZEITFUCHS, ASST. to STAN-DARD OIL CO. OF CALIFORNIA (U.S.P. 2,067,430, 12.1.37. Appl., 14.12.35).—A support for and the dimensions of the bulbs and tube of an Ostwald viscosimeter are claimed. B. M. V.

Viscosimeter. J. H. DILLON, Assr. to C. J. TAGLIABUE MANUFG. Co. (U.S.P. 2,068,976, 26.1.37. Appl., 21.2.36).—In a Saybolt viscosimeter the vertical thermometers are used as stirrers for the oil, being attached to cranks operated by an electric motor.

B. M. V. Unit heater for hot gases. C. L. GEHNRICH (U.S.P. 2,066,524, 5.1.37. Appl., 23.3.35).—Apparatus for heating gases by combustion, having no refractory material in the combustion chamber, is described. B. M. V.

Apparatus for preheating fluids. W. I. SALLEE (U.S.P. 2,067,417, 12.1.37. Appl., 26.7.34).—A no. of turns of pipe coils forming heat-receiving reservoirs are connected, any no. in series, by a rotary valve, those not in the heating series being connected to a drain. B. M. V.

Fluid processing. ENAMELLED METAL PRODUCTS CORP. (1933), LTD. From PFAUDLER CO. (B.P. 478,354, 16.6.36).—A container is provided with an agitator rotated by a vertical shaft and with a no. of stationary but adjustable baffles. B. M. V.

Apparatus for measuring flowing gaseous fluids. C. S. PINKERTON, Assr. to CUTLER-HAMMER, INC. (U.S.P. 2,067,645, 12.1.37. Appl., 15.10.34).—A very large flow is divided by means of orifices and automatic valves into a large flow and a small flow in strict proportion; all measurements of rate of flow, calorific power, etc. are made on the small flow. B. M. V. Conditioning of gases. W. L. FLEISHER (B.P. 477,478, 29.9.36).—Vertical non-absorbent threads, e.g., of glass, are irrigated by liquid creeping in the same direction as the flow of gas. Transversely to the gas flow the cleaner is divided into sections of different depth, those remote from the inlet being the thinner. [Stat. ref.] B. M. V.

Dust-separating apparatus. DAVIDSON & CO., LTD., A. A. AGAR, and J. W. GIBSON (B.P. 477,335, 24.6.36).—A minor flow of gas and the dust is drawn from a main vortex chamber and passed through a smaller vortical separator by means of a separate fan; the nearly clean minor flow is then delivered to a boiler or other furnace, preferably the one from which the dirty gases originated. B. M. V.

Centrifugal apparatus for separating and collecting dust or other solid particles from air and gases. C. H. W. and C. H. CHELTNAM, W. H. LAKE, and GEN. ELECTRIC CO., LTD. (B.P. 478,715, 23.7.36).—Primary and secondary separators are provided with separate fans, the second one being at the outlet of the secondary separator; the ratio of secondary dirty air skimmed off is variable, being increased when the supply is < normal. B. M. V.

Dust separator and collector. T. S. MONAGHAN, Assr. to J. B. PETERSON (U.S.P. 2,068,459, 19.1.37. Appl., 11.6.35).—Baffles in a cyclone separator are described. B. M. V.

Apparatus for subjecting gases and vapours to the action of liquids, for the purpose of scrubbing, washing, condensing, evaporating, distilling, or otherwise treating the same. E. M. SALERNI. From Soc. D'ÉTUDES ET DE VALORISATION INDUSTR. DES COMBUSTIBLES (B.P. 478,191, 10.6.36).—A no. of horizontal cylindrical containers are arranged abreast and the touching parts of the circumferences are cut away, forming communicating ports. Agitators in the form of discs rotate closely to the shells and the vapour is drawn off horizontally, generally countercurrent to the flow of liquid. B. M. V.

Device for detecting the presence of foreign gases or suspensions in air or other gas. F. HOLLMANN, Assr. to O. H. DRÄGER (U.S.P. 2,069,035, 26.1.37. Appl., 9.7.34. Ger., 10.1.34).—The air is pumped steadily by hand by means of a hollow differential piston through moisture-removing and detecting means in succession. B. M. V.

Dissipation of fog. W. C. KING, jun. (U.S.P. 2,068,987, 26.1.37. Appl., 23.8.34).—Ground or sea fog is pptd. by dissemination of colloidal clay (bentonite) which is allowed to settle by gravitation. The gel also forms a film on the land, thus preventing fog from "rising" again for some time. B. M. V.

Recovery of gas or vapours by means of solid adsorbent substances. CARBONISATION ET CHAR-BONS ACTIFS (B.P. 477,657, 21.12.36. Rumania, 20.1.36).—Two beds of adsorbent in one absorber are operated in parallel at all stages. B. M. V.

Generation of [fire-extinguishing] gas. J. T. WHITEFIELD (U.S.P. 2,068,119, 19.1.37. Appl., 4.2.35).—CO<sub>2</sub> is generated in a pressure vessel from its solid at the crit. temp. by means of externally applied heat, transmitted to the blocks of  $CO_2$  by brine which, when gas is present but not withdrawn, *i.e.*, normally, is pressed back out of contact.

B. M. V.

Antifreeze [mixture]. C. WINNING and J. B. HOLTZCLAW, ASSTS. to STANDABD OIL DEVELOPMENT Co. (U.S.P. 2,071,482, 23.2.37. Appl., 31.1.34).—A mixture of glycerin 85,  $H_2O$  14, and EtOH 1% in combination with urea 4, flax seed 5, *tert*.-butylphenol 4, Na<sub>2</sub>CO<sub>3</sub> 1, and a dye 0.1 g./gal. is claimed.

D. M. M. Oil seals for moving machine parts. C. FREUDENBERG GES.M.B.H. (B.P. 478,136, 10.7.36. Denm., 21.2.36).—Forms of U-collars of reinforced rubber or synthetic resin are described. B. M. V.

Temp.-measuring devices.—See II. Extrusion device.—See V. Machine elements.—See X. Cleaning gases. Thermostat.—See XI. Gas separation.—See XVIII. Grinding cereals. Casein dryer.—See XIX. High-vac. distillation. —See XX.

#### II.-FUEL; GAS; TAR; MINERAL OILS.

Underground gasification of coal. G. T. STROKOV. D. G. TZEITLIN. Underground gasification at the Gorlov station "Podzemgaz." I. S. STOILO. The Shuravlev method. N. A. SHURAVLEV. Multiple systems of bore holes at an anthracite mine. A. S. KUZNETZOV. Results at the Lisitschansk mine. L. P. KIRITSCHENKO. Rôle of adsorption in underground gasification of coal. P. A. MANUKIAN. Relation of underground coal-mine fires to underground gasification of coal. F. M. IVANOV (Podzem. Gaz. Uglei, 1934, No. 1, 8-14, 14-31; 1935, No. 10-11, 6-16; 1934, No. 1, 31-35, No. 2, 24-30, 10-17; 1935, No. 10-11, 44-46; 1934, No. 1, 36-38). CH. ABS. (e)

Coal preparation in 1936. A. GÖTTE (Glückauf, 1937, 73, 1121—1131, 1145—1149, 1174—1180).— Developments in connexion with the dry and wet cleaning and dedusting of coal, clarification of coal wash-H<sub>2</sub>O, etc. are comprehensively reviewed. New types of apparatus are diagrammatically described. R. B. C.

Drying of coal by the Fleissner process. H. KLEIN (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 217—221).—Recent experimental work is summarised. Addition of chemicals to assist drying, the behaviour of various types of coal when heated under pressure, and the corrosion of drying equipment are discussed. R. B. C.

Austrian coals. II. [Solvent] extraction. W. J. MULLER, E. GRAF, and R. GRUBER (Sparwirtschaft, 1937, 15, 198–199, 243–245; cf. B., 1937, 743).—Data obtained by extracting 22 different coals (including those of bituminous and brown type) with  $C_6H_6$ ,  $C_5H_5N$ , and tetralin at <1 atm. are tabulated and discussed. R. B. C.

Chemical characterisation and analytical examination of peat. S. W. SOUCI (Kolloid-Z., 1938, 82, 87–99).—For the extraction of humic acids a pretreatment with  $Ca(OAc)_2$  and subsequent washing with  $H_2O$  are followed by extraction with very dil. NaOH or an alkaline salt solution at a controlled  $p_{\rm H}$ . This treatment, however, is not suitable for quant. analysis, and a method is described whereby a separation into 8 main groups of constituents may be effected. F. L. U.

Composition of the volatile matter from coals of varying rank. C. E. SPOONER (J. Inst. Fuel, 1937, 11, 134-140).-The volatile products of the thermal decomp. of coal have all been related to the O or H contents of the original coal. C oxides and  $H_2O$  are directly  $\propto O$  content, whereas the free H, in the gas is inversely  $\propto 0$  content. The remaining volatile products are directly  $\propto$  H content. If the H content is >4.2% tar is formed, in amounts directly  $\propto$  the excess of H above 4.2%. When the H content is >3.5%, light oil,  $C_2H_6$ , and  $C_2H_4$  are formed, in amounts again directly  $\infty$  the H in excess of 3.5%. The amount of CH<sub>4</sub> formed is little influenced by the H content in excess of 4.2%, but below that it is taken as directly  $\propto$  H content. From a summation of the yields for the different volatile products, formulæ have been derived relating the volatile matter to the ultimate analysis of coals. These equations can only be applied with accuracy if the O content of the coal is <10%. Another more complicated formula covering the whole range of O contents has been derived, but this still requires further confirmation. H. C. M.

Petrographic investigation of slurry and dust samples from coal-cleaning plants in Donbas. J. N. FOMIN (Koks i Chim., 1934, No. 4, 37–42).— The slurry and dust consisted mainly of lustrous clarain, the vitrain and durain being present only in small quantities. Simple flotation is recommended for cleaning the slurry and dust. CH. ABS. (e)

Removal of mineral constituents of bituminous coals by means of acids. H. SUSTMANN and R. LEHNERT (Brennstoff-Chem., 1938, 19, 41-45; cf. following abstract).—Extraction of a flaming gas coal with 1.5N-HCl reduced the ash content from 16.2% to 11.7%; subsequent extraction with dil. HF reduced the ash content to 2%. The HCl extraction raised the ash fusion point from 1160° to 1365°, and reduced the volatile matter content (referred to the pure coal) from 35.05% to 31.4%. Removal of the ash had little effect on the ignition temp. of the coal. Extraction of a high-ash (18.4%)lean coal with HCl effected little reduction in the ash content, whereas extraction with dil. HF reduced it to 7.1%. Some results on the acid extraction of low-ash coals are recorded. A. B. M. TIT

Ignition temperatures of brown coal before and after ash removal, and of the cokes prepared therefrom, and the absorptive properties of the latter. H. SUSTMANN and R. LEHNERT (Brennstoff-Chem., 1938, 19, 21-27).—The ignition temp. of brown coals, determined by Kreulen's method (B., 1934, 353), from which the ash had been removed by extraction with HCl (cf. B., 1938, 120, 242) were 10-30° higher than those of the original coals; cokes prepared from the de-ashed coals also exhibited higher ignition temp. than those from the original coals. The differences are attributed to the catalytic action of the ash. The absorptive properties of the cokes towards  $C_6H_6$  vapour, after activation in steam at 600–900°, bore no relation to their ash content. A. B. M.

Ignition of coal. C. A. SEYLER and T. E. JENKINS (J. Inst. Fuel, 1937, 11, 122-129).-Kreulen's ignition point apparatus (B., 1930, 847) has been used to determine the actual rate of heat evolution from a coal at different temp. which could be maintained approx. const. The coal was charged into the apparatus, a current of  $N_2$  passed, and the apparatus rapidly heated to the temp. chosen and there maintained const. for a time to ensure that the coal and mantle were at the same temp. The N2 was then replaced by  $O_2$ . The temp. of the thermometer in the coal  $(0_c)$  immediately rose and, provided that the temp. of preheat  $(0_p)$  of the  $O_2$  was < a crit. val. which depended on the coal, rapidly attained a max., and there remained const. A real (if temporary) equilibrium was therefore reached at which the rate of heat evolution was = the rate of heat loss. Measurements were then made of the rate of heat loss (dH/dt), using an electrical method (details given), and it was found that the rate of heat loss was approx.  $\infty$  the temp. gradient  $(0_c - \theta_p)$ , or, algebraically,  $dH/dt = \lambda(0_c - \theta_p)$ . The val. of  $\lambda$  was determined for several coals; bituminous or lower-rank coals had a lower val. for  $\lambda$  than those of carbonaceous and anthracitic rank. The data thus obtained were then used to calculate the rate of heat evolution at different temp., and it was found that the rate of heat evolution (dH/dt) and temp. (T) could be correlated by the Arrhenius equation  $\log_{e} (dH/dt) = a - b(1/T)$  (cf. B., H. C. M. 1937, 1293).

Ignition of coal on a grate. P. O. ROSIN and H. R. FEHLING (J. Inst. Fuel, 1937, 11, 102-117).-Ignition curves have been obtained for a small fuel bed, 4 in. deep, ignited (a) from below by preheated air, (b) from above by radiant heat, and (c) by a combination of both (a) and (b). In each case the rate of rise of temp. at the bottom, in the middle, and at the top of the fuel bed was determined. The effect of air temp. and velocity in the case of (a), and of radiator temp. and air velocity in the case of (b), on the time required for ignition has been investigated for high-volatile bituminous coal, brown coal, and semi-anthracite. Other factors examined include those of particle size and moisture content of the fuel. The bearing of the results obtained on ignition in combustion practice is discussed in detail. H. C. M.

Ignition of fuel beds. A. C. DUNNINGHAM and E. S. GRUMELL (J. Inst. Fuel, 1937, 11, 117—122, 129—133).—The ignition of a fuel bed has been studied experimentally under conditions approximating to those obtaining on a chain-grate stoker, using an apparatus similar to that adopted in earlier work on combustion (B., 1936, 4). Ignition under such conditions is determined by (a) the rate of radiation of heat on to the bed, (b) the rate at which heat is removed by the air passing up through the bed, and (c) the physical and chemical characteristics of the fuel itself, e.g., the rank, size, moisture and ash content of the fuel. All these factors have been

studied. Ease of ignition is found to vary inversely as the C content or rank of a coal. At low air rates, min. inputs of heat are required and the difference between coals is relatively small. As the air rate becomes higher, the heat requirements increase and the differences between fuels are greatly accentuated. Up to a limit of approx. 2 in. a larger size of fuel will ignite more easily than a smaller size, because the cooling effect of air passing through the bed is less with a larger fuel. A fine fuel when wetted ignites slightly more easily than when dry, presumably due to the formation of larger aggregates. Cokes ignite much less rapidly than coals, and reactive cokes more easily than non-reactive. The effect of ash content is not very conclusive. H. C. M.

Fuel control in the iron and steel industry. M. KOOPMAN (J. Inst. Fuel, 1937, **11**, 146—152).— The responsibilities of a fuel engineer are discussed (cf. B., 1937, 999). Reference is made to recent developments in American soaking-pit practice.

H. C. M.

Calculation of calorific value of coal and a proposed formula. E. C. Koo and C. P. FAN (Ind. Res., China, 1935, 4, 377–383).—The calorific val. can be calc. from : calorific val. = 82(fixed C) + a(volatile matter) + b, where a and b are consts., b varying with the val. of the ratio of volatile matter to fixed C. CH. ABS. (e)

Maximum carbon dioxide content and the heating value of fuels. W. BOIE (Wärme, 1936, 59, No. 2, 27–28).—Data are recorded and discussed. CH. ABS. (e)

Photometric method of determining the degree of coal lustre. J. A. SHEMTSCHUSHNIKOV (Inst. Mech. Ob. Polez. Isk., 1935, 1, 37—51).—Coal lustre is indicative of the degree of coalification of coal, and is measured by a colour analyser. Vals. for Suchan coals are correlated with the volatile matter content. CH. ABS. (e)

Semi-micro-Kjeldahl method for determination of nitrogen in coal. A. E. BEET and R. BELCHER (Fuel, 1938, 17, 53-55).-0.1 g. of the coal, ground to pass a 72 B.S. sieve, is placed in a 30-c.c. Pyrex micro-Kjeldahl flask with 1 c.c. (1 g.) of a finely-powdered mixture of  $K_2SO_4$  32 pts.,  $HgSO_4$  5 pts., Se 1 pt., and conc.  $H_2SO_4$  3 c.c. The whole is mixed and heated over a micro-burner. After 3 min. 5 drops of perhydrol may be added to facilitate clearing, which then occurs after another 2 min. An "after-boil" of 15 min. is given. The mixture is diluted with about 10 c.c. of H<sub>2</sub>O and transferred to the distillation flask containing 12 c.c. of a mixture of 9 vols. of 40% NaOH and 1 vol. of 40% Na<sub>2</sub>S. The mixture is distilled (about 6 min.) in a current of steam into about 2 c.c. of saturated aq. H<sub>3</sub>BO<sub>3</sub>. The absorbed NH<sub>3</sub> is titrated (Me-red + methylene-blue) with 0.1x-HCl or  $-H_2SO_4$ . The results are equal in accuracy to those obtained by the macro-method.

A. B. M.

Determination of sulphur in solid fuels by combustion in a stream of oxygen. A. SEUTHE (Arch. Eisenhüttenw., 1938, 11, 343-344).—Fuels with or without volatile matter are burned in a partly-packed tube furnace at temp. rising to 1200° and the SO<sub>2</sub> is absorbed in  $H_2O_2$ . All the S, including that in the ash, is driven off in about 10 min. The results compare well with those given by the Eschka method. A. R. PE.

Rapid determination of sulphur in coal and coke. M. P. PEREDERI (Koks i Chim., 1934, No. 3, 64-65).—The coal is ignited in a special apparatus by means of MeOH and is burned in a stream of  $O_2$ . The SO<sub>2</sub> formed is absorbed in 3% H<sub>2</sub>O<sub>2</sub> or I and the H<sub>2</sub>SO<sub>4</sub> formed is titrated with N-NaOH. CH. ABS. (e)

Testing of Perederi's method of determining total sulphur in coal and coke. M. G. SCHIFRIN (Zavod. Lab., 1937, 6, 910—911).—The method (see preceding abstract) does not give satisfactory results. R. T.

Kaiser-Wilhelm Institut für Kohlenforschung, Mülheim-Ruhr. K. PETERS (Ges. Abh. Kenntn. Kohle, 1937, 12, 605-613).—The most important activities of the Institute since 1912 are reviewed. R. B. C.

Comparison of the reactivities of brown coals and their cokes. W. J. MÜLLER and R. GRUBER (Österr. Chem.-Ztg., 1938, 41, 13—18).—The ignition temp. of 5 brown coals and of cokes prepared from them by slow heating to 900° have been determined by two methods; tests measuring, or depending on, the reactivities to  $CO_2$  and the combustibilities have been applied to cokes prepared by slow and by rapid heating to 900°, the object being not only a grading of the fuels, but a comparison of the results yielded by the more or less arbitrary test methods. There was a tendency for the fuels to fall in similar order in all the tests, and it is believed that anomalies are partly due to catalytic effects of  $Fe_2O_3$  in the ash. A. R. PE.

Aids for retort house and laboratory. W. MASTERTON (Gas J., 1938, 221, 391—392).—Stoppage of the coke extractor of vertical retorts is indicated by a governor which completes an electric circuit. Tables are given whereby interpolations may be made in the Gas Referecs' correcting factors for gas vol. A. R. PE.

Combustion of bagasse. J. EIGENHUIS (Int. Sugar J., 1937, 39, 474-477).-A step-grate furnace for burning bagasse is described and the optimum conditions for operating it are discussed. In regard to the flue gas after it has left the fuel bed, and before it is allowed to come in contact with the boiler, the following precautions should be observed : the temp. should be kept as high as possible by avoiding both an excess of air and cooling by radiation; the gases should be well mixed, which is best brought about by changes in velocity and direction; the secondary combustion should be given time to complete itself before cooling off; the gas velocity should be kept low in the vicinity of the fuel bed to minimise the quantity of solid particles that are blown up with the gases. J. P. O.

Carbonisation of Maritza [Bulgaria] brown coal. E. MAIROWITSOH (Braunkohle, 1937, 36, 861-867).—The coal is a low-grade brown coal of high H<sub>2</sub>O and ash content. "Carbonisation" is effected by a modification of the Fleissner process; the coal, after removal of material of particle size < 16 mm., which is burned under the boiler, is treated with superheated steam under pressure (max. 26 atm.) and subsequently subjected to a moderate vac. The H<sub>2</sub>O content is reduced from about 30% to 13%. The resistance to weathering is also improved. Costs are given. A. B. M.

Influence of petrographic coal components on degree of graphitisation of cokes : electrical conductivity as indicator of graphitisation. L. M. MAIER and Z. I. BADANOVA (Koks i Chim., 1934, No. 4, 13—16).—The degree of graphitisation can be determined by measuring the electrical conductivity of the coke. Coke from vitrain had the highest degree of graphitisation and the lowest reactivity. Durain coke had lower and higher vals., respectively, and fusain coke the lowest and highest vals.

Сп. Авз. (е)

Dependence of the properties of coke on the conditions of its production. VI. VII. Dependence of the electrical conductivity on the carbonising times and temperatures. VIII. Rapid determination of the variation with time of the reactivity of coke. W. J. MüLLER and E. JANDL (Brennstoff-Chem., 1938, **19**, 27–29, 29–30, 45–48; cf. B., 1934, 947).—VI. The reactivity, combustibility, ignition temp., and electrical conductivity of cokes prepared from Witkowitz gas coal after successive extraction with HCl and HF (0.45% of ash) were, in general, < those of cokes prepared from the original coal (7.2% of ash). The differences, except those of ignition temp., decreased as the coking times were increased and the temp. raised.

VII. The electrical conductivities of the cokes increased as the temp. of carbonisation was raised or the time of carbonisation was increased.

VIII. 2 c.c. of the coke (sized between sieves of 2500 and 4900 meshes/sq. cm.) are placed in a boat of 25 sq. cm. surface area heated at 900° in a  $SiO_2$  tube (35 mm. internal diameter) through which a current of CO<sub>2</sub> (33.3 c.c./min.) is passed. The % reduction to CO is determined. Details of apparatus and technique are given. The results obtained are similar to those given by the more exact method (cf. B., 1934, 994) except that the changes of reactivity with time and temp. of carbonisation are more accentuated. A. B. M.

Preparation of coke for ash analysis. P. M. TSCHEBOTAREV (Koks i Chim., 1934, No. 5-6, 101-102).—The crushing of samples must be done in mechanical crushers made of hard Mn steel, and the grinding in an agate mortar. Fe mortars gave high results. CH. ABS. (e)

Determination of ash in coke. M. M. KEFELI and E. R. BERLINER (Koks i Chim., 1934, No. 5–6, 103–104).—A sample is burned in the Mars oven at 900–950° in a current of hot air (50–60 bubbles per min.); the accuracy is  $\Rightarrow \pm 0.37\%$ .

CH. ABS. (e) Low-temperature bituminous coke as raw material for chemical and metallurgical processes. W. DEMANN (Glückauf, 1937, 73, 1101— 1106).—Its applications, e.g., in the production of "synthesis" gas for the Fischer–Tropsch process, and of CaC<sub>2</sub>, are reviewed. R. B. C.

Manufacture of active charcoal. R. E. LEE, E. C. Koo, T. K. SHIH, and S. C. CHOW (Ind. Center, China, 1933, 2, 250—258).—Active C was prepared from pine wood, chestnut wood, walnut shells, and coconut shells by (a) air activation  $(300-400^{\circ})$ , (b) ZnCl<sub>2</sub> activation, and (c) activation with superheated steam  $(700-800^{\circ}/50$  lb. per sq. in.). Activation was carried on for 8—10 hr. in each case. Method (b) gave the best results, (c) being next. Digestion and washing with dil. HCl increases the activity of the steam-activated product, particularly if a second activation is applied subsequently.

CH. ABS. (e)

Grinding of wood charcoal. F. GJESMOE (Forhandl. Kong. Norske Vidensk. Selsk., 1937, 10, 64-67).-Experiments with wood charcoal show that the grinding of fibrous materials must be performed in the dry state if power consumption is to be kept low. The view that power consumption increases the longer the material is kept in the mill is confirmed. To avoid unnecessary work, fine material should be removed from the mill immediately it has reached the required degree of fineness. If the production of max. surface is required (as with pulverised fuel) it is unnecessary to remove fine material, for according to Rittinger's law the surface produced is directly  $\infty$  the work. Instead of using the residual surface as a measure of fineness it is easier to employ the ratio of the consts.  $\alpha$  and  $\beta$  in Rosin's formula as this R. B. C. is  $\infty$  surface.

Wet oxidation of carbon. II. A. E. BALFOUR, H. E. BLAYDEN, A. H. CARTER, and H. L. RILEY (J.S.C.I., 1938, 57, 1-7; cf. B., 1935, 789).-A study has been made of the oxidation rates in a solution of  $K_2Cr_2O_7$  in syrupy  $H_3PO_4$  at 100° of (a) C samples prepared at 500-1000° from coals of different rank, (b) cokes heated at various temp. up to 2000°. The coals of lower rank gave cokes much more susceptible to oxidation than those from higherrank coals. The heated cokes (b) showed an increase in oxidation rate between about 1400° and 2000°. The adsorptive power for H<sub>2</sub>O or I of cokes prepared between 500° and 900° from sucrose, starch, and lignin have been compared. Certain CrO3-H2SO4 solutions gave oxidation rates similar to those given by the CrO3-H3PO4 reagent. The oxidation of active carbons activated to various degrees and of a natural graphite in  $CrO_3$ -H<sub>2</sub>SO<sub>4</sub> solutions containing different amounts of H<sub>2</sub>O has been studied. The results obtained support the view that penetration of the oxidising agent between the layers of the graphite crystallites plays an important part in determining the velocity of these oxidations.

Industrial applications of the physical properties of graphite. I—IV. A. H. STUART (Engineering, 1938, 145, 17—19, 71—73, 142—144, 215— 217).—I. The presence of a very small amount of suspended graphite (e.g., 1—3 pts. per 10<sup>6</sup>) in any transparent medium has a marked effect on the lighttransmitting properties of the medium, and there is a definite relation between the concn. of graphite (C) and the amount of light transmitted (T), viz.,  $C = aT^{-0.6}$ , where a is a const. depending on the particle size of the graphite and on the medium employed. When the graphitised medium is placed in a magnetic field such that the field is parallel to the beam of light, it is found that owing to the anisotropic diamagnetism of graphite, the particles of suspended graphite aline themselves with their basal planes parallel to the magnetic field and, hence, to the beam of light, thereby allowing more light to be transmitted than when no magnetic field is operating. Rapid methods of test, based on these phenomena, for studying the suspension properties of a colloidal graphite, and for distinguishing between graphite proper and that which has had its cryst. structure partly destroyed (e.g., blue graphite), are described.

II. The val. of colloidal graphite in meeting the effects of oil-film rupture such as is liable to occur when running-in a new engine is discussed.

III. By incorporating colloidal graphite in the lubricating oil and the fuel of an engine substantial improvements in performance may be obtained, particularly during the starting-up period.

IV. The presence of colloidal graphite in an oil has no adverse influence on its sludging properties; on the contrary, it materially assists the filter to remove the foreign matter. H. C. M.

Hydrogenation of Formosan coals. T. OGAWA, A. MATSUI, and H. SENOO (Rep. Natural Gas Res. Inst., Formosa, Aug., 1937, No. 1, 17 pp.).—Data on the degree of hydrogenation of 12 coals are presented. The coals were hydrogenated for 1 hr. at 425°/100 atm. H. C. M.

Gas-retort furnaces and gas producers. LE PASLIER (J. Usines Gaz, 1937, 61, 626-637; 1938, 62, 8-14).—Practical hints on the operation and management of intermittent vertical chamber ovens, continuous vertical retorts, and gas producers are given. R. B. C.

High-efficiency gas producers for a glass works. R. MÖLLER (Z. Ver. deut. Ing., 1937, 81, 1167—1171).—A producer with a throughput of 7—45 tons per 24 hr. of brown-coal briquettes is diagrammatically described. The  $H_2O$  used for gas purification is employed to saturate the air. Performance data and costs are given. R. B. C.

Experience in operating revolving-grate gas producers. O. HEIBER (Glass Ind., 1938, 19, 54).— The relation between operating conditions and gas quality is illustrated by gas analysis. Controls such as a recording thermometer for the air-steam mixture, for the pressure of the producer gas, etc. are recommended. C. L. M.

Low-temperature bituminous coke as fuel for stationary suction gas producers. E. RAMMLER, K. BRETTLING, and J. GALL (Glückauf, 1937, 73, 1077—1088, 1106—1112).—Test data for a revolvinggrate producer designed for use with a 300—350 h.-p. engine show that low-temp coke is an excellent producer fuel. Coke of 10—30 mm. size appears to give the best results. High efficiencies are obtained at high ratings, and rapid starting of the fire is possible. Producer gas from low-temp. coke has a calorific val. > that from high-temp. coke but < that from anthracite. R. B. C.

Enrichment of producer gas. M. MEDICI (Energia termica, 1937, 5, 75).—Attempts were made to compensate for the inferior performance of a variable-compression, single-cylinder petrol engine running on producer gas by adding  $C_2H_2$  to the gas in an amount = 20—40% of the total energy of the mixture. In no case was the performance = that realised when using petrol alone; it was, however, > that expected from the increased calorific val. of the mixture. Gas containing 20% of  $C_2H_2$  gave a better thermal efficiency than that containing higher %. Ignition troubles were not encountered. R. B. C.

Destruction of ammonia liquor at gasworks. A. THAU (Gas Times, 1938, 14, No. 171, 30–33).— The process employed at Hamburg is described. The vapours leaving the  $NH_3$  still are passed through the hot-fire zone of a revolving-grate,  $H_2O$ -jacketed producer where  $NH_3$  and steam are decomposed.

R. B. C.

Determination of organic sulphur in gas. S. N. RASTORGUEV (Zavod. Lab., 1937, 6, 886– 887).—A modification of Drehschmidt's method is described. R. T.

Instrument for indicating and recording traces of hydrogen sulphide in coal gas. J. B. REED (J.S.C.I., 1938, 57, 43-44).—An instrument for testing gas leaving the gasworks for distribution is described. The gas passes continuously through a moving strip of bibulous paper impregnated with a Pb salt. In 24 hr. a record stain 12 in. long is produced. Provision is made for the stain to be measured *in situ* with the aid of light-sensitive cells. J. B. R.

Tully plant [for town's gas manufacture]. T. F. SCOTT (Gas J., 1938, 221, 389).—A short account is given of the operation of the plant and its ancillary units, and analyses of the gas produced are tabulated. A. R. PE.

Dry purification of [town's] gas. H. DENEKE (Gas- u. Wasserfach, 1938, 81, 66-69, 83-88).— Various operating systems applied to the 9 purifier boxes at Charlottenberg are described. The  $H_2O$ content of the oxide is not chemically of primary importance, but it plays a useful part in carrying away as latent heat some of the heat of reaction, of which 50-70% appears either in this form or as sensible heat. To obtain high S and low  $H_2O$  content of the spent oxide, external steam heating is used in winter. A. R. PE.

Determination of carbon monoxide in products of combustion of town's gas. E. C. ROBERSON (J.S.C.I., 1938, 57, 39–43).—Anomalies occurring in the determination of CO in products of combustion by the  $I_2O_5$  method are investigated and a modified method and apparatus are described.

Comparative values of producer and town's gas [for heating purposes]. H. REPKY (Feuerungstech., 1937, 25, 180–183).—The costs of producing producer gas under various conditions are analysed. Examples are given showing when it is more economical to use producer gas or town's gas for a given purpose. R. B. C. Check flue-gas analyses without computation. J. G. FAIRFIELD (Power, 1935, 79, 25, 36).—Charts are given. CH. ABS. (e)

Permissible methane detectors. L. C. ILSLEY and A. B. HOOKER (U.S. Bur. Mines, 1937, Rept. Invest. 3359, 4 pp.).—Three approved detectors of the compound Wheatstone bridge catalytic type, in which catalytic action at the surface of a Pt filament when in  $CH_4$  causes a change in the temp. and resistance of the filament, thereby unbalancing the bridge circuit and giving a reading which is  $\propto$  [CH<sub>4</sub>], are described. H. C. M.

Ignition of firedamp-air mixtures by compression. H. WOHLBIER (Glückauf, 1937, 73, 66-68).—A review. R. B. C.

Determination of acetylene in air and in liquid oxygen by condensation. R. S. OKS (Zavod. Lab., 1937, 6, 1399—1402).—The  $C_2H_2$ present in the gas is condensed at  $-160^{\circ}$  in a Dewar vessel filled with liquid  $O_2$  and the condensate is subsequently determined by any of the usual methods. Passage of the gas at the rate of 100—150 litres/hr. through the apparatus described ensures complete condensation of  $C_2H_2$ . Concurs. of  $C_2H_2$  in air or  $O_2$  which are too small to be analysed by absorption methods can be determined in this way. The method is rapid and accurate. D. G.

Classification of tars and oils according to their physical properties. T. H. BLAKELEY (J.S.C.I., 1938, 57, 7-14).—Sp. gr. (d) and viscosity  $(\eta)$  are made the basis of a classification of tar products ranging in  $\eta$  from light creosote to soft pitch. This is given a convenient form by deriving an additive function of  $\eta$ , which may be expressed over the range considered by log (const.  $+ \log \eta$ ). When d and this function are plotted, a classification chart results, in which crude tars fall near a band which corresponds with increasing  $\eta$  in passing from lowto high-aromatic crudes. Materials from a given carbonising system fall near a straight line or "origin" line which intersects the crude tar band and is parallel to the origin line for other carbonising systems. The high- or low-aromatic character of a tar product is defined by the particular origin line on which it falls. The chart may be used for estimating the dand  $\eta$  of mixtures, for representing specifications, and for correlating experimental data. A similar form of chart is possible for tars and pitches on the basis of d and yield of distillate to  $300^{\circ}$ .

Cut-back bitumens. ANON. (Nederl.-Indische Wegenvereeniging, 1936, Publ. 150, 22 pp.; Road Abs., 1933, 4, No. 566).—Tests to place Dutch East Indies cut-back bitumens in the American classification are described. It is concluded that: (a) the distillation figure as given by the Asphalt Institute method does not indicate properly the nature of the flux used, but an approximate indication is obtained by redistillation; (b) part of the flux remains in the residue on distillation to a vapour temp. of  $395^\circ$ , the amount being higher with heavier fluxes and increased bitumen content of the cutback; (c) distillation does not indicate the absorptive power of the bitumen on the flux, and the wt. of distillate is not an accurate estimate of the flux content; (d) with a  $C_6H_6$  flux the redistillation and distillation curves are similar but differ as the heavier hydrocarbon content of the flux increases, the original flux being normally heavier than is shown by the former curve; (e) distillation as in (b) causes slight cracking of bitumen and flux; (f) the time to reach equilibrium in air depends on the nature of the flux used; for road conditions in the Dutch Indies an evaporation test at > room temp. is necessary.

#### T. W. P.

Influence of addition of rubber on properties of bitumen. J. G. FOL and J. A. PLAIZIER (Wegen, 1937, 13, 201-211; Road Abs., 1938, 4, No. 567).-Ground vulcanised rubber, obtained from old motor tyres, added to bitumen improves the resistance to flow and reduces brittleness. A practical application is in the design of joint-filling mixes. Tests are described of mixes with unvulcanised rubber latex and dry rubber in powder or crumb form. Latex can be used only with bituminous emulsions. In small quantities (5, 10, and 20%) it raises the softening point of the binder left by the emulsion, reduces the tendency to flow of the resultant binder, raises the resistance to penetration, renders the binder more elastic, and increases the adhesion of binder to stone. Mixed with emulsion, sand, and Portland cement, it reduces the indentation under load and the permanent deformation. Rubber powder or crumb raises the softening point and resistance to penetration, improves the impact-resistance and resistance to indentation, and reduces the tendency T. W. P. to flow.

Aqueous bitumen emulsions and their use in producing plastic compounds. G. D. KREITZER and K. M. BEKRENEVA (Naro. Kom. Tyaz. Prom. S.S.S.R., 1935, 1, 342—353).—Emulsions from lowmelting bitumens are obtained by heating them slightly above their m.p. and stirring with hot  $H_2O$ . They give poor plastic compounds. Suspensions of high-melting bitumens are obtained by grinding them in  $H_2O$  containing 1% of alkali as stabiliser. By mixing the emulsions from high- and low-melting bitumens in various proportions, a wide variety of products can be prepared. CH. ABS. (e)

Technical application of base materials in emulsified state. H. EILERS (Chem. Weekblad, 1938, 35, 129–136).—A general discussion of problems relating to bitumen emulsions. F. L. U.

Homogeneity of West Texas asphalts. S. BORN (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 519– 524). R. B. C.

Indentation and compression shear tests for determining service stability of asphalt plank. H. W. GREIDER and H. MARC (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 530-539). R. B. C.

Laboratory, exposure, and simulated service tests of slow-curing liquid asphalts. R. H. LEWIS and W. O'B. HILLMAN (Publ. Roads, 1937, 18, 85-99; Road Abs., 1938, 5, No. 34).—Comparative tests were made. T. W. P.

Physico-chemical processes of mixing asphalts and tars. E. I. BARG (Naro. Kom. Tyaz. Prom. S.S.S.R., 1935, 1, 353–380).—Inhomogeneous mixtures are obtained from oil asphalt with natural asphalt, coal-tar pitch, stearic tars, or benzylcellulose (I). Good mixtures result from natural resin with bitumen, wood pitch with coal-tar pitch, and (I) with natural or coumarone resins. The  $\gamma$  may be <that of either component. Presence of C particles helps coagulation, but does not necessarily cause it.

Сн. Авз. (е)

Hardening of mud sheaths in contact with oil, and a suggested method for minimising their sealing effect in oil wells. C. P. BOWIE (U.S. Bur. Mines, 1937, Rept. Invest. 3354, 25 pp.).—It is proposed to add material sol. in crude oil but insol. in  $H_2O$  (e.g., crude rubber, rosin, etc.) to the mud fluid before potentially productive zones are penetrated, to prevent solidification of the mud in contact with crude petroleum. C. C.

Utilisation of coal with particular reference to production of oil. C. LEGRAND and M. SIMONO-VITCH (Publ. de l'Assoc. des Ingénieurs de l'École des Mines de Mons, No. 62, 1937; Fuel, 1938, 17, 4-10, 41-47).—The development of the oil industry during the last 25 years is outlined from the political and economic viewpoints, with particular reference to the production of oil from coal in Great Britain, Germany, France, Italy, and Belgium. A. B. M.

Comparison of cost of operating shell stills and pipe stills. W. L. NELSON (Refiner, 1936, 15, 7-10).—The advantages of the pipe still over the shell still are: adaptation to continuous operation and to flash-vaporisation, with less decomp., better heat transfer, and reduced fire hazard. Operating costs are compared. CH. ABS. (e)

Experimental cracking of a gas oil in fused metal. E. E. SLOWTER, F. B. HOBART, and J. R. WITHROW (Trans. Amer. Inst. Chem. Eng., 1935, 31, No. 4, 698—705).—Neither Sn nor Pb has a catalytic effect comparable with that of ordinary steel heattransfer surfaces. Molten baths give better heat transfer and uniformity of temp. and minimise the fouling of heat-transfer surfaces. For max. gasoline yields the lowest cracking temp. consistent with an economic no. of cycles and time of heating is best. CH. ABS. (e)

Recovery of mercaptans from cracked naphtha fractions. R. W. CRARY and M. M. HOLM (Ind. Eng. Chem., 1937, 29, 1389–1392).—Experiments were carried out on the removal of methyl and ethyl mercaptans from the butene- $C_4H_{10}$  and pentene- $C_3H_8$  fractions, respectively, of cracked naphtha by countercurrent extraction with NaOH. Equations for the equilibrium curves for stripping mercaptans from NaOH solution with steam and for absorbing mercaptans from naphtha with aq. NaOH are given, and the application of the data to the design of commercial equipment is discussed. C. C.

Extraction of divinyl from products of [oil] cracking. V. G. MOOR (Trans. VI Mendeléev Congr. [1932], 1935, 2, Pt. I, 719–724; cf. B., 1936, 631).—Extraction by  $H_2O$  and by aq. solutions of chlorohydrin, PhOH, or  $(CH_2 \cdot OH)_2$  gave the best results, but they have too low a solvent power.

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Сн. Авз. (е)

Obtaining alcohols and ethers from products of the vapour-phase cracking of oil. V. V. PIGULEVSKI (Trans. VI Mendeléev Congr. [1932], 1935, 2, Pt. I, 711—715).—The velocity of absorption of  $C_3H_6$  by  $H_2SO_4$  falls abruptly if the  $[H_2SO_4]$  is decreased, and is higher if the surface of the acid remains undisturbed. The reaction is autocatalytic. Ag salts accelerate absorption of  $C_2H_4$  but have much less effect for  $C_3H_6$ . V, U, and W salts have a feeble catalytic action. Unsaturated hydrocarbons with a *tert*. C atom are absorbed by  $H_2SO_4$  at an accelerated speed. Formation of acetic esters from alcohols and AcOH in presence of  $H_2SO_4$  gave no positive results. The use of naphthenesulphonic acids and sulphoaromatic acids as catalysts was effective. Esters can be obtained from acid sulphates of tartaric acids. CH. ABS. (e)

Organic syntheses based on technical unsaturated hydrocarbons. M. B. MARKOVITSCH (Trans. VI. Mendeléev Congr. [1932], 1935, 2, Pt. I, 691-704).—A review, with special reference to the use of oil as a raw material. CH. ABS. (e)

Obtaining chlorinated products from vapourphase products of oil. D. M. RUDKOVSKI (Trans. VI Mendeléev Congr. [1932], 1935, 2, Pt. I, 715—719). —A review of the catalytic treatment at normal pressures of the different fractions of cracked gasoline and  $C_6H_6$ . CH. ABS. (e)

Analysis of sixteen samples of Chinese petroleum. E. C. Koo (Ind. Center, China, 1934, 3, 371-373).—Comprehensive data are given.

Сн. Авз. (е)

Products of partial combustion of petroleum spirit. A. MAILLARD and R. FRIEDRICH (Compt. rend., 1937, 205, 673-675).-Minor products are separated from the main gases after combustion with excess of air by cooling with H<sub>2</sub>O at 15°, when aq. and oily layers separate. Acids and aldehydes in the aq. layer are mainly AcOH, HCO<sub>2</sub>H, higher acids, and  $CH_2O$ . Wts. of AcOH and  $CH_2O$  yielded by various varieties of petrol are given. Addition of EtOH to the original petrol increases aldehyde but not acid formation, whilst both vary only slightly with the d of the petrol. PhOH and acraldehyde have been identified in the oil. The presence of these acids and aldehydes and of PhOH explains the lachrymatory properties of exhaust gas from engines using alcoholised fuel. E. G. B.

Corrosion in French [petroleum] refineries. J. MOINARD, P. MOYNE, and J. NOCTURNE (Mét. et Corros., 1937, 12, 145—150, 174—179).—The types of corrosion encountered and methods for its avoidance are discussed. Types of ferrous and non-ferrous metals used for the various parts of the plant of Standard Franç. de Pétroles are described. R. B. C.

Specific gravity, refractive index, and viscosity data of Japanese commercial petroleum products. M. OGURA (Res. Bull. Govt. Printing Bur., Tokyo, 1937, No. 3, 1-6).—Data are tabulated and d, n, and  $\eta$  mathematically related. D. A. C.

Petroleum waxes : their properties and various uses. F. W. PADGETT (Oil and Gas J., 1938, 36, No. 38, 30-32, 45-46, 48).—The manufacture is reviewed, variations in the degree of refining being emphasised. Chemical and physical properties are discussed in some detail and industrial uses surveyed with special reference to the prep. of waxed paper. J. W.

Simplified absorption control cuts natural gasoline loss. G. M. LILJENSTEIN (Oil and Gas J., 1938, 36, No. 37, 180, 183).—Curves of the content of iso-C<sub>5</sub>H<sub>12</sub> and higher hydrocarbons in the discharge gas against the absorption factor are given. For min. absorption loss operation in the flat portion of the curve is recommended. Good control of stripping is effected by using a const. steam : oil ratio and working in the flat portion of the stripping factor-lean oil v.p. curve. Check testing methods are described. J. W.

Sweetening gasoline [is] more effective and less expensive with cupric chloride. W. A. SCHULZE and A. E. BUELL (Nat. Petroleum News, 1935, 27, No. 43, 24C - 24F, 24H; cf. B., 1935, 344).—Solid CuCl<sub>2</sub> is used effectively at a cost of 2 cents per 1000 gals. CH. ABS. (e)

Refining cracked gasoline from oil produced outside the United States. J. C. MORRELL, C. G. DRYER, and G. EGLOFF (Oil and Gas J., 1938, 36, No. 34, 54-55).—The amounts of crude refined and the properties of the motor fuel obtained are given for Iraq, Argentina, Canada, Bahrein, Dutch East Indies, Greece, and Sakhalin. J. W.

Synthesis of benzine from carbon monoxide and hydrogen under ordinary pressures. XXXVII. Gas-space velocity. S. TSUNEOKA and A. NISHIO. XXXVIII. Relations between conditions of synthesis and degree of unsaturation of the benzine formed. Y. MURATA and S. TSUNE-OKA (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1937, 34, 83–98, 99–115; cf. B., 1938, 130). XXXVII.—With const. quantity of catalyst and layer length the yield of benzine from CO and H<sub>2</sub> decreases with rise in gas-streaming velocity, although the yield in unit time increases. With const. gasspace velocity and catalyst-layer length the yield of benzine rises with increasing gas-streaming velocity to a max. and then sinks. Unsaturation of the benzine increases with gas-space velocity. The yield of CO<sub>2</sub> increases with quantity of catalyst when the gas-space velocity is not too great.

XXXVIII. With increase in b.p. of the benzine the % of unsaturated hydrocarbons decreases. The % of unsaturateds decreases in the order Fe, Co, and Ni when these are used as catalysts, and increases with very short layers of catalyst, and decreases on mixing the catalyst with SiO<sub>2</sub>. For different tube diameters the yields vary in the order 8 < 13 > 20 mm. The yield of unsaturateds, as measured by the I val., is a linear function of the % of H<sub>2</sub> in the initial gas mixture; it increases with gasstreaming and -space velocity, but no definite relation could be established between the % yield and the temp. and time of synthesis. R. S. B.

Determination of the iodine value of benzines. B. GARRE and H. GROSSE-OETRINGHAUS (Oel u. Kohle, 1938, 14, 94—95).—Kaufmann's method of determining the I val. of fats etc. by the use of Br + NaBr in MeOH (B., 1926, 447) is recommended for benzines. Substitution is reduced to a min. and accurate results are obtained even with benzines and pure hydrocarbons of high I val., with which the Hanus method gives indefinite results. A. B. M.

Polymerisation a tool of great economic utility. G. EGLOFF (Nat. Petroleum News, 1935, 27, No. 47, 25-26, 28, 30-31).—A review. CH. ABS. (e)

Thermal process for polymerising olefinebearing gases. M. B. COOKE, H. R. SWANSON, and C. R. WAGNER (Refiner and Nat. Gas Mfr., 1935, 14, 497-505).—Thermal and catalytic polymerisation tests on (a) gases produced by vapour-phase cracking of hydrocarbons ( $C_2H_4$  25,  $C_3H_6$  17,  $C_4H_8$  6%), (b) gases from stabiliser overhead ( $C_2H_4$  8,  $C_3H_6$  38,  $C_4H_8$  29%), and (c) natural gases are described. The high-pressure, low-temp. gasoline had the highest volatility, whereas the low-pressure gasoline was highly aromatic and of low volatility. CH. ABS. (e)

Polymerisation of natural gas. H. KUWANA and M. IMAI (Rep. Natural Gas Res. Inst., Formosa, Nov., 1937, No. 2, 8 pp.).—The thermal polymerisation of Formosan (Kitsui field) natural gasoline having the composition, after extraction of natural gasoline, CH<sub>4</sub> 97, CO and N<sub>2</sub> 3%, has been studied at 1050° at both atm. and reduced pressures, using a flow method. The max. yield of liquid products was produced at 1 atm., when 34 g. of light oil and 30 g. of liquid tar were obtained per 1000 litres of original gas; in addition, C<sub>2</sub>H<sub>4</sub> 24, H<sub>2</sub> 310, and CH<sub>4</sub> 700 litres were obtained. The deposition of graphitic C was < 0.7%. At the lower pressures there was a decrease in the yields of both light oil and liquid tar. H. C. M.

Chlorination of natural gas. T. OGURA, H. NAGAI, and K. YOSHIKAWA (Rep. Natural Gas Res. Inst., Formosa, Dec., 1937, No. 3, 7 pp.).—The chlorination of Formosan natural gas has been studied at  $450-500^{\circ}$  and at  $CH_4/Cl_2$  ratios of 1—3, using a flow method. In no experiment was MeCl obtained as the main product, and it was found that the yields of  $CHCl_3$  and  $CH_2Cl_2$  were > that of MeCl at low  $CH_4/Cl_2$  ratios. H. C. M.

Use of automobile motors with changing fuels. K. J. SYVÄHUOKO (Tekh. Aikakauslehti, 1936, 26, 9-24).—A carburettor which makes it possible to change from one fuel to another according to load variations is described. Data for various mixtures are given. CH. Abs. (e)

Improved motor fuel by reforming or cracking gasoline. G. EGLOFF, E. F. NELSON, and G. B. ZIMMERMAN (Oil and Gas J., 1935, 34, No. 32, 90– 104).—A review. CH. ABS. (e)

Road tests indicate highly volatile gasolines improve motor operation. G. G. BROWN (Oil and Gas J., 1936, 34, No. 35, 38—40; No. 36, 28—29, 32).—A discussion. CH. Abs. (e)

Alcohol-gasoline mixtures as fuel. E. C. Koo, N. C. CHIEN, Y. T. CHU, and S. M. CHENG (Ind. Centre, China, 1934, 3, 112–118).—EtOH is miscible with gasoline if the materials are not H<sub>2</sub>O-free, provided a blending agent (e.g., COMe<sub>2</sub>, Et<sub>2</sub>O, Bu<sup>•</sup>OH) is added. Such blended mixtures are suitable as motor fuels. CH. ABS. (e)

Manufacture of liquid fuel from vegetable oil. E. C. Koo, S. M. CHENG, and H. M. MA (Ind. Res., China, 1935, 4, 466—479; cf. B., 1937, 517).—Both vapour-phase and catalytic methods of cracking (CaO, NaOH, or KOH catalyst) rapeseed oil yield suitable gasoline substitutes. After removing the gasoline fraction, the residue yielded a fraction suitable for a kerosene substitute. A 1 : 1 mixture of cottonseed oil and ordinary petroleum fuel oil or crude oil from cracking of cottonseed oils is suitable for use in Diesel engines. CH. ABS. (e)

Improvements of Diesel fuels by extraction with sulphur dioxide. E. STEFFEN and E. SAEGE-BARTH (Refiner, 1938, 17, 12—14).—By extracting straight-run paraffinic and non-paraffinic and cracked gas oils with SO<sub>2</sub> at  $-1^{\circ}$  (Edeleanu process) aromatics were removed and fuels having a Diesel index of 60—80 were obtained. Data are tabulated.

R. B. C.

Development of high-speed Diesel engine fuels. W. MENDIUS, W. AINSLEE, and C. H. SCHLESMAN (Refiner, 1935, 14, 537-541).—A discussion.

Сн. Авз. (е)

Lag of ignition is utilised to determine cetane rating of Diesel fuel oils. P. H. SCHWEITZER and T. B. HETZEL (Oil and Gas J., 1936, 34, No. 36, 36-38, 40).—The "fixed ignition lag" method of rating Diesel fuels is described. CH. ABS. (e)

Variations of operating conditions change properties of polymerised fuel. M. B. COOKE, H. R. SWANSON, and C. R. WAGNER (Nat. Petroleum News, 1935, 27, No. 47, 33-44).—A review of operating conditions for various types of fuel.

Сн. Abs. (e)

Importance of polymerisation processes for gum formation in motor fuels. G. R. SCHULTZE (Oel u. Kohle, 1938, 14, 113-117).-The rates of polymerisation of cyclopentadiene (I) and of depolymerisation of dicyclopentadiene (II),  $2C_5H_6 \Longrightarrow C_{10}H_{12}$ , have been determined over the temp. range 132-182° and at pressures between 180 and 510 mm. The rates of reaction were independent of additions of N<sub>2</sub>, H<sub>2</sub>O vapour, and air. The bearing of the results on gum formation in motor spirits is discussed. Addition of increasing amounts of (I) to a motor spirit had only slight influence on the gum as determined by the Cu-dish test, whereas with addition of (II) the gum rose rapidly. Addition of (I), however, had a marked effect on the results of the "induction period "test with  $O_2$  under pressure. It is concluded that gum formation by polymerisation can occur in motor spirits even in absence of air. The substances forming gum may pass during storage from the lighter to the heavier fractions of the spirit. Anomalies in the results of gum tests may be due to such changes in the volatility of the gum-forming substances.

A. B. M. Effect of carburction and manifolding on fuel knock values. E. BARTHOLEMEW, H. CHALK, and B. BREWSTER (Oil and Gas J., 1938, 36, No. 35, 53– 54, 56–58, 60).—Recent laboratory and road knockrating tests show disagreement. The possible effect on the tests of recent changes in engine design and refining methods is discussed. An apparatus for sampling from each cylinder of a multi-cylinder engine is described and it is shown that fuel distribution varies from cylinder to cylinder, causing variation in air-fuel ratio and fuel composition. Intake manifolds for the CFR engine which simulate these conditions are described and knocking is discussed in the light of the results obtained. Results are also influenced by the ignition timing of each cylinder, and apparatus for the determination of this is described. Problems involved in the correlation of road and laboratory tests are critically discussed.

J. W.

Physical constants of series of hydrocarbons. Application to analysis of aviation spirits. R. LAUTIÉ (Bull. Soc. chim., 1937, [v], 4, 2071—2076).— Theoretical. Equations connecting d, n, and  $\sigma$ of members of homologous series are derived. E. S. H.

The smoke-tendency lamp. Use in testing kerosenes. J. B. TERRY and E. FIELD (Ind. Eng. Chem. [Anal.], 1938, 10, 33-34).—The lamp described previously (B., 1936, 866) has been redesigned on more compact lines and made portable.

L. S. T.

Determining densities of oils at high temperatures. W. L. NELSON (Oil and Gas J., 1938, 36, No. 37, 184—185).—Working curves, calc. by using the theory of corresponding states, are given. J. W.

Electrification of heating apparatus for oil testing. A. G. BOGDANTSCHENKO (Zavod. Lab., 1937, 6, 1135—1136).—Apparatus is described. R. T.

Testing the protective action of anticorrosive oils and vaselines. VARENTZOV and BATALOVA (Zavod. Lab., 1937, 6, 978-982).—Standard conditions for testing anticorrosive action are specified. R. T.

Lubricating oil and food from peanuts. L. T. KAO (J. Chem. Eng., China, 1935, 2, 112—116).— Peanuts are shelled, dried for 5—6 hr. at 70—80°, separated from the brittle skin, and treated in an oil press. The oil is oxidised by air-blowing for 8 hr. at 200°. The product had d 0.945,  $\eta$  936° Saybolt, acidity 0.011%, and residual C (left in the reaction vessel) 2.27%. The oil does not corrode Cu. The meal left after pressing out the oil is clean and yields a substitute for wheat flour. CH. ABS. (e)

Manufacture of lubricating oil from vegetable oils. E. C. KU and S. M. CHEN (Ind. Res., China, 1935, 4, 239—244).—After partial oxidation by airblowing, soya-bean oil becomes viscous and assumes the properties of lubricating oils. The best results were obtained by treatment at 200° for 8 hr. The product ( $\eta$  866° Saybolt, acid val. 0.26) was yellowishbrown. CH. Abs. (e)

Proximate analysis of some mineral lubricating oils. Concentration of optically active hydrocarbons. J. ROCHE (Ann. Off. nat. Comb. liq., 1937, 12, 711—734).—A German pharmaceutical vaseline oil  $[d^{15}$  0.8834, rotation ( $\alpha$ ) 2° 21'] was selectively extracted with Me<sub>2</sub>O and the sol. and insol. portions were fractionated. By recombining fractions of similar d,  $\alpha$ , and solubility, three classes of hydrocarbons were obtained: (a) sol., of low d and low  $\alpha$ , (b) moderately sol., of high d and high  $\alpha$ , and (c) slightly sol., of low d and low  $\alpha$ . Data for the d,  $\alpha$ , composition, and mol. wt. of (b) show that hydrocarbons of the  $C_n H_{2n-6}$  series are present, and the active constituent is assumed to be cholestane. Similar results were obtained when working with Rumanian, Russian, and Texas oils. R. B. C.

Measuring sludging characteristics of lubricating oils. W. F. WEILAND (Oil and Gas J., 1938, 36, No. 36, 83, 86, 93).—25 c.c. of oil are heated in an oil-bath at about 150° and air is bubbled through it at this temp. for 5 min. The darkened product is compared in colour density with the original oil, the relative change in this giving the oxidation no. Good duplication of results and good agreement with sludging observations is claimed. Oxidation is an exponential function of temp. and is closely related to the unsaturated hydrocarbon content of the oil.

J. W. Laboratory channel test for gear oils. J. P. STEWART (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 485—498).—On the basis of tests on the performance of oil in axles a method has been developed for determining the channel point, *i.e.*, the lowest temp. at which the oil will flow when chilled without disturbance after aëration under given conditions. The test employs the Amer. Soc. Test. Mat: pourpoint equipment with addition of a special stirring apparatus which reproduces the aërating action of the rotating axle gears. R. B. C.

Practical selection of improved lubricants. L. L. DAVIS, B. E. SIBLEY, and B. H. LINCOLN (Refiner, 1935, 14, 523-526; Proc. Amer. Petr. Inst., 1935, Sect. III, 16, 81-103).—Laboratory and road tests show that addition to the lubricant of a small % of an ester of a chlorinated aliphatic acid and a monohydric alcohol (e.g., Me  $\alpha\alpha$ -dichlorostearate) imparts desirable properties.

CH. ABS. (e)

High oiliness-low wear? G. L. NEELY (J. Soc. Auto. Eng., 1937, 41, 548—554T).—The reduction in friction between phosphor-bronze rubbing on steel caused by adding various substances to the lubricant employed between the surfaces is not always accompanied by reduction in wear; the reverse may be true. Friction and wear do not appear to be related. The testing machine employed is described. R. B. C.

Converting kinematic viscosity into Saybolt Universal viscosity. C. E. HEADINGTON and J. C. GENIESSE (Proc. Amer. Soc. Test. Mat., 1937, 37, I, 380-384).—A table for this purpose compiled from the experimental data of five independent workers is given. R. B. C.

Laboratory method for determining the behaviour of lubricating oils on vaporisation. H. BRUCKNER (Angew. Chem., 1938, 51, 53-55).—The sample is heated under controlled conditions up to  $550^{\circ}$  in a current of N<sub>2</sub> and the loss in wt. recorded automatically. From the vaporisation-temp. curves are derived two empirical consts. that serve to characterise the oils. Non-volatile residues are determined at the same time. L. S. T.

Fuel and power generation. Waste-heat recovery. Determining moisture. Sampling granular material. Testing crushing strength of granules.—See I. Esters from olefines. Dehydrated EtOH [for fuel]. Treating crude anthracene.-See III. By-product (NH4)2SO4. Bone black.-See VII. Influence of hydrocarbons on refractories.-See VIII. 9% Cr steel. Metallising in [oil] industry. Corrosion in petroleum refineries. Corrosion of metals by oils.-See X. Contamination of whale oil.-See XII. Coumarone resins. Wax polishes etc. Petroleum products for ink removal.—See XIII. Soil stabilisation with asphalt.-See XVI. Utilising sewage sludge. Sulphite waste.—See XXIII.

See also A., I, 146, Detonation of gas mixtures.

#### PATENTS.

Plant for handling material such as coal. GEN. ELECTRIC CO., LTD., and R. ROBSON (B.P. 477,391, 21.5.36).—A device for distributing coal in a hopper embodies automatic prevention of piling too high or running over the end of the hopper.

B. M. V.

Hydraulic cleaning and separating apparatus for treatment of coal and like materials. G. P. WINDSOR (B.P. 478,516 and 478,628, 21.7.36).—(A) The H<sub>2</sub>O in a jig is oscillated by compressed air admitted to and exhausted from compartments below the screens so shaped as not to obstruct the screen surface. Sludge from the hutch is lifted by additional H<sub>2</sub>O to a dewatering device. (B) The feed shoot extends some distance over the end of the screen, and some of the heavy refuse is discharged under the shoot solely by the pulsations of the H<sub>2</sub>O.

B. M. V. **Treatment of coal-washery slurry.** H. J. GREAVES (B.P. 478,764, 1.12.36).— $H_2O$  used in a coal washery is continuously regenerated for further use by passing all or some of it through an electrostatic flocculator where suspended matter is coagulated, being afterwards extracted from the  $H_2O$  in any known matter. The hardness of the  $H_2O$  may be adjusted at the same time. D. M. M.

Coke ovens. O. HELLMANN (B.P. 478,960, 23.7.36).—Fine coal preheated at 100—250° is fed (screw conveyor) into a loading box whence it is packed by gravity into bottomless moulds resting on the stationary heating surface of an oven. These are mechanically slid through the oven, which may be circular and wherein distillation occurs, the coke dropping out of the mould through a gap in the supporting plate immediately before it reaches the filling station once more, to be recharged. A series of ovens may be built one above the other with their filling stations fed from a common hopper.

#### D. M. M.

Temperature-measuring devices used in reaction vessels for hydrogenation of carbonaceous materials. H. E. POTTS. From INTERNAT. HYDRO-GENATION PATENTS CO., LTD. (B.P. 478,603, 19.8.36). —Pyrometers inserted through the cover of a highpressure vessel are provided with alarm devices to advise immediately of any access of pressure to the interior of the pyrometer. B. M. V.

Manufacture of (A) hydrocarbon gases from coal, (B) oils and/or gases from coal by a hydrogenation process. H. DREYFUS (B.P. 478,668 and 478,720, [A, B] 23.7.36, [B] 3.2.37).--(A) Coal is extracted at 200-400° with a mixture of a neutral solvent, e.g., tetrahydronaphthalene, with 15-35% of a phenolic or basic solvent, e.g., PhOH,  $C_5H_5N$ , the extract is hydrogenated under pressure, and the oils so produced are subjected to thermal decomp. at >600°. Unsaturated hydrocarbon gases, e.g.,  $C_2H_2$ ,  $C_2H_4$ , etc., suitable for use in various synthetic processes, are produced. (B) The process of (A) is modified by hydrogenating the coal extract in admixture with a second solvent, e.g., low-temp. tar. A. B. M.

Gas producers. E. W. BRANDT (B.P. 479,193, 30.6.36. Fr., 1.7.35).—A gas producer is provided with a central reducing chamber through which the products pass, this chamber being placed opposite peripheral air inlets which have the shape of Venturi tubes and cause high-temp. zones in the chamber by conduction from the high-temp. zones in the firebox. This chamber is claimed to dissociate the tars, resins, etc. into stable gases. D. M. M.

Gas-purification process. J. D. PRICE, Assr. to KOPPERS CO. (U.S.P. 2,070,620, 16.2.37. Appl., 9.12.33).—Fuel gas, e.g., coke-oven gas, freed from tar, is scrubbed in the cold with a circulating aq. solution containing 1% of Na<sub>2</sub>CO<sub>3</sub> and some residual NH<sub>3</sub> to remove H<sub>2</sub>S and NH<sub>3</sub> simultaneously. The solution is regenerated by treatment in another scrubber with air or inert gas and used again; the gas is given a second washing with fresh H<sub>2</sub>O, which may be used as make-up to the circulating liquid, equiv. quantities of which are removed. D. M. M.

Desulphurisation of combustible gases. CAR-BONIZATION ET CHARBONS ACTIFS (B.P. 479,410, 2.6.37. Fr., 11.3.37).—The gases are desulphurised, in presence of  $O_2$ , by a catalyst consisting of granules of a porous support, *e.g.*, active C, impregnated first with aq. FeCl<sub>3</sub> and then with aq. Na<sub>2</sub>CO<sub>3</sub> and afterwards washed and treated with superheated steam. D. M. M.

(A) Removal of hydrogen sulphide from hydrocarbon gases. (B) Separation and purification of gases. L.S. TWOMEY (U.S.P. 2,070,098—9, 9.2.37. Appl., [A, B] 9.5.34).—(A) The compressed gas is progressively cooled by admixture with cooler purified gas and by heat exchange with liquefied gases. (B)  $H_2$  in commercial gases, e.g., blue water-gas, is extracted and freed from impurities by progressively cooling the compressed gas, after removal of CO<sub>2</sub>, by heat interchange with liquefied gases, e.g., CH<sub>4</sub>, CO, and N<sub>2</sub>, to approx. -207°, purification being completed by the use of solid adsorbents. D. M. M.

Production of hydrogen [by pyrolysis of hydrocarbons]. G. D. BAGLEY and H. W. B. DE W. ERASMUS, ASSTS. to UNION CARBIDE & CARBON CORP. (U.S.P. 2,071,721, 23.2.37. Appl., 22.6.33).—H<sub>2</sub>, free from  $O_2$ ,  $CO_2$ , and unsaturated hydrocarbons and containing only small quantities, e.g., <10%in all, of N<sub>2</sub>, CO, and saturated hydrocarbons, is obtained by cracking a hydrocarbon gas at 1600— 2300° in a cylindrical shell lined with concentric layers of closely-sized refractory material of decreasing porosity from the centre outwards. The filling is designed so that the time of contact of the gas with the different layers of refractory is automatically regulated to give the same cracking efficiency throughout. The process is cyclic, the temp. being raised when necessary by the use of an air blast to remove deposited C, no other fuel being required. Both cracking and reheating take place alternately from either end of the vessel. D. M. M.

[Thermal] treatment of gases and apparatus therefor. RESEARCH CORP., Assees. of F. G. COTTRELL (B.P. 478,215, 20.7.36. U.S., 14.8.35).— In, e.g., the manufacture of  $H_2$  and CO from hydrocarbon gases and  $H_2O$ , or decomp. of a contaminant in a gas, a zone at reaction temp. is caused to reciprocate in a mass of refractory heat-absorbing fragments by sending the reacting gases through in alternate directions, the remainder of the mass affording preheating and after-cooling. A convenient means of initially obtaining and of maintaining the temp. of the hot zone is to divide the mass into two, with an unobstructed combustion space in the centre. B. M. V.

Production of acetylene. H. DREYFUS (B.P. 479,438, 4.8.36).— $C_2H_2$  is produced by passing liquid or gaseous hydrocarbons, e.g.,  $C_3H_8$  or  $C_4H_{10}$ , through two tubes or sections of tubes, preferably with baffles and each having a length 100—200 times its diameter. The first stage is heated at 600—1000° (800—900°) and the second at >1000° (1100—1200°), the products being rapidly cooled to <600°.

#### D. M. M.

Separation of gas mixtures. P. SCHUFTAN, Assr. to LINDE AIR PRODUCTS CO. (U.S.P. 2,067,349, 12.1.37. Appl., 10.7.36. Ger., 21.5.35).—A mixture of gases, e.g.,  $H_2O$ ,  $H_2$ ,  $C_2H_6$ ,  $C_3H_8$ , and  $C_4H_{10}$ , freed from hydrocarbons  $>C_4$  by scrubbing and to be separated by rectification, is compressed, cooled by a  $H_2O$ -coil, and stored in a vessel capable of containing a considerable bulk of condensed liquid and gas in order to neutralise as far as possible fluctuations in the temp. or compression of the feed gas.  $H_2O$  is drawn off from the storage vessel and the gases are then subjected to several stages of rectification with recovery of  $C_4H_{10}$  in liquid form, other liquid products being mostly returned one step. B. M. V.

Detection and indication of the presence of inflammable vapours or gases. H. T. RINGROSE (B.P. 477,338, 25.6.36).—In a flame type of miner's lamp, besides the visual indication, the presence of inflammable gas causes additional evolution of heat and this heat has been utilised to warp a bimetallic strip or diaphragm and thus close an electric warning circuit, but the effect may be cancelled by deficiency of  $O_2$  substantially always accompanied by excessive  $CO_2$ . In this invention, the presence of the latter gas is caused to move the electric contacts closer together by means which are not claimed but are described as

absorption in alkali producing a difference in pressure on a diaphragm carrying the fixed contact. B. M. V.

Apparatus for determining the total heating value per unit volume of combustible gases. E. X. SCHMIDT, Assr. to CUTLER-HAMMER, INC. (U.S.P. 2,068,436, 19.1.37. Appl., 25.4.35).—In a continuous gas calorimeter, cyclic variation in the flow of gas delivered by the gasmeter pump (of the positive-displacement type) is compensated for by providing a conduit between the pump and calorimeter equal in vol. to that of the gas delivered during one revolution of the pump, then splitting the combustion air (also pumped) so that a primary fraction equal in vol. to that of the gas is admixed with the gas at a point half way along the conduit.

B. M. V.

Refining of lignite tar, shale tar, peat tar, and the like. DEUTS. ERDÖL-A.-G. (B.P. 479,488, 4.8.36. Ger., 8.8.35).—The crude tar is topped to about 260° and the residue, after dilution with thinning oils, *e.g.*, benzine, or dewaxing, is treated with selective solvents, *e.g.*, phenols of low b.p. which may be diluted with H<sub>2</sub>O or the lower alcohols. The treatment takes place at >50° if direct, or at 20— 30° if the tar has been dewaxed or a thinner used. The raffinates may be used for lubricating oils or may be cracked. D, M. M.

(A) Improving tars for use in road construction, and particularly their binding properties. (B) Improving tars, and especially their binding properties. W. W. GROVES, Assee. of I. G. FARBEN-IND. A.-G. (B.P. 478,661 and 478,679, [A] 22.7.36, [B] 24.7.36. Ger., [A] 28.9.35, [B] 21.12.35. Addns. to B.P. 445,473; B., 1936, 597).—About 0.5% of (A) an unchlorinated polyvinyl chloride, or (B) other vinyl polymeride derivative, *e.g.*, polyvinylcarbazole or a polyvinylacrylic ester, is incorporated with the tar (heated to  $100-140^{\circ}$ ) either as powder or in solution in *cyclo*hexanone, anthracene oil, etc.

A. B. M.

[Tarry] compositions [for roads etc.]. (A) E. O. RHODES and H. E. GILLANDER, jun., (B) J. H. SWANBERG, ASSTS. to KOPPERS Co. (U.S.P. 2,069,927 and 2,069,929, 9.2.37. Appl., [A] 21.11.34, [B] 17.1.35).—(A) Low-boiling, cracked petroleum distillates are added to coal tars or oil-gas tar in sufficient quantity to cut back the tar. (B) Coal tar or oil-gas tar is mixed with a fluxing liquid consisting of an aromatic hydrocarbon oil from coal tar and a preponderant portion of aliphatic hydrocarbon oil originating from petroleum oil. The products, which are suitable for road work at atm. temp., are free from the sludge produced when aliphatic hydrocarbons alone are added to coal tar. D. M. M,

Manufacture of bituminous compositions. J. K. HUNT and J. H. SHIPP, Assrs. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,069,314, 2.2.37. Appl., 19.9.33).—Asphaltite is heated in an open kettle, or a covered vessel connected to condensing apparatus, or in an autoclave, at  $370-400^{\circ}$  for 3-10 hr. until >15 wt.-% is lost and the fixed C has increased by 20-65%. The product may be thinned with the volatile matter driven off, to form a coating composition. D. M. M. Cracking of hydrocarbons. K. A. BEACH, Assr. to SINCLAIR REFINING CO. (U.S.P., 2,071,723, 23.2.37. Appl., 4.5.31).—The hot vapour mixture from a vapour-phase cracking operation is passed through a liquid oil mixture in a coking chamber at >510°, thus supplying most of the heat required for the coking operation, the balance being supplied by combustion gases passing outside the coking chamber at a temp.  $110-160^\circ$  > that within the chamber. If desired, the vapour mixture may be used to dry the coke in a first coking chamber before passing through the liquid oil in the second one. D. M. M.

Conversion of hydrocarbons. H. TROPSCH, Assr. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 2,069,785, 9.2.37. Appl., 15.12.33).— $C_3H_8$ – $C_4H_{10}$ fractions of natural, still, or cracking gas are heated at 450—575° (525—550°)/25—100 (50—75) atm. for 40—120 sec., the conditions being so controlled that only 20—50 wt.-% is converted into hydrocarbons of <  $C_3$  and >  $C_4$  range. Those between these ranges are used as recycle stock, whilst the gaseous hydrocarbons of <  $C_3$  are separated and the liquid ones of >  $C_4$  recovered for motor fuel. D. M. M.

Purification of crude hydrocarbons. W. W. TRIGGS. From GUTEHOFFNUNGSHÜTTE OBERHAUSEN A.-G. (B.P. 479,441, 4.8.36. Addn. to B.P. 459,559; B., 1937, 319).—Crude hydrocarbons, e.g.,  $C_6H_6$  and benzines, are scrubbed with high-boiling liquids, e.g., PhOH or cresol, by bringing the vapours in contact with a porous mass, e.g., kieselguhr, impregnated with the purifying agents. The crude hydrocarbons may be distilled in separate fractions from a batch still and the vapours of each fraction purified separately, or all fractions may be vaporised together by heating under pressure and suddenly releasing the pressure, when they are all purified together.

D. M. M.

Treatment of hydrocarbon oils. J. C. MORRELL, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 2,070,295, 9.2.37. Appl., 15.9.33).—Cracked gasoline is fractionated into (a) a light fraction of low S content requiring only inhibitor treatment, and (b) a heavier fraction of high S content which is catalytically hydrogenated at  $316-455^{\circ}/100-3000$ lb. per sq. in. to remove the S and then refractionated in a separate still to produce a refined and desulphurised gasoline which may be blended with the light products from the first still. D. M. M.

Treatment of [fuel] oil. A. VON GROELING (U.S.P. 2,069,596, 2.2.37. Appl., 29.1.30).—The residue from fractionation and/or cracking of crude oil is treated at  $538^{\circ}/50$ —70 atm. by injecting H<sub>2</sub> and/or natural gas into the residue, the products being passed through a series of temp.- and pressurereducing stages to separate the heavier portions in each stage. D. M. M.

Extraction of light mineral oil distillates with sulphur dioxide. E. W. THIELE and F. W. SCHEINE-MAN, ASSTS. to STANDARD OIL CO. (U.S.P. 2,071,590, 23.2.37. Appl., 23.3.34).—Naphtha containing antiknock constituents is dried with CaCl<sub>2</sub>, brought in contact with gaseous SO<sub>2</sub>, cooled, extracted with liquid SO<sub>2</sub>, and separated by multiple-stage evaporation; the  $SO_2$  vaporised is partly condensed and both the condensed and gaseous  $SO_2$  are recycled. D. M. M.

Manufacture of a sulphur-bearing oil. B. M. CARTER, T. V. FOWLER, and H. F. MERRIAM, Assrs. to GEN. CHEM. Co. (U.S.P. 2,070,256, 9.2.37. Appl., 20.4.34).—An oil rich in S is produced by the destructive distillation, in absence of air, of acid sludge from the purification of oils containing < 0.15% S with H<sub>2</sub>SO<sub>4</sub> at 120—315°. The vapours produced are condensed, the SO<sub>2</sub> is separated, and the oil recovered from the oil-H<sub>2</sub>O mixture. This oil may be redistilled to give fractions of b.p. <177° and of 177—343°. The latter may be washed with NaOH. D. M. M.

Manufacture of residual oils of high asphaltic content. H. G. NEVITT, Assr. to SOCONY-VACUUM OIL Co., INC. (U.S.P. 2,069,620, 2.2.37. Appl., 16.6.32).—Residual oil of high asphaltic and low C content is produced by passing a heated stream of oil containing an asphaltic residue into a vaporising chamber, separating (by vaporising) all products lighter than an asphalt residue containing 60—70% of 100-penetration asphalt, and cooling the residue to about 350° by introducing a cool oil which is vaporised below the temp. of the first vaporisation. D. M. M.

Prevention of corrosion in oil stills. C. M. FISHER, ASST. to SOCONY-VACUUM OIL CO., INC. (U.S.P. 2,068,979, 26.1.37. Appl., 20.1.36).—A small proportion of oil-sol. alkaline-earth (Ca) naphthenate is added to the oil to be distilled. B. M. V.

Production of motor fuel. ANGLO-IRANIAN OIL CO., LTD., A. E. DUNSTAN, and S. F. BIRCH (B.P. 479,345, 29.7.36, 1.12.36, and 19.5.37).—Aviation or motor spirit is produced by alkylation of an *iso*paraffin. Thus *iso*-C<sub>4</sub>H<sub>10</sub> is condensed with an olefine or olefines, *e.g.*, C<sub>3</sub>H<sub>6</sub> or *iso*- or *n*-C<sub>4</sub>H<sub>8</sub>, in presence of H<sub>2</sub>SO<sub>4</sub> at low temp.; *e.g.*, at  $-10^{\circ}$  to  $30^{\circ}$  equimol. proportions of the *iso*-C<sub>4</sub>H<sub>10</sub> and the olefine interact. On settlement an upper hydrocarbon layer separates, from which the spirit may be separated on distillation. D. M. M.

Motor fuel. A. O. JAEGER, ASST. to AMER. CYANAMID & CHEM. CORP. (U.S.P. 2,070,304, 9.2.37. Appl., 21.7.31).—Gum formation is inhibited in cracked motor fuel by addition of 2—5 lb. of an aromatic amide, e.g., NH<sub>2</sub>Bz, phthalamide, or its alkyl-substituted derivitives, per 100 barrels of fuel. D. M. M.

Stabilisation of motor fuels. F. B. DOWNING and R. G. CLARKSON, ASSTS. to GASOLINE ANTIOXID-ANT CO. (U.S.P. 2,071,064, 16.2.37. Appl., 21.9.33). —Gum formation in cracked motor fuels is inhibited by addition of 0.002—0.003% of a *p*-hydroxy-*N*phenylmorpholine. D. M. M.

Catalytic treatment of motor fuel. A. L. MOND. From UNIVERSAL OIL PRODUCTS CO. (B.P. 478,996, 16.6.37).—The antiknock rating of motor fuel is improved by treating at elevated temp. (450— 700°) with granular catalysts consisting of MgO + >10% of added PbCrO<sub>4</sub> and ZnSO<sub>4</sub>. D. M. M.

Improving the antidetonating quality of gasoline. A. E. PEW, jun., Assr. to SUN OIL Co. (U.S.P. 2,069,847, 9.2.37. Appl., 20.5.32).—Antiknock properties of gasoline are improved and removal of gum formers is assisted by heat-treating it at 450° when mixed with fuel oil and subsequently separating it by fractionation. D. M. M.

Fuels, more particularly fuels suitable for use in welding and cutting metals. C. F. CARROLL (B.P. 479,483, 25.2.37. Belg., 25.2.36).—Suitable fuels consist of commercial "dry"  $C_3H_8$  (initial b.p. -46°, dew point -43°) and/or  $C_4H_{10}$  (-9° and -4°, respectively), with 1—7% (5%) of Et<sub>2</sub>O.

D. M. M.

(A) Lubricant. (B) Refining of mineral oils. (C) Purification of oil fraction and solvent recovery. M. H. TUTTLE, Assr. to M. B. MILLER & Co., INC. (U.S.P. 2,070,383-5, 9.2.37. Appl., [A] 5.9.33, [B] 31.1.34, [C] 9.10.34. Cf. U.S.P. 1,912,348-9; B., 1934, 183).—(A) The residue resulting from the distillation, below cracking temp., of an asphalticbase crude is subjected to selective solvent treatment by the simultaneous use of paraffinic and nonparaffinic solvents, and the paraffinic fraction is further refined to give a lubricating oil with  $\eta/d$ characteristic 0.815, n index 100, Conradson C no. <0.36, and free from constituents produced by  $H_2SO_4$  treatment or by distillation of residual oil. (B) Mineral oil is refined by simultaneous treatment with paraffinic and naphthenic solvents, e.g., C3H8, a raffinate fraction being separated and excess of the paraffinic solvent removed, e.g., by evaporation. Additional naphthenic solvent is added, if necessary, to cause stratification, the layers are separated, and the bottom one, being mostly naphthenic solvent, is returned to the previous step. (c) Oil is extracted as in (B) in a countercurrent system and the lower layer referred to in (B), after stratification of the paraffinic raffinate, is returned to the system between the point where the mineral oil is charged and that where fresh naphthenic solvent is introduced, preferably at a point where the composition of the mixture and oil and solvents resembles that of the lower layer. D. M. M.

Lubricant. E. WAHLFORSS, C. L. JOHNSON, and G. LACY, ASSTS. to GLIDDEN CO. (U.S.P. 2,069,790, 9.2.37. Appl., 10.10.34).—An extreme-pressure lubricant is claimed consisting of a hydrocarbon oil with 2% of a polychlororetene. D. M. M.

Manufacture of lubricants. C. OCKRENT, D. W. F. HARDIE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 478,972, 27.7.36. Cf. B.P. 447,778 and 259,507; B., 1936, 869; 1926, 1028).—Lubricating oils are produced by condensing (AlCl<sub>3</sub>) a chlorinated aliphatic hydrocarbon of high mol. wt., e.g., chlorinated paraffin wax (15-30% Cl) with an aromatic hydrocarbon, e.g., C<sub>6</sub>H<sub>6</sub>, PhMe, allowing the product to stratify, and separating the layers, the lower of which is used as catalyst for a further quantity of the reactants and lubricating oil is recovered from the upper. The lower layer may be purged and have fresh AlCl<sub>3</sub> added to it as required; the whole process may be worked continuously. D. M. M.

(A) Treating and reclaiming, (B) oxidationrefining, of lubricating oil. B. H. SHOEMAKER, Assr. to STANDARD OIL CO. (U.S.P. 2,070,626-7, 16.2.37. Appl., [A] 29.12.32, [B] 29.8.34).—(A) Used oil from motor-car crank cases is reclaimed by mixing with liquefied  $C_3H_8$ , cooled to  $<30^\circ$ , and  $C_3H_8$ -sol. constituents are separated and recovered. (B) Lubricating oil stock is oxidised by contact with gas containing  $O_2$ , e.g., air, at  $<93^\circ$  but < the cracking temp. for a time corresponding with 50 hr. air blowing at 171° and enough to oxidise a sufficient amount of the low- $\eta$  index constituents to raise the  $\eta$  index of the residue by 15 units. The oxidised oil is vac.distilled in presence of alkali or alkaline-earth hydroxides or carbonates. D. M. M.

Lubricating oil refining. C. E. ADAMS, Assr. to STANDARD OIL Co. (U.S.P. 2,070,567, 16.2.37. Appl., 10.5.35).—Hydrocarbon lubricating oil stock is refined by oxidation by contact with a gas containing free  $O_2$ , e.g., air, in presence of 0.1-10% (1%) of FeCl<sub>3</sub> at 120-205° (120-177°) for 30-200 hr.; the low- $\eta$ index constituents are pptd. by addition of 2-10 times its vol. of a low-boiling, normally gaseous hydrocarbon, e.g.,  $C_3H_8$ , at a temp. 5-45° (27°) below the crit. temp. of the normally gaseous hydrocarbons. The solvent is removed and the oil dewaxed and then given an acid or clay treatment. D. M. M.

Dyed lubricating oil. C. WINNING and S. C. FULTON, Assrs. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 2,071,481, 23.2.37. Appl., 16.11.31).—The pour point of a pale lubricating oil may be depressed and its colour and bloom improved by adding a small quantity, e.g., 0.08%, of a resin obtained by distilling cracked petroleum residue to remove oil constituents, treating it with a solvent in which asphaltenes are insol., acid-treating the extract containing the solvent, neutralising, and distilling off the solvent.

D. M. M.

Non-sludging oil. R. ROSEN, ASST. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 2,069,273-4, 2.2.37. Appl., [A, B] 30.12.33).—(A) A dewaxed or wax-free petroleum lubricating oil is mixed with 1—2% of a sludge-dispersing agent consisting of the heavy, fluid condensation product of waxy hydrocarbons, with or without an aromatic derivative, e.g., petrolatum and  $C_{10}H_8$ . (B) A wax-containing petroleum lubricating oil is mixed with a similar agent, as in (A).

D. M. M.

Lubricant compound. T. G. ROEHNER, Assr. to SOCONY-VACUUM OIL CO., INC. (U.S.P. 2,069,626, 2.2.37. Appl., 3.7.34).—A slushing oil used to coat metal surfaces as protection against  $H_2O$  is made by mixing pine fatty acids 3—5, amber petrolatum 8—15, and light paraffin oil 89—80%. The acids are obtained by fractionation of the fatty matter separated from pine wood when cooked by the alkaline process for wood pulp. D. M. M.

Manufacture of solid lubricants. B. H. LIN-COLN and E. W. NELSON, ASSTS. to CONTINENTAL OIL CO. (U.S.P. 2,070,014, 9.2.37. Appl., 3.5.35).—A mixture of stearic acid and tallow is heated in an open-top kettle to  $66-93^{\circ}$  and then saponified with NaOH while gradually raising the temp. to  $93^{\circ}$ , only enough NaOH being used to give a final free alkali content of 0.2-1.5 wt.-%. Heating is continued until the H<sub>2</sub>O content is reduced to  $\Rightarrow 0.2\%$ , when a heavy hydrocarbon oil amounting to  $1-1\frac{1}{2}$  times the wt. of the soap is added at such speed as to allow the temp. to remain const. The temp. of the mixture is then raised to  $< 205^{\circ}$  but > the flash point of the oil for  $\frac{1}{2}$ —3 hr., after which the mass is allowed to cool and harden. The final composition of the lubricant is soap (as Na stearate) 38.6-50, NaOH (free) 0.2-1.5, glycerol 0.01-0.5, S.-R. cylinder stock 60.8-49.0%. D. M. M.

Adhesive [lubricating] compositions. F. M. CLARK, Assr. to GEN. ELECTRIC CO. (U.S.P. 2,056,826, 6.10.36. Appl., 10.8.34).—Solid chlorinated  $Ph_2$  products are converted into soft gels by agitating with 3-15% of a fatty acid soap, e.g., Al stearate, with addition of a small proportion of a mineral oil. The products do not solidify at  $-25^{\circ}$  and may be used as lubricating greases, for dielectric and insulating purposes, and as adhesive media in gas-cleaning apparatus. S. M.

Antifreeze lubricating grease. J. C. ZIMMER and A. J. MORWAY, Assrs. to STANDARD OIL DEVELOP-MENT CO. (U.S.P. 2,071,488, 23.2.37. Appl., 26.9.34). -The grease consists of a lime-rosin soap 8-15, heavy hydrocarbon oil 35-60, wax tailings 10-20, antifreeze salt, e.g., CaCl<sub>2</sub>, MgCl<sub>2</sub>, or NaCl, 20-35, H<sub>2</sub>O 1-5%. D. M. M.

Testing of lubricants. E. A. SPERRY, jun., Assr. to Sperry Products, Inc. (U.S.P. 2,065,625, 29.12.36. Appl., 13.2.35).—The sticking power of the lubricant is measured by weighing a centrifugal disc when dry and after spinning off as much as B. M. V. possible of the lubricant spread over it.

Purification of [oily] liquids. C. H. M. ROBERTS and R. L. BELSHE, Assrs. to PETROLEUM RECTIFYING Co. of California (U.S.P. 2,067,345, 12:1.37. Appl., 12.3.34) .- Insulating oil containing ionised and polar impurities is treated in two stages of adsorption alternating with two of filtration, the first adsorbent being capable of adsorbing the ionised more rapidly than the polar impurities. A method of forming the final adsorbent in situ comprises striking an arc between C electrodes submerged in the oil.

B. M. V.

Oil-reclaiming devices. A. WOOSNAM. From PERFEX OIL RE-REFINERY SYSTEM, INC. (B.P. 478,441, 4.8.36).—A waste-oil cabinet in which the oil is heated to vaporise volatile constituents and then filtered is described. The heating is adjustable to produce clean oils of different  $\eta$ . B. M. V.

Coking of hydrocarbon material. A. J. BOYN-TON, Assr. to BRASSERT-TIDEWATER DEVELOPMENT CORP. (U.S.P. 2,069,815, 9.2.37. Appl., 17.2.34).

Furnaces for solid fuels. Peat insulation. Distilling schists etc. Retort. Filter cartridge etc. Centrifugal separator bowl. Viscosimeter. -See I. Recovering hydrocarbons. Separating bases.—See III. Constructional material.—See IX. Detecting gas in mines etc.—See XI. Reclaiming bone char.-See XVII.

#### III.-ORGANIC INTERMEDIATES.

Separation of ethane-ethylene mixtures by means of rectification. V. FISCHER (Z. Ver. deut.

Ing. Verfahrenstech., 1937, 118-124).-Separation in a column for the cases of  $C_2H_6$  and  $C_2H_4$  additions, respectively, is described. Heat balances and equations are derived which permit the application of Ponchon's graphical method for determining the no. of plates and necessary amounts of added  $C_2H_6$ and  $C_2H_4$ . The energy required for separation is discussed. A numerical example is given.

R. B. C. Analysis of mixtures of ethyl alcohol, ether, and water. A. N. JUZICHIN (Zavod. Lab., 1937, 6, 1013-1014).-The author's method (B., 1935, 395) is applied to such mixtures.

Direct synthesis of esters from olefines and organic acids. T. W. EVANS, K. R. EDLUND, and M. D. TAYLOR (Ind. Eng. Chem., 1938, 30, 55-58). -Conditions covering the direct catalytic addition of org. acids to olefines are outlined, with particular reference to the formation of Bu<sup>β</sup>OAc and C<sub>5</sub>H<sub>11</sub>·OAc from the crude olefine (obtained from cracked from the crude of  $H_2SO_4$ . petroleum) and AcOH in presence of  $H_2SO_4$ . F. N. W.

Importance of azeotropic mixtures in alcohol dehydration. S. RIEBER (Revista Chim. Ind., 1937, 6, 419-423).—Cane sugar is converted in the State of Pernambuco into anhyd. EtOH by the process of the Soc. Anon. des Distilleries des Deux-Sèvres (cf. B., 1929, 834) and is suitable for use as fuel-EtOH.

F. R. G.

Determination of diethyl ether in commercial preparations. E. J. BOORMAN (J.S.C.I., 1938, 57, 65-68).-Et<sub>2</sub>O is removed from the sample (diluted if necessary with OH·[CH<sub>2</sub>]<sub>2</sub>·O·[CH<sub>2</sub>]<sub>2</sub>·OEt) by controlled aeration; contaminants are removed by subsequent scrubbing of the air stream with 40% aq. KOH at 100°, and 25% aq.  $H_2SO_4$ , and the  $Et_2O$  is then quantitatively absorbed in conc.  $H_2SO_4$ . Further purification is effected if necessary by regenerating the  $Et_2O$  by adding the solution in conc.  $H_2SO_4$  to 3 vols. of  $H_2O$ , aerating the warm (45°) solution, and absorbing the purified  $Et_2O$  in conc. H<sub>2</sub>SO<sub>4</sub>. The Et<sub>2</sub>O is determined by quant. oxidation to AcOH by a known wt. of  $K_2Cr_2O_7$ , and back-titration of the unused K2Cr2O7 in an aliquot of the diluted reaction mixture by 0.1N-Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. An accuracy of 1% is claimed.

Detection of sorbitol by the Schotten-Baumann reaction. W. KRASZEWSKI and R. JUDELOWICZÓWNA (Przemysł Chem., 1937, 21, 308-310).-The method of Litterscheid is preferred to that of Werder or to the Schotten-Baumann reaction for detection of sorbitol in wines. R. T.

Determination of formic acid in cuprammonnium solutions of formates and carbonates. V. M. GRINEVITSCH (Zavod. Lab., 1937, 6, 1028).-10 ml. of tenfold diluted solution are added to 6 ml. of N-NaOH in 50 ml. of hot  $H_2O$ , and the solution is boiled for 5 min. and filtered. 0.5-1 g. of NaHCO3 is added to the filtrate, which is then boiled for 5min. with 40 ml. of 0.1N-KMnO<sub>4</sub>. Then 25 ml. of 20%  $H_2SO_4$  and  $0\cdot ln \cdot H_2C_2O_4$  are added and the excess of  $H_2C_2O_4$  is titrated; the amount of KMnO<sub>4</sub> used for oxidation of HCO<sub>2</sub>H is derived therefrom.

R. T.

Colloid-chemical studies on soluble alginate. I. Viscosity. N. SUZUKI (J. Agric. Chem. Soc. Japan, 1938, 14, 28–34).—The effects of various kinds and conces. of alkali used for extraction, methods of prep., temp., and electrolytes on the  $\eta$  of sol. alginates have been determined. J. N. A.

Composition and method of treatment of crude anthracene. N. A. NIKOLSKI (Koks i Chim., 1937, No. 10, 63-65).-86% of the anthracene (I) content of crude (I) is collected in the fraction of b.p. 325-345°, constituting 38% of the wt. of crude (I) taken for distillation. R. T.

Acidimetric (conductometric) determination of phenol in presence of fatty acids. M. I. LAPSCHIN (Zavod. Lab., 1937, 6, 1405—1409; cf. A., 1937, I, 323).—The PhOH-AcOH mixture is titrated conductometrically with NaOH for total acids and with aq. NH<sub>3</sub> to determine AcOH. The method may be used to determine PhOH and AcOH in concns. as low as 0.001 $\aleph$ ; the concn. of either component can be 10 times that of the other. D. G.

Comparison of the chief analytical methods for determination of picric acid. N. P. AGAFOSCHIN (Zavod. Lab., 1937, 6, 1016—1018).—The aq. solution is neutralised with aq. NH<sub>3</sub> and picric acid pptd. with  $CuSO_4$  in aq. NH<sub>3</sub> or with  $Hg(NO_3)_2$ . None of the standard methods gives exact results for picric acid in effluent H<sub>2</sub>O. R. T.

Coloured resins, adhesives, and textile dyes from urea. A. STEIGMANN (Kolloid-Z., 1938, 81, 330-334).-Coloured resins are formed by heating resorcinol, pyrogallol, etc. with glycerol and conc.  $H_2SO_4$ , allyl chloride, or  $\alpha\beta$ -dicarboxylic acids. Dyes are produced by condensing urea with citric acid etc. followed by aldehydes, allyl derivatives, etc. Adhesives are made by heating urea with, e.g., salicylic acid and (CH<sub>2</sub>)<sub>6</sub>N<sub>4</sub>; if the acid is omitted the product can be dispersed in H<sub>2</sub>O with addition of casein to yield a paint medium. A natural resin (m.p. 40-50°) from Belgian Congo is described which can be used directly as a rust-inhibitor for Fe or dispersed in aq. borax-urea-casein to produce protective coatings. S. M.

Appliance for rapid determination of water in Solidol intermediates. N. N. STASEVITSCH and A. K. BASTANDSHLAN (Zavod. Lab., 1937, 6, 887— 888).—H<sub>2</sub>O is determined by distillation with C<sub>2</sub>H<sub>2</sub>Cl<sub>4</sub>. R. T.

CH<sub>4</sub> detectors. Org. syntheses from unsaturated hydrocarbons. Products from cracking of oil. Physical consts. of hydrocarbons.— See II. Analysis of  $H_2SO_4$ -AcOH mixtures and of acetates.—See VII. Urea resins.—See XIII. Tanning materials from phenolsulphonic acids and CH<sub>2</sub>O.—See XV. Glycerol from sugar.—See XVII. Determining MeOH in EtOH.—See XVIII. Determining Ac<sub>2</sub> in butter. [Products from] low-grade coffee.—See XIX. Vanillin. Determining novatropine and mandelic acid. 2:4-(NO<sub>2</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>·OH, phenolphthalein and acetylsalicylic acid, hexylresorcinol, and CH<sub>2</sub>Ph compounds. Preservatives.—See XX.

Sce also A., I, 149, Effect of alkali on Cu MeOH catalysts. 150, Catalysts for gas-phase reduc-tion of  $PhNO_2$  to  $NH_2Ph$ . II, 80, Prep. of linolenyl alcohol. 81, Prep. of esters. 82, Maleic acid production. 83, Prep. of alkoxyacetaldehydes, and of ketones from higher fatty acids. 92, Prep. of aminopropanediols and derivatives. 93, Intermediates for azo dyes. Tolane and deoxybenzoin dyes. 94, Prep. of Ag phenoxides. Electrolytic substitution in naphthols. 95, Quinol and its oxidation products in alkaline solutions. 96, Prep. of glycerides of Ph-substituted aliphatic acids, and of Ph·[CH<sub>2</sub>]<sub>2</sub>·OH. 100, Catalytic hydrogenation of cinnamaldehyde and of citronellal. Prep. of  $\Delta^2$ -cyclohexenones. 102, Prep. and reduction of benzil. 106, Catalytic oxidation of camphor. 111, Prep. of 8-nitro-6methoxyquinoline.

#### PATENTS.

Recovery of hydrocarbons. W. H. A. THE-MANN. From CARBO-NORIT-UNION VERWALTUNGS-GES. M.B.H. (B.P. 478,486, 7.6.37).—The ability of C to absorb hydrocarbons from gases saturated with  $H_2O$  vapour is increased by raising the temp. (e.g., from 25° to 30—35°) (by cooling only part of the original gas or by diluting with a hot gas) so that the R.H. is <90% (>70%). The treatment of coke-oven gas is described. A. H. C.

Decomposition of hydrocarbons and catalyst therefor. F. PORTER, Assr. to ATMOSPHERIC NITRO-GEN CORP. (U.S.P. 2,067,729, 12.1.37. Appl., 16.7.31). —Catalysts consisting of an oxide of Cr, V, W, or Mo are suitable for promoting reaction between steam and hydrocarbons (CH<sub>4</sub>) which contain S impurities at 500—900° (700—900°). The catalysts may be prepared on a support or in presence of minor amounts of a second oxide as promoter; those prepared by heating (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>-(NH<sub>4</sub>)<sub>2</sub>Mo<sub>2</sub>O<sub>7</sub> mixtures (10% of MoO<sub>3</sub>) to  $< 300^{\circ}$  are claimed. A. H. C.

Hydrogenation of hydrocarbons containing sulphur. P. MARÉCAUX (B.P. 479,428, 29.5.36. Fr., 31.5.35 and 26.2.36).-Hydrocarbons containing S are converted into products of lower mol. wt. and b.p. by treatment with  $H_2$  or gases containing  $H_2$ , in presence of catalysts not affected by S, and in a stepwise manner in successive catalyst chambers, the  $H_2S$  being kept at 0.1-1.0%; excess of  $H_2S$  is removed by treatment in intermediate chambers with absorbents which may be periodically regenerated. Suitable catalysts are Mo or W or their compounds, and suitable H<sub>2</sub>S-absorbing agents are finely-divided metals, e.g., Fe, Ni, Cu, Co, Mn, Sb, Sn, Zn, Al, Pb, or their subsulphides; the pressure may vary in Ď. M. M. successive pressure chambers.

Alkali salts of [ $\beta$ -]chloroethanesulphonic acid. E. C. BRITTON and R. P. PERKINS, ASSTS. to DOW CHEM. CO. (U.S.P. 2,067,873, 12.1.37. Appl., 21.9.34). —An aq. alkali sulphite is added to an excess of hot CH<sub>2</sub>Cl·CH<sub>2</sub>Br (I) and the whole refluxed with Cu or Cu salt. Excess of (I) is distilled off and the alkali chloroethanesulphonate extracted from the dried salts with MeOH. The prep. of the Na and K salts (yields 88% and 78%, respectively) is described. A. H. C.

Hydrolysis of isobutyl chloride. E. C. BRITTON, G. H. COLEMAN, and G. V. MOORE, Assrs. to Dow CHEM. Co. (U.S.P. 2,067,473, 12.1.37. Appl., 18.4.34). —Bu<sup>g</sup>Cl is hydrolysed to Bu<sup>g</sup>OH, Bu<sup>y</sup>OH, and iso-C<sub>4</sub>H<sub>8</sub> by heating to >100° (120–350°) (autoclave) with an aq. inorg. base. Formation of Bu<sup>g</sup>OH is formation of Bu<sup>g</sup>OH is favoured by sol. hydroxides, that of Bu<sup>v</sup>OH by sol. carbonates or bicarbonates and by increasing the H<sub>2</sub>O: BuCl ratio. iso-C<sub>4</sub>H<sub>8</sub> formed may be converted into  $Bu^{\gamma}OH$  by reheating the acidified product to 75–150°. The use of NaOH and  $Ca(OH)_2$  is claimed. A. H. C.

Hydrogenation catalyst and its preparation. E. C. WILLIAMS and S. H. MCALLISTER, Assrs. to SHELL DEVELOPMENT Co. (U.S.P. 2,067,368, 12.1.37. Appl., 23.3.35).-A metal compound is converted into free metal by thermal decomp. and/or reduction with H<sub>2</sub> at 250–350°/1–25 atm. in presence of a liquid medium (e.g., hydrocarbon mixtures  $< C_8$ , b.p.  $100-250^\circ$ ) which is volatile at the temp. of prep. and carries off products of decomp. The resulting catalysts, which may be on an inert support, are suitable for liquid- or vapour-phase reduction and the liquid medium may itself be an unsaturated mixture which is subsequently reduced. The prep. of Ni catalyst by heating  $(\text{HCO}_2)_2$ Ni in a hydrocarbon  $(iso-C_{12}H_{26})$  at 250–350° is specifically claimed.

A. H. C.

(A) Manufacture and use, and (B) reactivation, of catalysts used in hydrogenation and like processes. T. H. DURRANS and B. T. D. SULLY (B.P. 478,386 and 478,487, 8.10.36).-(A) Catalysts of uniform activity are prepared by pptg. a Ni salt with excess of an alkali carbonate, removing sol. salts by repeated filtration and washing in a colloid mill, drying, dispersing in an inert liquid medium (mineral oil) by grinding in a paint mill, reducing with H<sub>2</sub> (200-300°), and, if necessary, regrinding. The use of promoters (Cu compounds) and crystallisation inhibitors (Al compounds) which may be co-pptd., and the hydrogenation of CHMe:CH·CHO to PrCHO and BuOH, is claimed. (B) Catalysts obtained as in (A) are reactivated by oxidising with dry or superheated steam and again reducing with H2 at the same temp. as that of the original reduction. A. H. C.

Synthesis of olefine derivatives. R. Z. MORA-VEC, Assr. to SHELL DEVELOPMENT CO. (U.S.P. 2,067,616, 12.2.37. Appl., 5.3.35).-Ethers, esters, and alcohols are produced by absorbing olefines in a liquid mineral acid at such a temp. ( $\gg 46^{\circ}$ ) and pressure that the olefine absorption product is in the liquid phase, and adding H<sub>2</sub>O in such amounts that the ratio of free acid to free acid  $+ H_2O$  is maintained within the range 0.5-0.98. E.g., a mixture of 75%  $H_2SO_4$  (50 g.) and Bu'OH (56.5 g.) is treated at  $35-43^{\circ}$ /pressure with separate lots of  $C_4H_{10}-C_4H_8$ (about 33% of  $iso-C_4H_8$ ) with agitation, each lot containing sufficient H<sub>2</sub>O to maintain the ratio free  $H_2SO_4/(free H_2SO_4 + H_2O) = 0.7 - 0.75$ , to give Bu'OH in 62.5% yield. N. H. H.

Treatment of unsaturated monohalides. H. P. A. GROLL and G. HEARNE, Assrs. to SHELL DEVELOPMENT Co. (U.S.P. 2,067,392, 12.1.37. Appl., 27.4.34).—Unsaturated monohalides (I), containing <4C with an olefinic linking between two aliphatic C and halogen linked to a saturated C, are caused to react, generally at  $\Rightarrow$  room temp., with aq. solution of a hypohalogenous acid, a preformed aq. solution of halogen in substantial absence of undissolved halogen (H halide concn. > 1.5N), or an aq. mixture of an org. hypohalite containing alkyl contiguous to the hypohalite radical, particularly Bu'OCl. When (I) contains the grouping ·CH:CH·C·C+·, the products are polyhalogenated primary or sec. alcohols if C<sup>+</sup> is not quaternary or tert., but if it is, and possibly part of a cyclic radical, the main reaction product is a further halogenated compound obtained by substitution of halogen for H and possibly by addition of halogen to the olefinic double linking. Where (I) contains  $\cdot C:C(C) \cdot C \cdot C^+ \cdot \text{ or } \cdot C \cdot C(C):C \cdot C^+ \cdot \text{ and } C^+ \text{ is not quaternary}$ or tert. the main product is a polyhalogenated tert. alcohol, whilst when C+ is quaternary or tert. the main reaction is substitution of halogen for H. Sp. claim is made to the prep. of  $\alpha \alpha'$ -dichlorotert.-butyl alcohol, b.p. 70°/14.2 mm., and y-chloro-a-bromobutanβ-ol from HOCl and CH2:CMe·CH2Cl and CHMe:CH·CH, Br, respectively.

Manufacture of liquid polymerisation products of a low degree of polymerisation from olefines. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 478,601, 5.8.36).—Mono- and di-olefines ( > C<sub>7</sub>) are polymerised in presence of AlF<sub>3</sub>, which may be anhyd. or hydrated, alone or on a carrier, at 160-500°  $(180-300^{\circ})/1-50$  atm. to yield chiefly liquid products of b.p.  $<200^{\circ}$ . The polymerisation of  $C_3H_6$ ,  $C_4H_8$ , and (CH2:CH)2 is described. A. H. C.

Production of higher molecular aliphatic and/or cycloaliphatic compounds. N. V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 479,137, 10.8.36. Holl., 21.8.35).-Olefines or olefinic mixtures which may be obtained by cracking hydrocarbon mixtures are polymerised (e.g., in presence of AlCl<sub>2</sub>,  $H_3PO_4$ -kieselguhr, etc.), the polymerides treated with  $H_2SO_4$ , and the acid sulphates converted, if necessary, into salts, ethers, esters, or alcohols. The polymeris-ation of a mixture of 32% of a  $(CH_2:CH)_2$  fraction (containing 15.4% of  $n \cdot C_4H_8$ ) and 68% of a  $C_6H_{12}$ fraction in  $C_6H_6$  at 26–28° in presence of AlCl<sub>3</sub> and conversion of the polymeride into a Na alkyl sulphate and alcohol, and the prep. of a Na alkyl sulphate from the polymerides of a  $C_3H_6-C_4H_8$  fraction polymerised at 200-250°/10-15 atm. over H<sub>3</sub>PO<sub>4</sub>-kieselguhr, are described. A. H. C.

Apparatus for the continuous manufacture of polymerisation products of acetylene. I. G. FARBENIND. A.-G., and G. W. JOHNSON (B.P. 479,477, 24.9.36. Addn. to B.P. 445,358; B., 1936, 632).-The continuous polymerisation of  $C_2H_2$  (e.g., that contained in the products of thermal decomp. of hydrocarbons) in presence of acid with Cu<sub>2</sub>Cl<sub>2</sub> as catalyst is more economically effected by treating catalyst which has been in contact with a gas weak in  $C_2H_2$  with a richer gas (e.g., the residual gas obtained on removing polymerides is recirculated)

R. G.

either before or during regeneration. Plant is described. A. H. C.

Manufacture of titanic acid esters. A. CARP-MAEL. From I. G. FARBENIND. A.-G. (B.P. 479,470, 7.8.36).—Esters, Ti(OR)<sub>4</sub>, are prepared by treating Ti tetrahalide (TiCl<sub>4</sub>) with alcohols in presence of sufficient NH<sub>3</sub> or org. base to combine with the HCl formed. When using an org. base it is preferable to add an inert solvent in which the base hydrochloride is insol., e.g., C<sub>6</sub>H<sub>6</sub>, CCl<sub>4</sub>. Pptd. NH<sub>4</sub>Cl or hydrochloride is filtered off and the ester vac.-distilled from the filtrate. Esters where R is from an alcohol of high mol. wt. may be obtained by interaction of the alcohol with an ester in which R is of low mol. wt., e.g., EtOH. The prep. of Ti(OEt)<sub>4</sub>, b.p. 150—155°/12 mm.,  $Ti(OBu)_4$ , b.p. 185—188°/11 mm., and  $Ti(O\cdot CHPhPr^a)_4$ , an oil, is described. R. G.

Manufacture of esters. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 479,122, 24.6.36).-Capillary-active isocyclic compounds,  $R_n \cdot A \cdot X$ , where  $R = aliphatic or cycloaliphatic radical of < C_3, A =$ isocyclic radical,  $X = CO_2 R'Y$ ,  $\cdot OR'' \cdot CO_2 R'Y$ ,  $\cdot R'' \cdot CO_2 R'Y$  ( $Y = SO_3 H$ ,  $0 \cdot SO_3 H$ ; R' = aliphatic orisocyclic radical; R'' = aliphatic radical the chain ofwhich may be interrupted by other atoms), are prepared by condensing the isocyclic carboxylic acid chloride, in which H replaces R'Y in the groups X, with a hydroxylated or halogenated aliphatic or isocyclic sulphonic acid or sulphuric ester thereof or a sulphuric ester of a polyhydroxy-aliphatic or -isocyclic compound or their salts. Claim is specifically made for the use of ethionic acid or carbyl sulphate as this second component. Examples describe the condensation of isooctyl-, isododecyl-, and dibutyl-phenoxyacetyl chloride with

 $OH \cdot [CH_2]_2 \cdot SO_3 Na.$  These compounds are used as emulsifying agents for  $H_2O$ -insol. substances and in the prep. of textile treatment baths, e.g., for cleansing, if desired in conjunction with reducing or oxidising agents, soaps, salts, solvents, or emulsion stabilisers. The condensation of hydroxyalkylsulphonic acids or their salts with polyalkylated aromatic compounds  $R_{n+1}^{"} \cdot B \cdot Z \cdot COC1$  ( $R^{""} = aliphatic radical <math>< C_3$ , B =aromatic ring system, Z = aliphatic hydrocarbonradical directly linked to B by C \cdot C linking) is excluded from all phases of the present invention (cf. B.P. 455,379; B., 1937, 120). R. G.

Manufacture of dialkoxy-substituted glycols. DR. A. WACKER GES. F. ELEKTROCHEM. IND. G.M.B.H. (B.P. 479,253, 14.4.37. Ger., 9.5.36).—An alkoxyaldehyde is condensed in presence of an alkaline condensing agent, preferably an alkoxide of the alcohol corresponding with the alkoxyl group, in absence of H<sub>2</sub>O below room temp.; the dialkoxysubstituted hydroxy-carbonyl compound so produced is hydrogenated in the liquid phase in presence of Ni skeleton catalyst to the corresponding glycol. *E.g.*, NaOMe in MeOH is added to OMe·CHMe·CH<sub>2</sub>·CHO with agitation at  $-5^{\circ}$ ; condensation to

OMe·CHMe·CH(CHO)·CH(OH)·CH,·CHMe·OMe

is complete in about 2 hr. The reaction mixture is acidified with AcOH and diluted with MeOH, and the product treated with H<sub>2</sub> in presence of 20 wt.-% of Ni skeleton catalyst for 48 hr. at 40°;  $\leq 80\%$  is

converted into  $\delta$ -hydroxy- $\alpha\eta$ -dimethoxy- $\gamma$ -hydroxymethylheptane, b.p. 105—109° /0.05 mm. R. G.

Treatment of a liquid mixture containing oxygen derivatives of hydrocarbons. J. H. JAMES, ASST. to C. P. BYRNES (U.S.P. 2,067,532, 12.1.37. Appl., 4.10.28).—Partly oxidised (aliphatic) hydrocarbons obtained, e.g., by the process of U.S.P. 1,697,653 (cf. B., 1929, 425) from a California gas oil are stirred with an equal vol. of  $H_2SO_4$  (containing 25% of fuming  $H_2SO_4$ ) at <40-45%. The reaction mixture, if desired after separating excess of  $H_2SO_4$ and unchanged hydrocarbons, is made alkaline with NH<sub>3</sub>, NaOH, or Na<sub>2</sub>S, and the org. sulphates are hydrolysed to alcohols (by boiling) and separated. The latter are useful insecticides and fungicides.

N. H. H.

Preparation of ethers. T. W. EVANS and E. F. BULLARD, ASSTS. to SHELL DEVELOPMENT CO. (U.S.P. 2,067,385, 12.1.37. Appl., 26.4.34).—Ethers are prepared from mixtures of aliphatic hydrocarbons and olefines of about the same no. of C which are capable of forming sec. alcohols on hydration (and are free from olefines which give tert. alcohols on hydration) by treatment with an aliphatic OHcompound (a primary or sec. alcohol) in presence of a non-basic catalyst, e.g., HCl, H<sub>2</sub>SO<sub>4</sub>, POCl<sub>3</sub>, SiO<sub>2</sub> gel, active C, if desired at elevated temp. and pressure. Examples are : MeOH-H<sub>2</sub>SO<sub>4</sub> (55% H<sub>2</sub>SO<sub>4</sub>) (4 pts.) with C<sub>4</sub>H<sub>10</sub>-C<sub>4</sub>H<sub>8</sub> (95·2% of  $\Delta^{\beta}$ -butene) (3 pts.) at 90—100° for 2 hr. gives MeOBu<sup>\beta</sup>, b.p. 61°, and (CH<sub>2</sub>·OH)<sub>2</sub> (330) with 95% H<sub>2</sub>SO<sub>4</sub> (140) and  $\Delta^{\beta}$ -butene (200 pts.) at 95° gives OH·[CH<sub>2</sub>]<sub>2</sub>·OBu<sup>\beta</sup>, b.p. 156— 162°, and the corresponding diether. N. H. H.

Manufacture of amides of thioformic acid. F. HOFFMANN-LA ROCHE & CO. A.-G. (B.P. 478,993, 27.5.37. Switz., 14.8.36).—HCS<sub>2</sub>H or one of its salts (K) is caused to react at temp.  $\geq 20^{\circ}$  with NH<sub>3</sub> or amines in presence of a solvent (H<sub>2</sub>O, Et<sub>2</sub>O); high yields of thioformamides are obtained. The prep. is described of thioform-p-anisidide, m.p. 128°, monothioformyl-, m.p. 77° (decomp.), and thioformylacetylo-phenylenediamine, m.p. 173°, dithioformylethylenediamine, m.p. 146—147°, 4-thioformamido-1-phenyl-2:3-dimethyl-5-pyrazolone, m.p. 175°, 4-hydroxy-, m.p. 199—200°, and 4-amino-2-methyl-5-thioformamidomethylpyrimidine, m.p. 190° (decomp.). R. G.

[Preparation of] dithiocarbamates. J. G. LICHTY, Assr. to WINGFOOT CORP. (U.S.P. 2,067,494, 12.1.37. Appl., 5.4.32).—Compounds of the general formula  $(Y \cdot CS \cdot S)_n (R \cdot CO \cdot O)_n M$ , where Y = a tert. N, R = C or CH, M = H, metal, or alkyl, aryl, or aralkyl, and n = 1 or more, are vulcanisation accelerators. An example is the prep. (in 70% yield) of the NH<sub>4</sub> salt of carboxymethyl di(dimethyldithiocarbamate),  $(NMe_2 \cdot CS \cdot S)_2 CH \cdot CO_3 H$ , (I) by the interaction of aq.  $CHCl_2 \cdot CO_2 NH_4$  ( $\frac{1}{4}$  mol.) and  $NMe_2 \cdot CS_2 Na$ ( $\frac{1}{4}$  mol.) at 50° for  $\frac{3}{4}$  hr. Similarly, carboxymethyl di(diethyldithiocarbamate) and di(dipentamethylenedithiocarbamate) and their Et esters are prepared. The conversion of (I) into its (NHPh)\_2C:NH salt is described. N. H. H.

Manufacture of derivatives of substituted succinic acids and capillary-active agents. A.

CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 478,308, 13.7.36 and 8.7.37).-Interaction, if desired in presence of an inert solvent, of succinic acids substituted in one CH<sub>2</sub> by one hydrocarbon radical of < C5 with primary or sec. amines gives mono- or di-amides or imides according to the conditions. Products containing at least one acid group (as alkali salts) are valuable wetting, emulsifying, dispersing, etc. agents. E.g., interaction of isononenvlsuccinic anhydride (I) and NH3 at 40-60° gives the monoamide, which by further heating at 150-160° gives the *imide*, b.p. 202–205°/9 mm. In a similar manner are prepared the monoanilide and phenylimide, b.p. 233-237°/8 mm., the n-butylamide and n-butylimide, b.p. 187-192°/8 mm., the β-hydroxyethylimide, b.p. 200—212°/7 mm., m-aminophenylimide, b.p. 267— 275°/9 mm., the carboxymethylimide, b.p. 260— 265°/12 mm., p-hydroxyphenylimide, N-phenyl-Nethylimide, and p-tolylimide, b.p. 245-255°/11 mm. In another example (I) with NHEt<sub>2</sub> in presence of a hydrosilicate (Tonsil) gives the diethylamide, b.p. 195-205°/10 mm. N. H. H.

Working up of aqueous formaldehyde solutions. DEUTS. GOLD- U. SILBERSCHEIDEANSTALT, VORM. ROESSLER (B.P. 479,255, 20.4.37. Ger., 8.5.36).— Dil. aq. CH<sub>2</sub>O is conc. in the distillate on fractionating under pressure (1.5-6 atm.) so that the ratio of reflux to distillate is >2 (4-8):1. A continuous process is described. A. H. C.

Manufacture of acetals. A. CONTARDI and B. CIOCCA (B.P. 478,684, 27.7.36. It., 26.7. and 16.11.35). —Acetals, e.g., CHMe(OMe)<sub>2</sub>, and their alcoholic solutions are prepared by treating  $C_2H_2$  with alcohols in presence of a catalyst (HgO and/or HgSO<sub>4</sub>) and  $H_2SO_4$  (4—12 wt.-% of the alcohol) at about 40—60° under a pressure limited by the stability of  $C_2H_2$ . To save a considerable proportion of the acid the alcohol may be added in successive stages with the catalyst. The acetal or its alcoholic solution is separated by neutralising the reaction liquid with alkali, e.g., Ca(OH)<sub>2</sub>, and removing the neutralisation products. The acetal may be salted out from the alcoholic solution by addition of CaCl<sub>2</sub> and distilled. R. G

Treatment of hydrocarbons with activated phosphorus pentoxide. B. MALISHEV (B.P. 478,424, 14.5.36).—Reactions of hydrocarbons or mixtures of these at elevated temp. and in presence of  $P_2O_5$  (e.g., alkylation, polymerisation) are improved in presence of  $\Rightarrow 1\%$  of HX (X = Cl, Br, I, F,  $\frac{1}{2}S$ , CN) or a compound producing it (e.g., alkyl halides). The ethylation of  $C_6H_6$  with  $C_2H_4$  in presence of  $P_2O_5$ -HCl and  $P_2O_5$ -H<sub>2</sub>S and the dealkylation of hydrocarbons at a higher temp. (400°) in presence of similar catalysts is claimed. A. H. C.

Manufacture of aminoarylsulphones. Soc. CHEM. IND. IN BASLE (B.P. 478,624, 26.5.37. Switz., 26.5.36).—Aminoarylsulphones are prepared in good yield by heating the corresponding arylsulphone containing halogen, and, if desired, other substituents, e.g., alkyl, alkoxy,  $SO_3H$ , halogen,  $SO_2 \cdot NH_2$ , or other sulphone groups in the nucleus, but no  $NO_2$ , with aq.  $NH_3$  under pressure (in presence of a catalyst, e.g., Cu or a Cu salt). The starting materials are prepared from PhCl by treatment with  $CISO_3H$ , reducing the 2-mono- or 2:4-di-sulphonyl chlorides to the corresponding sulphinic acids, and treating the alkali salts of the latter with, *e.g.*, MeBr, EtBr. Examples are: 1-chlorophenyl-2:4-diethyldisulphone (30) or the dimethyl-, dipropyl-, or dibutyl-disulphones with 24% aq. NH<sub>3</sub> (150) and EtOH (100) at 130–135° for 10–20 hr. give the corresponding 1-amino-2:4-dialkyldisulphones. Amino-monosulphones are prepared, *e.g.*, by heating  $p-C_6H_4Cl\cdotSO_2Et$  at 150–200°/90–100 atm. N. H. H.

Separation and purification of aromatic and non-aromatic nitrogen bases. J. R. BAILEY. Assr. to UNION OIL CO. OF CALIFORNIA (U.S.P. 2,067,704, 12.1.37. Appl., 17.10.32).-Mixtures of org. N bases obtained from, e.g., California keroscne (I) or the pyrogenic distillates of cottonseed oil are resolved into aromatic and non-aromatic fractions by dissolving in an inert org. solvent (COMe<sub>2</sub>, EtOH) and adding  $H_2SO_4$  (d 1.84) to ppt. the acid sulphates of the aromatic bases. The H2SO4 is preferably added at low temp. and in the amount calc. on the N content of the crude bases used. Examples are the separation of 2:8-dimethyl- and 2:3:8trimethyl-quinoline from fractions from the distillation under reduced pressure of bases from (I) of b.p. 247-258° and 275°, respectively, by treating cooled solutions in 2 vols. of  $COMe_2$  with conc.  $H_2SO_4$ 

Ñ. H. H.

Preparation of diphenylguanidine. G. KNOTH (B.P. 478,525, 14.8.36. Ger., 13.2.36).—Cl<sub>2</sub> is passed into aq. NaCN at  $<15\cdot5^{\circ}$  in amount necessary to form CNCl; aq. caustic alkali is added to give a faintly alkaline reaction and CNCl distilled off. The gas is dehydrated (CaCl<sub>2</sub>) and is passed in slight excess into anhyd. NH<sub>2</sub>Ph, preferably in countercurrent, so that the latter reacts completely. NH:C(NHPh)<sub>2</sub> is obtained pure in practically quant. yield from the resulting hydrochloride. Apparatus is claimed and illustrated. R. G.

Manufacture of arylaminonaphthalene derivatives. I. G. FARBENIND. A.-G. (B.P. 479,447, 5.8.36. Ger., 26.10.35).—An amino- or hydroxynaphthalene [excluding sulphonic or carboxylic acids and  $1:8\cdot(NH_2)_2$ ,  $\cdot(OH)_2$ , or  $\cdot(NH_2)\cdotOH$  derivatives] is heated with an aminohydroxy- or aminoalkoxy-benzene, and a neutral and H sulphite.  $E.g., \beta \cdot C_{10}H_7 \cdot OH, p \cdot NH_2 \cdot C_6H_4 \cdot OH, NaHSO_3, and$  $Na_2SO_3 in H_2O at 117° give p-hydroxyphenyl <math>\beta$ -naphthylamine. p-Hydroxyphenyl- $\alpha$ -naphthylamine, m.p. 91° (Me ether, m.p. 110°), and 2:7di-p-hydroxyanilinonaphthalene, m.p. 249—250°, are described. H. A. P.

Manufacture of polyamines. P. L. SALZBERG, Assr. to E. I. DU PONT de NEMOURS & Co. (U.S.P. 2,067,291, 12.1.37. Appl., 13.12.33).—Arylglycine nitriles, e.g., NHPh·CH<sub>2</sub>·CN (I) or its p-Me or -OMederivatives, are hydrogenated in presence of a catalyst, e.g., Ni-kieselguhr (at 50—100° and 500—2000 lb. sq. in.), using, if desired, an inert solvent (EtOH, dioxan, cyclohexane), to give a mixture of amines; e.g., (I) in 95% EtOH at 70—100°/500—900 lb. gives NHPh·[CH<sub>2</sub>]<sub>2</sub>·NH<sub>2</sub>, b.p. 140—145°/12 mm. (hydrochloride, m.p. 202—203°), and  $di-(\beta-anilino-$  ethyl)amine, b.p.  $260-268^{\circ}/12$  mm. (hydrochloride, m.p.  $219-222^{\circ}$ ). At higher pressures, e.g., 1500 lb., in addition to the above products,  $tri-(\beta-anilino$ ethyl)amine, m.p.  $142^{\circ}$ , is formed. N. H. H.

Manufacture of phenolic compounds containing a chloromethyl group and nitrogen-containing condensation products therefrom. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 478,571, 16.7.36).—Phenolic compounds containing a CH<sub>2</sub>Cl radical are prepared by treating a phenol containing in the nucleus at least one long aliphatic hydrocarbon chain (< 4 C) with CH<sub>2</sub>O solution saturated with HCl. The products are useful as textile adjuvants and in the prep. of dyes, tanning agents, etc. By interaction with org. N bases which may contain an acid group, if desired in presence of solvents or diluents, they give products which are sol. in H<sub>2</sub>O, alone or with alcohol. The prep. is described of chloromethyl compounds from isobutyl- (I), dodecyl-(II), isooctyl- (III), and discoctyl-phenol (IV), and a technical mixture (V) of iso-dodecyl-, -tridecyl-, and -tetradecyl-phenol, and of the condensation products of the above derivatives of (I) with C<sub>5</sub>H<sub>5</sub>N, m.p. 260° (decomp.), of (II) with  $C_5H_5N$ ,  $NEt_3$ ,  $NH_2Ph$ , and NHPhMe, of (III) with  $C_5H_5N$  and Na sulphanilate, of (IV) with C5H5N, and of (V) with C5H5N, m.p. 200-212°, quinoline, NMe3, and NPhMe2. R. G.

[Preparation of] anthraquinone derivatives. G. C. SEMPLE, C. SHAW, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 478,665, 22.7.36) .- Anthraquinone compounds containing replaceable negative substituents are condensed with aminoazo compounds and the products are (optionally) sulphonated. E.g., interaction of Na 4-bromo- or 4-chloro-1aminoanthraquinone-2-sulphonate (I) with p-NH2 CBH4 N2Ph (II) in aq. EtOH in presence of Na2CO3, NaHCO3 and a Cu salt [e.g., CuCl, Cu(NO3)2, Cu borate or oxalate] gives a green wool dye (III) of good fastness to washing, milling, and light; similar products are obtained from 2:4-dibromo-1-aminoanthraquinone-5- and 5-chloro-4-bromo-1-aminoanthraquinone-2-sulphonic acid and (II), mixed 4-benzeneazo-1-naphthylamine-6- and -7-sulphonic acids and (I), whilst azo compounds, m.p. 215-217° and 262°, respectively, are obtained from 1-chloroanthraquinone or Na anthraquinone-1-sulphonate and 4-chloro-1-benzamidoanthraquinone and (II). (III) is converted by 98% H<sub>2</sub>SO<sub>4</sub> at 10° into a yellowgreen wool dye of good fastness to washing and H. A. P. milling.

Manufacture of imidazolines [higher 2-alkylglyoxalines]. E. WALDMANN and A. CHWALA (B.P. 479,491, 5.8.36. Austr., 4.4.36).—A fatty acid or its derivatives of  $\leq C_9$  is heated at 200—350° (>230°) with a diprimary or a primary-sec.  $\alpha\beta$ aliphatic diamine and its salt with a strong acid; the products may be sulphonated if desired. The products as salts form capillary-active solutions which are claimed to improve the properties of dyeings on vegetable fabrics. *E.g.*, lauric acid, (CH<sub>2</sub>·NH<sub>2</sub>)<sub>2</sub> (I), and (CH<sub>2</sub>·NH<sub>2</sub>)<sub>2</sub>,HCl (II) at 230— 290° give the hydrochloride of 2-undecylglyoxaline, m.p. 75°; this is also formed by heating the dilauryl derivative of (I) with (II) at 270-290°, and by heating the hydrochloride of the monolauryl derivative of (I) at 260-295°. 2-Heptadecenylglyoxaline is prepared by heating Et oleate with (I) and (II).

H. A. P. Manufacture of compounds of the azole series. I. G. FARBENIND. A.-G. (B.P. 478,549, 25.2.37. Ger., 28.2.36).—Treatment of azoles,  $R \left\{ \begin{array}{c} C X \\ C N \end{array} \right\} \subset H$ , where R = arylene of the  $C_6H_6$ ,  $C_{10}H_8$ , anthraquinone, or benzanthrone series, and X = S, O, NH, N-alkyl, N·aralkyl, or N·aryl, with a Cu salt of an org. acid, e.g., of AcOH, BuCO<sub>2</sub>H, or BzOH, at elevated temp. and, if desired, in presence of a solvent, e.g., C<sub>6</sub>H<sub>3</sub>Cl<sub>3</sub>, C<sub>10</sub>H<sub>8</sub>, C<sub>10</sub>H<sub>7</sub>Cl, gives the corresponding bis-thiazolyls, -oxazolyls, and -iminazolyls, which are intermediates or dyes. E.g., benzthiazole with Cu butyrate (I), 5-benzamidobenzthiazole, m.p. 167°, with Cu(OAc)2 and PhNO<sub>2</sub>, benzoxazole with (I), and N-methylbenziminazole at about the boil give respectively bis-1: 1'-benzthiazolyl, m.p. 305-306°, 5:5'di(benzamido)bis-1:1'-benzthiazolyl, m.p. above 306°, bis-1: 1'-benzoxazolyl, m.p. 260°, and I: 1'-dimethyl-2:2'-bisbenziminazolyl, m.p. 206°. Other examples illustrate the prep. of analogous compounds from anthraquinone-1:2- and 2:3-(N)-thiazoles.

N. H. H.

Manufacture of aza compounds of high mol. wt. [diazapyrenes and diazaperylenes]. I. G. FARBENIND. A.-G. (B.P. 479,407, 21.5.37. Ger., 22.5.36) .- 6- and 8-Aminobenzanthrones are condensed with compounds capable of ring-formation with the NH<sub>2</sub> and CO, viz., carboxylic acid amides, esters, and nitriles,  $\beta$ -ketonic esters, cyanoacetic esters, and ketones. The products are dyes or intermediates for dyes or pharmaceuticals. E.g., 8-aminobenzanthrone is heated with HCO·NH, (excess), NH<sub>4</sub>HSO<sub>4</sub>, and PhNO<sub>2</sub> at the b.p. to give 1: 3-diazaperylene, m.p.  $254-255^{\circ}$ , a yellow dye for cellulose acetate; with COMe<sub>2</sub> and 2% NaOH at 140° 2-methyl-1-azaperylene, m.p.  $218-219^{\circ}$ , with CH<sub>2</sub>(CO<sub>2</sub>Et)<sub>2</sub> and NaOAc in boiling PhNO<sub>2</sub> E 2-hydroxy-1-azaperylene-3-carboxylate, m.p. 319-320°, and with NH2 CO2Et or urea 2-hydroxy-1:3diazaperylene is formed. Interaction of 6-aminobenzanthrone with HCO·NH<sub>2</sub> and NH<sub>4</sub>HSO<sub>4</sub> gives 6:7-benz-1:3-diazapyrene, m.p. 188-189°.

H. A. P.

 $C_2H_2$ .—See II. Carbazole derivatives.—See IV. NaF salts. [Products from] reactions of C oxides and  $H_2$ .—See VII. Froth-flotation agents. —See X. Halogenated diene polymerides. Thiazyl derivatives. Antioxidants.—See XIV. Hexylpyrocatechol. Org. S compound. Highvac. distillation.—See XX.

## IV.-DYESTUFFS.

Dyes from urea.—See III. Dyes for paper.— See V. Pigments. Colours as catalysts.—See XIII.

See also A., I, 116, Absorption spectra of unsymmetrical cyanine dyes. II, 93, Tolane and deoxybenzoin dyes. 110, Pechmann dyes. Supposed isomerism with Kugel dyes. 116, Phthalocyanine-like pigments. Conversion of ætioporphyrin-I into bilirubinoid dyes.

#### PATENTS.

Manufacture of azo dyes [for leather]. I. G. FARBENIND. A.-G. (B.P. 478,966, 27.7.36. Ger., 27.7.35).-Monoazo dyes made by diazotising aminodiphenylaminesulphonic acids and coupling with o-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> (I) or its derivatives are oxidised, particularly by air, or converted into a metal compound with or without oxidation. The dyes afford Havanabrown to olive-brown shades on leather. In the examples, the dye

 $4:2-NO_2 C_6H_3(SO_3H) \cdot NH \cdot C_6H_4 \cdot NH_2 \cdot 4 \quad (II) \rightarrow (I) \text{ is}$ air-blown for 1-3 days, when the alkaline solution becomes yellow, or alternatively it is treated at 80° for 1 hr. with CuSO<sub>4</sub> dissolved in aq. NH<sub>3</sub>. The dye (II)  $\rightarrow 1:2:3-C_6H_3(OH)_3$  treated in the same way affords similar dyes. K. H. S.

Manufacture of azo dyes. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 478,514, 17.7.36).— Diazo compounds are coupled with a *p*-coupling monoamine of the  $C_6H_6$  series, RNXY, where X = analkylene oxide group and Y = H, a hydrocarbon or substituted hydrocarbon radical; not more than one SO<sub>3</sub>H or CO<sub>2</sub>H is present in the mol. The dyes are used for dyeing and printing cellulose acetate silk and are of good fastness and dischargeability. Among the examples (14) are  $p \cdot NO_2 \cdot C_6H_4 \cdot NH_2 \rightarrow \gamma$ -phenylmethylamino- $\alpha\beta$ -propylene oxide (I) (scarlet),  $1:4:2\text{-}\mathrm{NO}_2\text{-}\mathrm{C}_6\mathrm{H}_3(\mathrm{NH}_2)\text{-}\mathrm{SO}_3\mathrm{H} \rightarrow (\mathrm{I})$ (Bordeaux),  $2:4:6:1-(NO_2)_2C_6H_2Br\cdot NH_2 \rightarrow \gamma - N-6 - methoxy-m$ tolyl-N-butylamino- $\alpha\beta$ -propylene oxide (reddish-blue). K. H. S.

Manufacture of azo dyes. Soc. CHEM. IND. IN BASLE (B.P. 478,609, 13.10.36. Switz., 23.10.35).-Aryl esters of o-NH<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·CO<sub>2</sub>H are diazotised and coupled with arylamides of 2:3-OH·C<sub>10</sub>H<sub>6</sub>·CO<sub>2</sub>H containing at least one alkoxy-group o or p to the NH·CO linking. The examples are

 $o\text{-NH}_2 \cdot C_6 H_4 \cdot CO_2 \cdot C_6 H_4 \text{Cl} - p' \rightarrow o\text{-anisidide}$ (orange) coupled in substance or on the fibre. The p-phenetidide affords a scarlet. K. H. S.

Manufacture of azo dyes [pigments and ice colours]. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 476,493, 6.6.36).-An o-hydroxyaroyl derivative of an aminoazaphenanthrene is coupled in substance or on the fibre with diazo compounds. Examples are: 2:3-hydroxynaphthoic 4-aza-9phenanthrylamide  $\leftarrow 3: 1: 4$ -NH<sub>2</sub>·C<sub>6</sub>H<sub>3</sub>(CF<sub>3</sub>)·SO<sub>2</sub>Et (scarlet-red) or o-NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·NH<sub>2</sub> (red); 4-aza-8phenanthrylamide  $\leftarrow$  4-chloro-6-cyano-m-toluidine 4-aza-10-phenanthrylamide (brick-red);  $(I) \leftarrow 4$ benzamido-2: 5-diethoxyaniline (green);  $(I) \leftarrow \alpha$ - $C_{10}H_2 \cdot NH_2 \leftarrow o - NH_2 \cdot C_6H_4 \cdot OEt$  (black). C. H.

[Manufacture of] ice colours. F. ZWILGMEYER, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,064,332, 15.12.36. Appl., 18.7.35).—Furoylacetic arylamides are used as coupling components for ice colours. Examples are : anilide  $\leftarrow 4$ -chloro-mtoluidine (reddish-yellow), 4-chloro-o-anisidine (reddish-yellow); 4-chloro-o-toluidide + 6-chloroo-toluidine (reddish-yellow); bisfuroylacetyltolidinesulphone  $\leftarrow$  4-chloro-*o*-toluidine (2 mols.) (yellow). C. H.

Manufacture and application of [mono]azo dyes [for furs]. M. MENDOZA, G. S. J. WHITE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 476,428, 4.6.36).—Diazotised 4-nitro-4'-aminodiphenylamine-2-sulphonic acid is coupled with an aminonaphthol or derivative free from SO<sub>3</sub>H and CO<sub>2</sub>H, e.g., 1:5-, 2:7-, or 1:7-NH<sub>2</sub>·C<sub>10</sub>H<sub>6</sub>·OH or the corresponding NHAC, NMe2, NHPh, or OH C2H4 NH compounds. Brown to violet shades on Cr-tanned fur are obtained. C. H.

Manufacture of [azo] dyes for cellulose esters. COMP. NAT. DE MAT. COL. ET MANUF. DE PROD. CHIM. DU NORD REUNIES ETABL. KUHLMANN (B.P. 478,228, 22.3.37. Fr., 24.3.36. Addn. to B.P. 454,757; B., 1937, 223).—Azo dyes for acetate silk are obtained by coupling diazo compounds devoid of SO<sub>3</sub>H or CO<sub>2</sub>H with sulphato-derivatives of O- or ON-hydroxyalkyl derivatives of 3-hydroxydiphenylamines or by treating the dyes of the parent specification with sulphating agents. The examples describe the sulphation of 3-B-hydroxyethoxydiphenyl-N-hydroxyethylamine with ClSO<sub>3</sub>H and its coupling with diazotised p-NO2 C6H4 NH2 or its 2-Cl- or 2:6-Cl2derivatives. S. C.

Manufacture of azo dyes on the fibre. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 477.887. 4.6.36).—The use as diazo components of p-aminoazo compounds of the C<sub>6</sub>H<sub>6</sub> or C<sub>10</sub>H<sub>8</sub> series having as substituent at least one group containing CO or SO<sub>2</sub> either directly joined or joined through O or tert. N (the third substituent is here a hydrocarbon radical) to hydrocarbon radicals (one of which carries the paminoazo group) gives with 2:3-hydroxynaphthoic or  $\beta$ -ketocarboxy-arylamides yellow to black dyes having good fastness to washing, light, and Cl<sub>2</sub>. In cases in which SO<sub>2</sub> is linked to one hydrocarbon radical by O the other linking must be direct. Examples of diazo components are : 4'-nitro-4-amino-2:5-dimethoxyazobenzene - 2' - carboxydiethylamide (dark blue with 2:3-hydroxynaphthoic 5-chloro-o-4-amino-2'-sulphonmethylamido-2:5toluidide), dimethoxyazobenzene, and the compounds: p- $\begin{array}{l} \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_4 \cdot \mathrm{O} \cdot \mathrm{CO}_2 \mathrm{Et} \rightarrow 1:2:5 \cdot \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_3 (\mathrm{OMe})_2 \quad (\mathrm{I}), \\ m \cdot \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_4 \cdot \mathrm{O} \cdot \mathrm{CO}_2 \mathrm{Et} \rightarrow 3:1:4 \cdot \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_3 \mathrm{Me} \cdot \mathrm{OMe}, \\ o \cdot \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_4 \cdot \mathrm{CH}_2 \cdot \mathrm{SO}_2 \cdot \mathrm{NPhMe} \rightarrow (\mathrm{I}), \\ n \cdot \mathrm{NH}_2 \cdot \mathrm{C}_6 \mathrm{H}_4 \cdot \mathrm{CH}_2 \cdot \mathrm{SO}_2 \cdot \mathrm{NPhMe} \rightarrow (\mathrm{I}), \end{array}$ 

 $p-\mathrm{NH}_2 \cdot \mathrm{C}_{6}\mathrm{H}_4 \cdot \mathrm{O} \cdot \mathrm{SO}_2 \cdot \mathrm{NMe}_2 \longrightarrow (\mathrm{I}),$   $m-\mathrm{NH}_2 \cdot \mathrm{C}_{6}\mathrm{H}_4 \cdot \mathrm{NMe} \cdot \mathrm{SO}_2 \cdot \mathrm{NMe}_2 \longrightarrow (\mathrm{I}), \text{ and } \rightarrow$   $\alpha-\mathrm{C}_{10}\mathrm{H}_7 \cdot \mathrm{NH}_2, p-(\mathrm{II}) \text{ and } m-\mathrm{NH}_2 \cdot \mathrm{C}_{6}\mathrm{H}_4 \cdot \mathrm{NMe} \cdot \mathrm{CO}_2\mathrm{Et}$   $(\mathrm{III}) \longrightarrow (\mathrm{I}), p-\mathrm{NH}_2 \cdot \mathrm{C}_{6}\mathrm{H}_4 \cdot \mathrm{NEt} \cdot \mathrm{CO} \cdot \mathrm{NMe}_2 (\mathrm{IV}) \longrightarrow (\mathrm{I}),$   $m-\mathrm{NH}_2 \cdot \mathrm{C}_6\mathrm{H}_4 \cdot \mathrm{O} \cdot \mathrm{CO}_2\mathrm{Et} \rightarrow (\mathrm{I}), p-\mathrm{and}$   $\alpha-\mathrm{NH}_4 \cdot \mathrm{C} + \cdot \mathrm{O} \cdot \mathrm{SO}_2 \cdot \mathrm{NEt} \rightarrow (\mathrm{I}), p-\mathrm{A} \cdot \mathrm{A} \cdot \mathrm{A}$  $o\text{-NH}_2 \cdot C_6 H_4 \cdot CH_2 \cdot SO_2 \cdot NEt_2 \rightarrow (I),$ 

p-NH<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·NMe·SO<sub>2</sub>·NMe<sub>2</sub>  $\rightarrow$  (I) and  $\rightarrow$  $\alpha$ -C<sub>10</sub> $H_7$ ·NH<sub>2</sub>, and *m*-NH<sub>2</sub>·C<sub>6</sub> $H_4$ ·CH<sub>2</sub>·SO<sub>3</sub>Ph  $\rightarrow$  (I). (II), m.p. 61-62°, and (III), b.p. 128-129°/12 mm., are prepared from p- or m-NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·NH<sub>2</sub> and ClCO<sub>2</sub>Et, followed by reduction; (*IV*), b.p. 164—  $165^{\circ}/12$  mm., is prepared by interaction of COCl<sub>2</sub> with p-NO<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·NHMe, followed by condensation with NH<sub>2</sub>Me and reduction. H. A. P.

Manufacture of disazo dyes. J. R. GEIGY A.-G. (B.P. 478,227, 2.3.37. Ger., 8.5.36).—*m*- or *p*- Diaminodiphenylsulphones having no other nuclear substituents except Me are tetrazotised and coupled with mono- or di-amines of the  $C_6H_6$  or  $C_{10}H_8$ series free from SO<sub>3</sub>H or CO<sub>2</sub>H (2 mols.) or their *N*-alkyl derivatives. The examples are

*N*-alkyl derivatives. The examples are  $(m-\mathrm{NH}_2 \cdot \mathrm{C}_6\mathrm{H}_4)_2\mathrm{SO}_2 \rightrightarrows \alpha \cdot \mathrm{C}_{10}\mathrm{H}_7 \cdot \mathrm{NH}_2$  (I) (yellowishbrown) or  $1:2:4\cdot\mathrm{C}_6\mathrm{H}_3\mathrm{Me}(\mathrm{NH}_2)_2$  and

 $(p-\mathrm{NH}_2 \cdot \mathrm{C}_6\mathrm{H}_4)_2\mathrm{SO}_2 \rightrightarrows (I)$  (brownish-red) or

 $\alpha$ -C<sub>10</sub>H<sub>7</sub>·NHEt (brownish-red). The dyes are used for copperplate printing and are faster to sublimation than those of B.P. 301,726, 440,698, and 454,029 (B., 1930, 455; 1936, 267, 1218). K. H. S.

Manufacture of metalliferous azo dyes. Soc. CHEM. IND. IN BASLE (B.P. 478,231, 11.5.37. Switz., 14.5.36).—Diazo derivatives of

4:2:1-NO<sub>2</sub>·C<sub>10</sub>H<sub>5</sub>(NH<sub>2</sub>)·OH having at least one SO<sub>3</sub>H at 6 and/or 8 are coupled with  $\beta$ -C<sub>10</sub>H<sub>7</sub>·OH and the azo dye is combined with a metal. In the examples, the dye having 6-SO<sub>3</sub>H (4·4 pts.) is dissolved in H<sub>2</sub>O (90) and boiled for 24 hr. with Cr formate (I) (0.95 Cr<sub>2</sub>O<sub>3</sub>) or the dye with 8-SO<sub>3</sub>H (4·4) dissolved in H<sub>2</sub>O (100) is heated for 6 hr. at 125–130° with (I) (0.9 pt. Cr<sub>2</sub>O<sub>3</sub>). Wool and silk are dyed in black shades. K. H. S.

Manufacture of dyes of the 2-naphthalene-2'indole-indigo series. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 479,140, 14.8.36).—Dyes of the 2-naphthalene-2'-indole-indigo series dyeing vegetable fibres in bluish-grey to blue to green shades of good fastness particularly to light are obtained by condensing 4-hydroxy-N-alkyl- or -N-arylnaphthostyrils with reactive  $\alpha$ -derivatives of isatin. In the examples, 4-hydroxy-N-methylnaphthostyril is condensed with the  $\alpha$ -chlorides of 5-bromo-, 5:7-di-bromo-, 5-chloro-7-methoxy-4-methyl- (I), 5:7-dichloro-4: 6-dimethyl-, and 7-chloro-5: 6-dimethylisatin, 2:1-naphthisatin and its Br2-derivative, and 1-chloro-2: 3-naphthisatin (II) and its Br-derivative; 4-hydroxy-N-phenylnaphthostyril with (I) and (II); and 2-chloro-4-hydroxy-N-methylnaphtho-2-bromostyril with 5:7-dichloroisatin (III); 4-hydroxy-N-panisylnaphthostyril with (I) and (III); 4-hydroxy-No-anisylnaphthostyril with (I); 4-hydroxy-N-diphenylyland -N-cyclohexyl-naphthostyril with (I) and (III). S. C

Manufacture of carbazole derivatives [dyes etc.]. I. G. FARBENIND. A.-G. (B.P. 479,066, 31.7.36. Ger., 2.8.35).—Carbazole derivatives which are vat dyes or intermediates are obtained by causing Cu to react at the b.p. of an indifferent high-boiling solvent (PhNO<sub>2</sub>) with sec. amines in which one substituent is an aryl residue and the other a residue of a p-quinone of a ring system having two or more condensed nuclei (a-naphthoquinone, anthraquinone), each of these residues containing halogen ortho to :NH. tert. Amines  $(C_5H_5N, quinoline)$  may be added to accelerate the reaction. The prep. of 5-methyl-(yellow on wool), 5-chloro-, 5-phenyl- (orange on wool), 4:5-benzo- (orange on wool), and 4:5-benzoylene-2:3phthaloylindole, 5:5'-bis-(2:3-phthaloylindole), brown on cotton, 6-methyl- and 5:6-benzo-1:2-phthaloylcarbazole is described. R. G.

Manufacture of halogenated phthalocyanines useful as pigments. C. E. DENT, W. A. SILVESTER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 478,256, 14.7.36).—Phthalocyanines are treated with  $Cl_2$  or Br alone or in presence of a halogen carrier (PCl<sub>5</sub>, SbCl<sub>5</sub>, FeCl<sub>3</sub>) in molten phthalic or chlorinated phthalic anhydrides, preferably at >250°, to give *chloro-* and *bromo-phthalocyanines* (metal-free, Cu, Al, and Ni compounds are exemplified) containing 11—16 halogen atoms. When suitably dispersed the products are useful as pigments of a clear full green shade. S. C.

Manufacture of [polymethine] dyes. GEVAERT PHOTO PRODUCTEN, N. V. (B.P. 477,990, 8.6.36. Austr., 6.6.35).—Styryl and cyanine dyes containing a polymethine linking  $>C_3$  and at least one quaternary N when heated with a high-boiling basic solvent (quinaldine, NH<sub>2</sub>Ph, NHPhEt) lose a mol. of alkyl halide with the formation of colourless to yellow di-tert. bases, which give highly coloured salts with acids. The examples describe the "dequarternation" of thiazole-purple, 2-p-dimethylaminostyrylpyridinium methiodide, pinacyanol,  $\beta$ -naphthothiazolecarbocyanine ethiodide, thiocyanine, and 2-(p-dimethylaminostyryl)-4-methylthiazole methiodide. The new bases are used as photo-sensitisers and as indicators. S. C.

Manufacture of sulphonated coeruleins. DURAND & HUGUENIN A.-G. (B.P. 479,334, 26.8.37. Ger., 2.9.36).—Reduced gallein is treated with  $H_2SO_4$ , oleum, or CISO<sub>3</sub>H at low temp. (20—30°), whereby dehydration and sulphonation to sulphonated coerulein take place simultaneously. The dye obtained by drowning and salting the reaction mixture gives clear green shades on chromed wool. The NaHSO<sub>3</sub> compound is also described; with Cr lactate it dyes silk in clear green shades. S. C.

Anthraquinone derivatives. Azole compounds. Aza compounds.—See III. Transparent colours in lacquers.—See XIII.

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

German natural fibres. M. LÜDTKE (Papier-Fabr., 1938, 36, 65—68).—Possible sources of fibrous raw materials are given together with their available quantities in Germany, and their suitability for the pulp and paper industry is discussed. D. A. C.

Growth and structure of cotton fibre. D. B. ANDERSON and T. KERR (Ind. Eng. Chem., 1938, 30, 48—54).—The history of its growth is sketched and its structure described in detail. Opposing hypotheses of the micellar organisation in the fibre walls are discussed. D. A. C.

Recent developments in the chemistry of silk and silk processing. W. M. Scorr (Amer. Dyestuff Rep., 1937, 26, 756—758, 770—777).—Developments in the chemistry, soaking, degumming, weighting, and dyeing and finishing of silk during 1936—7 are reviewed; an extensive bibliography is given.

A. J. H. Sterilisation of wool: its effect on physical and chemical properties of a wool fabric. H. HUMFELD, R. E. ELMQUIST, and J. H. KETTERING (U.S. Dept. Agric. Tech. Bull., 1937, No. 588, 26 pp.). -In sterilising wool for subsequent bacteriological studies (using *B. mesentericus*), ultra-violet light,  $KMnO_4$ , I, alcohols, glycerol, and  $\beta$ - $C_{10}H_4Br_3$ ·OH failed to give complete sterility,  $CH_2O$ ,  $CH_2Cl_4$ , and Hg salts sterilised but were retained by the wool, intermittent wet and dry autoclaving changed the properties of the wool, but heating in xylol, Stoddart solvent, or  $C_2Cl_4$  gave satisfactory results without effecting changes in the wool. A. G. P.

Sulphur content of the intercellular phase of the wool fibre. J. B. SPEARMAN and P. R. MCMAHON (Nature, 1938, 141, 118—119).—Determinations of the S content of cells from the root ends of nonmedullated Australian 64's merino-wool staples indicate that the S content of the amorphous intercellular phase of the fibre is < that of the cells (cf. A., 1937, III, 199). L. S. T.

Detection and determination of lanital in mixtures with other fibres. E. CERBARO (Boll. Staz. Sperim. Ind. Carta, 1937, 32, 848-855).—Some physical and chemical properties of lanital (I) are described. (I) fibres may be distinguished from wool by treatment first with CH<sub>2</sub>O solution and then with a methylene-blue solution. Wool fibres are not dyed appreciably by this treatment. The determination of (I) in mixtures with wool is based on the complete solubility of the wool when treated with aq. NaOH (d 1·19) for 3 hr. at 30°, whereas (I) undergoes a const. loss (10·7 wt.-%). For separating (I) from vegetable and artificial cellulose fibres treatment with H<sub>2</sub>SO<sub>4</sub> (d 1·66) is recommended.

O. J. W. Chemical evaluation of two-crop-season ramie. M. KOGAN (Rayon Text. Month., 1935, 16, 617—618, 738—739).—Ramie bast of the second crop grown in the U.S.S.R. was superior to the first in fibre quality and decorticating ability. It contained 11% more cellulose, 72% less lignin, 28% less pentosans, and 32% less tanning substances than the first crop. Ash analyses are recorded. The second crop had a somewhat increased salt requirement.

CH. ABS (e)

Recent trends in textile technology. E. R. SCHWARTZ (Amer. Dyestuff Rep., 1938, 27, 78— 84P).—Improvements in apparatus and methods for measuring the twist in yarn, and the flexibility, porosity, strength, air-permeability, and k of fabrics are reviewed. A. J. H.

Mercury-free hair felt hats. A. STOCK (Angew. Chem., 1938, 51, 33—35).—Data are given for the Hg given up in wear and when new by hair felt hats pickled with Hg compounds. J. S. A.

Recent developments in textile testing and textile microscopy. J. H. SKINKLE (Amer. Dyestuff Rept., 1937, 26, 786-787). A. J. H.

Measurement of stiffness and resiliency [of textiles]. E. J. SAXL (Amer. Dyestuff Rep., 1938, 27, 65-69r).—The earlier testing apparatus (B., 1936, 184) is now modified so that it has better accommodation for heavy (carpet) fabrics and can measure a wider range of stiffness. Its use in evaluating crease-resistant finishes and the stiffening power of sizes is discussed. A. J. H.

Apparatus for measuring the thermal transmission of textiles. R. S. CLEVELAND (J. Res. Nat. Bur. Stand., 1937, 19, 675—684).—A horizontal, electrically heated plate is thermostatically controlled and, except on the upper side, is surrounded by guard plates maintained at the same temp. The specimen under test is laid flat on the plate and enclosed in a Cu hood to shield it from air currents. The temp, difference between the plate and the centre of the hood ( $\Delta T$ ) and the heat supplied to the plate in unit time (Q) are measured. The ratio  $Q/A\Delta T$  (A = area of the plate) is taken as a measure of the thermal transmission of the specimen. The results are reproducible to about  $\pm 1\%$ . Data for various fabrics are recorded. J. W. S.

Investigation and detection of faults in raw and manufactured textile materials. A. HERZOG and P. A. KOCH (Textilber., 1937, 18, 429-436, 505-512, 593-608, 701-720, 785-800, 869-892, 965-976).—Detailed description is given of the faults and methods of examining them with reference to woven and knitted fabrics, crêpes, hose, and lace.

> A. J. H. nd surface

Micellar structure of cellulose and surface fixation of larger molecules. H. MARK (Papier-Fabr., 1938, 36, 57-62).—The microstructure of cellulose is described. Recent advances in this field are surveyed, with special reference to X-ray methods of measuring the dimensions of intermicellar spaces by deposition of Ag and Au particles within the fibre. D. A. C.

Cell-wall structure of higher plants. I. W. BAILEY (Ind. Eng. Chem., 1938, 30, 40-47).-The cellulose of the primary and secondary cell walls is in the form of a porous matrix through which noncellulosic constituents are dispersed. Both cellulose and non-cellulose form continuous systems so that if one is dissolved out the other remains substantially unmodified in structure; this is illustrated with photomicrographs. Well-defined planes of structural weakness, however, exist in the matrix; these are considered to be determined by sub-microscopic structures, but they can be dissected, e.g., by enzyme action and subsequent swelling, into relatively large but heterogeneous fragments. The complex and variable nature of the structural pattern of the cell walls is stressed; it is due to differences in porosity of the matrix, miscellar orientation, and distribution of non-cellulosic substances. Thus variations in fibrillar orientation may occur even in different parts of the same cell, which, it is considered, render impossible the representation of all types of fibres in a single structural model. Fibrillar orientation may be demonstrated by deposition of I crystals within the cell-wall layers. D. A. C.

Determination of cellulose. A. G. KULMAN (Zavod. Lab., 1937, 6, 959—962).—The operations of extracting the material with Kürschner's solution, EtOH, and  $\text{Et}_2\text{O}$  are performed in a special extraction vessel, the residue being weighed as cellulose. R. T.

Structural viscosity and properties of solutions of cellulose esters. III. Causes of anomalous viscosity of solutions of secondary cellulose acetate. Z. ROGOVIN and M. JOFFE (J. Gen. Chem. Russ., 1937, 7, 2167—2174).—The  $\eta$  of 18% cellulose acetate (I) in COMe<sub>2</sub> rises rapidly with increasing Ca content of the (I), and this in turn depends on the hardness of the H<sub>2</sub>O used in its production. Solutions of abnormally high  $\eta$  are obtained when (I) has a high content of de-acetylated products; this can be avoided by conducting acetylation and maturation in such a way that the rate of esterification or hydrolysis = the rate of diffusion of the reagents to or from the cellulose mols. R. T.

Stretch-spinning of viscose with double baths. T. KOMORI (Cellulose Ind., Tokyo, 1935, 11, 249– 256).—The compositions of the coagulation and regeneration baths were, respectively: Na<sub>2</sub>SO<sub>4</sub> 13·0%, 0·1N-AcOH ( $p_{\rm H}$  3·1, temp. 40°, spinning-out pressure 76 cm. Hg), or Na<sub>2</sub>SO<sub>4</sub> 13·21%, N-AcOH ( $p_{\rm H}$  2·5); and Na<sub>2</sub>SO<sub>4</sub> 11·7 (or 12·0), ZnSO<sub>4</sub> 2·4 (2·5), H<sub>2</sub>SO<sub>4</sub> 8·2 (S·2)%. The yarn from the coagulation bath at  $p_{\rm H}$  3·1—2·5 may be stretched at least 5-fold; its physical properties vary little with  $p_{\rm H}$ . The stretched yarn shows a 60—70% increase in strength compared with the unstretched yarn. The micelles of cellulose fibre are more or less completely oriented with 2fold stretching. The yarn obtained under increased stretching is less lustrous, and coarser, especially when stretched 3·2—4·0-fold. The inner structure becomes very heterogeneous. CH. ABS. (e)

Creep of cellulose acetate filaments. R. L. STEINBERGER (Textile Res., 1936, 6, 191-206).— The elongation of a series of single cellulose acetate filaments at varying R.H. has been measured. The amount of creep at the end of a fixed time increases slowly from 0 to 60% R.H., but above 60% R.H the increase is very rapid. The rate of creep decreases with the total time of stressing. Rupture is governed by a limiting elongation. CH. ABS. (e)

Developments in spun rayon. F. BONNET (Amer. Dyestuff Rep., 1937, 26, 724-725).—A review of manufacturing methods. A. J. H.

Lustreless rayon. R. BRIXI (Textil. Obzor, 1934, 32, 52).—BaWO<sub>4</sub> and Sn<sub>3</sub>(PO<sub>4</sub>)<sub>4</sub> remove lustre, but do not resist washing. Coagulation methods are used in which aq.  $K_2CO_3$  is introduced into the viscose and the CO<sub>2</sub> evolved forms in the fibre closed bubbles, which decrease the lustre. The use of oil, finely dispersed in the viscose mass, is not recommended. Better results are obtained by adding insol. substances such as TiO<sub>2</sub> to the viscose. Strong alkalis can be used in acetate rayon to regenerate lustreless cellulose.

CH. ABS. (e) Nitrocellulose from wood pulp. J. SEIBERLICH (Pulp and Paper Mag. Canada, 1938, 39, 17—19).— The literature is briefly surveyed. H. A. H.

Composition of "Udonoki" and "Tsuge" [woods]. I. MIURA (J. Cellulose Inst. Tokyo, 1937, 13, 494—495).—Results of chemical analysis of "Udonoki" (*Pisonia umbeldifera*, Nyct) from the Tenian Islands are compared with those of *Calpidia Nishimura*, Rehd et Wils, from the Bonin Islands. Both woods are very soft and contain a very high % of ash. The former, compared with semi-tropical hardwoods, has a very high lignin content and H<sub>2</sub>O extract, and gives a low yield of a low- $\alpha$ -cellulose pulp. The latter in these respects is slightly superior to Udonoki, with the exception that the  $H_2O$  extract is very high. "Tsuge" (*Buxus japonica*) is very hard, and in most of its chemical properties it is slightly superior to Udonoki. Its ash and  $H_2O$ extracts are  $\ll$  those of either of the other woods. D. A. C.

Identification of [papermaking] fibres other than wood. F. F. WANGAARD (Paper Ind., 1937, 19, 777-784, 794).—Structural details of some 17 papermaking fibres other than wood are given. H. A. H.

Manufacture of paper pulp from bamboo. T. K. SHIH (Ind. Center, China, 1934, 3, 247-248, 333-335, 366-370).—Young bamboo (4-5 years old) is planed into thin slices and cooked with aq. NaOH under pressure. The pulp is suitable for making paper. CH. Abs. (e)

Comparison of old and new methods of paperpulp manufacture from bamboo. T. K. SHIH (Ind. Res., China, 1935, 4, 35–39).—A review. CH. ABS. (e)

Nitric acid pulp from beechwood. G. FELDT-MANN (Zellstoff u. Papier, 1938, 18, 55—56).—The initial difficulties which had to be overcome for the successful operation of the process are briefly described. Beechwood by this process now yields a high- $\alpha$ -cellulose pulp which, after alkali purification, is very similar in chemical properties to cotton linters, for which it is used as a substitute. D. A. C.

(A) Comparison of technical conditions of production of kraft pulp for reworking into cable papers. (B) Effect of spruce wood on properties of kraft pulp for production of cable papers. J. A. DENISOV (Tzent. Nauch.-Issledov. Inst. Bumash. Prom. Mat., 1935, No. 1, 13-70, 70-105).-(A) A medium-hard kraft pulp is suitable for production of cable papers.

(B) Comparative pulping of pine and spruce woods and the effect of the spruce wood on the properties of kraft pulp and cable paper were studied. The use of the mixed woods for production of kraft pulp and cable papers has no advantage over spruce wood alone. CH. ABS. (e)

Acid pulping of southern pine. Sulphite pulps for viscose manufacture. C. CARPENTER and F. McCALL (Ind. Eng. Chem., 1938, 30, 15-20).—The wood from young longleaf, loblolly, and slash pines, as well as the separated summer and spring wood from the loblolly, were cooked by the sulphite process to test their suitability for viscose production. 41-42% yield of screened pulp (on the bone-dry wt. of wood) was obtained with all the different samples, irrespective of cooking schedule. The pulp had α-cellulose 89-93%, η 50-100 centipoises, Ĉu no. 2·5-2·9, and MeOH extract 0·4-0·9%. Satisfactory bleaching was obtained with < 3% of Cl consumption using NaOCl in a single-stage treatment; this resulted in a pulp having  $\alpha$ -cellulose 87— 91%,  $\eta$  19-31, Cu no. 1.6-3.1, and MeOH extract 0.1-0.7%. The pulp so obtained was satisfactorily converted into viscose, its behaviour during pressing and shredding being similar to that of commercial rayon pulps. Filtration varied from poor to good,

and was materially improved by two-stage bleaching, whilst the clarity of the viscose solutions depended to a large extent on the washing of the pulp. Yarn strengths comparable with those obtained from commercial rayon pulp were obtained, but no definite correlation was found between yarn strength and conditions of cooking or bleaching. D. A. C.

Purification of pulp and its control by determining the degree of polymerisation and complete hydrolysis. M. STEINSCHNEIDER, R. SCHEPP, and F. WULTSCH (Papier-Fabr., 1938, 36, 36—40).— It is considered that, in order to obtain a clear picture of the purifying process, it is necessary to determine the degree of polymerisation, hydrolysable material, and yield of pulp. The individual products of hydrolysis should also be determined so that the effects of the purifying process on by-products may be shown. The significance of the tests is shown by applying a no. of different treatments to a strong sulphite pulp. D. A. C.

Mitsumata. VI. Factors affecting the determination of beating degree. H. IMAI and Y. KASHIWABARA. VII. Consumption of caustic soda and rate of removal of reducing sugar. H. IMAI and F. ISHIKAWA (Res. Bull. Government Printing Bureau, Tokyo, 1937, No. 4, 1–9, 11– 14; cf. B., 1936, 1086).—VI. The effects of temp., pulp concn.,  $p_{\rm H}$ , and china clay content on the wetness (S.R.) of Mitsumata pulp is investigated. Max. wetness at about  $p_{\rm H}$  6 is obtained, but the effect of  $p_{\rm H}$  becomes appreciable only at wetness > about 50° S.R. Increase in china clay content increases the wetness mainly in the region of 40–50° S.R. (e.g., 0–35% clay increment produces 40–55° S.R. increase). Correction curves are given.

VII. The effect of cooking Mitsumata pulp with NaOH at temp. varying between 70° and 98° and liquor concns. of 0.75-1.25% is investigated. Rise in temp. of 10° accelerates NaOH consumption and removal of reducing sugars by >30%. 50% of the total NaOH consumption occurs in the first 3 min. of the cook. D. A. C.

Importance of roll pressure in beating [paper pulp] as compared to roll position. C. D. DEMERS (Paper Mill, Nov. 6, 1937, 17—18, 20, 22).—Beaterroll pressure is considered to be a more important adjustment than roll position in assisting the control of uniform beating. The advantages of the Taylor beater-roll pressure recorder in this connexion are discussed. H. A. H.

Influence of fibre length and fibre mucilage on wetness and strength properties of beaten pulps. M. STEINSCHNEIDER and E. GRUND (Papier-Fabr., 1938, 36, 1—12, 13—21).—The beating effects of the Jokro and Lampén mills and the Rieth hollander are compared, using different grades of bleached and unbleached sulphite pulps. The results are evaluated by determining the tensile strength at normal and zero test-strip lengths, the fine-fraction content (passing 160-mesh), and the fibre length after beating to definite degrees (S.R.) of wetness. Very similar results were obtained with the Jokro and Lampén mills, which are characterised by a crushing action

resulting in rapid strength development, whilst cutting is a secondary action occurring mainly in the later stages of beating. The Rieth hollander, however, had a severe cutting action which was shown by development of the fine fraction and deterioration in fibre length. A considerably lower strength also was obtained than with the above mills. The fine fraction in the early stages of beating (up to about 50° S.R.) produced increased strength of the pulp, whilst at higher wetness (75-85° S.R.), when the fine fraction was present in considerable proportions, it decreased the strength. Removal of the fine fraction reduced the wetness from 85° to 39° S.R. 15% of the fine fraction derived from beaten pulp, when added to unbeaten pulp, increased the wetness from 15° to 61° S.R., max. wetness (87.5° S.R.) being obtained with 70% of the fine-fraction content. Max. strength (normal strip), which was almost double that of the original pulp, was obtained by addition of 40% of fine fraction, whilst for zero test-strip lengths it progressively decreased. Experiments in the bleaching of pulp showed that chlorination tended to increase the resistance to beating, whereas subsequent OCI' bleaching aided fibre destruction. It is concluded that measurement of the beating degree by drainage methods alone is inadequate and sometimes misleading; they should therefore be supplemented by determination of the average fibre length and fine-fraction content, which are sensitive to differences in beating apparatus and procedure, and also generally show a close relation to the strength properties of the beaten pulp. The tensile strength at zero strip length is  $\infty$  individual fibre strength only in the early beating stages, since in the later stages it is affected by change in fibre structure due to fibrillation and mucilage formation. D. A. C.

Can pulp suitable for viscose and medium grades of printing paper be produced in one cooking operations? M. G. ELLASHBERG (Bumash. Prom., 1935, 14, No. 9, 17—27).—This combined double process is considered to be impractical. A whiter pulp is required for paper than for viscose. The presence of carbohydrates in viscose pulp is undesirable and there should be > 6-7% of pentosans. In printing paper, a higher carbohydrate content is desirable; this is obtainable by using a higher combined acid and by a milder pulping. CH. ABS. (e)

Vacuum washers versus diffusers [in kraftpulp mills]. H. A. MORRISON (Paper Trade J., 1937, 105, TAPPI Sect., 384—386).—Multiple-stage vac. filters, so designed that air is not intimately mixed with black liquor, are considered to be much superior to diffusers for washing Southern pine kraft pulp. H. A. H.

Specific heat of sulphite[-pulp] waste liquor. K. A. KOBE and W. MCCLEAVE (Paper Trade J., 1938, 106, TAPPI Sect., 1).—A calorimetric method is briefly described for determining it, the accuracy of which is adequate. H. A. H.

Waste-heat recovery in the sulphate pulping process. ANON. (Paper Ind., 1937, 19, 1067— 1072).—Direct savings resulting from the more efficient utilisation of waste heat from the combustion of black-liquor residues in modern equipment are analysed. H. A. H.

Did Tilghman invent the sulphite [pulping] process? E. F. TUCKER (Pulp and Paper Mag. Canada, 1937, 38, 749—750).—A letter draws attention to the existence of U.S.P. 17,895, dated 28 July, 1857, granted to J. A. Roth for the treatment of wood with  $H_2SO_3$ , ten years before Tilghman's process. Roth's process, however, was a pre-bleaching treatment and not a pressure-cooking one.

H. A. H.

Straw paper and straw board. W. W. GALLO-WAY (Paper Ind., 1937, 19, 415—421).—The process of manufacturing straw paper and board is described. H. A. H.

Paper stock from plant stems. H. Y. CHANG, C. C. HUNG, and Y. K. CHANG (Ind. Center, China, 1934, 3, 212—214).—The utilisation of cotton-plant stem, wheat stem, rice straw, reed, millet straw, kaoliang stem, maize stem, and mulberry bark is described. CH. ABS. (e)

Italian contributions to the making of paper. R. SANSONE (Paper Ind., 1937, 19, 927-931).—The Italian papermaking industry and its indigenous cellulose resources are briefly surveyed. H. A. H.

Brazilian paper industry. R. BENNETT (Paper Ind., 1938, 19, 1166—1169).—The wood resources and mills employed are briefly described. The potential usefulness of Parana pine (fibre length 4.5 mm., free from resin) is indicated, but there are difficulties of location and transport. H. A. H.

Improved reworking of (cellular) materials for production of cigarette, transfer, and condenser papers. L. A. KANTOR and S. M. ICHELZON (Tzent. Nauch.-Issledov. Inst. Bumash. Prom. Mat., 1935, No. 1, 180—191; cf. B., 1935, 222).—Flax tows, treated to reduce the chaff content to 8-9%, when cooked with 10% CaO and 5% NaOH at 4 atm. for 9 hr., followed by washing, beating to 35—38° freeness, and bleaching with a  $3\cdot5-4\%$  consumption of active Cl, gave a white, chaff-free halfstuff suitable for production of eigarette and transfer papers of superior mechanical properties. Bleaching of halfstuff with 4% Cl for >4-5 hr. gave porous and perforated condenser paper. CH. Abs. (e)

Production of paper by beating in jordans. N. O. ZEILIGER (Tzent. Nauch.-Issledov. Inst. Bumash. Prom. Mat., 1935, No. 1, 224—240).—The use of jordans has the following advantages compared with beating in hollanders: the beating is continuous, giving a more uniform product; regulation is simple; and there is an improvement in operating conditions and costs and in the mechanical properties of the resulting paper. Ch. Abs. (e)

Effect of loading on paper. Y. SAEKI and M. SUZUKI (Res. Bull. Govt. Printing Bur., Tokyo, 1937, No. 2, 1—21).—The retention of clay, talc, BaSO<sub>4</sub>, TiO<sub>2</sub>, and chalk, and their effects on the physical properties of paper, are investigated. It is concluded that retention depends primarily on the mechanical filtering action of the fibrous material during sheet formation. The chemical or colloidal properties of the pulp-filler suspension are of relatively little importance except in the case of the finest fillers.  $TiO_2$ , because of its high n, results in the greatest increase in opacity and whiteness, and at the same time gives the least strength reduction of the paper. D. A. C.

Metallic dendrites in paper. M. M. and W. R. RUBIN (Paper Ind., 1938, 19, 1155—1162).—The influence of raw materials, equipment, and processing in pulp- and paper-making on chemical and metallic residues in paper is outlined. The importance of the capillary structure and large sp. area in concentrating and accelerating chemical activity on the surface of paper is emphasised, and the val. of dendritic inhibitors in both papermaking and roto printing is mentioned. Several photomicrographs are given. H. A. H.

Starch in paper. H. N. LEE (Paper Ind., 1937, 19, 785-794).—Starch occurs in many forms and is distributed in many ways throughout the structure of paper treated with it either in the beaters or by surface application. In addition to differences due to the type of starch used and its prep., it is believed that variations in the papermaking process may profoundly affect both the structure and distribution of starch, and also its effect on the properties of the paper. Numerous colour-photomicrographs and diagrams are given to indicate the possibilities of microscopical methods of investigating problems relating to the use and efficacy of starches in papermaking. H. A. H.

Paper coatings [with calcium carbonate]. O. F. REDD (Paper Ind., 1937, 19, 559—561).—The method of producing CaCO<sub>3</sub> suitable for paper coating, by pptn. and ball-milling, is described. H. A. H.

Sulphonated oils in paper-coating processes. H. W. ROSE (Paper Trade J., 1937, 105, 30 Dec., 22-24).—Their prep. and methods of analysis are briefly discussed. Sulphonated castor oil is of val. in paper coating as a leveller for the coating mixture rather than as an anti-froth reagent. H. A. H.

[Papermakers'] alum—its use and effect [in papermaking]. L. M. BOOTH (Paper Ind., 1938, 19, 1163—1165).—The val. of alum in papermaking is briefly discussed. It is pointed out that  $p_{\rm H}$  data alone are not sufficient for acidity control. H. A. H.

Atmospheric moisture and its relation to [the printing of] newsprint. W. BAUMRUCKEE, jun. (Paper Ind., 1938, **19**, 1174—1177).—From American pressroom records taken for almost a year, it is concluded that there is no definite relation between the printing quality of newsprint paper on high-speed rotary presses, and the humidity of the surrounding air, nor is there any relation between the running quality of the paper (freedom from breaks) and R.H. Running quality may, however, be correlated with abs. humidity. The moisture content of the air should be as high as 95 grains per lb. H. A. H.

[Identification of] colours used in dyeing paper. E. R. LAUGHLIN (Paper Ind., 1937, 19, 771-776).—The results of the usual extraction tests with 1% and 10% NaOH, 1% and 10% H<sub>2</sub>SO<sub>4</sub>, 10% HNO<sub>3</sub>, EtOH, COMe<sub>2</sub>, dil. Ca(OCl)<sub>2</sub> containing 0.2% of available Cl, and 15% Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, on a no. of beater-dyed papers arranged in colour groups and not in dye classes, are tabulated. H. A. H.

Colloid chemistry in the paper industry. A. KING (Chem. and Ind., 1938, 177-180).—A review dealing with the swelling of and action of electrolytes on cellulose, sizing, etc.

Report on the [paper-]testing methods standardised by D.V.M. KORN (Papier-Fabr., 1938, 36, 21-24, 29-32).—Standardised paper-testing procedure in Germany is discussed and curves are given showing the effect on standardisation of R.H. as well as some of the main variables encountered in the bursting, tensile, and folding tests. Both the tensile and bursting tests are fixed to take place in  $20 \pm 5$  sec., within which limits there is no appreciable error due to variation in the rate loading. Apparatus for determining the speed of the lower jaw of the Schopper tensile tester is shown. D. A. C.

Instrumentation studies. XXIII. Measurement of elasticity and compressibility [of paper] by the Bekk hardness tester. XXIV. Variations in physical properties of papers due to their nonuniformities. INST. OF PAPER CHEMISTRY (Paper Trade J., 1938, 106, TAPPI Sect., 16-21, 28-30; cf. B., 1938, 261).-XXIII. From results on a wide variety of papers it is concluded that elasticity, as measured by % rebound of a pendulum bob striking a paper surface backed by a steel plate, as in the Bekk instrument, is not  $\infty$  to compressibility under dynamic load, and cannot be used as a measure of that property. When the momentum of the bob is > a certain (defined) arbitrary val. and the paper is < a certain thickness (depending on the type of paper), the elasticity of the steel plate masks the true paper elasticity. Under these conditions, misleading vals. for compressibility are also obtained, because a much greater compression occurs than in the printing operation. Better results are obtained by decreasing the initial amplitude of the pendulum from 100 to 25 arbitrary units, or by increasing the no. of sheets tested at one time. Structural modifications to increase the sensitivity of the instrument are suggested.

XXIV. The results of some 9 physical tests, carried out on sulphite writing papers (bond, mimeograph, and ledger) of as uniform structure as possible, are examined statistically. Folding strength shows the greatest variation, largely on account of the structural variations possible between the extremely small areas under test; the average probable error in the machine direction was 6.1% and in the cross-direction 8.2%. Amongst other physical tests, the bursting test showed a probable error of 1.4%; the tensile test of 2.3% (machine-) and 1.9% (cross-direction); the tear test of 2.2% (machine) and 2.4% (cross). Results for Gurley stiffness, Gurley air-permeability, opacity (contrast ratio), wt., thickness, and apparent d are also given. H. A. H.

Freeness tester in manufacture of boxboard and test liners. F. G. BARBER (Paper Ind., 1937, 19, 545-547).—The importance of freeness control in board mills is emphasised. H. A. H.

63, 19-27).-Methods of determining total acid,

 $p_{\rm ff}$  of aq. extract, and actual  $p_{\rm ff}$  (or "acid figure") of paper are reviewed. E. C. S.

Colour measurement. I. Statistical consideration of the values obtained with the Ives tint-photometer. K. YAMARAMI, K. KAWAHARA, and T. OHARA (Res. Bull. Govt. Printing Bur., Tokyo, 1937, No. 1, 23 pp.).—Results obtained for coloured lithographic paper by 30 individual operators are collected. Representation of the colours is by means of rectangular co-ordinates, which is held to be superior to the triangular system. D. A. C.

Test for dimensional changes in offset papers. C. G. WEBER and M. N. V. GEIB (J. Res. Nat. Bur. Stand., 1937, 19, 665-673).—A method has been developed for determining the expansivity of paper with variations of R.H., in which specimens about 24 in. long are mounted under const. tension in a cabinet in which the R.H. is controlled by salt solutions, the changes in length being observed by an optical lever. J. W. S.

Forgery-proofing document papers by printing methods. E. KELLER (Farben-Chem., 1938, 9, 5-7).-A survey. D. A. C.

Permanence of books. G. REICHARDT (Papier-Fabr., 1938, 36, 85—89м).—Factors, both chemical and bacteriological, which affect book papers, with especial reference to the preservation of books in libraries, are discussed. D. A. C.

Petroleum waxes [for paper].—See II. Detecting resins etc. in varnishes.—See XIII. Paper bags for K fertilisers.—See XVI. Drinkingstraws for milk. Packing butter. Ice-cream containers. Cheese wrappers.—See XIX. Cellulose derivative compositions for films.—See XXI. Sulphite waste.—See XXIII.

#### PATENTS.

Lubrication or application of lubricants or such like to wool or other textile fibres prior to any process for which lubrication of the fibres is required. L. P. ANTROBUS (J. BRIGGS & SONS) (B.P. 470,870, 21.3.36).—The lubricant, consisting of an oil, oil emulsion, or oil solution, is added to the washing and scouring baths to ensure its even application on the fibres. Apparatus is claimed.

F. R. E. [Treatment of] pile fabric. G. S. HIERS, Assr. to COLLINS & AIKMAN CORP. (U.S.P. 2,057,831, 20.10.36. Appl., 31.7.33).—A loosely-woven pile fabric is impregnated from the back with an aq. dispersion of rubber latex, wax, and an antioxidant, whereby the pile fibres are firmly fixed without impairing their flexibility or rendering the fabric tacky. F. R. E.

Cellulose digester. F. W. L. SCHILDE (U.S.P. 2,059,149,27.10.36. Appl., 4.11.35. Austr., 10.11.34). —In the production of pulp by pressure digestion, steam ejectors and injectors are used exclusively for evacuation of the filled digester before cooking, steam and liquor introduction, external circulation and withdrawal of liquor, and introduction of wash- $H_2O$  into the digester after the cook. D. A. C. Manufacture of carbohydrate compounds [cellulose ethers]. S. SOKAL. From KALLE & Co. A.-G. (B.P. 470,994, 1.4.36).—Cellulose or a derivative thereof is treated with the sulphonic acid of an  $(\alpha\beta$ -unsaturated) olefine, e.g., of C<sub>2</sub>H<sub>4</sub>, in presence of excess of alkali, and the cellulose ether is liberated from the alkali-cellulose ether sulphonate by means of acid. F. R. E.

Production of cellulose ethers. E. I. DU PONT DE NEMOURS & Co. (B.P. 470,926, 24.2.36. U.S., 23.2.35).—Disintegrated cellulose pulp is treated with aq. NaOH (>50% concn.) and either previously, simultaneously, or subsequently with an aq. solution of an alkali lower-alkyl sulphate (NaEtSO<sub>4</sub>), containing a wetting agent if desired. The product contains at least one alkyl per C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>. F. R. E.

Manufacture of nitrocellulose. R. K. ESKEW, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,059,326, 3.11.36. Appl., 2.3.35).—A sheet of cellulose pulp (thickness 0.02-0.08 in.; compactness 50—115) is granulated into chips approx.  $\frac{1}{3}-\frac{1}{16}$  in. square, and nitrated at  $< 40^{\circ}$  with 10 times the dry wt. of mixed acid containing 50—75 (60)% of HNO<sub>3</sub> together with H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>O. F. R. E.

Stabilisation of cellulose esters. GEVAERT PHOTO-PRODUCTEN N.V. (B.P. 470,947, 1.10.36. Austr., 2.10.35).—After treatment with dil. acid (0.1% AcOH or H<sub>2</sub>SO<sub>4</sub>), the esters are heated (at 20—100°) with an alkali (0.5% ammoniacal EtOH, 0.1% aq. K<sub>2</sub>CO<sub>3</sub>) sufficiently dil. to avoid saponification. F. R. E.

Manufacture and treatment of cellulose derivatives [to reduce their corrosive activity]. BRIT. CELANESE, LTD. (B.P. 471,833 and Addn. B.P. 471,847, [A] 11.11.36, [B] 24.2.37. U.S., [A] 13.11.35, [B] 24.2.36).—Cellulose ethers or secondary cellulose esters while in solution are treated with a substance containing or capable of liberating free Cl<sub>2</sub> (NaOCl) (A) so that no combination of Cl with the cellulose derivative occurs, (B) in amount >1 wt.-% of the cellulose derivative. The products after treatment with an antichlor (borax) are pptd. and bleached.

F. R. E.

Manufacture of rayon. (A, c) F. W. MATTINSON, (B) G. W. BRYANT, Assrs. to SKENANDOA RAYON CORP. (U.S.P. 2,068,031-3, 19.1.37. Appl., [A] 15.11.34, [B] 27.3.35, [C] 25.6.35).---(A, B) Rayon cake after usual washing and centrifuging, but before drying, is taken out and subjected to inward radial pressure along localised lines to produce a fluted cake of reduced diameter, which is re-centrifuged and dried to produce crimped yarn of superior dyeing properties. (B, C) A die-like apparatus for the fluting is described. B. M. V.

Manufacture of cellulosic pellicles. BRT. CELLOPHANE, LTD. (B.P. 478,854, 1.1.37. U.S., 4.1.36).—Regenerated cellulosic pellicles resistant to deformation under variations of atm. H<sub>2</sub>O content are prepared by introducing into the gel-regenerated cellulosic film or sheet, preferably while in the wet or gel state, a solution in H<sub>2</sub>O or org. solvent (MeOH, EtOH, COMe<sub>2</sub>) of a high-boiling softening agent which if exposed in a thin layer to atm. of 95% R.H. at 25° for 120 hr. would absorb 1—80% of H<sub>2</sub>O. It may be an ether-, keto-, or hydroxy-ester, or a compound of  $NH_2 \cdot CO_2 H$  esterified with an alcohol containing an ether group. Several sp. compounds in each class are claimed, *e.g.*, bisethoxyethyl succinate, diethylene glycol di(ethoxyacetate) or di-(lævulate), ethoxyethyl tartrate, butoxyethyl carbamate. R. G.

Extrusion [for making cellulose films]. O. S. PETRESCU, ASST. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,056,982, 13.10.36. Appl., 6.1.34).— The hopper lips are made of an alloy of Ni 55—60, Cr 19·5—23·8, Cu 7·5—9·52, Mo 2·46—4·23, W 1·57—3·64, Mn 1·55—2·22, Si 0·56—1·05, Fe 2·79— 4·16, and C 0·1—0·29% and are held in place on the hopper by means of Ni bolts which are preferentially corroded by the acid coagulating solution used in making transparent cellulose films from viscose.

A. R. P.

Manufacture of transparent films. G. A. RICHTER, Assr. to BROWN Co. (U.S.P. 2,068,630, 19.1.37. Appl., 2.5.34).—The tear-resistance of films formed by casting from aq. solutions of cellulose derivatives is improved and the transparency substantially unaffected by incorporation of 2-10%of mechanically gelatinised glassine-paper pulp manufactured at a consistency of 5% and thickened to 20% before incorporation. B. M. V.

Treatment of Cellophane and like products. J. E. MALIVERT, ASST. to SOC. L'ACCESSOIRE DE PRÉCISION (U.S.P. 2,058,703, 27.10.36. Appl., 24.9.34. Fr., 30.9.33).—Cellophane is saturated in  $H_2O$  at 50° and then stretched on a frame in order to prevent contraction during the subsequent drying. Its use in making gas-mask windows is indicated. D. A. C.

Apparatus for hydrolysis of celluloses and cellulose complexes. M. C. G. TOURNEL (B.P. 470,898, 2.3.36).—A rotary metallic autoclave enamelled on the inside and free from sharp angles, *e.g.*, spherical, is provided with perforated inlet and outlet steam tubes which are composed of material resistant to the hydrolysing agents. F. R. E.

Manufacture of water-resistant indurated fibre. D. W. HOLLINGWORTH, ASST. to CONTINENTAL-DIAMOND FIBRE CO. (U.S.P. 2,059,947, 3.11.36. Appl., 30.10.33).—A no. of sheets of cellulose are subjected to partial hydrolysis, e.g., with  $ZnCl_2$ ,  $H_2SO_4$ , etc., united, washed, dried, and impregnated (before, during, or after hydrolysis) with an insol., infusible, thermoplastic resin (NH<sub>2</sub>Ph-CH<sub>2</sub>O resin), which has been pptd. from its acid salt prior to its application or directly on to the sheets. F. R. E.

Pulp process. A. HOCHE (U.S.P. 2,058,791–2, 27.10.36. Appl., [A, B] 20.11.34. Renewed [B] 18.3.36).—(A) The raw material, e.g., wood chips, sisal, bagasse, is mixed with  $HNO_3$  (d > 1.45) and small quantities of starch or sugar; the mixture reacts to produce a distillate which is bubbled through the raw material, contained in 1–10% H<sub>2</sub>SO<sub>4</sub>. The fibres liberated by the last treatment are washed free from acid. (B) The raw material, contained in 1–10% H<sub>2</sub>SO<sub>4</sub>, is similarly subjected to the action of the products formed by bubbling a mixture of Cl<sub>2</sub>
and SO<sub>2</sub> through Ac<sub>2</sub>O. It is stated that a bleached pulp of high strength is thus produced. D. A. C.

Apparatus for refining paper pulp stock. Cowles Co. (B.P. 477,965, 6.7.36. U.S., 5.7.35).— A perforated screen and impeller rotating closely thereto are described. B. M. V.

Manufacture of paperboard. H. L. KUTTER, Assr. to BLACK-CLAWSON CO. (U.S.P. 2,059,184, 27.10.36. Appl., 16.6.34).—Stock consistency in the vat of <0.4% is used in operating cylinder-mould machines. The stock is fed to the down-turning side of the mould at a rate greatly in excess of the amount of white-H<sub>2</sub>O removed by drainage, in order to produce a rapid flow of stock adjacent to the mould surface. Excess of stock is withdrawn at the up-turning side of the mould and recirculated, together with the white-H<sub>2</sub>O, to the mixing box. Higher machine speeds and improved formation of the board are claimed.

D. A. C.

Coated wrapping paper. E. M. KRATZ, ASST. to MARBO PRODUCTS CORP. (U.S.P. 2,058,021, 20.10.36. Appl., 22.3.34).—Sized paper is coated with an aq. solution containing gelatin and sulphonated castor oil. The paper is then chilled and dried by festooning, and may subsequently be treated with  $CH_2O$ . Impermeability of the paper to air is claimed.

D. A. C.

Manufacture of plasticised glassine paper. L. DOZIER, ASST. to RHINELANDER PAPER Co. (U.S.P. 2,058,961, 27.10.36. Appl., 27.5.36).—The application of the softening agent to glassine is divided into two stages. About 4% on the wt. of paper is applied at a point within the drying section of the paper machine, whilst about 8% is applied at the dampers before supercalendering. In the second stage the softening agent is dissolved in the spray-H<sub>2</sub>O. The softening agent may consist of a mixture of glycerin, glucose, and a wetting agent. D. A. C.

Manufacture of reinforced sheet material. L. E. LOVETT, ASST. to INDUSTRIAL RAYON CORP. (U.S.P. 2,058,476, 27.10.36. Appl., 26.10.33).—A coarse-mesh textile fabric is woven and continuously supplied to a heated cylinder which, at the same time, is fed with a cellulose solution (e.g., viscose) to form a continuous sheet incorporating the fabric. The cellulose is regenerated on the cylinder and thus serves to maintain the alinement of the warp threads of the fabric. D. A. C.

Production of plates, blocks, and the like from several separate interconnected layers of wood, paper, vulcanised fibres, and the like. J. VAN HULLEN (B.P. 477,800, 14.1.37).—Pressing is effected in a controlled atm., an elastic jacket being a convenient enclosure. B. M. V.

Preparation of warp for weaving and apparatus therefor. LINEN INDUSTRY RES. Assoc., J. A. MATTHEW, H. BOFFEY, and R. J. B. KEIG (B.P. 479,759, 10.8.36).

Digester. Filters.—See I. Treating textiles, paper, etc.—See VI. Plaster board.—See IX. Thermoplastic moulding. Mouldings from cellulosic material. Composite article. Wrappers for food products.—See XIII. Leatherboard.— See XV. Stabilising nitrates of carbohydrates. —See XXII. Air conditioning.—See XXIII.

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

Problems in the bleaching of vegetable fibres. L. J. N. VAN DER HULST (Chem. Weekblad, 1938, 35, 97–101).—A crit. review of the methods used for testing the bleaching of vegetable yarns and fibres. The influence of  $p_{\rm H}$  on the course of the bleaching process is discussed. S. C.

Degree of whiteness obtainable by bleaching. Its relation to varieties of cottons. G. B. JAM-BUSERWALA (Amer. Dyestuff Rep., 1937, 26, 799-802, 820).-The purity (measured by residual ash and fat content) and whiteness (measured by a described photoelectric cell equipment; the results agreed substantially with visual results) of hanks of Indian (A), Surat (B), Egyptian (C), Ugandian (D), and American (E) cotton yarns first kiered (8 hr. at 15 lb. pressure) with a solution containing NaOH (2) and Na<sub>2</sub>CO<sub>3</sub> (3%), with and without 1% of Turkey-red oil (I), and then bleached with aq. Ca(OCl)<sub>2</sub>, NaOCl, H<sub>2</sub>O<sub>2</sub>, or Na<sub>2</sub>O<sub>2</sub> (neutralised with  $H_2SO_4$ ) were determined, and the detailed results are tabulated. The presence of (I) in the kier liquor profoundly influences the bleaching results. Without (I) the OCl' liquors produce a better whiteness than the peroxide liquors, but with it this result is reversed. Whiteness in the cottons bleached with the peroxide and hypochlorite liquors, respectively, decreases in the order: C, E, B, D, A and E, B, C, D, A. Bleached A and B cottons had the min. ash, but no definite correlation between ash and fat contents and whiteness was established. A. J. H.

Aniline-black dyeings. E. J. MUELLER (Text. Mfr., 1936, 62, 74).—The action of aromatic O carriers is discussed. CH. ABS. (e)

Vegen Salt A, a new textile auxiliary for use in dyeing mixed [wool-cellulose fibre] materials. ANON. (Textilber., 1937, 18, 642-643).---A difficulty encountered in dyeing wool-cotton (or other cellulosefibre) mixture materials in the usual one-bath process, using a neutral dye liquor and direct and neutraldyeing acid dyes, is that at 100° the wool is slowly decomposed (the isoelectric point of wool is  $p_{\rm H}$  4.9) and with certain dyes [e.g., Sirius Light Blue BRR (1)] the light-fastness and brightness of the resulting shade are reduced; in some cases this shade is quite different from that obtained at a lower temp. of dyeing [e.g., (I) colours wool brown instead of blue when applied from a boiling neutral bath for 1 hr.]. This difficulty is avoided by using 5-10% of Vegen Salt A (I.G.) in the dyebath. It is also recommended to impregnate wool fabrics with this salt before decatising them in the usual manner with dry steam. A. J. H.

Chemistry of oxidation fur dyeing. IV. W. E. AUSTIN (J. Tech. Assoc. Fur Ind., 1935, 6, 127–130). —Formation and decomp. of Bandrowski's base (I) from  $p \cdot C_6 H_4(NH_2)_2$  (II) was studied. When pure (II) dissolved in  $H_2O$  was treated with  $H_2O_2$ , practically no insol. material formed in 24 hr. Addition of 0.0125-0.025% of CH<sub>2</sub>O gave a 75–90% yield of (I), which separates in two forms, one of which is a red-brown powder apparently containing  $H_2O$  of crystallisation. The red colour formed when oxidation dyeings with (II) are aged may be a further oxidation product of (I), but cannot be the black azine (cf. B., 1934, 359). (I) when stored in glass for 1 year gave white needles showing all the reactions of (II), an indication of possible spontaneous decomp. of (I) in furs. CH. ABS. (e)

Absorption of dyestuffs by cellulose. VII. Analysis of the diffusion of Sky-blue FF through single and multiple membranes. W. M. GARVIE and S. M. NEALE (Trans. Faraday Soc., 1938, 34, 335-350; cf. B., 1936, 881).—The diffusion of the dye in cellulose sheet has been studied by determining the rate of dyeing of single sheets, the rate of diffusion through single sheets, and the rate of absorption by individual sheets in a multiple membrane. Fick's law is not applicable; the process can be represented by  $dS/dt = Fc^{0.5}(dc/dx)$ , where F is a const.

#### E. S. H.

Review of the fastness problem in relation to textile fabrics. N. HAMER (J. Text. Inst., 1938, 29, P5-18).—Largely historical. It is suggested that uniform types of guarantees, an agreed min. standard of performance, and a standardised system of testing should be adopted. A. G.

Wool mordanted by sulphoxylates. R. BRIXI (Textil. Obzor, 1934, 32, 8).—Addition of formaldehyde-bisulphite is recommended in printing wool with sulphoxylates. It removes  $H_2S$  formed in a sidereaction in the alkaline medium. CII. ABS. (e)

Effect of salt on silk. E. C. WALDE, J. E. Ross, M. BARR, and R. EDGAR (J. Home Econ., 1936, 28, 179—182).—Weighted and pure silk fabrics treated with NaCl and stored for a year showed no discoloration or deterioration. CH. ABS. (e)

Degradation of weighted silk fibroin by acid and alkali. J. E. Ross, R. L. JOHNSON, and R. EDGAR (Textile Res., 1936, 6, 207-216; cf. B., 1936, 13).—The degradation of plain woven fabrics of Fe-, Pb-, Sn-, Pb-Sn-, and Zn-weighted silks by HCl and NaOH in 10 hr. at 40° has been followed by determining the wt., ash, N, wet warp breaking strength, and elongation at breaking load of the residual fabrics. Weighting is not a factor of the acid or alkaline degradation of silk fibroin. CH. ABS. (e)

Alkaline mercerisation of wool. M. BARR and R. EDGAR (Iowa State Coll. J. Sci., 1935, 10, 45–48). —The losses in wt., N, and S in the mercerisation (5 min. at  $15^{\circ}$ ) of plain woven, unstoved wool (ash 0·30%, sulphates nil) decreased with increase in the [NaOH] (16–38%) and were greater at 44% NaOH. The loss of wet and dry breaking strength was less the greater was the alkali conen. CH. ABS. (e)

Waterproofing of knitted woollen fabrics. S. R. TROTMAN (J.S.C.I., 1938, 57, 56-60).—The relative waterproofing vals. for knitted woollen goods have been determined for (1) different metallic scaps of the same fatty acids, (2) the same metallic scap of different fatty acids, (3) different fats and waxes, (4) combinations of the most efficient members of the three classes. The best combinations consist of Cr or Al stearate, emulsified with ceresin. Botany and cross-bred webs were treated with a hot emulsion of ceresin and K stearate neutralised with stearic acid, followed by a cold bath of  $AlCl_3$ ; the fabric was then dried at 110°, soaked in cold  $H_2O$ , dried, and finished. Bathing dresses made from the treated webs subjected to practical tests drained quickly and soon felt much drier than similar untreated garments. After 4 hr. those made of Botany and cross-bred wool retained, respectively, 13 to 17% and 18% of  $H_2O$ .

Crease-resistance of artificial silks. E. ELÖD and P. ETZKORN (Angew. Chem., 1938, 51, 45-52).--The creasing of rayons and the production of creaseresistance by impregnation with synthetic resins are discussed, the effect of the latter on tensile strength, extensibility, and swelling characteristics being investigated. Rayons which show an increased susceptibility to creasing have high moisture-absorption and swelling capacities, and these are reduced on application of resins. The crease-resistance etc. effects obtained with the resins depend largely on the particle size of the precondensate used for impregnation and on the way in which the resin is present on the fibre; impregnation throughout the fibre gives a much better effect than a surface coating. The resins improve the tensile strength (although presence of a large proportion is not desirable) and cause a reduction in extensibility. R. J. W. R.

Silk processing. Measuring fabric stiffness etc. Dyeing paper.—See V.

## PATENTS.

Dyeing of textiles [with ice colours]. E. I. STRASSER (B.P. 477,689, 4.6.36).—The use as stabilised diazo compounds of azoxycarboxylic acid dorivatives, e.g., esters or amides (containing a  $H_2O$ -solubilising group in the part to be split off), is claimed. E.g., cotton impregnated with 2:3-hydroxynaphthore o-toluidide is treated with p-nitrobenzeneazoxycarboxy-p-sulphoanilide,

 $NO_2 \cdot C_6 H_4 \cdot NO.N \cdot CO \cdot NH \cdot C_6 H_4 \cdot SO_3 Na$ , and the dye is developed by warming with aq.  $Na_2 CO_3$  or NaOH.

H. A. P.

Dyeing mixed textile material. S. W. GLEED, H. A. THOMAS, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 478,663, 22.7.36).-Mixed fabrics of animal, vegetable, or regenerated cellulose fibres are dyed in solid shades by padding with an aq. solution of sulphuric esters of leuco-vat dyes together with a swelling agent, e.g., NH<sub>4</sub>CNS (I), an acid-generating agent, e.g., Et2 tartrate (II), a solubilising agent, e.g.,  $(CH_2 OH)_2$  (III), and a wetting agent, drying, steaming, and developing by oxidation. Among examples, a fabric of wool-viscose stable fibre is padded at 60° with Soledon Jade Green (5), (II) (10), (III) (20), (I) (5), sulphonated petroleum-Pr<sup>B</sup>OH condensation product (B.P. 274,611; B., 1927, 841) (5), and H<sub>2</sub>O (728), squeezed, dried, steamed at 100° for  $\frac{1}{2}$  hr., and immersed for 3 min. in a bath of (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (10), AcOH (5), and H<sub>2</sub>O (1000 pts.); a bright, level shade of good fastness is obtained. K. H. S.

Production of fast dyeings. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 478,696, 17.7.36). -Mixed fabrics of wool and cellulose or regenerated cellulose are treated with acid solutions of  $NH_2$ - or OH-derivatives of polycyclic aza-compounds. Their amides with o-hydroxy- or keto-carboxylic acids, if sol. in acids, may also be used. Dyes are developed on the padded fabric by treatment with aromatic or heterocyclic diazo compounds. Among examples (5), a fabric of wool and viscose is padded at 50° with 9-methylamino-4-azaphenanthrene (5 g.) and 85% HCO<sub>2</sub>H (10 c.c.) dissolved in H<sub>2</sub>O (1000 c.c.) and developed with the diazo derivative of 1:4:3-CF<sub>3</sub>·C<sub>6</sub>H<sub>3</sub>Cl·NH<sub>2</sub>; a level scarlet fast to washing and rubbing is obtained. K. H. S.

Dyeing of [natural] sponges. M. COHN (U.S.P. 2,056,166, 6.10.36. Appl., 6.11.34).—Fast shades are obtained by placing the bleached sponge in a cold ( $>38^{\circ}$ ) solution of a dye of the diazotisable type, adding NaCl slowly, and raising the temp. of the bath. After 10 min. at  $>49^{\circ}$ , the colour is developed by diazotisation and treatment with a coupling component (preferably in presence of Na<sub>2</sub>CO<sub>3</sub>) for 15 min., the sponge being finally soaped and dried. Preliminary bleaching can be effected with aq. KMnO<sub>4</sub>  $(\frac{1}{4}-\frac{1}{2})_{0}$  followed by acidified Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>; any stains which remain are removed with 1% aq. H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> or 1-2% H<sub>2</sub>SO<sub>4</sub>. R. J. W. R.

Dyeing rayon in cake form. T. McCONNELL, Assr. to HAMPTON Co. (U.S.P. 2,068,277, 19.1.37. Appl., 20.6.35).—An apparatus is described in which a no. of dehydrated rayon cakes are wrapped separately in a pervious fabric and assembled in a cage-like support in a horizontal position. The ends of the support are impervious to the dye liquor, which passes under pressure through the soft cakes. S. C.

Manufacture and application of titanium dioxide products. H. DREYFUS (B.P. 475,356, 14.5.36).—The fastness to light of dyed rayon fabrics weighted with  $\text{TiO}_2$  is improved by boiling the weighted fabric, or the  $\text{TiO}_2$  itself, in 0.15—0.25% AcOH containing 0.3—0.5% of  $\text{CuSO}_4$ . F. M. L.

Manufacture on the fibre of transformation products of dyes containing sulphonic or carboxylic acid groups. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 478,953, 24.6.36).—Org. dyes containing free SO<sub>3</sub>H or CO<sub>2</sub>H are treated on the fibre with a complex metal compound of an aromatic or heterocyclic base containing <2 basic N atoms, particularly the Cu complexes of 8-amino-quinoline (I) or -quinaldine (II). The formation of the complex and the after-treatment of the dye may be carried out in the same bath. Among examples (7), the Cu complex of the product of interaction of C<sub>3</sub>N<sub>3</sub>Cl<sub>3</sub> (1) with m-NH2 C6H4 NMe3Cl (1) and 5-amino-8-hydroxyquinoline (1 mol.) and  $H_2O$  is used to treat a 2% dyeing of Diamine Pure Blue FF on cotton. The shade becomes greener and is faster to washing and light. The same dye treated with (I) becomes duller and faster to washing. Similarly, cotton dyed with Sirius Black L is treated with o-phenanthroline-CuCl<sub>2</sub>, Diamine Green B with the complex of CuCl<sub>2</sub> or FeCl<sub>3</sub> and 2:2'-dipyridyl, or Direct Deep Black EW with (II). second terting on - K. H. S. le

Wet treatment of articles. V. BÖHM (B.P. 478,164, 5.4.37).—For the dyeing of loose articles such as hat bodies, a perforated drum is rotated only partly submerged in a bath, and the liquid of the bath is circulated by an external pump, being delivered back on to the unsubmerged part of the drum.

B. M. V.

Dyeing or like treatment of textile fabrics. BRIT. CELANESE, LTD. (B.P. 470,415, 14.2.36. U.S., 14.2.35).—Uniform tension is maintained throughout the length of a fabric during jig dyeing etc., by connecting the braking devices on the rolls to a centrally pivoted movable bar at the ends of which are the initial guide rollers of the jig. The device is specially suitable for use with fabrics of materials which are thermoplastic or softened by liquids, *e.g.*, cellulose esters or ethers. Apparatus is claimed. R. J. W. R.

Printing with vat dyes. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 478,567, 20.6.36. Addn. to B.P. 443,436; B., 1936, 487).—Viscous, easily sol. condensation products made by heating compounds  $NH_2 \cdot CX \cdot NHY$  (X = 0, S, or NH; Y = H or alkyl) with compounds R \cdot NH \cdot R' · OH (R' = alkylene; R = an org. radical substituted by at least one  $NH_2$ ) are added to pastes of anthraquinone vat dyes used for printing viscose or cupramnonium silk or mixtures thereof with cotton. Among examples (8), the condensation product of urea (1 mol.) with  $NH_2 \cdot [CH_2]_2 \cdot NH \cdot [CH_2]_2 \cdot OH$  (1 mol.) (80) is mixed with the 20% paste (80) made from Ndihydro-1: 2: 1': 2'-anthraquinoneazine (20), dextrin (20), and H<sub>2</sub>O, added to a reducing thickening, left for 2—3 hr., printed, dried, and oxidised. Fuller, more even and vivid prints are obtained in a shorter time of fixation than without the addition. In other examples there are used condensation products of 1 mol. each of (CH<sub>2</sub>)<sub>2</sub>O with urea, or with guanidine, or (CH<sub>2</sub>)<sub>2</sub>O (1.25 mols.) with  $p-C_6H_4(NH_2)_2$  further condensed with urea (1 mol.). K. H. S.

Treatment [steaming and crêpe twisting] of textile yarns. BRIT. CELANESE, LTD. (B.P. 471,382, 28.4.36. U.S., 30.4.35. Addn. to B.P. 437,019; B., 1936, 95).—The entrance aperture of the steaming chamber is fitted with a shield (e.g., a funnel) so that the thread passes through a steam-air mixture prior to steaming. The shield is perforated for the inlet of air. The threads may be of continuous or cut filaments of cellulose esters or ethers and may contain fibres of other materials. R. J. W. R.

Sizing, dressing, or rendering fast to shifting of textile threads and fabrics. DEUTS. HYDRIER-WERKE A.-G. (B.P. 470,424, 15.2.36. Ger., 16.2.35).— The materials are treated with solutions or aq. emulsions of alcohols obtained by the reduction of natural resins or resin acids, e.g., copal, abietic acid (I), etc. Derivatives of such alcohols, e.g., glycol or glyceryl ethers or lauryl esters, may also be used and the products incorporated with aq. starch or glue preps. The sizes are fast to light and readily removed by treatment in a soap bath. E.g., an alcohol obtained by catalytic high-pressure reduction of (I) (b.p., 195—215°/3 mm.) (50) emulsified in H<sub>2</sub>O (1000) containing Na laurylsulphate (5 pts.) is used for warp-sizing cotton. R. J. W. R.

Treatment of textile materials [to render them crease-resistant etc.]. CALICO PRINTERS' Assoc., LTD., and J. R. WHINFIELD (B.P. 470,097, 8.11. and 13.12.35).-Textile materials (cotton, rayon, etc.) are made resistant to creasing and shrinking by impregnation with a neutral aq. solution (I) of a primary condensation product of CH<sub>2</sub>O and urea (or derivative), followed by treatment with a cold, acidified, conc. solution of a salt which has a strong affinity for H<sub>2</sub>O but no marked swelling action on cellulose. E.g., mercerised cotton is impregnated with an aq. solution containing 16% CO(NH·CH<sub>2</sub>·OH)<sub>2</sub> and 2% aq. CH<sub>2</sub>O (40%), dried, and treated for < 15min. with a cold aq. solution containing 60% CaCl<sub>2</sub> and 1.5 vol.-% of 28% aq. HCl, afterwards being rinsed, soaped, and dried. Embossed or glazed etc. effects are rendered fast to washing by a similar process, the necessary mechanical treatment being carried out after impregnation with (I) and drying.

R. J. W. R.

Imparting a matte finish to silk. I. G. FARBEN-IND. A.-G., and G. W. JOHNSON (B.P. 478,327, 17.7.36). —A matte finish is imparted to natural or artificial silk by treating successively in either order with a H<sub>2</sub>O-sol. stannate and a basic org. substance containing  $\langle C_8, e.g., \rangle$  $C_{12}H_{25}\cdot NH_2$ , oleylamine, C<sub>16</sub>H<sub>33</sub>·NHMe, or mixtures thereof or quaternary NH4, phosphonium, or ternary sulphonium compounds of high mol. wt. Protective colloids or dispersing agents may be added to the baths and also to neutral baths containing the H<sub>2</sub>O-insol. reaction products of stannates and bases for application to silk from a single bath. Hard H<sub>2</sub>O is used for the rinsing baths. Among examples, artificial silk is treated at  $45^{\circ}$  for  $\frac{1}{4}$  hr. with aq. Na stannate (I) (10 g. per l.) followed by 10 min. at room temp. in a bath containing  $C_{18}H_{37}$ ·NH<sub>2</sub>,AcOH (II) (3 g. per l.), or viscose silk dyed black is treated in a single bath with (I) (5), (II) (3), and the reaction product (1.5 g.per l.) of (CH<sub>2</sub>)<sub>2</sub>O (80) and oleyl alcohol (1 mol.).

K. H. S.

Matting of textiles. Soc. CHEM. IND. IN BASLE (B.P. 469,688, 24.2.36. Switz., 23.2. and 18.7.35).-Delustred effects, fast to washing, are obtained by treatment with an aq. colloidal suspension of a H<sub>2</sub>O-insol. condensation product of CH<sub>2</sub>O and urea or similar substance, e.g., guanidine or CS(NH2)2. This suspension may be produced by dilution of a solution of resin in strong acid, e.g., HCl, or by condensation of the components in the treatment bath. The liquor may contain an electrolyte to assist exhaustion. Among numerous examples, 250 c.c. of a 40% solution of CO(NH·CH<sub>2</sub>·OH)<sub>2</sub> in HCO<sub>2</sub>H are added to 30 litres of warm H<sub>2</sub>O containing 40 g. of Na<sub>2</sub>SO<sub>4</sub>,10H<sub>2</sub>O and artificial silk yarn is treated in the liquor for  $\frac{1}{2}$  hr. R. J. W. R.

Treatment of cellulosic textile materials, paper, films, and the like. A. W. BALDWIN, J. G. EVANS, C. S. SALKELD, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 477,991, 8.6.36).—A H<sub>2</sub>Orepellent finish, unaffected by exposure to the weather, washing, or dry-cleaning, is imparted to cellulosic materials by impregnation with a quaternary NH<sub>4</sub> salt; NR'R''-CH<sub>2</sub>·N(tert.)X in which R' and/or R' contain(s) an aliphatic hydrocarbon radical of  $\ll C_{10}$ , N(*tert.*) is the N atom of an aliphatic or heterocyclic *tert.* amine, and X is the radical of a salt-forming acid, in aq. media, optionally drying, and heating to decompose the quaternary salt. E.g., cotton or viscose cloth is impregnated with 0.5% aq. stear-amidomethylpyridinium chloride and dried at 105° for 10 min.; if dyed before treatment, *e.g.*, with a substantive dye, the colour is almost unaffected. Similar results are given by the nitrate, bromide, *m*-nitrobenzenesulphonate, and sulphate, and by lauramido-, oleamido-, and *N*-carbomethoxyundecyl-amino-methylpyridinium salts. H. A. P.

Production of waterproof fabrics permeable to air. F. F. SCHWARTZ and M. A. CHAVANNES (B.P. 471,231, 10.11.36. Fr., 15.11.35).—The material is coated or impregnated with a solution or emulsion of a plastic or elastic substance (I) (e.g., wax, synthetic resin, or rubber), the amount of (I) applied being insufficient to close the interstices of the fabric. It is then subjected to mechanical pressure (and heattreatment if desired) to reduce to size of the interstices sufficiently to render the fabric impermeable to  $H_2O$  but not to air. (I) may be applied as a series of thin coatings. E.g., a closely woven cotton fabric is impregnated with latex which contains vulcanising agents, squeezed, dried, and calendered at 150°. Vulcanisation may be completed by a subsequent heat-treatment. R. J. W. R.

Treatment [waterproofing] of cellulosic material. A. W. BALDWIN, R. J. W. REYNOLDS, E. E. WALKER, C. S. WOOLVIN, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 469,476, 24.12.35).-Soft, H<sub>2</sub>O-repellent finishes, resistant to laundering and dry-cleaning, are obtained on materials containing cellulose or cellulose esters by treatment with a halogenomethyl ether (I) containing an aliphatic chain of  $\langle C_8$ , in an inert solvent, e.g.,  $C_2HCl_3$ , at raised temp. and preferably in presence of an acidbinding agent (IÎ), e.g., NH2Ph or C5H11N. In place of (I) and (II) a quaternary salt of  $(\hat{I})$  and a tert. base (e.g., octadecoxymethylpyridinium chloride) may be used. *E.g.*, cotton fabric (6) is treated for  $\frac{1}{2}$  br. at 95° in PhMe (250) containing  $C_{18}H_{37}$ ·O·CH<sub>2</sub>Cl (0·12) and NPhEt<sub>2</sub>(0·24 pt.), rinsed in EtOH, and dried. In another example, the fabric is impregnated with the reagents, dried, and heated on a drying cylinder at 120° for 3 min. Among the examples of (I) are CH<sub>2</sub>Cl N-dodecyl (b.p.  $149^{\circ}/10$  mm.), sec.-dodecyl (b.p. 146°/15 mm.), and hexadecyl (b.p. 200°/13 mm.) ethers. R. J. W. R.

Rendering materials moth-proof. A. J. STEPHENS. From J. R. GEIGY A.-G. (B.P. 478,398, 6.2.37).—Fabrics consisting of animal fibres are rendered moth-proof by treatment with tetronic or benzotetronic acids substituted at 3 by COR, where R = O-aralkyl, O-alkyl, NH<sub>2</sub>, NH-aryl, NH-alkyl, NH- and N-cycloalkyl, simple or mixed substituted tert. amine groups, ureido- or guanyl radicals. Among compounds mentioned are 3-carboalkoxytetronic acids, the benzyl ester, amide, n-butylamide, piperidide, ureide, guanidide, anilide, and phenylhydrazide of benzotetronic-3-carboxylic acid, and 3-carbethoxy-2 : 3-naphthatetrone. In the examples, pelts, feathers, or wool are dipped in a solution of dehydracetic acid (2) dissolved in EtOH (98 pts.) or in dil. alkalis and dried. K. H. S.

Rotproofing and waterproofing of materials. NAT. PROCESSES, LTD., and W. J. CARTER (B.P. 471,415, 3.12.35, 20.6. and 3.11.36).-Textile and other fibrous materials, plaster, stone, etc. are treated with a H<sub>2</sub>O-insol. rotproofing agent (I) and a waterproofing agent (II). (I) is used as a suspension or aq. solution (prepared by addition of a solubilising agent) and (II) is applied as a dispersion in a liquid which is capable also of giving a stable solution or suspension of (I). The reagents may be used either simultaneously or consecutively; in the latter case (I) is applied first. Pptn. on the fibre is effected by neutralisation or evaporation of the liquid media. (I) may be a metal salt of tar or petroleum acids, a complex org. S or S-N compound (e.g., a dixanthate or a derivative of NH2 ·CS2H), or an org. derivative of a complex inorg. acid (e.g., NHPh<sub>2</sub> fluosilicate; cf. A., 1931, 612). Examples of (II) include rubber, synthetic resins, cellulose esters, waxes, and bitumen compositions. In an example, a suitable mixture contains Al naphthenate (50) dissolved in aq. NH<sub>3</sub>, latex (either prevulcanised or containing vulcanising agents) (50), Na2SiO3 (10), and a filler (kieselguhr) R. J. W. R. (90 pts.).

Manufacture of impermeable rubbered fabric. CELA HOLDING SOC. ANON., Assees. of SERI HOLDING SOC. ANON. (B.P. 469,575, 24.9.36. Fr., 2.10.35).— Fabrics or threads are impregnated with latex or rubber solution and, after drying, treated with a solution of paraffin wax in a rubber solvent, e.g.,  $C_2HCl_3$ , which solution may contain a resin, to modify the handle, vulcanising agents, and sol. dyes. The treated fabrics are impermeable to H<sub>2</sub>O, but airpermeability may be retained by using a low concn. of rubber, any excess being removed before drying. R. J. W. R.

[Marking inks for] identification of laundry articles. L. S. SMITH, jun. (U.S.P. 2,056,809, 6.10.36. Appl., 19.4.35).—Articles are marked with a viscous or sticky ink containing a fluorescent substance. After laundering or dry-cleaning, the marking is visible only when irradiated. R. J. W. R.

Esters. Phenolic CH<sub>2</sub>Cl compounds. Capillary-active agents. Imidazolines.—See III. Azo dyes on the fibre. Dyes for cellulose esters.— See IV. Coating for porous [textile] surfaces.— See XIII.

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

Trends in processes, raw materials, and uses for sulphuric acid. T. J. KREPS (Chem. Met. Eng., 1938, 45, 22–25).—The developments of the chamber and contact processes, possible sources of S or SO<sub>2</sub>, the possibility of replacing  $H_2SO_4$  by  $H_3PO_4$  in fertiliser manufacture, and the uses of  $H_2SO_4$  are reviewed. D. K. M.

Colorimetric analysis of gases for nitrogen peroxide and nitric oxide in sulphuric acid factory practice. I. N. KUZMINICH and E. J. TURCHAN (Zavod. Lab., 1937, 6, 1002-1006).—A colorimetric procedure is described. R. T.

Accelerated analysis of mixtures of sulphuric and acetic acids, and of acetates. S. S. MAGIDOVA and E. K. DIVINSKAJA (Zavod. Lab., 1937, **6**, 820— 822).—A portion of solution, containing  $H_2SO_4$ and AcOH, is diluted to approx. N, and electrotitrated. A second portion is evaporated almost to dryness at 100°, whereby AcOH is eliminated, and the residue is titrated similarly. Commercial NaOAc is analysed by adding the solution to excess of N- $H_2SO_4$  and titrating, and repeating the titration after evaporation as above, when the first titration gives the free alkali content and the second the NaOAc content. R. T.

Application of physico-chemical coefficients to the analysis of concentrated nitric acid. V. F. UST-KATSCHKINTZEV (Zavod. Lab., 1937, 6, 1065—1070).—The  $\gamma$  of 85—100% HNO<sub>3</sub> is  $\alpha$  its concn., and is unaffected by presence of  $\geq 6\%$  of dissolved N<sub>2</sub>O<sub>4</sub>, the concn. of which is  $\alpha$  the d. The [N<sub>2</sub>O<sub>4</sub>] and [HNO<sub>3</sub>] can thus be determined, at 0° or 20°. Apparatus for the rapid measurement of  $\sigma$  is described. R. T.

Measurement of the temperature of the gauze in contact apparatus for ammonia oxidation. P. G. KOVALENKO (Zavod. Lab., 1937, 6, 1024— 1025).—Apparatus is described. R. T.

Conditions of storage of quicklime which may constitute a fire risk. M. POPP (Bodenk. Pflanzenernähr., 1937, 6, 119–126).—The fire risk from stored ground CaO definitely exists, but is  $\ll$  that from lump CaO. A. G. P.

Colour of sodium chloride recrystallised in multiple-effect evaporators. J. KRZYŻANOWSKI (Przemysł Chem., 1938, 22, 12-19).-A yellow coloration is imparted to conc. brine by bituminous substances (initially present) which undergo concn. together with the NaCl. During concn. part of the tallow added to prevent foaming decomposes to yield coloured products. The antifoaming action of tallow is only temporary, as it undergoes hydrolysis with time, to give foam-promoting soaps. The crystals obtained from yellow brine have a greyishyellow colour, which is the more intense the higher is the drying temp. Coloured brines are obtained in presence of rust, 4 mg. of Fe<sub>2</sub>O<sub>3</sub> per kg. of NaCl being sufficient to impart a distinct rose-yellow colour. In absence of rust colourless solutions are obtained by adding H<sub>2</sub>O<sub>2</sub> or other oxidising agents to the brine. **R. T**.

Determination of sulphide sulphur in technical cyanides, and the potentiometric titration of solutions of cyanide melts. M. M. RAINES and A. R. PUSCHNING (Zavod. Lab., 1937, 6, 811-815).---Four breaks are obtained in the electrotitration of commercial NaCN solutions with 0·1N-AgNO<sub>3</sub>, corresponding with formation successively of Ag<sub>2</sub>S, NaAg(CN)<sub>2</sub>, AgCN, and AgCl; the Na<sub>2</sub>S, NaCN + NaCNS, and NaCl contents are derived therefrom. R. T.

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Obtaining potassium nitrate from ammonium nitrate and potassium chloride. S. I. ARONOVA and Z. N. LUNSKAJA (Trans. VI Mendeléev Congr. Chem. [1932], 1935, **2**, Pt. 1, 579–587).—The 100° isotherm for the system  $NH_4NO_3 + KCl \Longrightarrow KNO_3 + NH_4Cl$  was studied. CH. ABS. (e)

Crystallisation problems in the production of potassium chlorate by the lime method. S. S. SCHREIBMAN (Kalii, 1937, 6, No. 5—6, 18—26).— The effects of crystallisation temp. and of  $[CaCl_2]$  and [KCl] are illustrated by means of graphs and tables. Data are given showing the solubility at certain temp. of KClO<sub>3</sub> in presence of each of the following substances : K<sub>2</sub>CO<sub>3</sub>, KNO<sub>3</sub>, KOH, NaClO<sub>3</sub>, MgCl<sub>2</sub>. The cryst. salt is refined by washing immediately after filtering in order to avoid the crystallisation of any impurities present. D. G.

Saturators for manufacture of ammonium sulphate in by-product plants. A. THAU (Z. Ver. deut. Ing. Beih. Verfahrenstech., 1937, 105—111).— Factors governing the production of  $(NH_4)_2SO_4$  of specified size, purity, etc. by absorbing  $NH_3$  in  $H_2SO_4$ , and the principles of absorber design, are discussed. Ten different types of absorber are diagrammatically described. R. B. C.

Hygroscopicity and caking in storage of ammonium nitrate and Leuna nitrate. S. I. ARONOVA (Trans. VI Mendeleev Congr. Chem. [1932], 1935, 2, Pt. 1, 569).—Admixture of  $NH_4NO_3$  and KClcan lead to the formation of  $KNO_3$  and  $NH_4Cl$  with diminution of hygroscopicity. Mixtures of equiv. quantities of the components cake more readily than does  $NH_4NO_3$  alone. Addition of  $(NH_4)_2SO_4$  produces intermediate hygroscopicity. When heated to 150°  $NH_4NO_3$  is stable. Cfl. ABS. (p)

Volumetric determination of calcium sulphate and calcium sulphide in bone black. E. S. GAVRILENKO and O. B. RABINOVITSCH (Nauch. Zap. Sachar. Prom., 1934, 11, Book 45, No. 7, 50—56).— Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>, Fe, and Al are removed by treating the HCl solution with magnesia mixture and NH<sub>3</sub>. Any Ba present is pptd. as BaCrO<sub>4</sub>, and when neutralisation is complete CaCrO<sub>4</sub> is formed and analysed iodometrically. The sulphide is determined by treating with acid and measuring the H<sub>2</sub>S evolved iodometrically. CH. ABS. (e)

Sulphuric acid method of accelerated analysis of barium sulphate for chlorine. I. L. SCHERE-SCHEVSKI (Zavod. Lab., 1937, 6, 819–820).—Air is aspirated through a solution of 10–20 g. of material in anhyd.  $H_2SO_4$  at 100°, and the HCl evolved is absorbed in 0·1N-AgNO<sub>3</sub>, excess of which is titrated.

R. T. Rapid determination of magnesium oxide in acid-soluble slags. S. L. TZINBERG (Zavod. Lab., 1937, 6, 1008—1009).—0.5 g. of slag is dissolved in 10 ml. of HCl + 3 ml. of HNO<sub>3</sub> in 5 ml. of H<sub>2</sub>O. The solution is diluted, and 2 g. of NH<sub>4</sub>Cl and aq. NH<sub>3</sub> to an alkaline reaction are added, followed by a few drops of Br, to oxidise Mn. Excess of Br is removed by boiling, and the solution diluted to 250 ml. and filtered. 25 ml. of hot 10% NaOAc and 20 ml. of hot 10% NH<sub>4</sub>Cl are added, followed by excess of 2% 8-hydroxyquinoline in EtOH, to the boiling solution. The ppt. of Mg salt is collected, washed, dissolved in HCl, and the solution titrated. R. T.

Rapid determination of magnesium chloride in the electrolyte. S. P. SOLIAKOV (Kalii, 1937, 6, No. 4, 13—14).—Mg is determined volumetrically as Mg(OH)<sub>2</sub>. The electrolyte, containing 2—8% of MgCl<sub>2</sub>, is dissolved in H<sub>2</sub>O and the Mg pptd. by NaOH aq. at 50—60° in a graduated test-tube. The height of the ppt., after settling, is read off. The method is accurate to within  $\pm 0.5\%$ . 15 analyses can be carried out simultaneously at an average time of 1½ min. D. G.

Dolomite. A. K. SOARES (Revista Chim. Ind., 1937, 6, 456-463).—Analyses of a no. of samples of Brazilian dolomites are recorded. Many industrial and agricultural applications of dolomite are given.

F. R. G.

Decomposition of rock phosphate by sulphur dioxide and chlorine. L. V. VLADIMIROV (Trans. VI Mendelćev Cong. Chem. [1932], 1935, 2, Pt. 1, 547-548).—Decomp. of phosphate rock is effected by passing SO<sub>2</sub> through an aq. suspension of the rock under pressure (3 atm.), but not by direct treatment with SO<sub>2</sub> at high temp. 85% decomp. was obtained at ordinary temp. and atm. pressure by treating the aq. suspension with SO<sub>2</sub>-Cl<sub>2</sub>. CH. ABS. (p)

Utilisation of by-products in the inorganic chemical industry. V. I. VOLODIN (Trans. VI Mendeléev Congr. Chem. [1932], 1935, 2, Pt. 1, 509— 594).—Utilisation of F in the superphosphate industry, of phosphogypsum, of slurry from the production of  $Al_2O_3$ , of slag and CO from the thermal sublimation of P and As from pyrites roasting, and of slime from  $H_2SO_4$  chambers is discussed. CH. ABS. (e)

Calcining and leaching of crystallised copper sulphate. K. HIRAKOSO (J. Electrochem. Assoc. Japan, 1935, 3, 266—275).—In open-air calcination the min. content of  $H_2O$ -sol.  $CuSO_4$ , the max.  $H_2SO_4$ sol.  $CuSO_4$ , and the main desulphurisation occur at 540°, 580°, and 570°, respectively. In absence of air the corresponding temp. are 600°, 620°, and 600°. Partial desulphurisation occurs at 90—360°, but only in presence of air. CH. ABS. (e)

Use of pumice as a support for copper-chromium oxide catalysts in dehydrogenations. D. COOPER, R. COOPER, and R. E. DUNBAR (Proc. S. Dakota Acad. Sci., 1935, 15, 75—77).—The catalyst is prepared by pptg. and decomp. the Cu-Cr oxide catalyst with heat in presence of Italian acid-washed pumice (size 20). CH. ABS. (e)

Bauxite clays of Grudków as raw material for the chemical industry. K. GLASER (Przemysł Chem., 1938, 22, 1–2).—The clay contains  $Al_2O_3$ 60—73, SiO<sub>2</sub> 22—35, and Fe<sub>2</sub>O<sub>3</sub> 1·3—1·5%, and may be used for Al production. R. T.

Modern production methods in refining diatomite. P. D. V. MANNING (Chem. Met. Eng., 1938, 45, 28—31).—The plant of the Dicalite Co., and the uses of diatomite, are described. D. K. M.

Precipitation of titanium dioxide from aqueous solutions of titanium sulphate. M. E. ZBOROVSKI

and E. V. GERMOGENOVA (Trans. All-Union Sci. Res. Inst. U.S.S.R., 1935, No. 68, 29-62).-Data for the extraction of TiO<sub>2</sub> from Ural and Volinsk ilmenites, and from a concentrate from Kusinsk titaniferous magnetite, are recorded. The use of excess of H<sub>2</sub>SO<sub>4</sub> was not advantageous unless the mineral was finely ground. The effect of additions of NaHSO<sub>4</sub>, Na<sub>2</sub>SO<sub>4</sub>, K<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, KCl, NaCl, MgCO<sub>3</sub>, CaCO<sub>3</sub>, MnO<sub>2</sub>, SnCl<sub>2</sub>, and CaF<sub>2</sub> on extraction was studied. The best results were obtained with addition of a mixture of  $CaF_2$  and  $CaCO_3$ , the extraction being 90% for a  $H_2SO_4$ : ilmenite concentrate ratio of 1.84:1 (optimum temp. 210-220°). Hydrolysis of the extract to yield H<sub>2</sub>TiO<sub>3</sub> began at 80° and was complete at 100°. At a given temp. the hydrolysis was increased by raising the pressure. Сн. Авз. (е)

Production of titanium dioxide from blastfurnace slags. E. V. GERMOGENOVA and S. I. SHUR (Trans. All-Union Sci. Res. Inst. U.S.S.R., 1935, No. 68, 63-84) .- The following blast-furnace Ti slags were treated with  $H_2SO_4$  for the extraction of  $TiO_2$ : (A) non-granulated, with  $\text{TiO}_2$  37.73,  $\text{SiO}_2$  16.09,  $\text{Al}_2\text{O}_3$  19.99, FeO 1.97, CaO 14.53, MgO 8.07,  $\text{Na}_2\text{O}$ 2·12, S 2·07%; (B) granulated, with TiO<sub>2</sub> 30·58, SiO<sub>2</sub> 19·98, Al<sub>2</sub>O<sub>3</sub> 17·25, FeO 3·83, CaO 15·22, MgO 10.06, S 1.02%; (C) granulated, with TiO<sub>2</sub> 28.66, SiO<sub>2</sub> 20.71, Al<sub>2</sub>O<sub>3</sub> 16.93, FeO 4.06, CaO 14.32, MgO 10.46, S 0.27%. The slag, ground to 200–250-mcsh, was heated with  $H_2SO_4$  (d 1.84) using  $H_2SO_4$ : slag ratio 1.65:1 at 180-200°. In A a 70-75% extraction resulted in 3-4 hr.; in B and C extraction was 80-83% in 2-2.5 hr. Сн. Авз. (е)

Liquid air and utilisation of the thermal energy of the sea. G. CLAUDE (Chim. et Ind., 1938, 39, 3-18).-Reminiscences of the author's work on dissolved  $C_2H_2$ , liquefaction of air and the recovery of the rare gases, and the manufacture of Ne tubes. Large-scale experiments on the utilisation of the temp. difference between the surface and depths of the sea in the tropics to generate power are described.

#### C. I.

port of solid Recovery of sulphur from sulphur dioxide. R. LEPSOE and W. S. KIRKPATRICK (Pulp and Paper Mag. Canada, 1938, 39, 20-22, 54).-The process employed at a large Canadian Pb and Zn mining and smelting plant is described. It consists essentially in fixing the washed waste SO<sub>2</sub> by passage through aq.  $NH_3$  as a continuous process, liberation of SO<sub>2</sub> in a purified form with  $H_2SO_4$ , and its reduction to S by passage, along with a little O2 to avoid side reactions, through an incandescent coke bed. The colour of the condensed liquid S may be improved by subsequent use of high-tension electrostatic precipitators to remove a trace of C. An average purity of 99.95% is claimed. At present the plant produces about 45 tons of S per day. H. A. H.

Autoclave process of melting sulphur from flotation concentrates. I. N. MASLENITZKI (Inst. Mech. Ob. Polez. Isk., 1935, 1, 225-254; cf. B., 1935, 724).—The coalescence in hot  $H_2O$  of S from flotation concentrates in sealed tubes at 150° in presence of quartz, gypsum, and limestone was studied. Quartz in grain sizes of 0.080-0.050 mm. was not wetted by S and did not interfere with

coalescence, even when present up to 40 wt.-% in a mixture. The other minerals were wetted by S and interfered with coalescence. Protecting materials  $(e.g., 5-25 \text{ g. of } Na_2SiO_3/\text{litre})$  increased the S yield to >90%, but decreased it if present in larger amounts. Oak extract in presence of NaOH, and  $Na_2CO_3$ , had a similar effect to  $Na_2SiO_3$ .

Сн. Авз. (е)

Extraction of iodine from seaweed by treating with bleaching liquids. F. K. REVVA (Trans. VI Mendeléev Congr. [1932], 1935, 2, Pt. 1, 783-785).-I goes into solution as iodate on treating seaweed with aq. OCl'. After reaching a max. the yield falls, owing to adsorption. CH. ABS. (e)

Determination of fluorine in sodium fluoride, fluorspar, electrolytes, and in slag from magnesium manufacture. K. M. POPOV (Kalii, 1935, No. 10, 24-27).-By treating the sample with SiO<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub> all the F is evolved as H<sub>2</sub>SiF<sub>6</sub>, which is determined by alkalimetric titration. Сн. Авз. (е)

B.-p. elevation of solutions.-See I. Lowtemp. bituminous coke [in  $CaC_2$  prep.].—See II. CaCO<sub>3</sub> [for papermaking].—See V. Acid-resist-ing enamels.—See VIII. Production of  $H_2SO_4$ etc. from gypsum.—See IX. Analysis of mixed acids and salts.—See XV. Paper bags for fertilisers.—See XVI. KOH from distillery slop.— See XVIII. NO evolution from nitrated products.—See XXII. Respirators for potash industry. Antiseptic power of salts. H<sub>2</sub>O chlorinator.—See XXIII.

See also A., I, 137, Prep. of colloidal S. 149, **Prep.** of pure  $\gamma$ -FeO·OH and of  $\gamma$ -Fe<sub>2</sub>O<sub>3</sub>. NH<sub>3</sub> synthesis at atm. pressure. 150, Prep. of HCN by the electric arc. 153, Prep. of D compounds. Rapid conversion of D<sub>2</sub>O into D. 154, Prep. of 3CaO,Al<sub>2</sub>O<sub>3</sub>,6H<sub>2</sub>O. Prep. of N<sub>2</sub>O. 155, Prep. of  $(\mathbf{NH}_4)_2\mathbf{H}_2\mathbf{P}_2\mathbf{O}_5$ . 162,  $\mathbf{F}_2$  generator.

### PATENTS.

Manufacture of hydrocyanic acid [from formamide]. E. I. DU PONT DE NEMOURS & Co., and E. P. BARTLETT (B.P. 469,563, 27.1.36).-HCO·NH<sub>2</sub> (I) is vaporised by contact at, e.g., 300° with, e.g., comminuted SiO<sub>2</sub> or Al<sub>2</sub>O<sub>3</sub>, and immediately passed over a dehydration catalyst, e.g., crushed Mn + about 4% of SiO<sub>2</sub>, at, e.g., 600°, in a vessel constructed of or lined with a non-ferrous metal (Cu, Al). The vapours, which contain practically no (I), are scrubbed with dil. H<sub>2</sub>SO<sub>4</sub>, which absorbs the HCN and any NH<sub>3</sub>, HCN being recovered by distillation. At 1000 space velocity over the catalyst, 96-98% yield of HCN is obtained. I. C. R.

Manufacture of fluorosulphonic acid. I. G. FARBENIND. A.-G. (B.P. 479,450, 5.8.36. Ger., 6.8.35).-FSO<sub>3</sub>H is prepared by the controlled interaction of HF and SO3 in an apparatus of Al, one of the reactants being maintained liquid (SO<sub>3</sub> at 30-33°) by cooling while the other is introduced as a gas below the liquid surface. A. H. C.

Purification of solutions of alkali hydroxides. H. M. SPITTLE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 475,937, 26.5.36).-The solution is digested with Fe<sup>III</sup> and Ca salts, to effect coagulation and removal of Si, Al, and Mn compounds. F. M. L.

Finely-granulated kitchen salt preparations. L. ELION (B.P. 478,629, 3.8.37. Holl., 6.8.36).— 2—5% of Ca or Ca Na lactate is incorporated with the NaCl. B. M. V.

Production of sodium fluoride salts and sodium fluoride double salts. W. MIERSCH (B.P. 479,362, 12.8.36).—Na phenolate solutions are treated with either the equiv. or twice that amount of HF to give NaF or acid NaF, respectively, the fluoride and phenol oil are removed, and the fluoride in the motherliquor is separated as AlF<sub>3</sub>,3NaF (I) by treating with AlF<sub>3</sub>. The acid NaF may be separated before or after the phenol oil, and the d of the mother-liquor increased to separate it from the phenol oil by adding solid NaF and heating. Phenolate solutions may be treated with the equiv. amount of acid AlF<sub>3</sub> to give (I). W. J. W.

Preparation and use of compositions containing ammonia and potassium nitrate. C. K. LAWRENCE and E. W. HARVEY, Assrs. to ATMOSPHERIC NITROGEN CORP. (U.S.P. 2,050,493, 11.8.36. Appl., 21.1.33).—Claim is made for saturated solutions of KNO<sub>3</sub> in H<sub>2</sub>O containing NH<sub>3</sub> in the ratio NH<sub>3</sub>: H<sub>2</sub>O = 25—55: 100 and for their use in treating double and triple superphosphate to obtain a mixed fertiliser. A. R. P.

Froth-flotation concentration of (A) minerals, (B) ores. (A) F. R. TATE. (B) F. B. DEHN. From POTASH CO. OF AMERICA (B.P. 475,725 and 475,789, [A] 20.2.36, [B] 25.2.36).—Halite-sylvite mixtures are floated in saturated brine at 16°, using a Pb or Bi salt as activator and firstly a fatty acid or a salt thereof (e.g., coconut oil soap) as collector for the halite and secondly lauric acid, lauryl alcohol, or a sulphated higher aliphatic alcohol as collector for the sylvite. F. M. L.

Purification of metaphosphates. W. W. TRIGGS. From RUMFORD CHEM. WORKS (B.P. 469,704, 16.9.36). —Impure NaPO<sub>3</sub> which contains, e.g., Fe, Al, Cr, or V as impurity, obtained by dissolving phosphate rock, e.g., in H<sub>2</sub>SO<sub>4</sub>, adding NaOH (or Na<sub>2</sub>CO<sub>3</sub>) to form NaH<sub>2</sub>PO<sub>4</sub>, filtering, evaporating, and fusing the residue, is purified by dissolving (1 pt.) in H<sub>2</sub>O (4 pts.), adding sufficient NaOH to ppt. the impurities but not to redissolve Al(OH)<sub>3</sub> (preferably 0·1 pt. by wt.), filtering, evaporating, and fusing the residue. The product is suitable for H<sub>2</sub>O treatment. I. C. R.

Production of chlorides of metals of the alkaline-earth and zinc series. H. BROWNING (B.P. 475,930, 25.5., 13.8., and 2.11.36).—The carbonate, suspended in  $H_2O$ , is treated with  $Cl_2$  in presence of traces of finely-divided Ni or Co at 75—100°. F. M. L.

Manufacture of a product [fertiliser] containing calcium nitrate and ammonium nitrate. STOCKHOLMS SUPERFOSFAT FABRIKS AKTIEB. (B.P. 469,577, 14.10.36. Swed., 13.11.35).—CaCO<sub>3</sub>, e.g., powdered limestone or dolomite, reacts in the solid phase with  $NH_4NO_3$ ,  $2HNO_3$ , e.g., in a mixing machine for 1 hr., to form a neutral or nearly neutral product, containing 20.6% N, suitable for use as fertiliser. The reaction may be accelerated by heating, and a little  $NH_3$  may be liberated by addition of CaO. I. C. R.

Production of [calcium] bisulphite solutions. G. HAGLUND (B.P. 469,724, 27.2.37. Ger., 3.3.36).— The plant consists of a tower with its lower section wider than the upper in order that liquor collecting at the bottom may be circulated over the limestone or dolomite (lumps) in the lower section, while that in the upper is sprayed with H<sub>2</sub>O. SO<sub>2</sub> passes up the tower, and is completely absorbed. The [SO<sub>2</sub>] may be increased by passing the liquor down, and circulating it in the lower portion of, a similar tower packed with coke or rings, up which SO<sub>2</sub> passes on its way to the first tower. I. C. R.

Stabilisation of gilsonite. W. HASSARD (U.S.P. 2,066,289, 29.12.36. Appl., 19.2.36).—While heated at slightly above the m.p., Mg silicates, casein, salt, and raw sugar are mixed in to render the product less liable to crack or soften with fluctuating temp. B. M. V.

Apparatus for thermal decomposition of metal salts or mixtures thereof. METALLGES. A.-G., and K. EBNER (B.P. 477,617, 8.7.36).—A conc. solution, suspension, or aq. melt of the salt is sprayed with the aid of gas into hot gas in an elongated decomp. vessel, the salt and decomp. products being conveyed therethrough in suspension, to issue at a temp. still approx. that of decomp. B. M. V.

(A) Preparation of solid carbon dioxide in agglomerated form. (B) Manufacture of "dry ice." W. HESSLING (B.P. 477,587 and 477,464, [A] 30.6.36, [B] 1.7.36).—(A) CO<sub>2</sub> snow is placed in an extrusion press in which it is subjected to steps of subdivision and deflexion before finally emerging through a no. of small orifices. The chamber between the piston and jets has a certain degree of elasticity. (B) CO<sub>2</sub> is, immediately after formation by expansion, consolidated between rollers or a roller and table. B. M. V.

Transport of solid carbon dioxide or "dry ice." W. HESSLING (B.P. 477,834, 30.6.36).—Small pieces are pneumatically conveyed by a gas containing < 50% of CO<sub>2</sub> which, conveniently, may be expanded gas from the factory. B. M. V.

[Heat removal in] carrying out reactions of oxides of carbon with hydrogen. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 469,618, 3.2.36).— In the production of hydrocarbons or their O derivatives from CO (or  $CO_2$ ) and  $H_2$ , heat is removed and a uniform temp. maintained by introduction of wet steam (containing up to 40% of liquid  $H_2O$ ) into the cooling space (e.g., tubes, around which the catalyst is placed). Superheating is avoided, e.g., by introduction of  $H_2O$  as a mist or spray, and the dry steam may be used on a turbine etc.

I. C. R.

**Production of sulphur** [from sulphide ores]. T. C. OLIVER, ASST. to CHEM. CONSTRUCTION CORP. (U.S.P. 2,068,430, 19.1.37. Appl., 9.6.34).—The ore is autoclaved in a limited amount of air-containing gases (from the end of the process) preheated to  $315-425^\circ$ , the heat generated being enough to melt the Fe oxides and Cu metal. The hot gases (>15%) of  $SO_2$ ) produced exchange heat with the combustionsupporting gases, the  $SO_2$  being reduced to S. After separation of the S the waste gases are scrubbed (6% down to a trace of  $SO_2$ ) with a suitable aq. liquid, and the gases (3% of  $SO_2$ ) from stripping the liquid by air are preheated to form the combustion-supporting gases for the first part of the process. B. M. V.

Preparation of wettable sulphur. A. H. HEN-NINGER, Assr. to GEN. CHEM. Co. (U.S.P. 2,067,397, 12.1.37. Appl., 29.12.32).—98% of finely-divided non-wettable S is vigorously rubbed with 2% of evaporated sulphite-pulp waste liquor, the friction heat being sufficient to dry the mixture completely.

B. M. V.

Apparatus for purification of sulphur. V. F. FEENY. From CONSOLIDATED MINING & SMELTING CO. OF CANADA, LTD. (B.P. 478,230, 4.5.37).— Molten S at the temp. of min.  $\eta$  is subjected to a highvoltage, unidirectional field and the portions to which the impurities migrate are removed separately from the bulk by directing them into quiescent settling zones. B. M. V.

Apparatus for supplying chlorine. M. F. MCCOMBS and F. W. DECKER, Assrs. to NIAGARA ALKALI Co. (U.S.P. 2,067,720, 12.1.37. Appl., 5.9.35). —Liquid Cl<sub>2</sub> is supplied from a tank car through or past an auxiliary storage vessel mounted on a weighing machine, then through a needle valve, into a flash evaporating coil and gas container submerged in a water-bath which is circulated and maintained at const. temp. (e.g., 77°) by a steam jet, the steam being controlled by a thermostat in the H<sub>2</sub>O. Thence the flow of gaseous Cl<sub>2</sub> is through a needle valve and orifice with pressure gauge between them. B. M. V.

Manufacturing finely-divided substances. Cooling of liquids. Cooling apparatus [for crystallisers].—See I. Treating gases. H<sub>2</sub> from hydrocarbons.—See II. Catalysts.—See III. Treating Ta and/or Nb ores—See X. Fluorescent material.—See XI. Ti pigments.—See XIII.

### VIII.-GLASS; CERAMICS.

Refractory lining for protection of grog brick against corrosion in glass-tank furnaces. L. M. BLUMEN (Keram. i Steklo, 1935, 11, No. 9, 9—16).— Fluxes are used in small amounts to produce a denser body. The bond between the grog brick and the lining must act as a mineraliser to promote the formation of mullite crystals from the grog. Waterglass answers these requirements. While the lining is being destroyed, the basic grog brick undergoes mullitisation, this being greatest in the contactmetamorphic zone. CH. ABS. (e)

Magnesia as a constituent of glass. F. ZSCHACKE (Glashütte, 1937, 67, 643-645).—The advantages associated with MgO as a batch constituent are reviewed in detail. MgO endows the glass with properties necessary to the modern glassmaking machines. Various glass analyses are quoted. C. L. M.

Production of milk bottles of good quality. DEUTS. FLASCHENVERKAUFS G.M.B.H. (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 380-384).-- The properties of glass for food processes and containers are described. Milk bottles which have to be subjected to rough handling must be made of glass which resists scratching, starring, and pitting during wear and tear; the alkali content, particularly low Na<sub>2</sub>O, must be carefully controlled. W. L. D.

Faults in working glass by the blowpipe. K. MEYER (Glashütte, 1937, 67, 619–623).—Various causes of roughening are reviewed. S in the blowpipe flame is injurious, but flames of  $C_3H_8$ ,  $C_2H_2$ , and  $H_2$  do not cause roughening; the defect is greater when using an oxidising flame. The formation of white films on glasses with high alkali and low  $Al_2O_3$  is brought about by gases in the flame. Seed formation may be due to the absorption of  $H_2$  from the flame, or by vaporisation of  $B_2O_3$  in glasses of high  $B_2O_3$  content.

C. L. M.

Testing glass ampoules. O. KNAPP (Keram. Runds., 1937, 45, 589-590, 600-603).—A min. liberation of alkali is essential as it may cause pptn. of alkaloids. Ten standard methods of testing, including those of the principal pharmacopœias of the world, were compared on 3 commercial glasses. The Deuts. Glastechn. Ges. method on powdered glass is regarded as the most reliable, but is rather slow. Mylius' extraction method is unreliable; most boiling methods are inconvenient, but the methods of the German and particularly the English pharmacopœias are satisfactory. In the latter the liquid may be titrated with 0.01N-NaOH from a micro-burette. G. H. C.

Glasses coloured by sulphurous matter. VI. Colouring glasses by carbon and Glover [Glauber's?] salt. K. FUWA (J. Soc. Chem. Ind. Japan, 1937, 40, 413—414B; cf. B., 1937, 1338).— S-content data and light-adsorption curves are recorded. A yellow-orange colour (S >0.02%) requires a batch containing >0.2% of C +  $\frac{1}{5}$  of this amount of salt. J. A. S.

Defects in Fourcault glass. E. FISCHER (Glass Ind., 1938, 19, 27–28).—Common faults in drawn sheet glass are defined and procedures for avoiding loss of material recommended. C. L. M.

Optics and the glass industry. E. D. TILLYER (J. Opt. Soc. Amer., 1938, 28, 1-4).

Optical glass requirements of the optical industry. W. B. RAYTON (J. Opt. Soc. Amer., 1938, 28, 8-12).

Optical glass and the National Bureau of Standards. A. N. FINN (J. Opt. Soc. Amer., 1938, 28, 13-17).—A brief review of research.

Glass strains at elevated temperatures. A. J. MONACK (Glass Ind., 1938, 19, 11–13).—A polariscope furnace is described, by means of which samples of, e.g., glass-metal seals may be examined at  $600^{\circ}$ ; a special cooling arrangement for the nicol prism is incorporated in the design. By the use of this apparatus the temp. at which all strain disappears may be determined. Valuable data for annealing conditions, and data relating to the intensity and distribution of strains in a given sample over a range of temp., may be obtained. Strain conditions at the temp. of operation of a vac. tube carrying a W-glass seal are reviewed. C. L. M.

Immersion cell for polariscope use. E. E. BEETON (Glass Ind., 1938, 19, 51–53).—An immersion cell for determining stresses in glass-metal joints is described. Immersion media such as Russian mineral oil,  $C_6H_6$ , xylol, and PhNO<sub>2</sub> are recommended. Photographs illustrate the difference in the strain picture seen in a polariscope with and without the use of such a cell. C. L. M.

Theory of photo-elasticity. H. MUELLER (J. Amer. Ceram. Soc., 1938, 21, 27—33).—Birefringence is caused by (1) distortion of the lattice structure (negative) and (2) the internal deformation of the at. structure (positive). The former effect increases with the val. of  $\mu$  and thus explains why light glasses have a positive and heavy (flint) glasses a negative photo-elastic const. The theory agrees with Warren's theory of the glassy state, by which the existence of large cryst. groups are excluded. J. A. S.

Effect of atmosphere on the viscosity and surface tension of a simple glass. A. E. J. VICKERS (J.S.C.I., 1938, 57, 14-22).-Experimental observations on the effect of environment on the viscosity  $(\eta)$  and surface tension  $(\gamma)$  of a simple molten magma (Na<sub>2</sub>O 32.7, SiO<sub>2</sub> 63.7%) are described. It has been found that common industrial gases have a profound effect on both  $\eta$  and  $\gamma$ . H<sub>2</sub>, H<sub>2</sub>O, and SO<sub>2</sub> cause a decrease in  $\eta$  due to dissolution of the gas in the magma. All gases have an effect on the  $\gamma$  of this simple magma.  $H_2$  and  $SO_2$  produce a very marked lowering of  $\gamma$ . The observations are of importance in the manufacture of glass and pottery and the operation of furnaces, and as explaining problems concerning the flow of igneous rocks and magmas. When a magma crystallises a decrease in  $\gamma$  takes place during the deposition of crystals. Improvements in the use of the Margules method of determining  $\eta$  are described; these consist in obtaining accurate vols. of molten magma at the temp. of experiment. Various methods of determining  $\gamma$  are examined and it is concluded that the bubble-pressure method due to Jaeger is best suited to the study of y at high temp.

Electric oven for decorating glass and porcelain. A. JOORIS (Verre et Silic. Ind., 1937, 8, 342-343).—The oven is described and figures are given relating to current consumption and temp. obtained. C. L. M.

Thermal analysis of silicates. F. J. VASENIN (Bull. All-Union Sci. Inst. Cement, 1937, No. 1, 79– 83).—Modifications to the Kurnakov instrument for recording temp. measurements are described.

G. N. G.

Colorimetric determination of silica, and the accelerated analysis of corundum. F. J. GALA-CHOV (Zavod. Lab., 1937, 6, 1011-1012).-0.5 g. of corundum is fused with 4 g. of 2:1 NaKCO<sub>3</sub>-borax mixture, and the melt extracted with H<sub>2</sub>O containing 4.5 ml. of H<sub>2</sub>SO<sub>4</sub>. The solution is diluted to 250 ml., Si being determined colorimetrically in 50-ml. portions of solution. Fe, Ti, and Ca are determined in the remaining solution by the usual methods. R. T. Petrographic methods applied to the study of silica bricks. V. L. BOSAZZA (Trans. Ceram. Soc., 1938, 37, 1-5).—The technique of grinding and mounting thin sections of 5-6 sq. cm. in area is described. An examination of 3 different sections by the method of traverses gave the content of quartz, tridymite, cristobalite + silicate, etc. The shape and size of the grains were also measured.

Ground-coat studies. VI. Restoration of lost set. E. P. CZOLGOS (Better Enameling, 1934, 5, No. 2, 20—22; cf. B., 1935, 850).—Set is restored by using a freshly prepared ground-coat enamel slip or by electrolysis. A hot solution of borax is most used, whilst aq.  $NH_3$  and  $MgSO_4$  are used under certain conditions. Addition of Na aluminate to the initial mill charge did not improve the consistency, but when used to restore set by means of blunging it gave excellent results. CH. ABS. (e)

Modification of the Bingham plastometer. J. T. IRWIN and R. E. BEVIS (J. Amer. Ceram. Soc., 1938, 21, 66-68).—The Bingham plastometer for determining the consistency of enamel slips is provided with a second capillary approx. twice the length of the first. One time and two vol. measurements, determined simultaneously during a single experiment, give two points defining the linear relationship between the shearing force and rate of flow. The yield val. and mobility are derived in the usual way. The advantages of the apparatus are simplicity and the reproducibility of results.

J. A. S. Determination of the softening point of enamels. G. SCHMIDT (Sprechsaal, 1938, 71, 53— 56).—An apparatus in which a loaded quartz probe rests upon the surface of the (previously fused) enamel in a crucible in an electric furnace is described. The displacement of the probe is measured on a scale or optically, and may be made to operate a photo-cell to cut off the heating current. The rate of heating must be standardised. G. H. C.

Factors influencing properties of acid-resisting enamels. G. H. SPENCER-STRONG (J. Amer. Ceram. Soc., 1938, 21, 1—8).—The effects of metal gauge, firing treatment, and drying and application methods on the acid-resistance and physical properties (hardness, surface finish, opacity, etc.) of 3 enamels were studied. The firing and application methods affected the acid-resistance, and the other factors affected only the physical properties. The type of enamel controlled the degree of effect of the various factors. Dust coats were the most sensitive. J. A. S.

Acid-resisting and non-poisonous enamels. C. A. OTTERSBACH (Glashütte, 1937, 61, 647-649). The effect of various constituents of the enamel batch (e.g.,  $BaCO_3$ ,  $Na_2SiF_6$ , cryolite, borax,  $MgCO_3$ ,  $Ce_2O_3$ ) is examined, as regards the acid-resistance and poisonous characteristics of the product. C. L. M.

Testing the resistance of enamels to corrosion by acids. ANON. (Verre et Silic. Ind., 1937, 8, 344— 345).—The method described is that recommended by the Porcelain Enamel Institute of America. Samples may be treated in the cold with a 10%.

J. A. S.

solution of citric acid, whilst at higher temp. a mixed acid solution containing 1.5% each of citric and malic acids is recommended. The details of procedure are defined. C. L. M.

Optical specification of vitreous enamels. D. B. JUDD, W. N. HARRISON, and B. J. SWEO (J. Amer. Ceram. Soc., 1938, 21, 16-23).—Extensive data are presented which show how well the reflectance characteristics of an enamel can be specified by the Kubelka and Munk relationship between the thickness and reflectance. The equation contains the two consts. of reflectivity and coeff. of scatter. J. A. S.

Rim enamels. ALDINGER (Glashütte, 1937, 67, 605-607).—The difficulties associated with the use of these enamels, *e.g.*, the breaking away of the enamel from the curved surface or the edge of sheet ware, are investigated. Three major causes of difficulty are defined. Each is considered in detail and formulæ for suitable enamels are given. C. L. M.

Ability of some underslips and glazes to cover surface imperfections. J. F. MoMAHON (Bull. Amer. Ceram. Soc., 1938, 17, 5-12).--A tile was provided with a range of artificial imperfections in the form of perforations 0.03-0.135 in. in diameter and 0.03 - 0.21 in. deep. The holes were left empty or filled with powdered coal in order to simulate cracks and C "spots," respectively. The slip or glaze was applied to the tile, fired, and examined for the degree to which the holes were obscured. The effectiveness of the layer varied greatly according to the type and amount of plastic clay it contained. A very suitable type of frit consists of Na<sub>2</sub>O(K<sub>2</sub>O) 4.32—14.80, CaO 0—6.2, BaO 6.64—20, ZnO 13.23—20, PbO 17.01— 18.23, CaF<sub>2</sub> 0-3.32, B<sub>2</sub>O<sub>3</sub> 8.3-20, Al<sub>2</sub>O<sub>3</sub> 0.83-8.58, SiO<sub>2</sub> 30-36.35, and ZrO<sub>2</sub> 0-8.30%. A cavity left by the combustion of a coal particle 0.049 in. in diameter was difficult to cover and the screening of carbonaceous clays through 16-20-mesh is recommended. J. A. S.

Flow of glazes on horizontal and inclined surfaces. C. M. LAMPMAN (Bull. Amer. Ceram. Soc., 1938, 17, 12—16).—The distance and area of flow of a ball and button of glazes (cones 014-6) on horizontal and inclined ( $45^{\circ}$ ) plates were studied. Horizontal flow and inclined flow were not always related. The rate of change of fluidity with temp. was usually greater with cone 014-03 than with cone 6 glazes. The blistering of a glaze before maturing appeared to cause sufficient agitation to increase the spread and flow. The importance of this effect in causing good adherence to the body is emphasised. The effects of various constituents on the fluidity of a glaze were studied. J. A. S.

Improvement of stability against crazing by variation of crude and fritted content of glaze. ANON. (Keram. Runds., 1937, 45, 588-589).---Replacement of various proportions of the frit by PbO + kaolin did not itself reduce the tendency to craze, but it enabled greater stability to be achieved by introduction of more  $SiO_2$  without spoiling the glaze. G. H. C.

Thermal insulation of kilns. F. VOGELER (Tonind.-Ztg., 1938, 62, 87-89).—The introduction of a layer of heat insulation, e.g., kieselguhr or bricks made from it, costs little in comparison with the economy which it effects in heat. G. H. C.

Radiant tube decorating lehr. ANON. (Glass Ind., 1938, 19, 23—25).—The lehr may be used for decorating or annealing purposes. The heating elements are metallic heat-resisting tubes, in which the gas is burned. These "radiant" tubes are distributed above and below the conveyor belt, with a circulating fan above the tubular heating elements. The heated air is distributed under accurate control. Higher belt speeds are possible and gas consumption is lowered. C. L. M.

Special wear-resisting materials for claymachinery parts. J. O. EVERHART (J. Amer. Ceram. Soc., 1938, 21, 69—72).—Actual plant tests were carried out on mill knives, die liners, muller tyres, and grinder parts made in 50 alloy irons and steels. Sp. recommendations are made. J. A. S.

Instrument for measuring the workability of clays. F. H. NORTON (J. Amer. Ceram. Soc., 1938, 21, 33-36).-The apparatus automatically traces (on a smoked plate) the stress-strain relation of a tube (diameters  $\frac{3}{8}$  and  $\frac{7}{8}$  in., length 2 in.) of material undergoing torsion at a rate of approx. 3 r.p.m. (corresponding with the working of clay in the usual commercial machinery). A typical curve exhibits an elastic deformation region, a yield point, a plastic deformation region, and a breaking point. Some clays (especially coarse-grained china clays and bauxites) show a temporary decrease in strength at the yield point [due to a condition of thixotropy (?)], followed by a kind of "strain-hardening." The workability of a clay is expressed in terms of the yield point (a), the ultimate strength, and deformation (b). The H<sub>2</sub>O content of best workability corresponds with the max. val. of  $a \times b$ . The shape of the deformation curve is greatly affected by the rate of shear, thus indicating that the forming operations of clay should be rapid in order to obtain the best results. The elasticplastic behaviour of clays beyond the yield point is similar to that exhibited by metals. J. A. S.

Sulphur content of sand [for use in brick manufacture]. W. MARSCHNER (Tonind.-Ztg., 1938, 62, 76—77).—The introduction of S (which produces efflorescence) may occur with sand. All the 32 samples of sands actually in use contained appreciable amounts of S. Apart from sol. sulphates, some is present as  $FeS_2$  which may undergo oxidation.

G. H. C.

Talc porcelain. III. Effect of addition agents on properties of talc-kaolin mixtures. IV. Microscopical observation. V. Supplementary experiments on highly talcous and sole-talc bodies. VI. Cordierite bodies. VII. Lowtalc aluminous bodies. VIII. Microstructure of ignition-plug insulators on the market. IX. Influence of various gases on firing behaviour of talc. X. Physical properties of talc and talc porcelain fired by a particular method. XI. Barium oxide bodies and quartz bodies. XII. Specific electrical resistance of porcelain composed of alkaline earths, alumina, and silica. S. KONDO and S. SUZUKI (J. Soc. Chem. Ind. Japan, 1937, 40, 18B, 19B, 149—150B, 150B, 150—151B, 151B, 468—470B).—III. The effects of adding 0.5— 2% of Fe<sub>2</sub>O<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, MnO<sub>2</sub>, CoO, NiO, CaF<sub>2</sub>, or MgNH<sub>4</sub>PO<sub>4</sub> to bodies containing tale (70 and 85%) and clay were studied at cones 11—14. CoO, NiO, MgNH<sub>4</sub>PO<sub>4</sub>, and CaF<sub>2</sub> increased the vitrification range. Data for *d*, strength, thermal expansion, and sp. electrical resistance are recorded. (Cf. B., 1937, 240.)

IV. High-talc vitrified bodies consist of clinoenstatite, with small amounts of  $3Al_2O_3$ ,  $2SiO_2$ , cristobalite, and quartz. Bodies with a higher clay content consist of minute crystals of cordierite in a glassy matrix, but addition of fluxes may alter the form and nature of the crystals.

V. Ceramic data for bodies containing 60-97% of talc are recorded.

VI. Adsorption, thermal shock, thermal expansion, strength, d, and electrical resistance tests were carried out on bodies containing 25—40% of tale. The fluxes most effective in extending the vitrification range are felspar, Fe<sub>2</sub>O<sub>3</sub>, and MnO<sub>2</sub>. The thermal shock resistance is increased and the thermal expansion decreased as the composition approaches that of cordierite. The electrical resistance is increased by addition of Al<sub>2</sub>O<sub>3</sub>, but decreased by addition of felspar, Fe<sub>2</sub>O<sub>3</sub>, and quartz.

VII. Data are recorded for bodies consisting of 10-55% of talc and MgO + Al<sub>2</sub>O<sub>3</sub> in place of the usual clay. The bodies have low thermal expansion and high electrical resistance at 600° (52 megohms/sq. cm.). Technically useful bodies lie within the range 0.20-0.45 KNaO, 0.01-0.04 CaO, 1.10-2.08 MgO, 1.0 Al<sub>2</sub>O<sub>3</sub>, 2.0-3.0 SiO<sub>2</sub>, 0.01-0.02 MnO<sub>2</sub>.

VIII. The bodies may be divided into two classes: (1) containing phenocrysts of quartz, retaining their shape in a glassy matrix, and (2) containing minute crystals of cordierite.

IX. The cracking of talc on firing to  $1100^{\circ}$  and above is avoided by prefiring at  $400-600^{\circ}$  in certain gases (unspecified).

X. The physical properties of the above-mentioned materials are described.

XI. The properties of a series of bodies containing 20-45% of talc are described. The best body contained calcined talc 30, kaolin 40, quartz 10, felspar 10, Al<sub>2</sub>O<sub>3</sub> 10, CaCO<sub>3</sub> 2, and MnO<sub>2</sub> 0.2%, vitrified at cones 9-14 (shrinkage 9.75-13.60%, modulus of rupture 495 kg./sq. cm.).

XII. Electrical measurements were made on a range of bodies vitrifying at cones 11–14. The relationship between temp. and sp. resistance ( $\rho$ ) for 400–800° was log  $\rho_T = -A/T + B$ . J. A. S.

Microscopical determination of porosity of porcelain. E. K. ZAVADOVSKAJA (Zavod. Lab., 1937, 6, 1021–1022).—The no. of pores, as measured microscopically, diminishes with increasing fineness of the abrasive used for polishing; coarse abrasives give fictitiously high vals. R. T.

Refractory clays of Parszów near Wachock. M. KAMIEŃSKI and H. HANS (Przemysł Chem., 1937, 21, 301-307).—Analytical and other data are recorded for the fired and unfired clays. R. T. Quick methods of chemical analysis of refractory clays and quartzites. V. V. KRAFT, V. A. PALOUZOV, A. J. SHAPIRO, and E. M. SKIBINA (Ogneup., 1935, **3**, 458—463).—The time of determination of SiO<sub>2</sub> can be reduced to 5—6 hr. by sintering. Less flux and acid are needed and the pptd. SiO<sub>2</sub> can be washed quickly.  $Al_2O_3$  is determined by the 8-hydroxyquinoline method. CH. ABS. (e)

Protective appliance for ovens for determinations of refractoriness to heat. V. A. LEBEDEV (Zavod. Lab., 1937, 6, 1006).—A shield with a central aperture is placed obliquely above the oven. R. T.

Testing the quality of heat-refractory pastes. S. S. KOZAKIEVITSCH (Zavod. Lab., 1937, 6, 866– 869).—Standard methods are described. R. T.

Study of an alumina-silica chequer brick from the regenerator of a glass tank. C. L. THOMPSON and E. P. REXFORD (J. Amer. Ceram. Soc., 1938, 21, 55-59).—A brick (SiO<sub>2</sub> 33·2, Al<sub>2</sub>O<sub>3</sub> + TiO<sub>2</sub> 63·2%) which had undergone destruction by the splitting off of an outer layer was examined chemically and petrographically. The outer layer had been converted, by the action of the Na<sub>2</sub>O vapour and dust, into nephelite (Na<sub>2</sub>O,Al<sub>2</sub>O<sub>3</sub>,2SiO<sub>2</sub>) with small amounts of corundum and  $3Al_2O_3$ ,2SiO<sub>2</sub>. The reversible thermal expansion of the altered layer was twice that of the core, and this effect together with the permanent expansion undergone by the outer layer explains the progressive splitting of the brick. J. A. S.

**Pyrometry and the steel-maker's refractories.** R. B. SOSMAN (J. Amer. Ceram. Soc., 1938, 21, 37 49).—The role of temp. and its measurement in the manufacture and use of refractories is reviewed with special reference to the refractoriness and slagging-resistance of SiO<sub>2</sub> roofs. The working range of a roof is from 1585° (the min. working temp. of low-C steel) to 1650° (the softening point of SiO<sub>2</sub> in the presence of FeO + Fe<sub>2</sub>O<sub>3</sub>). Automatic control within this range is possible by means of the specially designed total radiation and photo-electric pyrometers, which are described in detail. Regenerator pyrometry is also discussed. J. A. S.

Silica firestone refractories. E. A. BURR (Indust. Heating, 1937, 4, 581-583, 642-646, 755-760).—Their properties, e.g., thermal expansion and crushing strength, and general applications are reviewed. R. B. C.

How and why refractories insulate. W. TRINKS (Indust. Heating, 1937, 4, 911—914).—A discussion. R. B. C.

Scrap grinding wheels used as foundry refractories. W. H. SALMON (Found. Tr. J., 1937, 57, 427-428).—SiC has been successfully employed in the production of mouldable chills, hard facings, and mould dressings, also abrasives high in Al<sub>2</sub>O<sub>3</sub> for repairing furnace linings. R. B. C.

Influence of gaseous hydrocarbons on refractories. M. P. BABKIN and P. N. GOLOVATNUI (Ogneup., 1935, 3, 582—587).—The deposit of C on the lining of coke ovens depends on the composition of the refractories. At 600° an increase in SiO<sub>2</sub> decreases the rate of deposition of C; at >800° the reverse takes place. Much greater deposits form on  $\operatorname{SiO}_2$  bricks than on grog bricks and the C is in a more amorphous condition. Deposition increases in all cases if 1-2% of  $\operatorname{Fe}_2O_3$  is added. On grog and semi-acid grog the max. deposit of C forms at 800°. Raising the firing temp. of the refractories lessens the deposition. It is increased by increased porosity.

CH. ABS. (e)

Action of carbon monoxide on refractory materials. III. Experiments with laboratoryprepared specimens. IV. Deposition of carbon on certain ferruginous substances. W. HUGHL, H. ELLERTON, and A. T. GREEN (Trans. Ceram. Soc., 1938, 37, 6—11, 12—16; cf. B., 1934, 146).—III. Particles (0.5—1.0 mm.) of hæmatite, magnetite, pyrites, and Fe<sub>2</sub>O<sub>3</sub>-clay slag were separately added (in amount = 2 and 5% of Fe<sub>2</sub>O<sub>3</sub>) to 3 clay mixes of ball clay, China clay, and ball clay +15% of grog. The specimens fired at 1000—1380° were exposed to CO at 420°. The resistance to disintegration by C deposition increased with decrease in Fe<sub>2</sub>O<sub>3</sub> content, with rise in firing temp., and according to the nature of the ferruginous addition in the order Fe<sub>2</sub>O<sub>3</sub>-clay slag, pyrites, magnetite, hæmatite. Conclusions as to the effect of the clay could not be drawn.

IV. The ferruginous materials, after-treated at (1) 500° and 900° in an oxidising atm., (2) 1200° and 1400° in an atm. of burnt town's gas, and (3) 1400° in a Hirsch furnace, were exposed to CO at 500° and the wt. of C deposited and the loss in wt. of the ferruginous material were determined. Little deposition occurred on the raw materials, but hæmatite gave the most (27.8%) after 30 hr.). The initial firing treatment in all cases greatly increased the deposition, as much as 500% being found. The ferruginous materials were partly reduced. J. A.S.

Influence of additions of iron chromite and bauxite on fundamental properties of magnesite refractories. S. N. MUISCHKIN (Ogneup., 1935, 3, 243-248).—For chromite-magnesite samples the highest mechanical strength was obtained with pure chromite, and the highest resistance to spalling with 30-40% of chromite, the setting rate being practically zero. In bauxite-magnesite samples >40%of bauxite could be used. The best chromitebauxite-magnesite charge was Fe chromite 10, burnt bauxite 10, and metallurgical magnesite 80%. The spalling-resistance of the brick obtained was 12 coolings in  $H_2O$ , against 1 for magnesite and 2 for chromite-magnesite. The mechanical strength was much lower. Сн. Abs. (e)

Determination of size of fine abrasive powders. Comparison of microprojection and sedimentation methods. F. L. JONES (Ind. Eng. Chem. [Anal.], 1938, 10, 45–47).—Size-distribution curves obtained by the two methods for  $Al_2O_3$  abrasive powders are compared and discussed. When the abrasive is composed of long, narrow grains of irregular shape all agreement between the two methods disappears. L. S. T.

Supporting pottery. Vibration viscosimetry. —See I. Glass-works gas producer.—See II. Refractory cements and mortars.—See IX. Fe and steel for enamelling.—See X. Dairy plant.— See XIX. Pb and silicosis.—See XXIII.

See also A., I, 121, Anomalous dispersion of Di glass. 130, Tempering and annealing of  $B_2O_3$  glass. 131,  $\eta$  of glass.

#### PATENTS.

(A) Regenerator tank and method of operation. (B) Glass making. V. MULHOLLAND, Assr. to HARTFORD-EMPIRE Co. (U.S.P. 2,068,924—5, 6.1.37. Appl., [A] 2.12.32, [B] 13.6.34).—(A) The melting and refining zone is divided from the working zone by a bridge wall and the former is worked in three zones comprising melting, superheating, and refining; natural circulation is caused in the middle (deepest) zone, up the centre, and down the sides, the hot air from regenerators above being admitted through the roof at an angle to cause the hottest flame to be along the centre line. (B) Cf. B.P. 447,228; B., 1936, 739. B. M. V.

**Converter.** T. S. CURTIS (U.S.P. 2,065,566, 29.12.36. Appl., 14.6.35).—A furnace for heat-treating lumpy sillimanite or the like comprises a chamber with tuyères through the refractory walls, the upper tuyères being supplied with less fuel to compensate for the preheating effect of the lower ones. B. M. V.

Manufacture of glass. C. ARNOLD. From NON-METALLIC MINERALS, INC. (B.P. 472,027, 1.3.37).— A stable, granular form of CaO suitable as a glassbatch constituent is prepared by calcining crushed limestone or dolomite with a small amount (3-8%) of aluminous flux. E.g., dolomite crushed to pass  $\frac{1}{8}$ -in. opening and to be held on 30-mesh is mixed with a china-clay slip, calcined at 1430—1600°, and crushed to pass 20-mesh. J. A. S.

Glass building block. D. E. GRAY, Assr. to CORNING GLASS WORKS (U.S.P. 2,068,798, 26.1.37. Appl., 21.5.34).—The blocks are brought up to within 0.005 in. of standard size, measured between any pair(s) of opposite faces, by an intimately united layer of a completely polymerised vinyl acetate resin on each face. B. M. V.

Manufacture of glass wool. D. C. SIMPSON, Assr. to OWENS-ILLINOIS GLASS CO. (U.S.P. 2,068,202 -3, 19.1.37. Appl., [A] 29.11.32, [B] 27.10.33. Renewed [A, B] 25.3.36).—(A) After blowing, the wool is allowed to fall down a vertical shoot into containers, of the same horizontal area, which are moved on a conveyor and into which the wool is compressed immediately by a downwardly inclined conveyor belt to form slab-like masses. A coating material may be applied to the warm wool in the shoot. (B) The filaments are blown in the shoot and compact themselves in the moulds by impact, the moulds having a perforated bottom to exhaust the air or steam blast. B. M. V.

Annealing lehr. E. L. WALTERS, ASST. to LIBBEY-OWENS-FORD GLASS CO. (U.S.P. 2,066,376, 5.1.37. Appl., 29.5.33).—In a tunnel lehr especially for sheet glass, radiation from the outside is controlled by louvre-like plates which can be adjustably opened. Annealing of glassware. D. G. MERRILL, Assr. to HARTFORD-EMPIRE Co. (U.S.P. 2,068,923, 26.1.37. Appl., 8.11.35).—The final rapid cooling of the glass in a tunnel lehr is effected by air admitted at the goods-exit end, caused to flow towards the hot end, and returned in a suction flue, the point of reversal being adjustable, as also is the position of a pyrometer close to it. Adjustment is effected either by a telescopic extension of the suction conduit or by means of a large no. of transfer ports, closed in succession.

B. M. V.

Apparatus for tempering glass articles. CORN-ING GLASS WORKS (B.P. 477,414, 30.6.36. U.S., 24.9.35).—The articles are heated in an annular or other kiln, placed one by one in metallic baskets, and submerged in a chilling bath of inorg. salts heated to the correct temp.; the articles are then lifted out of the salt bath and cooled in air and  $H_2O$ . B. M. V.

Tempering glass. E. M. GUYER, Assr. to CORNING GLASS WORKS (U.S.P. 2,068,799, 26.1.37. Appl., 2.9.33).—The glass sheet is placed between electrodes which are subject to a high-frequency p.d. and is heated by dielectric losses; simultaneously cooling medium is blown over the faces of the glass, between it and the electrodes. B. M. V.

Tempering glass. A. QUENTIN (B.P. 472,022, 8.2.37).—The sp. heat of the air used in the cooling jets is kept const. by saturating the air with  $H_2O$  vapour at const. temp. The cooling efficiency of the air is also thereby increased. J. A. S.

Production of safety glass. W. KÖNIGSWARTER and L. FEJES (ELEKTRO-OSMOSE [GRAF SCHWERIN GES.]) (B.P. 470,135, 14.7.36).—The interposed layers are prepared from a solution of polyvinyl acetate in at least one solvent, *e.g.*, diacetone alcohol, having b.p.  $100-200^{\circ}/1$  atm. and evaporation rate (from filter-paper) >30 times that of Et<sub>2</sub>O. Pigments and opacifiers may be added. S. M.

Safety glass. D. MEYER (B.P. 471,904, 11.3.36. Ger., 25.3. and 17.4.35).—Sheets of glass, precoated with polyvinyl acetate (containing a cellulose derivative, if desired) and dried, are wetted with a liquid which neither dissolves nor disperses the coating (e.g., BuOH,  $C_6H_6$ , etc.) and are caused to adhere by pressure alone, without the use of heat. J. A. S.

Compound glass or other laminated products. A. KAMPFER (B.P. 472,140, 13.2.36).—The thermoplastic laminating layer is formed by extrusion and applied directly to the surface of the glass, which may or may not have been heated or coated with an adhesive. Apparatus is described. J. A. S.

Manufacture of laminated glass. J. F. WALSH, Assr. to A. D. LITTLE, INC. (U.S.P. 2,054,108, 15.9.36. Appl., 14.10.32. Cf. U.S.P. 1,966,604; B., 1935, 467).—The interposed layer consists of zein plasticised with an aromatic sulphonalkylamide (alkyl  $\Rightarrow C_2$ ). S. M.

Application of colour to moulded glass articles. A. G. REZ (U.S.P. 2,067,949, 19.1.37. Appl., 20.2.33). —A fusible pigment is applied through a stencil of the like while the glass is still hot enough to melt the pigment, *i.e.*, at a point between the moulding machine and the lehr. B. M. V.

(A) Joining ceramic bodies to one another or to metallic bodies. (B) Application of layers of base metal [iron] upon ceramic bodies. SIEMENS & HALSKE A.-G. (B.P. 475,878 and 475,935, [A, B] 26.5.36. Ger., [A] 19.6.35, [B] 12.7.35).-(A) The surface is coated with a mixture of finely-divided Fe, Cr, W, or Ni mixed with an org. adhesive (nature not stated), and the article is heated until the metal sinters; joints are then made between the metallised surfaces, using hard solders of m.p.  $\neq$  700° (>800°). (B) Electrical resistances are made by coating a ceramic body with a mixture of Fe powder and a neutral binder, e.g., EtOH mixed with a small amount of a lacquer, and heating it in an inert atm. at 1220-1260°. F. M. L.

Manufacture of articles of self-bonded granular material [refractory oxide]. NORTON GRINDING WHEEL Co., LTD. (B.P. 471,346, 26.9.36. U.S., 30.9.35).—A process and apparatus are described for the pressure-moulding of an oxide powder (e.g., Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub>, MgO, etc.) heated to a temp. just below its m.p. A graphite mould may be operated at 100—1000 lb./sq. in. J. A. S.

**Refractory bodies.** G. E. SEIL, Assr. to E. J. LAVINO & CO. (U.S.P. 2,066,543, 5.1.37. Appl., 10.4.36).—Chromite ore (containing Mg silicate) is mixed with  $Al_2O_3$  (excess over theory) and heated at  $<1700^\circ$  to form cryst. spinel and mullite uniformly distributed over the chromite particles. B. M. V.

Manufacture of refractory bodies. GEN. MOTORS CORP. (B.P. 472,110, 13.12.35. U.S., 25.1.35). —Finely-pulverised, non-plastic materials  $(e.g., Al_2O_3, ZrO_2, TiO_2, etc.)$  are mixed with thermo-plastic or -setting resins and pressure-moulded. Addition of a small amount of lubricant (stearic or oleic acid etc.) prevents sticking to the die and also carries the finest particles to the surface of the article, thus giving a glazed surface to the fired article. The process is specially adapted to the manufacture of sparkingplug insulators. J. A. S.

Refractory [dolomite] bricks. E. RICHARDSON (B.P. 471,373, 6.3.36).—The free CaO is wholly or partly removed from calcined dolomite by treatment with acid solutions, and a flux is introduced by treatment with chlorides of Fe, Al, Cr, Mn, etc. The product is dried, shaped, and fired in the usual way. Such bricks are resistant to moisture. J. A. S.

Spalling-resistant refractory brick. G. M. CARRIE, J. W. CRAIG, F. E. LATHE, and A. C. HALFER-DAHL (U.S.P. 2,068,641, 26.1.37. Appl., 16.7.31. Can., 31.1.31).—The brick is composed of 15—50 (30)% of a coarse (4.0-0.5-mm.) Cr-Fe ore and 85—50 (70)% of fine (1-mm. size to dust) deadburned MgO clinker containing 10—25 (18)% CaO. B. M. V.

Manufacture of high-pressure non-plastic refractory. R. P. HEUER, Assr. to GEN. REFRAC-TORIES CO. (U.S.P. 2,068,411, 19.1.37. Appl., 9.1.34). —A dry refractory brick of high d and strength is formed of anhyd. materials and a bond (<3% of org. matter or Na silicate) and is dried but not burned before use in building a furnace. The screen analysis of the mix is, e.g., passes 3- but held on 30-mesh 45-65%, smaller than 50-mesh 55-35%; the proportion of intermediate sizes must be very small. B. M. V.

Manufacture of grinding or abrasive wheels. NORTON GRINDING WHEEL CO., LTD. From NORTON Co. (B.P. 478,028, 15.12.36).—The wheel centre comprises discs alternately of metal and reinforced resinoid adhesive; the same reinforcement (metal foil or cloth) extends into the abrasive annulus which is bonded by the same resinoid. B. M. V.

Grinding wheels and like abrasive articles. NORTON GRINDING WHEEL CO., LTD., and W. HAD-DOCK (B.P. 478,242, 11.6.36).—The exposed surfaces not used for grinding, including the central hole, are coated with a varnish resistant to the lubricant used. B. M. V.

(A) Mounted grinding wheel. (B) Grinding wheel. M. B. LANE, ASST. to NORTON CO. (U.S.P. 2,065,941-2, 29.12.36. Appl., 21.3.36).—An abrasive body is cemented to a metal driving plate by separate layers of vulcanised soft rubber (containing 40-70% of ZnO) and (A) Na silicate or (B) converted resinoid. B. M. V.

Glass to metal seals. STANDARD TELEPHONES & CABLES, LTD., Assees. of V. L. RONCI (B.P. 477,728, 27.11.36. U.S., 4.2.36).

Manufacture of grinding rings from emery and a medium made of raw rubber. H. RANDALL (B.P. 478,180, 5.7.37).

Very hard substances.—See X. Transfers.— See XIII.

## IX.-BUILDING MATERIALS.

Production of Portland cement and sulphur dioxide from gypsum. S. M. ROJAK, M. I. GERSCHMAN, K. F. MILOSLAVSKI, and Z. I. NAGEROVA (Trans. All-Union Sci. Inst. Cement, 1935, No. 10, 5—121).—A detailed account is given of a laboratory and factory-scale study of the utilisation of gypsum for Portland cement manufacture with  $H_2SO_4$  as by-product. A suitable composition of the mix was CaSO<sub>4</sub> 80, dried clay 15, and coke, anthracite, etc. 5%. G. N. G.

Peculiarities of the process of burning Portland cement derived from gypsum. V. N. JUNG (Trans. All-Union Sci. Inst. Cement, 1935, No. 10, 129—140).—The progress of the reactions during burning and the requirements in the design of the rotary kiln for the manufacture of Portland cement from gypsum, with  $H_2SO_4$  as by-product, are examined. G. N. G.

Economics of the manufacture of Portland cement and sulphuric acid from gypsum. A. A. MAMUROVSKI and V. E. SCHNEIDER (Trans. All-Union Sci. Inst. Cement, 1935, No. 10, 141-152). G. N. G.

Production of fused Portland cement in blast furnaces by introduction of an oxygen blast. V. V. SEROV (Bull. All-Union Sci. Inst. Cement, 1937, No. 1, 75—76).—An attempt is made to develop a process of Fe smelting in an O<sub>2</sub> blast to produce a slag of the composition of Portland cement clinker. G. N. G. Magnesia in Portland cement. V. Preparation of  $MgO,SiO_2$  and  $2MgO,SiO_2$ . VI. X-Ray analysis of magnesia in  $2CaO,Fe_2O_3$  and  $4CaO,Al_2O_3,Fe_2O_3$ . Y. SANADA (J. Soc. Chem. Ind. Japan, 1937, 40, 396B, 460—461B; cf. B., 1937, 1343).—V. MgO,SiO<sub>2</sub> formed by heating the component oxides at 1200° was insol. in 30% HCl, and  $2MgO,SiO_2$  formed in the same way at 1400° gelatinised with (1:2) HCl.

VI. MgO in clinkers of  $2CaO,Fe_2O_3$  and  $4CaO,Al_2O_3,Fe_2O_3$  (calcined at  $1400^{\circ}$  for 2 hr.) was present as the free oxide. J. A. S.

Tricalcium aluminate and microstructure of Portland cement clinker. L. S. BROWN (Proc. Amer. Soc. Inst. Mat., 1937, 37, [II], 277-305).---Microscopical recognition of Ca<sub>3</sub> aluminate (I) in the clinker is difficult. To determine its mode of occurrence about 150 burns were made, ranging from pure (I) through high-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> mixes into the field of Portland cement compositions. (I) crystallises in large units enclosing Ca<sub>3</sub> silicate (II) and CaO when present, but with a tendency to exclude Ca, aluminoferrite (III). In this habit (I) becomes a matrix or interstitial material which, because of its similarity in optical properties to those of (II), is difficult to distinguish. Its presence is demonstrated indirectly through its control over the orientation of (III) crystallites, which show a common mass or field birefringence over large, roughly equidimensional areas. R. B. C.

Microstructure of Portland cement clinker derived from gypsum. N.S. MANULOVA and S. M. ROJAK (Trans. All-Union Sci. Inst. Cement, 1935, No. 10, 122—128).—A microscopical study of specimens shows that the petrographic structure of the correctly burned clinker is identical with that of ordinary Portland cement. A considerable quantity of an amorphous substance is also present. The formation of  $\beta$ -Ca<sub>2</sub> silicate (Rankin's silicate) is due to defects in the burning process. G. N. G.

Production of the first two lots of clinkerless slag cement from acid blast-furnace slag at the Nevianski cement works. I. B. STANKEVITSCH (Bull. All-Union Sci. Inst. Cement, 1937, No. 1, 76— 78).—The cement is prepared from granulated acid slag 85% and  $CaSO_4$  15 or 10%, with or without  $Ca(OH)_2$  15%. The compressive and tensile (28day) strengths are 412 and 273 and 39.2 and 30.2 kg./sq. cm., respectively. G. N. G.

Colour changes and strength of manganeseand sulphur-bearing [cement] clinkers, and their production under reducing conditions. G. MUSS-GNUG (Zement, 1937, 26, 809—812).—When raw materials containing Mn are burned under reducing conditions, the clinker acquires a chocolate-brown colour. The presence of sulphide is a more certain indication of reduction than the colour, as the higher oxides of Mn may dissociate if overheated. Reduced clinker has lower early strength, but its slower hydration appears to be due to difference of physical structure rather than of mineralogical composition. G. H. C.

Celite. IV. Compressive strength of plastic mortar and concrete of celite cement. V. Effect of iron modulus on burning of raw mixture. Y. SANADA (J. Soc. Chem. Ind. Japan, 1937, 40, 395B, 461-462B; cf. B., 1937, 242).--IV. 1:3 mortars and 1:2:4 concretes gave strengths of 22-33 (7 days) and 52-71 (6 months) and 21-32 and 47-65 kg./sq. cm., respectively. The strength increased with decrease in celite content of the clinker. V. The free CaO in clinkers prepared at 1150-

1400° from mixtures with a SiO<sub>2</sub> modulus of 2·0 and 2·5 was a min. when the Fe<sub>2</sub>O<sub>3</sub> modulus (Al<sub>2</sub>O<sub>3</sub>/Fe<sub>2</sub>O<sub>3</sub>) was 1·20—1·75, and decreased with a modulus beyond these limits. J. A. S.

Quick-setting and heat-evolving cements. III. Setting time and strength of cement with activity indices of 1, 1.5, 2, and 2.5. K. AKIYAMA (J. Soc. Chem. Ind. Japan, 1937, 40, 414—415B; cf. B., 1937, 1054).—Physical and chemical data are recorded for 24 cements containing CaO 50—70,  $Al_2O_3$  8—25, and SiO<sub>2</sub> 15—35%. J. A. S.

Refractory cements and mortars. II. S. NAGAI and J. KATAYAMA (J. Japan. Ceram. Assoc., 1937, 45, 219—226; Zement, 1937, 26, 778; cf. B., 1937, 348).—Good refractory cements show deterioration when exposed to somewhat lower temp. (800— 1200°), whilst poorer cements give better strengths after this treatment. The latter shrink and deform between 1080° and 1200°. G. H. C.

Hydraulic refractory cements. II. S. NAGAI (J. Soc. Chem. Ind. Japan, 1937, 40, 470–471B; cf. B., 1937, 1208).—Chemical and physical data are recorded for cements containing  $Al_2O_3$  52.5—77.4,  $SiO_2$  10.8—35.3, CaO 6.2—11.3, TiO\_2 2.0—3.3, and  $Fe_2O_3$  1.4—2.5%. J. A. S.

Tedzamski tuff. A. T. IVANOVA (Bull. All-Union Sci. Inst. Cement, 1937, No. 1, 84—86).—A brief account is given of the composition and structure of tuff of the Caspian region. Preliminary tests indicate marked hydraulicity. G. N. G.

Mortars. F. MAUNE (Tonind.-Ztg., 1938, 62, 95-97).-Mortars with high strength are apt to be short, and this may destroy their val. because the bricks are badly laid. The H<sub>2</sub>O content and capillary attraction of the mortar must be sufficient to prevent loss by suction into the bricks, resulting in cracking. The adhesion of mortar to bricks is ascribed to formation of a bond layer; its maintenance is conditioned by the shrinkage forces in the mortar. Watertightness and frost-resistance are determined by porosity. Plasticity of CaO-mortars is improved by presence of some CaCO<sub>3</sub>, but this must be formed by carbonation of the CaO and not left by inadequate burning. If cement be added, it should not exceed half of the amount of the CaO. G. H. C.

Influence of the nature of the coarse aggregate on properties of concrete, particularly of road concrete. O. GRAF (Schriftenreihe d. Forschungsges. f. das Strassenw. e.V., 1937, No. 10, 46 pp.; Betonstr., 1937, 12, 25—35, 56—62, 77—80; Road Abs., 1938, 4, No. 568).—Detailed test data are given on twelve stones used in concrete (two granites, one porphyry, one diabase, three basalts, one quartzite, one shell limestone, one Jura limestone, one sparry aphrite—a form of aragonite, and Syntholith—a CaO-SiO<sub>2</sub> slag). The influence of particle shape and surface texture on strength was found to be negligible, but the rounder aggregates gave the more workable concrete. The bending strength of mortars was slightly < that of concretes made therefrom. Bending strength, elasticity, abrasion-resistance, shrinkage, and swelling data are given on all the types of concrete. The abrasion-resistance varied with the nature of the stone, differences being more marked in wet than in dry tests. Data on the effect of adding limestone powder and trass are given and precautions in using gravel concrete containing particles of chalk, limestone, weathered granite, etc. discussed. T. W. P.

Creep of Portland blast-furnace cement concrete. A. D. Ross (J. Inst. Civil Eng., 1937—8, No. 4, 43—52).—The average creep at 45 days of the concretes was 66% > that of concretes made with normal Portland cements. For conditions demanding min. deformation, aluminous or rapid-hardening Portland cements should be used, but for conditions in which the avoidance of cracking is of first importance, Portland blast-furnace cement may be most suitable. Experimental methods are described and test data given. T. W. P.

Plastic flow and volume changes in concrete. R. E. DAVIS, H. E. DAVIS, and E. H. BROWN (Proc. Amer. Soc. Test. Mat., 1937, 37, [11], 317-331).-Flow is still discernible in plain concretes under sustained stresses of 900-1200 lb./sq. in. even after 10 years; 95% of the total flow, however, takes place within 5 years. Movements due to dryingshrinkage or flow in reinforced concrete under load are of practical importance mainly during the first Tests to determine the effects of H<sub>2</sub>O-cement year. and aggregate-cement ratios on flow indicate that the denser is the cement paste the less is the flow, which in normal concretes is  $\infty$  the cement paste content. Flow in concrete under tensile stress is > that under compressive strength during the early ages; the reverse relation holds at the later ages. A low-heat type of Portland cement exhibits much greater plastic properties, particularly at the early ages, than does a normal Portland cement. This phenomenon is discussed in relation to vol. changes and cracking of concrete structures. R. B. C.

Effect of curing conditions on strength of concrete test specimens containing burnt-clay aggregates. W. F. KELLERMANN (Publ. Roads, 1937-8, 18, 53-58, 61; Road Abs., 1938, 5, No. 48).—The bending strength of concrete containing an artificial light-wt., burnt-clay aggregate was affected by variations in curing and moisture content at the time of test more than were concretes containing naturally occurring aggregates. The variations were caused by the slower rate of loss or gain of  $H_2O$  by the former. Testing should therefore be performed on saturated specimens. If the latter have been subjected to drying, they should be immersed in  $H_2O$  for 43 hr. before testing.

T. W. P.

Hydraulicity of slags. L. CHASSEVENT (Compt. rend., 1937, 205, 670-672).—Slags may be classified according to their hydraulicity by their rate of attack by 0.05% aq. Na<sub>2</sub>CO<sub>3</sub>, by their resistance to com-

pression after treatment with 20% aq. Na<sub>2</sub>CO<sub>3</sub>, or by the rate of evolution of heat on treating the slag with this solution. A. J. E. W.

Fillers containing calcined bituminous schist. ANON. (Rev. Gén. des Routes, 1937, 12, 172—175; Road Abs., 1938, 4, No. 565).—The material is not suitable as a filler unless calcined, when it may be used successfully. It contains a proportion of carbonaceous matter, finely subdivided, which is thought to form an envelope around the mineral particles. Data are given on comparative tests with different tars and both ordinary fillers and fillers consisting mainly of the calcined material.

T. W. P.

Design of asphalt mixtures for underwater construction. R. M. MOCRONE and F. C. FIELD (Proc. Amer. Soc. Test. Mat., 1937, 37, [II] 499-506). R. B. C.

Compression testing of asphalt mixtures. II. R. VOKAC (Proc. Amer. Soc. Test. Mat., 1937, 37, [II], 509-518). R. B. C.

Delignification of wood by strong alkaline solutions. G. R. LUSBY and O. MAASS (Canad. J. Res., 1937, 15, B, 536-544).—The rate of delignification by LiOH, NaOH, and KOH solutions increases with rise in at. wt. of the alkali metal, or in concn. (1·4-14·3M), or in temp. (120-180°), but is diminished by the presence of NaCl or of the reaction products. A. LI.

Examination of woods attacked by fungus with the polarisation microscope. K. LOHWAG (Mikrochem., 1937, 23, 198-202).—The application of the method is described. J. S. A.

Vibration viscosimetry.—See I. Sand for bricks. Thermal analysis of silicates.—See VIII. Cu-plated plaster.—See X. Polishes for wood etc.—See XIII. Rubber-lined vessels.—See XIV. Dairy plant. Wood containers for foodstuffs.— See XIX.

#### PATENTS.

Manufacture of Portland cement products. C. BATCHELLER (U.S.P. 2,066,550, 5.1.37. Appl., 9.9.35).—In the manufacture of asbestos-cement sheets or the like, a small proportion of colloidal clay is incorporated in the original mix and the material which oozes out during the pressing and that trimmed off the edges are mixed with more cement, colloidal clay, and asphalt emulsion and added to a new batch. B. M. V.

Silicate cements. F. D. SNELL, INC. (B.P. 470,890, 23.10.36. U.S., 29.2.36).—A cement is produced from the reaction between a cone. solution of an alkali silicate  $(M_2O:SiO_2 = 1:1 \text{ to } 1:3\cdot25)$  and a setting agent composed of a fluosilicate (e.g., Na<sub>2</sub>SiF<sub>6</sub>) with or without an acid fluoride (e.g., NaHF<sub>2</sub>), the setting agent being in sufficient quantity to neutralise the silicate. An inert aggregate may also be added. The working time of the cement may be adjusted by replacement of a portion of the Na<sub>2</sub>SiF<sub>6</sub> by NaHF<sub>2</sub> or by use of an excess of Na<sub>2</sub>SiF<sub>6</sub>. It is claimed that the products are completely neutral, acidproof, and waterproof. T. W. P.

Manufacture of [cement] tiles and the like. ASSOCIATED PORTLAND CEMENT MANUFRS., LTD., and H. A. HOLT (B.P. 470,871, 26.3.36).—A decorated cement tile is made by placing in the bottom of the mould nodules of coloured cementitious material which, having been covered with the ordinary cement mix, are compressed into a homogeneous surface by the subsequent pressing operation. The decorated surface may be ground and polished. J. A. S.

Production of cementitious material. G. A. HOGGATT, Assr. to CERTAIN-TEED PRODUCTS CORP. (U.S.P. 2,067,762, 12.1.37. Appl., 1.3.34).—In order to reduce the H<sub>2</sub>O-carrying capacity of the plaster, *i.e.*, the proportion of H<sub>2</sub>O needed to form a castable slurry, NH<sub>4</sub>OAc, Na citrate, or 1—3 lb./ton of a H<sub>2</sub>O-sol. salt of an alkali and an aliphatic acid ( $\Rightarrow$  C<sub>8</sub>) alone or mixed with an alkali-halogen compound, or K tartrate is mixed in before calcination of the gypsum is completed. B. M. V.

Apparatus for producing cellular cementitious materials. J. A. and R. B. RICE, Assrs. to BUBBLE-STONE CO. (U.S.P. 2,069,078, 26.1.37. Appl., 15.12.34).—A mechanical aërator for slurry comprises an imperforate container, a perforated cylinder rotated by power on a horizontal axis, and, within, a no. of loose perforated cylinders of decreasing diameter. B. M. V.

Manufacture of cellular products. W. M. SCOTT, ASST. to E. M. CARSLEY (U.S.P. 2,065,757, 29.12.36. Appl., 17.5.34).—A filler and aq. Na silicate are beaten together in an enclosed space or an atm. of high humidity; the articles are moulded and hardened by drying. B. M. V.

(A) Treatment of slag. (B) Formation of slag blocks. W. C. CORYELL (U.S.P. 2,067,312--3, 12.1.37. Appl., [A] 29.6.33, [B] 31.5.35).--(A) Slag in viscous fluid condition (e.g., direct from a blast furnace) is mixed with combustible matter in the early part of a chamber in which foaming is produced by combustion of the intermixed material; the outlet passage from the chamber extends, at least partly, upwards and the foamed slag lifts itself out. (B) The foamed slag is delivered on a continuous conveyor and makes contact, before it completely solidifies, with rolls and brushes to form a slab with an outer skin and, if desired, tongues and grooves along the edges. The continuous slab remains on the conveyor until it is brittle enough to be broken into pieces. B. M. V.

Manufacture of bricks, blocks, and other shaped articles from materials typifiable by dolomite. F. L. DUFFIELD (B.P. 478,707, 21.7.36). —Ground dolomite is sintered "and fluxed" in an oscillating furnace and poured into moulds travelling below the spout of the furnace; it is moulded by pressure before the temp. has fallen much, and cooled in the moulds. B. M. V.

Manufacture of artificial stone produced by fusion from refuse clinker. L. VON ROLL A.-G. F. KOMMUNALE ANLAGEN, Assees. of H. BAUM-GARTNER (B.P. 469,538, 16.12.36. Switz., 17.12.35).-Clinker from the refuse-burning operation (500-1500°) is mixed with suitable fluxes, fused in a separate furnace, and cast to shape. The composition of the fused product is maintained within the limits 2—6 pts. of  $(R^{IO} + R^{IIO} + R^{IIIO})$  and 2—6 pts. of  $A^{IVO}_2$ , where  $R^{I}$ ,  $R^{II}$ , and  $R^{III}$  are basic elements (e.g., Na, K, Ca, Al, etc.) and  $A^{IV}$  is an acidic element (e.g., Si, S, etc.). J. A. S.

Artificial stone. E. H. EICHERT, Assec. to M. WEGER (U.S.P. 2,057,330, 13.10.36. Ger., 6.4.34).— An artificial stone mass resembling a Mg oxychloride composition is prepared by combining (a) an org. filler (e.g., sawdust, cork, peat), (b) stone dust, (c) a mixture of CaCl<sub>2</sub>, Na<sub>2</sub>SO<sub>4</sub>, and CaCO<sub>3</sub> in preferred proportions 0.125-0.150%, 7-8%, 92-93%, respectively, and (d) a hydraulic binder (e.g., Portland cement). A preferred ratio is (a) 10, (b) 5, (c) 1, (d) 4-5 pts. T. W. P.

Colouring of stone. C. E. CLEVELAND and V. E. PETERSON (U.S.P. 2,068,483, 19.1.37. Appl., 16.12.35).—Any natural or artificial material containing CaO is coated with liquid gelatin to seal the surface to a considerable depth, the design is then cut in the gelatin and, preferably, also sand-blasted, then a fluosilicate of a metal (according to the colour desired) is applied, and the gelatin finally removed. B M V

B. M. V. Manufacture of asbestos-cement sheets. J. HARDIE & Co., PTV., LTD. (B.P. 478,626, 30.6.37. Austral., 7.7.36).—Aërated sheets are formed of a no. of laminations; the asbestos composition including a metal (Al or Zn), and a gas-forming reagent (NaOH) is applied to each lamina during manufacture in such concn. that a part of the gas is evolved after uniting the laminæ. *E.g.*, asbestos 70—90, cement 400 pts., and Al 1 pt. are premixed moist with a small portion of the cement. B. M. V.

Constructional material. A. C. FISCHER, Assr. to PHILIP CAREY MANUFG. Co. (U.S.P. 2,065,439 and 2,067,707, [A] 22.12.36, [B] 12.1.37. Appl., [A] 19.11.32, [B] 18.5.32).—(A) In the manufacture of roofing shingles, insulating sheets or tapes, packing, etc., the base is saturated with bitumen containing a solvent and is coated on the outside with a slowdrying tacky substance. (B) A sheet is moulded from a mixture of fibrous material, waterproof mastic, and a substance that remains tacky for a very long time, the last being incorporated when the mastic is at approx. 52°. No definite examples are given. B. M. V.

Soundproofing. A. FLECK, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 469,667, 29.1.36).—A soundabsorbent body consists of an aggregate of particles of chlorinated rubber bonded by the use of a suitable solvent, e.g.,  $C_6H_6$ ,  $CCl_4$ , etc. Reinforcing means (fibre, wire) are incorporated. J. A. S.

Plaster board and the like. G. C. TYCE, V. LEFEBURE, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 471,432, 3.3.36).—A composite board is claimed consisting of a layer of cementitious material with liners. The liner on one side consists of two or more sheets of paper, cardboard, etc. bound together with a waterproof adhesive, the outer sheet being of absorbent material; that on the other side consists of paper sheets etc., bound similarly, but having the outer sheet resin-impregnated or -coated. The latter may be decorated, e.g., by incorporating pigments in the resin or by applying a clear resin to a decorated paper. The absorbent side keys to plaster etc. for fixing. A preferred resin is polymerised Me methacrylate; preferred waterproof adhesives are chlorinated rubber, nitrocellulose, phenol-formaldehyde resins.

T. W. P.

Coating of plaster. G. L. HADDEN, Assr. to DOHERTY RES. Co. (U.S.P. 2,065,069, 22.12.36. Appl., 26.1.35).—Moist, freshly plastered walls are finished by giving them a waterproofing coat of vulcanised, substantially uncoagulated, alkaline rubber latex, which is allowed to coagulate by evaporation and affords a suitable surface for paint. B. M. V.

(A) Moisture-resisting composition for wood and the like. (B) Method of finishing floors.
F. H. LYONS, ASST. to E. L. BRUCE CO. (U.S.P. 2,066,295-6, 29.12.36. Appl., [A] 8.6.31, [B] 6.4.32).
—Compositions of linseed and tung oils, rosin, paraffin wax, Zn stearate or other metallic soap, and naphtha are described.
B. M. V.

Impregnating solutions for wood and other materials. BOLIDENS GRUVARTIEB. (B.P. 468,378, 2.1.36. Swed., 22.10.35).—The solution contains a mixture of  $Na_2Cr_2O_7$  20.6,  $H_3AsO_4$  55.9, ZnO 12.8, and ZnCl<sub>2</sub> 10.7% such that when the CrO<sub>3</sub> is reduced by the wood the  $Na_2O$  liberated neutralises the Cl' and insol. Zn and Cr arsenates are deposited in the wood. A. R. P.

Preparation of impregnating solutions for wood etc. BOLIDENS GRUVAKTIEB. (B.P. 470,232, 2.1.36. Addn. to B.P. 468,378; preceding).— The solution consists substantially of  $Na_2Cr_2O_7 +$  $2Na_2HAsO_4 + 3H_3AsO_4 + 3ZnSO_4$  (or  $3ZnCl_2$  etc.), the As as  $Na_2HAsO_4$  being 20—50% of the total As. The Zn salt, solid or in solution, is added to a solution of the other salts. I. C. R.

Manufacture of artificial lumber. J. V. NEVIN (U.S.P. 2,068,926, 26.1.37. Appl., 27.8.34).—Uncooked, wet, mechanically disintegrated wood waste is mixed with an aq. solution of synthetic resin-forming materials (urea, cresylic acid, and  $CH_2O$ , only partly condensed) and the mixture thoroughly agitated before felting; the mat produced by felting and draining is subjected to heat and pressure to render the resin infusible. B. M. V.

Machines for separating water from sand and like material. HARDY & PODMORE, LTD., and C. GUISE (B.P. 478,612, 5.11.36).

Manufacture of cores for laminated board. W. DÖLLKEN & CO., G.M.B.H. (B.P. 478,397, 27.1.37. Ger., 27.1.36).

Heat- and sound-insulating materials. Stone breakers.—See I. Road tars.—See II. Glass building block.—See VIII.

# X.—METALS; METALLURGY, INCLUDING ELECTROMETALLURGY.

Rapid determination of phosphorus in iron ores. N. F. MICHAILOVA (Zavod. Lab., 1937, 6, 1154).—2 g. of ore are extracted with 20 ml. of conc. HCl, 20 ml. of  $H_2O$  are added, and the solution is filtered. The  $SiO_2$  content of the filtrate is so small as not to interfere with P determination. R. T.

Spectrum method of determining aluminium in iron ores. P. D. KORSH (Zavod. Lab., 1937, 6, 970—972).—A spectrographic method is described. R. T.

Soda desulphurisation in blast-furnace practice at the Röchling iron and steel works. A. HOLSCHUH (Stahl u. Eisen, 1938, 58, 133—136).— The pig Fe produced by the Thomas process at this works is treated with 6.5 kg. of Na<sub>2</sub>CO<sub>3</sub> per ton, the soda being melted in a tiltable drum furnace and poured into the ladle with the molten Fe. With a Mn content of 0.55% the S content of the Fe can be reduced to 0.035% by this treatment; the apparatus used in continuous operation is described with special reference to the device employed to remove the very fluid slag from the Fe. A. R. P.

Reduction of titaniferous magnetites at moderate temperatures. N. P. TSCHISHEVSKI, A. P. VLASOV, and V. I. SCHMELEV (Sborn. Trud. Moskov. Inst. Stal, 1935, 92—122).—Reduction at 900—1000° with coal gave poor results, the product being contaminated with Si, Mn, Cr, Ti, and V. Reduction with H<sub>2</sub> gave good results. The slag obtained by melting the sponge from gaseous reduction was rich in Ti, V, and Cr. CH. ABS. (e)

Trends of continental steel-foundry practice. P. C. FASSOTTE (Found. Tr. J., 1937, 57, 389-391).--French, Belgian, and German practice is reviewed. The slow development of the soda-ash process is noted. R. B. C.

Behaviour of nitrogen in the arc-furnace process [of steel manufacture]. N. BONTHRON (Jernkont. Ann., 1937, 121, 637—659).—The duplex process (basic Bessemer + arc furnace) was studied. The Bessemer steel contains 0.01-0.015% N, which may be reduced to 0.005% by controlled decarburising. Carburisation with anthracite ([N] = 1%) leads to increased [N] in the steel. N absorption takes place continuously at the electrodes, making it impossible to reduce [N] below 0.004%. Addition of Al does not reduce [N] appreciably, the Fe<sub>3</sub>N<sub>2</sub> segregating on solidification to the same extent as Fe<sub>3</sub>P<sub>2</sub>. No absorption of N<sub>2</sub> during the melting of large scrap was noticed. M. H. M. A.

Function of tuyères in cupola control. J. E. FLETOHER (Found. Tr. J., 1937, 57, 432-433).— Estimated analyses of the gases produced in the bed of a balanced-blast cupola are given. The functions of the main and auxiliary tuyères and the influence of air fluctuations are discussed. R. A. C.

[Steel] soaking pits fired simultaneously from both sides. C. LONGENECKER (Blast Furn. Steel Plant, 1937, 25, 995—997).—The plant of the Lukens Steel Co., Coatesville, Pa., is described. Oil firing is employed. R. B. C.

Rotary-kiln [sand] dryers for foundries. R. LIEBETANZ (Giesserei, 1937, 24, 544).—The construction and operation of a recent type are described. The kiln is connected with a furnace in which the combustion of low-grade fuel is controlled by means of rabbles. R. B. C.

Open-hearth slags. T. BLUNDELL (Iron and Steel Ind., 1936, 9, 174-175).—A discussion. CH. ABS. (e)

Steel-melting slags. W. R. MADDOCKS (Iron and Steel Ind., 1936, 9, 213—214).—Acid and basic open-hearth slags and basic electric arc furnace slags are discussed. CH. ABS. (e)

Slag control. W. ASH (Iron and Steel Ind., 1936, 9, 175—177).—In the Perrin process, highly oxidised metal is poured into an artificial slag which is deficient in FeO. A high degree of deoxidation is obtained in a few min., the product being equal to high-quality acid steel. By making a basic slag with high affinity for  $P_2O_5$  dephosphorisation can be achieved. CH. ABS. (e)

Determination of iron and manganese in a single sample of silicates (slags, ores). A. P. DUBINSKI (Zavod. Lab., 1937, 6, 873-874).--A combination of known methods is described. R. T.

Rapid analysis of basic open-hearth slag for ferrous, manganous, and calcium oxides. L. G. STADLEE and I. M. BESSONOV (Zavod. Lab., 1937, 6, 1138—1144).—Fe oxides are determined by the Reinhardt-Zimmermann method, MnO by Lang's method (A., 1935, 1094), and CaO by pptn. with  $H_2C_2O_4$  after elimination of Mn as MnO and removal of Fe<sup>III</sup> by adding tartaric acid. R. T.

High-duty [cast] iron. Experiments in the rocking arc furnace. B. MACDOUGALL (Found. Tr. J., 1937, 57, 407—412, 433).—Conditions governing the production of plain and alloyed cast Fe of max. tensile strength, resistance to wear, impact, and heat were investigated. Superheating is not the only factor apart from composition affecting graphitisation. In synthetic low-C unalloyed Fe, the tensile strength depends on the total C. >2.0% of Si has little influence on this property in the total C range 2.2—2.9%. In synthetic Ni-Fe 1—1.6% of Ni improves the tensile strength. Fe containing Ni + Mo had high tensile strength. R. B. C.

Production of synthetic cast iron from old broken iron in rotating ovens. S. LEIJONHUFVUD (Gjuteriet, 1935, 25, 181-194).--A discussion.

Сн. Abs. (e)

Refining chrome-nickel cast iron in openhearth furnaces. A. E. CHLEBNIKOV (Sborn. Trud. Moskov. Inst. Stal, 1935, 136-214).—Operating conditions for remelting open-hearth furnace cast Fe (C  $4\cdot10-4\cdot70$ , Si  $0\cdot80-1\cdot40$ , Mn  $2\cdot60-3\cdot06$ , P  $0\cdot24 0\cdot40$ , S  $0\cdot03-0\cdot13$ , Cr  $2\cdot40-3\cdot10$ , Ni  $0\cdot35-0\cdot88$ , Ti  $0\cdot20\%$ ) to obtain a high-grade steel (Ni  $0\cdot5-0\cdot8$ , Cr  $0\cdot2-0\cdot7$ , P  $0\cdot04-0\cdot05\%$ ) are described. CH. ABS. (e)

Heat-resisting cast iron. P. G. PETROV and A. I. SMIRNOV (Sborn. Trud. Moskov. Inst. Stal, 1935, 215-218).—Resistance to oxidation at 550-950° was in general  $\propto$  the amount of Cr in the cast Fe. The most resistant samples had Cr 1 and Ni 0.5%. The following are recommended as other constituents: C 3.2-3.4, Si 1.5-3.2, Mn 0.6-0.7, P > 0.3-0.4, S 0.08-0.1%. CH. ABS. (e)

Hot- and cold-working of malleable cast iron. J. V. MURRAY (Metallurgia, 1938, 17, 85-87).- Malleable cast Fe can be hot-worked by rolling or forging, and partly cold-worked, in absence of primary graphitic C or free cementite, which is formed on overheating. The working enhances tensile strength and hardness but reduces ductility. Experiment proved that during rolling the material at the centre of a bar is pushed forward relative to the exterior. Photomicrographs of structures are given.

S. J. K.

Utilising improved properties of cast iron by improvements in design. A. THUM (Giesserei, 1937, 24, 533-537).—Because of its low notchsensitivity and its case of casting, cast Fe can be employed satisfactorily in place of steel in engineering work if attention is paid to design. Improvements effected in the load-carrying capacity of cast Fe crankshafts by constructing them in terms of "designstrength" are discussed in relation to practical examples. R. B. C.

**Examination of an unusual cast iron.** G. H. SPENCER-STRONG (J. Amer. Ceram. Soc., 1938, 21, 60-65).—A cast Fe (graphitic C 2.89, combined C 0.58, Si 2.52, P 0.60, Mn 0.36, S 0.11%) containing many blowholes gave unexpectedly good results with 3 enamels. A full metallographic examination is described. It is suggested that correct crystal structure may be more important for good enamelling than the hitherto suspected deleterious factors.

J. A. S.

Wear tests on cast iron. D. E. ACKERMAN (Amer. Soc. Test. Mat. Symp. on Wear of Metals, 1937, 24-40).—A study was made of the variables, e.g., temp. and frictional oxidation, controlling the wear of cast Fe when using an Amsler wear-testing machine. Attempts were made to prevent oxide formation on the surface of the specimens by performing the tests in a protective atm., e.g., N<sub>2</sub>. Data are tabulated and discussed. It is concluded that the results of wear tests should be interpreted with caution. Ni-Cr cast Fe was more resistant to wear than plain Fe.

R. B. C.

Ferrite—its occurrence and control in grey cast iron. R. H. BANCROFT and A. H. DIERKER (Trans. Amer. Found. Assoc., 1937, 45, 449—458T).— A study was made of the rôle of C in the formation of ferrite in cast Fe. It is concluded that any given Fe gives a normal pearlitic structure at a definite rate of cooling; above or below this crit. rate types of ferrite, defined as primary and secondary, are formed. R. B. C.

What factors control the formation of ferrite in iron castings? I. IITAKA and T. TANAKA (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 1419—1425). —When molten Fe was cooled and thrown into  $H_2O$ at  $30-215^\circ <$  the solidification point no ferrite was formed. When, however, the test-pieces were heated at 910° for  $\frac{1}{2}$  hr. and cooled in the furnace ferrite appeared. Hence ferrite is formed as the result of slow cooling after solidification, when Fe<sub>3</sub>C separates out from austenite on nuclei of graphite. R. S. B.

Graphitisation and inclusions in grey [cast] iron. J. W. BOLTON (Trans. Amer. Found. Assoc., 1937, 45, 467—544T).—Recent work is summarised. R. B. C. Graphitisation of grey cast iron. R. M. PARKE, V. A. CROSBY, and A. J. HERZIG (Met. & Alloys, 1938, 9, 9—14).—Evidence in favour of the view that graphite can form in both the liquid and solid states is summarised, and on this basis is explained the anomalous occurrence of a ferriticgraphitic region between the chilled and pearliticgraphitic regions in grey cast Fe. The discussion is supplemented by photomicrographs. P. G. McC.

Relation of properties of cast iron to thickness of castings. H. L. CAMPBELL (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 66—70).—Tensile and compressive strengths of irons cast in round bars of different diameter are tabulated. The strength of grey cast Fe depends on the size of the casting from which specimens are prepared, metal in light section being stronger than that of the same composition in a heavy section. R. B. C.

Metallographic characteristics and enamelling. qualities of certain cast irons. R. B. SCHAAL (J. Amer. Ceram. Soc., 1938, 21, 24—26).—The analyses, microstructures, and enamelling properties of 3 irons are described. One, which annealed perfectly during enamelling without surface alteration, enamelled without defects, but the other two, which gave troublesome blistering (particularly on refiring), showed either poor annealing or decarburation. The surface structure, which is probably affected by the fluidity of the metal and the thickness of the casting, appears to influence the enamelling properties. J. A. S.

Accelerated analysis of cast iron for its basic elements, in a single sample. I. N. KRIVENKO (Zavod. Lab., 1937, 6, 1152—1153).—An analytical scheme is described. R. T.

Zinc oxide separation as applied to determination of manganese in special cast irons. E. C. PIGOTT (Analyst, 1937, 62, 860—863).—Treatment with AgNO<sub>3</sub> before oxidation with Na<sub>3</sub>BiO<sub>4</sub> should be avoided, since  $Ag_3BiO_4$  is pptd., dissolves in HNO<sub>3</sub>, and oxidises  $(NH_4)_2Fe(SO_4)_2$  in the cold, giving high results. The method is excellent for steel, but unsatisfactory with cast Fe owing to presence of P. To eliminate this, a double pptn. with ZnO is incorporated in a revised method, which is described in detail. E. C. S.

Flash-baking of [iron] wire rods. K. B. LEWIS (Indust. Heating, 1937, 4, 885—886, 888).— Apparatus developed by an American firm is described. Baking takes place in a current of air at 399°, the operation being completed in 5 min. R. B. C.

Corrosion of iron and steel in mining [equipment], especially in colliery winding and haulage ropes. E. H. SCHULZ (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 146—152).—Factors affecting the rusting of Fe and steel, corrosion prevention in wire ropes by coating them with Zn, and the favourable effect on corrosion-resistance of P in Cu steels are discussed. R. B. C.

Autogeneous layed-on welding in mining [equipment]. E. GREGER (Berg- u. Hüttenmänn. Jahrb., 1937, 85, 137-141).—The building up of worn components, e.g., boring crowns and pulleys, by layer welding and by hard-facing is discussed. R. B. C.

Structural and hardening characteristics of iron-cobalt-tungsten alloys. W. P. ŠYKES (Trans. Amer. Soc. Met., 1937, 25, 953-1012).—A lecture. R. B. C.

Properties of high-carbon iron-manganesecarbon alloys, particularly their suitability as hard alloy. G. HAENSEL (Diss., Tech. Hochschule, Breslau, 1937; Bull. Iron Steel Inst., 1938, No. 1, 151A).—The val. as cutting alloys of compact masses prepared by sintering or melting white Fe containing Mn 5 and C 4% was investigated. Details of the heat-treatment adopted and of attempts to N<sub>2</sub>-harden the material in powder form are given. R. B. C.

Slip, twinning, and cleavage in iron and silicon ferrite. C. S. BARRETT, G. ANSEL, and R. F. MEHL (Trans. Amer. Soc. Met., 1937, 25, 702—736).—Slip in pure Fe crystals is on the [110], [112], and [113] planes at all temp. from room temp. to  $-195^{\circ}$ . In Si ferrite low deformation temp. or high Si contents cause slip to be confined wholly to the [110] planes. The mechanical properties of Fe–Si alloys are interpreted in terms of curves showing the relative variations of the stresses necessary to produce slip, twinning, and cleavage. R. B. C.

Manufacture and use of iron and steel rolls. W. H. WHITE and F. L. MACQUARRIE (Iron Steel Eng., 1937, 14, No. 11, 18-35).—An illustrated review. R. B. C.

Report of Research Committee [of the American Society for Testing Materials] on yield point of structural steel. ANON. (Proc. Amer. Soc. Test. Mat., 1937, 37, I, 87—102).—The effect of age on the mechanical properties of a hot-rolled steel was investigated. The yield point decreased by about 2% between 1 day and 1 month, with little or no change thereafter. The tensile strength, however, increased slightly. Ductility increased with age, mostly during the first month. R. B. C.

Characteristics of iron and steel for porcelain enamelling. F. R. PORTER and J. H. NEAD (J. Amer. Ceram. Soc., 1938, 21, 9—16).—The chemical, physical, and metallographical characteristics of low-C mild steel and open-hearth Fe sheets are described in detail, and the effects of C, Mn, S, P, and Si on the enamelling properties are discussed. The use of open-hearth Fe is extending because of its low C, Si, and Mn contents and its freedom from warpage, its soundness, uniformity, and weldability. J. A. S.

Metals, particularly iron and iron alloys, for plant construction at Achema. VIII. F. HEIN-RICH (Chem. Fabr., 1938, 11, 93—97).—A lecture. Trends in world and German production of metals, and in the use of Cu, Ni, Pb, Al, Fe, and their alloys as constructional materials for chemical plant, are reviewed. I. C. R.

Ingot phase of steel production. E. GATHMANN (Blast Fur. Steel Plant, 1936, 24, 1067—1068; 1937, 25, 81—83, 202—204, 213, 289—291, 416—418, 504—505, 622—623, 730—731, 1004, 1017).—A general review. R. B. C. Method of standard structures for metallographic control of casting of steel. S. A. SALTIKOV (Zavod. Lab., 1937, 6, 827—835).—Standard methods for describing the grain structure of steels, and of determining the no. and nature of non-metallic inclusions, are described. R. T.

High-temperature properties of cast and wrought carbon steel from large valves for hightemperature service. H. C. CROSS and F. B. DAHLE (Trans. Amer. Soc. Mech. Eng., 1936, 58, 103—113; cf. B., 1935, 190).—Short-time tension, impact, and creep properties were determined at 400°, 455°, and 510° on samples from two cast and two forged valves after heat-treatment. CH. ABS. (e)

Yoloy—its properties and welding. F. J. ESSLINGER (Welding J., 1936, 15, No. 1, 18—19).— A review of the properties of a new low-alloy steel containing P, Cu, and Ni. CH. Abs. (e)

Continuous gas carburising [of steel]. R. J. COWAN (Trans. Amer. Soc. Met., 1937, 25, 843—862). —Steel was carburised to a case depth of 0.070 in. in town's gas, cracked gas containing  $C_3H_8$ , and natural gas under various operating conditions. An incorrect rate of gas flow resulting in agitation within the muffle caused non-uniform carburisation. The presence of  $H_2O$  in the carburising gas did not affect the results. R. B. C.

Abnormal structure in carburised steel. H. SAWAMURA and A. IMANICHI (Suiyokai-shi, 1935, 8, 923—928; cf. B., 1936, 322).—Hydrocarbons are generally very effective for preventing formation of abnormal structure in the carburised case of Armco Fe. Commercial low-C steels were also carburised with  $C_2H_2$ ,  $C_6H_6$ , and  $C_5H_{12}$ , but abnormal structures developed even when the O content was = or < that of Armco Fe. CH. Abs. (e)

Surface hardening of [steel] crankshafts and other parts by inductive heat. E. F. CONE (Met. & Alloys, 1938, 9, 1—6).—A large-scale process of hardening the parts in 1.8—6.0 sec., depending on the steel being treated and on the bearing sizes, is outlined. Macrostructures of cross-sections of 'the treated parts are included. P. G. McC.

Annealing and hardening of steel. KOCH (Oberflächentech., 1937, 14, 237–239, 247–249).— The principles of the hardening of steel are reviewed, and an account is given of the carburising process. C. E. H.

Chilled metallic [steel] shot and grit used in sand-blasting. J. E. HURST and J. H. D. BRAD-SHAW (Found. Tr. J., 1937, 57, 447-448, 450, 474-476).—Notes on the properties, performance, and service life of the above are given. R. B. C.

Standard hardness blocks for Rockwell-C testing [of steels]. A. HULTGREN (Jernkont. Ann., 1937, 121, 619-632).—Standard blocks are made from oil-hardened, thrice-tempered, high-speed and high-C, high-Cr steels. Changes in dimensions and hardness after use have been studied. M. H. M. A.

Yield point in the tensile test [of steel], with special reference to effect of method of loading and springing of the test machine. (A) E. SIEBEL

and S. SCHWAIGERER. (B) A. KRISCH. (c) H. ESSER (Arch. Eisenhüttenw., 1938, 11, 319—328).—(A) Just above the yield point of a soft steel there is a region of plastic flow in which the tension registered by a rigid machine falls rapidly for a comparatively small extension of the specimen. In a machine with spring suspension the fall occurs over a much greater extension; with sufficiently mild springing it becomes smaller and may be eliminated. The yield point and the lowest val. reached by the tension beyond that point are both diminished by loading slowly. To obtain a characteristic tension-extension curve free from testing-machine effects, the machine should be as rigid as possible and the rate of loading low.

(B) The fall of tension of a soft steel specimen just beyond its yield point is a characteristic property, but the specimen must be carefully mounted so as to avoid bending. If the tension is increased uniformly by gravity-loading, the extension beyond the yield point may occur much more rapidly than in the ordinary test machine where tension temporarily falls. (c) The increase of the rate of extension of a soft steel loaded by gravity just beyond its yield point is confirmed, contrary to the finding of Welter (B., 1936, 374, 502). If the load is suddenly diminished as soon as the yield point is passed, the extension continues unless the diminution brings the load below a definite limit characteristic of the specimen.

A. R. PE.

Effect of overload on fatigue properties of several steels at various low temperatures. H. B. WISHART and S. W. LYON (Trans. Amer. Soc. Met., 1937, 25, 690—701).—The probable damage diagram method of testing was applied to SAE 1020 steel, 0.75% C steel, and 3.0% Cr steel, diagrams being determined at  $21^{\circ}$ ,  $-12^{\circ}$ ,  $-29^{\circ}$ , and  $-40^{\circ}$ . The results show that there is little or no change of damage with change of temp. Since the endurance limits of the materials increased with fall in temp. it is probable that range of stress rather than temp. is the crit. factor in evaluating damage. R. B. C.

Relation between mechanical properties of ferrous materials and liability to breakdown in service. L. W. SCHUSTER (Metallurgia, 1938, 17, 81—82).—The commonly accepted mechanical tests cannot be correlated with usual failures in service; this is especially true of yield point, limit of proportionality, and ductility determinations; bend, fatigue, and Izod tests are of greater significance in certain cases. S. J. K.

Rimming steels. A. JACKSON (Iron and Steel Ind., 1936, 9, 179-182).—The effects of up-run and down-hill teeming, various teeming times, and various ingot treatments on the position of blowholes and skin thickness were investigated. CH. ABS. (e)

Selection of mould steel. J. C. ALEXANDER (Machinery, 1936, 47, No. 1, 469-470).—A discussion of desirable characteristics. CH. ABS. (e)

Viscosity, surface tension, and castability in metallurgy, more particularly in foundry work. P. BASTIEN (Bull. Assoc. Tech. Fond., 1937, 11, 361–374).—A lecture.  $\eta$  and  $\gamma$  are discussed with respect to the action of the slag in steel-making and the phenomenon of wetting. The author's previous work on castability is reviewed and the relation of this property to the other two is discussed. C. E. H.

Causes and prevention of grinding cracks in hardened and ground tool steels. J. G. MORRISON (Indust. Heating, 1937, 4, 365—368, 378, 455—456, 629—630, 735—736).—The effect of incorrect choice and heat-treatment of the steel and of incorrect grinding technique is discussed. R. B. C.

Welding and cutting high-chromium steels. W. J. PRIESTLY (Welding J., 1936, 15, No. 1, 14—17). —A flux of high solvent power must be used to remove Cr oxides. Addition of Ti or Nb to 4—7% Cr steels prevents air-hardening and the steels are readily welded. The use of these metals with other Cr steels and the special methods of welding employed are discussed. CH. ABS. (e)

High-carbon, high-chromium tool steel. W. H. WILLS (Trans. Amer. Soc. Met., 1937, 25, 1013— 1029).—Prolonged heating at or above the normal air-hardening temp. reduced the impact val. of the steel. R. B. C.

Properties of 9% chromium steel. H. D. NEWELL (Met. Progr., 1936, 29, No. 2, 51-55).-Data are given. This alloy is suitable for severe service up to  $680^{\circ}$  in such applications as furnace tubes and heat-exchanger tubes for oil refining and for superheater tubes in steam boilers. CH. ABS. (e)

Stable 18 chromium-8 nickel steel without stabilising additions. H. J. FRENCH et al. (Trans. Amer. Soc. Mech. Eng., 1936, 58, 115–116).—Two induction-furnace heats of 18–8 steel without stabilising elements were found to be resistant to high-temp. deterioration. CH. ABS. (e)

Austenitic chrome-manganese steels. H. LEGAT (Arch. Eisenhüttenw., 1937-8, 11, 337-341).—The Fe corner of the Fe-Cr-Mn phase diagram is given, showing the limits of the austenitic region for 0.1-0.2% C as determined by photomicrographs and magnetic tests. The mechanical properties of a no. of steels (Mn 12-43, Cr 0-18, C 0.1-1.0%) before and after heat-treatment are described, and the effects on these properties of additions of Ni, Cu, and Mo up to 4, 6, and 6%, respectively, are shown. The steels are divided into seven classes according to their behaviour on machining, which is best for <0.3% C. A. R. PE.

Chromium-manganese steels as heat-resisting steels. J. H. G. MONYPENNY (Metallurgia, 1938, 17, 93-96).—The embrittlement and scaling at elevated temp. of steels with  $\geq 20\%$  of Cr and 10% and 15% of Mn, respectively, are compared with that of Ni-Cr steel. Mn-Cr steels have a limited range of usefulness as heat-resisting steels, the 15% Mn alloy up to 800° and the less mechanically satisfactory 10% Mn alloy possibly up to 900°. Resistance to SO<sub>2</sub> attack is > for Ni-Cr steels and with 0.2—0.3% C may prove valuable on that account. Addition of Si may provide improved alloys. S. J. K.

Chromium and manganese in structural and stainless steels. A. B. KINZEL (Met. Progr., 1936, 29, No. 3, 47-51).—A discussion of the interrelation between Cr, Mn, and Si in the low-alloy steels and also in high-alloy austenitic-ferritic stainless steels. CH. Abs. (e)

Durability of plated steel exposed to weather. W. BLUM (Met. Progr., 1936, 29, No. 2, 40-41).— The total thickness of Ni or of Ni + Cu is the most important factor in protective val. The usual Cr coatings of about 0.00002 in. thick add little to protection against corrosion and are chiefly valuable for resisting tarnish. Thin coatings of Zn or Cd (0.0002 in.) furnish better protection against corrosion than do equally thin coatings of Ni or Cr, although they rapidly lose lustre. Methods of applying coatings have no marked effect on their protective val.

Сн. Авз. (е)

Metallising in industry. H. R. LELAND (Refiner, 1935, 14, 567—570).—A review of operating methods. Special precautions are given for metal-coating the interior of cracking-still reaction chambers with Al.

CH. ABS. (e) General material problems in the scope of the four-year plan. C. FRICK (Metall u. Erz, 1937, 34, 639-645).—Efforts to make Germany self-supporting by developing the use of Al alloys and special steels as substitutes for imported metals are discussed.

A. R. P.

Determination of metallic iron in spongy iron. J. MALECKI and S. LESZCZYŃSKI (Przemysł Chem., 1937, 21, 298—301).—The Fe content of the sample is derived from the amount of  $H_2$  evolved when it is dissolved in 20% HCl. R. T.

Quantitative spectral analysis of highly-alloyed iron. G. LIMMER (Z. wiss. Phot., 1938, 37, 41-50). —The application of Scheibe and Sonntag's method (B., 1935, 854) to complex alloys is discussed, and experimental results are given for steels containing W, Cr, V, Co, Mo, and Ni. Calibrating curves are prepared for each constituent, with which the curves from the spectral analyses are compared. The greatest error was 5% of the actual contents. J. L.

Pondermotive method of study of magnetic dispersion currents [in steel]. V. I. NIKOLIN (Zavod. Lab., 1937, 6, 840—844).—The method described enables the magnitude and location of defects in steel to be determined. R. T.

Apparatus for volumetric determination of carbon in steels and ferro-alloys by A. Eder's method. ANON. (Chem.-Ztg., 1937, 61, 476).— The Eder apparatus is modified by providing circulating cooling-H<sub>2</sub>O to keep the temp. const. and two gas-measuring burettes, for use, respectively, when the steel contains <0.25% C and 0.25—1.25% C; both burettes are filled with brine containing CO<sub>2</sub> in equilibrium with that in the gas mixture.

A. R. P.

Volumetric determination of carbon in refined ferrochromium, using a complex flux catalyst. P. I. DOLINSKI (Zavod. Lab., 1937, 6, 878—881).— I g. of Fe-Cr and 6—8 g. of 1:1 CuO-Pb are heated at 1150° in a stream of  $O_2$ , and the CO<sub>2</sub> evolved is measured in a Würtz apparatus. R. T.

Polarographic determination of copper in steels. J. I. USATENKO and J. S. LIALIKOV (Zavod. E E (B.)

Lab., 1937, 6, 1394—1398).—The method is described. Empirical curves are constructed for pure Cu salts and for Cu in presence of pptd.  $Fe(OH)_3$ . Comparative analyses of steels containing 0.09-0.70%Cu by polarographic and electrolytic methods show good agreement. A polarometric determination occupies  $\frac{1}{2}$  hr. D. G.

Photocolorimetric determination of copper in steels. O. V. DATZENKO (Zavod. Lab., 1937, 6, 1402—1405).—Cu is determined in ammoniacal solution in a Se photocolorimeter. With Cu contents of 0.30-0.65% the experimental error is  $\pm 0.015$ . A determination occupies 25—30 min. D. G.

Rapid determination of copper in mild steel. T. P. HOAR (Analyst, 1937, 62, 788—790).—The sample is dissolved in dil.  $H_2SO_4$ , any Cu solubilised being pptd. by addition of Cu-free Zn. The residue (containing Cu and a little Fe) is dissolved in HNO<sub>3</sub>, and after dilution the Cu is determined as described previously (A., 1937, I, 580). Advantages are rapidity, and elimination of losses of Cu inherent in pptn. by  $H_2S$  (e.g., due to oxidation or peptisation): complete removal of Fe also is unnecessary, and AsO<sub>4</sub><sup>'''</sup> does not interfere. J. G.

Electrolytic determination of copper in chromium-copper steels. M. T. VORONTZOVA (Zavod. Lab., 1937, 6, 875—876).—2 g. of steel are dissolved in 40 ml. of 10% H<sub>2</sub>SO<sub>4</sub>, the solution is conc. to pptn. of sulphates, 5—7 ml. of H<sub>2</sub>O are added, and heating is continued to evolution of SO<sub>3</sub>. 40—50 ml. of H<sub>2</sub>O are added, the solution is filtered, and the filtrate + washings are electrolysed at 20° (c.d. 0.5— 0.9 amp./sq. cm., at 2.5 v.) for 45 min. The cathode is washed, dried at 100°, and weighed. R. T.

Rapid determination of copper and nickel in steel. S. N. SCHKOTOVA (Zavod. Lab., 1937, 6, 1010).—A solution of 1 g. of steel in 60 ml. of 20% $H_2SO_4$  is boiled with 0.2-0.4 g. of Cu-free Fe, the solution filtered, and Ni determined in the filtrate by Moore's method. The residue is dissolved in dil. HNO<sub>3</sub>, oxides of N are removed by boiling, and 5 ml. of 20% citric acid and excess of aq. NH<sub>3</sub> are added. Cu is determined in the solution by titration with KCN. R. T.

Electrolytic determination of nickel in steel. O. T. BOBERKOVA and A. F. NOVITZKAJA (Zavod. Lab., 1937, 6, 877).—1—2.5 g. of steel are dissolved in 30—50 ml. of HCl and KClO<sub>3</sub> is added, excess of which is decomposed by prolonged boiling. 5—10 g. of NH<sub>4</sub>Cl are then added, the solution is again boiled, 100 ml. of aq. NH<sub>3</sub> (d 0.91) are added, and the vol. is made up to 500 ml. The solution is filtered, Ni deposited electrolytically from 200 ml. of filtrate, and the Ni weighed. In presence of Cu the deposit is dissolved in HNO<sub>3</sub>, the solution diluted to 200 ml., Cu electrolytically deposited, and the corresponding wt. of CuO subtracted from the wt. of the Ni deposit. R. T.

Potentiometric titration of nickel [in steel] without compensation. N. J. CHLOPIN (Zavod. Lab., 1937, 6, 882–884).—0.5 g. of steel is dissolved in 25 ml. of 20%  $H_2SO_4$ , the solution boiled with 2—3 ml. of HNO<sub>3</sub>, 15 ml. of 25% NH<sub>4</sub>Cl are added

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followed by 30 ml. of aq.  $\rm NH_3$  (d 0.92), and the solution is electrotitrated with standard KCN (4.5 g. of KCN + 2.5 g. of KOH per litre). In presence of W the amount of HNO<sub>3</sub> should be raised to 10—15 ml. and of aq.  $\rm NH_3$  to 60 ml. R. T.

Determination of manganese, nickel, and phosphorus in iron and steel. Use of rapid spectrophotometric methods. W. M. MURRAY, jun., and S. E. Q. ASHLEY (Ind. Eng. Chem. [Anal.], 1938, 10, 1—5).—Mn is oxidised to HMnO<sub>4</sub> by the KIO<sub>4</sub> method, Ni is converted into a sol. dimethylglyoxime complex and P into a yellow phosphovanadomolybdate, and the determinations are completed by means of a Zeiss Pulfrich step-photometer. Accuracies are 0.01% of Mn over the range 0.01— 1.5%, and 0.05-0.2% of Ni over the range 0.5-19%. With 4% Si steels the formation of a yellow silicomolybdic acid vitiates the method for P. 4—6 determinations occupy 1 hr., and the accuracy is  $\leq$ that obtainable with most routine determinations. L. S. T.

Sources of error in determination of phosphorus [in iron and steel]. I. P. ZAVIALOV (Zavod. Lab., 1937, 6, 1037—1040).—Polemical, against Milovidova and Glazunova (B., 1935, 64). R. T.

Determination of molybdenum [in steel]. A. F. ANDREEV (Zavod. Lab., 1937, 6, 793-797).—A solution of 0.5 g. of steel in 25 ml. of  $4n-H_2SO_4$  is heated with HNO<sub>3</sub> until SO<sub>3</sub> fumes appear, when 20 ml. of hot  $H_2O$  are added and the solution is filtered. The filtrate + washings are treated with excess of Cd-Hg in presence of methylene-blue, and the reduced solution is titrated with  $K_2Cr_2O_7$  in a  $CO_2$  atm. V interferes, but not Cr. R. T.

Determination of aluminium and aluminium oxide in steels. L. N. PODKOFAEV (Zavod. Lab., 1937, 6, 1053—1054).—10 g. of steel are dissolved in 150 ml. of 30% HCl and the insol. residue is collected, freed from SiO<sub>2</sub>, and fused with KHSO<sub>4</sub>. The melt is extracted with dil.  $H_2SO_4$  and Al determined in the extract by electrolysis at a Hg cathode. Al is determined similarly in the HCl solution. R. T.

Detection and determination of slag inclusions in non-rusting steel. M. V. OZOLINA (Zavod. Lab., 1937, 6, 937—944).—Part of the sample is dissolved electrolytically in 3% FeSO<sub>4</sub> in 1% NaCl, and the content of slag inclusions is derived from the loss in wt. of the sample and from the wt. of the anode sludge. An analytical procedure for detecting and determining Ca, Mg, Mn, Al, Cr, and S is described.

R. T. Volumetric determination of silicon in ferromanganese, cast iron, and steel. V. G. KARPOV and G. S. SAVTSCHENKO (Zavod. Lab., 1937, 6, 1051—1053).—1—1.5 g. of material are dissolved in 10—15 ml. of HNO<sub>3</sub>, 2 g. of H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>, 2—3 ml. of HF, and excess of KCl are added, the solution is filtered through paraffin after 15 min., and the ppt. of K<sub>2</sub>SiF<sub>6</sub> washed with aq. KCl and titrated with 0.5N-NaOH (phenolphthalein). R. T.

Application of X-ray analysis to high-speed steels. M. A. GUREVITSCH and N. V. KARIAKINA (Zavod. Lab., 1937, 6, 844-849).—Detection of austenite and martensite in such steels is most readily achieved by X-ray spectrum methods. R. T.

Metallurgical research on ores of the Mufulira Mine, N. Rhodesia. R. F. POWELL (Bull. Inst. Min. Met., 1937, No. 395, 16 pp.).—The ore contains 6.15% Cu as various sulphide and oxidised minerals, native Cu, and clay impregnated with Cu carbonates. Considerable variations in composition of the ore at various parts of the deposit led to difficulties in the recovery of the Cu by flotation; thus portions containing graphite would not froth at  $p_{\rm H} < 7.2$ , whilst the weathered portions floated well at low  $p_{\rm H}$ but gave poor froths at  $p_{\rm H} > 8.6$ . The best results were obtained by grinding under conditions to give an alkaline deflocculated slime, removing the slime by decantation, and floating the remainder with K ethylxanthate 0.45 and pine oil 0.25 lb. per ton; in this way a concentrate containing >40% Cu and a tailing containing <0.6% Cu were obtained, compared with products containing 29% Cu and 1.85% Cu, respectively, by similar treatment of the undeslimed ore. A method of recovering oxidised Cu minerals from the oxidised zones, using a solution of  $CaS_x$  and an unspecified org. reagent, is also described. A. R. P.

Polarographic analysis of minerals. E. N. VARASOVA (Zavod. Lab., 1937, 6, 804-807).—The polarographic analysis of Cu ores for Ni and Cu is described. R. T.

Appliance for electrolytic determination of copper in ores. V. A. KOLTIPIN (Zavod. Lab., 1937, 6, 965-969).—Apparatus is described. R. T.

Open-fired, bright-annealing furnace for copper. J. W. TIELKING and W. LEHRER (Iron Age, 1937, 140, No. 24, 59, 136—138; Indust. Heating, 1937, 4, 1063—1068).—The furnace is fired with cokeoven gas free from S, the products of combustion being employed as the furnace atm. Steam may be added to prevent air infiltration. The metal is cooled by  $H_2O$  containing a sol. oil which protects the surface. Costs are discussed. R. B. C.

Application of controlled atmospheres to annealing of copper and copper alloys. W. A. DARRAH (Indust. Heating, 1937, 4, 554–555, 560, 619–622, 674–676, 722–726).—The effect of  $H_2$ , CO, temp. and time of annealing on Cu, brass, Cu-Ni and Cu-Ni-Zn, the control of gas atm. to give a bright metal surface, and the types of annealing furnace employed are discussed. R. B. C.

Relaxation of copper at normal and elevated temperatures. J. BOYD (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 218—234).—The interdependence of factors such as stress, temp., time, and amount of cold-work was investigated. The relaxation of Cu at room temp. and up to 200° is represented by  $\tau = \tau_0[1-A \log(1 + Bt)]$ , where  $\tau =$  stress at any time t,  $\tau_0 =$  initial stress, and A and B are consts. A marked increase in relaxation takes place at >80°. At 150° the stress falls to 20—25% of its initial val. in a service time of 20 years. R. B. C.

Disintegration and corrosion of the heating tubes in heaters and evaporating structures.

J. HAMOUS (Listy Cukr., 1935, 54, 36; Z. Zuckerind. Cechoslov., 1936, 60, 126-127).-Corrosion in tubes is due to an inadequate Cu content in the brass used, variable composition throughout the length, and uneven thickness. Within the steam chest CO2 and  $NH_3$  are the chief disintegrating agents.  $CO_3''$ , Cl', NO3', and NH3 cause corrosion in the liquor Сн. Авз. (е) chamber.

Copper as a material for dairy plant. A. KARSTEN (Lait, 1938, 18, 145-149).-The metallurgy of Cu and its alloys is described. The deleterious effect of traces of Cu in milk is realised and the metal should be confined to sheets and piping not making direct contact with milk. Heavily tinned Cu is permissible for most parts, but the tinplate should be regularly examined and replaced if worn. W. L. D.

Factors controlling the porosity of hot-tinned coatings on copper. W. D. JONES (J. Inst. Metals, 1938, 62, Advance copy, 541-549).-One of the main sources of porosity of Sn coatings on Cu is a tendency to de-wet caused by a high Sn surface tension; this tendency is reduced by withdrawing the metal from the Sn bath through a palm oil or SnBr, cover and increased by withdrawing it through an  $NH_4Cl$  or a resin cover. Scratches, inclusions, and imperfectly wetted areas tend to favour de-wetting, whilst an increase in the  $\eta$  of the Sn film, brought about either by keeping the temp. low or by introducing intermetallic compounds, tends to prevent de-wetting. A. R. P.

Brass die-castings. J. C. Fox (Proc. Amer. Soc. Test. Mat., 1937, 37, I, 215-222).-The materials used for dies, the compositions and properties of brass die-casting alloys, and the effect on the properties of brass of additions of Pb, Bi, Al, Fe, etc. R. B. C. are reviewed.

Polarographic analysis of brass. E. MNICH (Z. Elektrochem., 1938, 44, 132-134).-The limitations of the polarographic method (cf. B., 1937, 452) are discussed. In particular, the Fe content should be >0.1%. E. S. H.

Determination of the alloying elements in red brass and bronzes. K. BRUCKNER (Chem.-Ztg., 1937, 61, 951-953).-The alloy is dissolved in conc. HCl with the aid of frequent small additions of  $H_2O_2$ , the Cu and Sb are removed by shaking the solution with Fe wire, and the ppt. is removed after diluting the solution with an equal vol. of  $H_2O$ . Sn is then determined in the filtrate by reduction with Al turnings, redissolution of the pptd. sponge with HCl in a  $CO_2$  atm., and titration with I. In the removal of Cu by Fe no adsorption of Sn occurs if the solution contains >25 vol.-% of conc. HCl.

A. R. P.

X-Ray examination of a brass cartridge case. L. LOSKIEWICZ (J. Inst. Metals, 1938, 62, Advance copy, 551-552).-From X-ray photographs of a 90:10 brass cartridge case it was found possible to say how the case was made from the sheet brass; repetition of the process produced a case of identical X-ray structure and physical properties. A. R. P.

Copper-nickel (70:30) alloy. M. S. NOYES (J. Amer. Soc. Naval Eng., 1936, 48, No. 1, 1-18).- Corrosion test data are recorded. The alloy has a good resistance to salt H<sub>2</sub>O. Сн. Авз. (е)

Supernickel. I. T. HOOK (Welding Eng., 1935, 20, No. 4, 24-26).-Supernickel (Ni 30, Cu 70%) retains its strength at high temp. better than do most Cu alloys. Its mechanical and welding properties are reviewed. CH. ABS. (e)

Fine dispersion of lead in copper. H. J. NESS (Met. Prog., 1937, 32, 678-679).-By melting Pb-Cu alloys under a cover of a Li compound, e.g., LiCO3, improved diffusion of Pb and increased mechanical strength are claimed. R. B. C.

Segregation in lead bronzes. W. CLAUS (Giesserei, 1937, 24, 593-595).-Inverse segregation, e.g., in Cu-Pb-Sn-Ni, is described and methods of combating it are discussed. R. B. C.

Rapid determination of bismuth in copper, brasses, bronzes, etc. H. R. FITTER (Analyst, 1938, 63, 107-109).-In the colorimetric determination of Bi as Bil<sub>3</sub>, excess of SO<sub>2</sub> used to reduce the I liberated during pptn. of Cu is removed with 0.1N-KMnO<sub>4</sub> until a faile brown control of NaH<sub>2</sub>PO<sub>2</sub>. exactly decolorised by addition of NaH<sub>2</sub>PO<sub>2</sub>. E. C. S.  $KMnO_4$  until a faint brown colour remains, this being

Effect of cold-working and heat-treatment on the electrical and magnetic properties of pure nickel. I. Drawn nickel wire. H. BITTEL (Ann. Physik, 1938, [v], 31, 219-244).-The effect of tempering at temp. up to 1000° on the electrical resistance, its temp. coeff. and variation in a magnetic field, and the magnetisation of cold-drawn Ni wire has been investigated and is discussed. O. D. S.

Determination of cadmium in zinc and zinc alloys by internal electrolysis. (A) E. I. FOGELSON and N. V. KALMIKOVA. (B) J. J. LUBIE (Zavod. Lab., 1937, 6, 884-885, 1040).-(A) Minor modifications of Lurie and Troitzkaja's method (B., 1936, 684) are described.

(B) The modifications are of importance only under exceptional circumstances. R. T.

Accelerated analysis of refined lead. II. Determination of zinc. S. J. FAINBERG (Zavod. Lab., 1937, 6, 798-800; cf. B., 1937, 795).-200 g. of Pb are fused with 9 g. each of KOH and NaOH, the melt is extracted with  $H_2O$ , and the solution made acid with H<sub>2</sub>SO<sub>4</sub>, evaporated down to 70-80 ml., and filtered. 10 ml. of 50% aq. Na tartrate and 8 ml. of 50% aq. NaOH are added to the filtrate + washings, followed by 10 ml. more of 2N-NaOH than is required to neutralise the solution. Zn is pptd. with 1% oxine solution in 0.4% aq. AcOH at 100°, and the washed ppt. is dissolved in HCl and repptd. as before. The final ppt. is dissolved in HCl and its amount determined iodometrically. R. T.

Spectrum analysis of lead. I. Principal binary alloys. R. BRECKPOT and G. SEMPELS (Bull. Soc. chim. Belg., 1937, 46, 619-651; cf. A., 1937, 1, 426).—From are spectra, produced and recorded under standard conditions, for prepared binary Pb-M mixtures, line-intensity criteria are established and tabulated for the determination (to <10% error) of the common impurities Bi, Cu, Ag, Cd, Tl, In, Sn, As, and Sb. Save for Sn, As, and Sb, where the lower limit is 0.001-0.05%, the range is from 0.0001 to 1-3%. I. McA.

Lead joints for pipes. W. CARROTT (Chem. & Ind., 1938, 199—200).—The comparative advantages of the molten Pb and Pb-wool joints for spigot and socket pipes are discussed. F. J. B.

Influence of surface alloying on strength of soft-soldered joints. R. CHADWICK (J. Inst. Metals, 1938, 62, Advance copy, 581-599).-The strength of standardised joints made in various grades of Cu with Sn, Pb, and various Sn-Pb solders have been measured. When pure Sn or a Sn-Pb alloy is used for joining Cu, brittle Cu-Sn alloys are formed on the Cu surface, the thickness of the brittle layer increasing with time of heating; on testing, fracture always occurs in this brittle layer. Joints made with pure Pb failed on testing by tearing of the Pb film, no brittle alloy being formed, but addition of only 2% of Sn to the Pb resulted in the formation of the brittle layer. When the Cu contains As and O failure of joints made with Sn-Pb alloys and subsequently aged at elevated temp. occurs by complete stripping of the solder, leaving bright untinned Cu. For joints which are to withstand elevated temp. for long periods the Ag-Pb eutectic is recommended as a solder. A. R. P.

Tellurium-lead. I. H. SUCH (Steel, 1938, 102, No. 4, 45-46).—Properties and applications of the all oy are discussed. R. B. C.

Colorimetric and spectrophotometric analysis of bismuth alloys. A. OKÁČ (Chem. Listy, 1938, 32, 27–30).—The method (Picon, A., 1934, 668) serves for determination of  $(1-25) \times 10^{-6}$  g. of Bi. The yellow colour which interferes with determination of small amounts of Bi is due to formation of quinine iodides, and is avoided by reducing the amount of quinine taken. Cu interferes, but not Ag, Hg, Cd, As, Co, Cr, Fe, Sb, Al, Zn, Mg, nor Ca. R. T.

Creep of tin and tin alloys. II. D. HANSON and E. J. SANDFORD (J. Inst. Metals, 1938, 62, Advance copy, 601-619) .- Addition of Cd + Sb to Sn produces alloys of superior creep strength, the best results in the case of cold-rolled and self-annealed alloys being obtained with Cd 7 and Sb 9%; this alloy should withstand 1200-1400 lb./sq. in. without failure for many years. For alloys which have been annealed at 170° for 2 days and allowed to cool slowly the best composition is Cd 2, Sb 7%; this alloy withstands 3500 lb./sq. in. after this heat-treatment. Annealing at 200° provides optimum creep properties at Cd 3, Sb 7%; this alloy withstands 3700 lb./sq. in. An alloy with Cd 1 and Ag 3.5% after cold-rolling and self-annealing has superior creep-resistance to the Cd 7, Sb 9% alloy. Alloys with 1 and 2% Ag, 1% Cu, or 0.3% Ni are inferior to any of the foregoing. (Cf. B., 1936, 502.). A. R. P.

Control of lead content of tin vessels. J. LANGLOIS and C. MORIN (Bull. Sci. Pharmacol., 1937, 39, 497—502).—Pb is determined by dissolving 5—10 g. of Sn in  $HNO_3$  ( $d \ 1.39$ ), with heating, diluting with H<sub>2</sub>O, and filtering off the H<sub>2</sub>SnO<sub>4</sub>. The filtrate is conc., made alkaline, and slightly acidified with AcOH. Pb is pptd. with  $0.1N-K_2Cr_2O_4$ , the ppt. redissolved in alkali, and Cr determined volumetrically as follows: (a) Pb is pptd. with 20% H<sub>2</sub>SO<sub>4</sub>, 1 g. of KI is added, and the solution titrated with  $0.1N-Na_2S_2O_3$ , or (b) the solution is acidified with 20% HCl, 1 g. of KI is added, the pptd. PbI redissolved in NaOAc, and I titrated with  $0.1N-Na_2S_2O_3$ . Cu, if present, may be determined iodometrically in the filtrate and washings from PbCrO<sub>4</sub> pptn. J. L. C.

Cobalt problem in the U.S.S.R. S. A. PER-VUSHIN (Redk. Met., 1935, 4, No. 3, 6-13).—Large amounts of low-grade ores are available.

Сн. Авз. (е)

Flotation test on recovery of gold from an oxidised copper ore. J. E. LASCHINGER (J. Chem. Met. Soc. S. Afr., 1937, 38, 225-227).—A recovery of >80% of the Au and Ag from an oxidised Cu ore containing 2.7% Cu in a jasperised quartz gangue was obtained by flotation with (a) Na amylxanthate and pine oil after a Na<sub>2</sub>S treatment, (b) Na ethyl-xanthate and dixanthogen-6 (I), or (c) reagent 425 and (I), the best results being obtained with (b) in a pulp of  $p_{\rm H}$  7.8, using pine oil as frother. A. R. P.

Copper minerals in cyanidation circuits. ANON. (Chem. Eng. Min. Rev., 1937, 29, 407-412). Au-extraction tests on three cupriferous Australian ores are recorded; in two cases 0.1-0.4% Cu present as chalcopyrite produced no excessive CN' consumption, whereas in the other case this reached 3 lb./ton. Roasting of the ore or tailings from amalgamation or gravity concn. resulted in a much improved Au extraction and a much lower CN' consumption. Wetground Jarrah charcoal was found to be a suitable precipitant for the Au in solutions containing Cu since it produced a much higher-grade bullion. A. R. P.

Use of air-slaked lime in cyanidation [of gold ores]. E. W. O'BRIEN (Chem. Eng. Min. Rev., 1937, 30, 79—80).—In the cyaniding of tailings (6 dwt. of Au per ton) from an antimonial Au ore it was found necessary to use 40 lb. of CaO per ton to reduce the CN' consumption to a reasonable figure. Good Au extractions were obtained when air-slaked agricultural CaO was used to provide the protective alkalinity, but when  $H_2O$ -slaked CaO was used the Au extraction fell by 50% and excessive frothing occurred in the Zn pptn. boxes. No explanation of these effects is offered. A. R. P.

Effect of lime on extraction of gold from Baleisk ores by the cyanide process. N. I. VANEEV (Sovet. Zolotoprom., 1935, No. 10, 46–48).— The extraction dropped sharply from 95% to approx. 60% when the amount of lime (75% CaO) was increased from 2 to 3 kg. per ton of pulp. A similar reduction in the solubility of pure Au in the cyanide + CaO solution was observed. CH. ABS. (e)

Precipitation of dissolved gold by charcoal. ANON. (Chem. Eng. Min. Rev., 1937, 30, 46–48).— Examples are given of the use of wet-ground charcoal for pptg. Au from cyanide solutions. Generally it is possible to use this charcoal until it contains 4-5% of Au by carrying out the pptn. in three stages. In the recovery of Au from slime tailings by cyaniding, filtration difficulties may be overcome by treating the slime with dil. aq. NaCN, agitating with powdered charcoal to ppt. the Au, and separating the Aucharcoal by flotation. A. R. P.

Increasing assay-furnace capacity by larger muffles. J. T. Roy (Min. & Met., 1938, 19, 97— 99).—The construction of a natural gas-fired Carbofrax muffle furnace to handle 168 cupels at one time is described with reference to detailed plans.

A. R. P.

Application of active amalgamation to analysis of gold-platinum slimes. V. V. SCHTSCHEKIN (Sovet. Zolotoprom., 1935, No. 10, 44-46).—The concentrate is ground and the slime made up in the ratio liquid : solid = 0.5—1 : 1. It is acidified to 0.5N with H<sub>2</sub>SO<sub>4</sub>, HCl, or NaHSO<sub>4</sub> and then agitated with the amalgam (Zn 20, Hg 80%). HNO<sub>3</sub> renders the Pt passive. If Fe amalgam is used the acidity of the slime is made up to 2.0N and CuSO<sub>4</sub> added to give a concn. of 2—3%. The Fe amalgam is prepared from soft Fe filings, heated at 500—600° to remove oil, and freed from oxide by acid. The filings are covered with aq. CuSO<sub>4</sub> and then with Hg. 97—100% of the Pt was extracted and all of the Au. CH. ABS. (e)

Micro-titration of platinum in cupellation beads. W. B. POLLARD (Bull. Inst. Min. Met., 1938, No. 400, 9 pp.).—Au and Pt in a Ag bead are brought into solution as chlorides and reduced by  $SnCl_2$ . Pptd. Au can be filtered off and determined if required (cf. A., 1937, I, 533). The Pt<sup>II</sup> solution is titrated from a micro-burette with  $NEt_2 \cdot CS_2Na$ solution in presence of benzol, the end-point being the complete discharge of the colour of the aq. liquid on shaking. A. R. PE.

Washing of mercury amalgams. A. G. BAJULA (Zavod. Lab., 1937, 6, 888).—An appliance for washing mineral matter from Au-Hg and Ag-Hg is described. R. T.

Powder metallurgy: tungsten and other refractory metals. S. L. HOYT (Met. Prog., 1937, 32, 749-754).—The prep. of W oxide from ore, its reduction to metal, and the sintering of the pressed powder are described. Brief reference is made to the sintering technique employed for Ta, Mo, and Nb.

Production of high-grade titanium concentrate by reduction with coal. M. E. ZBOROVSKI and E. V. GERMOGENOVA (Trans. All-Union Sci. Res. Inst. U.S.S.R., 1935, No. 68, 13–28).—The concentrate (TiO<sub>2</sub> 44.78, Fe 37.70%) was reduced at  $>1000^{\circ}$ with half its wt. of (brown) coal. A 98—99% reduction of the Ti resulted. Anthracite and coke gave poor results. The reduced ore was leached for 2 hr. at room temp. with a solution containing 20% of commercial FeCl<sub>2</sub> and 3% of HCl (ratio of liquid to solid 15:1), whereby 98% of the Fe was removed as FeCl<sub>3</sub>. CH. ABS. (e)

Carbides of refractory metals. G. A. MEERSON (Redk. Met., 1935, 4, No. 4, 6–20).—TiC was prepared by heating a mixture of  $TiO_2$  and C at 1200—3000°. It had a cubic lattice ( $a \cdot 26$ —4·31 A.). The TiC was mixed with WC and Co, pressed, and sintered at 1500°. The alloy had Rockwell-C hardness 87—90 and gave good results in cutting tests. Mixtures of W and Ti carbides were prepared by heating finely-ground W, TiO<sub>2</sub>, and C. TiC forms at a much lower temp. in presence of W. CH. ABS. (e)

Beryllium and beryllium alloys. M. G. CORSON and J. D. ZEISER (Iron Age, 1936, 137, No. 10, 28–32, 74).—Be alloys are classified as those melting at < and at  $>1000^{\circ}$ , respectively. The latter class includes binary alloys with Cu, Ni, Fe, Co, and Pt. Properties and applications are discussed. CH. Abs. (e)

Diffusion of beryllium in nickel. J. LAISSUS (Rev. Mét., 1938, 35, 27-35).-Cf. B., 1937, 1064. E. S. H.

Corrosion of magnesium and magnesium alloys. H. NISHIMURA and H. SAWAMOTO (Suiyokaishi, 1935, 8, 911—922).—Additions of Mn and Zn to Mg decrease corrosion by dil. acids or aq. NaCl. Al and Cu increase it. CH. Abs. (e)

Nickel-copper-magnesium alloys. W. R. D. JONES and K. J. B. WOLFE (J. Inst. Metals, 1938, 62, Advance copy, 553-572) .- The beneficial effect of up to 2% Cu on the properties of Mg castings is greatly enhanced by replacing part of the Cu with Ni, a combined Ni + Cu content of  $2 \cdot 2 - 2 \cdot 5\%$  (Ni  $0 \cdot 5 - 5$ 1%) giving the best mechanical properties. Ni additions generally result in vals. for the reduction in area > the elongation. Ni-Cu-Mg alloys are readily forged and rolled; the best mechanical properties of forged bars are obtained with Ni 0.5 and Cu 1%, but for subsequent rolling the Cu should be raised to 2%. Mechanical properties of various alloys after different mechanical and thermal treatment are shown in tables and graphs. A. R. P.

Use of metals in the dairy industry. I. Aluminium. G. GÉNIN (Lait, 1938, 18, 113–131). —The metallurgy, purity, and the physical, chemical, and plant-fabrication properties of Al are described. Al is suitable for storage and transport of cold sweet milk, but is attacked by hot milk and liquid products containing lactic acid. Its alloys with Mg and Si behave similarly. 0.5% aq. NaOH and Na<sub>2</sub>CO<sub>3</sub> attack Al and Na<sub>3</sub>PO<sub>4</sub> to a smaller extent. Al is fairly resistant to NaOCl, chloroamine-*T*, and neutral refrigerating brines, but corrodes badly with alkaline brines. Na<sub>2</sub>CrO<sub>4</sub> added to aq. NaCl completely prevents corrosion. W. L. D.

Spot- and seam-welded aluminium tanks for aircraft. F. V. HARTMAN (Mech. Eng., 1937, 59, 925—929).—Tank design and the welding techniques adopted are described. R. B. C.

Fatigue properties of metals used in aircraft construction at 345° and 10,600 cycles. T. T. OBERG and J. B. JOHNSON (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 195-205).—A ball-bearing, rotating-beam machine operating at 10,600 r.p.m. is described. The fatigue limits determined on this machine for notched and unnotched specimens of 18/8 Cr-Ni steel, Inconel, Alcoa, etc. were comparable with those determined on ball- and plain-bearing machines operating at 3450 and 1725 r.p.m., respectively. Fatigue data are tabulated. Unnotched, forged Alcoa 27 S-T (Cu 4·18, Si 0·83, Mn 1·1, Fe 0·35, Sn 0·05%, Al remainder) has a satisfactory fatigue limit (10,000-12,000 lb./sq. in. at 3450 r.p.m.).

R. B. C.

Annealed austenitic Cr-Ni steel has a higher fatigue limit in the notched than in the unnotched condition. R. B. C.

Fluxes in aluminium casting. R. IRMANN (Giesserei, 1937, 24, 597—601).—The nature of fluxing action, and the compositions of fluxes used for various purposes, *e.g.*, for prevention of oxidation and gassing during melting, are discussed. R. B. C.

Age-hardening in aluminium alloys. III. Double ageing peaks. W. L. FINK and D. W. SMITH (Amer. Inst. Min. Met. Eng. Tech. Publ. 865, 1937, 11 pp.; Met. Tech., 1937, 4, No. 8).—The peaks observed in the hardening of Cu–Al alloys are explained on the basis of localised straining at grain boundaries and slip planes, followed by preferential pptn. in these areas. Softening following the first peak is probably due to over-ageing. R. B. C.

Modulus of elasticity of aluminium alloys. R. L. TEMPLIN and S. TOUR (Proc. Amer. Soc. Test. Mat., 1937, 37, I, 258—260).—Data are tabulated for various types of Alcoa alloy (compositions given). R. B. C.

Influence of tempering temperature on physical properties of aluminium-magnesium alloys. P. LACOMBE (Mét. et Corros., 1937, 12, 131-132).--Al-Mg (8% Mg) tempered at 140° for 500 hr. had a tensile strength of 70,000 lb./sq. in.; for an alloy containing 9.5% of Mg tempered at this temp. for 50 hr. the val. was 60,000 lb./sq. in. R. B. C.

Methods of analysis for determining alloy constituents in aluminium. K. STEINHÄUSER (Angew. Chem., 1938, 51, 35–38).—A review of current technical methods for determining Fe, Si, Mn, Zn, Mg, and Mn + Mg in Al alloys. J. S. A.

Determination of aluminium oxide in aluminium bronze. G. A. PANTSCHENKO and E. G. REMESNIKOVA (Zavod. Lab., 1937, 6, 944—946).— 1 g. of Al-bronze turnings in a Pt-gauze bag in filter paper is electrolytically dissolved in 150 ml. of 0.5N-H<sub>2</sub>SO<sub>4</sub> containing 0.5 ml. of HNO<sub>3</sub>, the ppt. of oxides is washed, dried, and ignited, SiO<sub>2</sub> is eliminated as SiF<sub>4</sub>, the residue is dissolved in HCl, Al and Fe are pptd. with aq. NH<sub>3</sub>, and the ppt. is collected, washed with H<sub>2</sub>O and aq. (NH<sub>4</sub>)<sub>2</sub>S, ignited, and weighed (Al<sub>2</sub>O<sub>3</sub> + Fe<sub>2</sub>O<sub>3</sub>). The oxides are then treated with HCl and Fe is determined colorimetrically in the filtrate. R. T.

Microchemical determination of small amounts of sodium in aluminium and silumin. E. I. NIKITINA (Zavod. Lab., 1937, 6, 947-950).-0.5 g. of Al or silumin is dissolved in 15-25 ml. of HCl and 1-2 ml. of HNO<sub>3</sub>, or in 25-30 ml. of aqua regia, the solution is boiled to remove N oxides, slight excess of aq. NH<sub>3</sub> is added, and the solution boiled for 5 min., cooled, diluted to 100 ml., and filtered. 50 ml. of filtrate are evaporated to dryness, the residue is ignited and then extraoted with 15 ml. of hot H<sub>2</sub>O, and the solution filtered. The filtrate is conc. to 5 ml. and Na determined by the Zn-UO<sub>2</sub>(OAc)<sub>2</sub> method.

R. T. Spectrum analysis of admixtures in pure aluminium and in silumin. K. A. SUCHENKO and L. A. ALIFANOVA (Zavod. Lab., 1937, 6, 1412–1419). -Methods of determining small amounts of Mg, Si, Fe, and Cu in pure Al, and of Mg and Fe in silumin, in an ultra-violet spectrograph, by selecting suitable pairs of spectral lines are described. To determine Mg and Fe in silumin the no. of Al spectrum lines is insufficient to select homologous pairs; electrolytic Cu is chosen as one electrode, to overcome this difficulty. Spectrum analysis is 10-15 times quicker than chemical analysis. The probable errors in the Mg and Fe in silumin determinations are  $\pm 5$  and  $\pm 11\%$ , respectively, whilst those of Si and Fe in pure Al are  $\pm 3.0$  and  $\pm 1.5\%$ . The large error in the Fe in silumin determination is due to the inaccuracy of the method of chemical analysis used for comparison. D. G.

Visual spectral-analytical method for rapid identification of aluminium and magnesium alloys. A. R. STRIGANOV (Zavod. Lab., 1937, 6, 1098—1102).—The visual spectra of 14 commercial alloys serve for their identification. R. T.

Quantitative spectrographic method of analysis of aluminium and its alloys. A. R. STRIGA-NOV (Zavod. Lab., 1937, 6, 972—978).—Methods are described. R. T.

Analysis of aluminium-lithium alloys. N. S. LITVINENKO (Zavod. Lab., 1937, 6, 1055-1058).-0.5-20 g. of alloy, according to its Li content, are dissolved in HCl, 1-2 drops of  $H_2O_2$  are added, and AlCl<sub>3</sub> is pptd. by saturation at 0° with gaseous HCl. The solution is filtered, the AlCl<sub>3</sub> redissolved in HCl and repptd., and the combined filtrates are evaporated to dryness; the residue is then moistened with HCl and dissolved in  $H_2O$ . 0.5% 8-hydroxyquinoline in 2% AcOH is added to the solution at  $60-70^{\circ}$ , followed by slight excess of aq. NH<sub>3</sub>, when Fe, Mg, and residual Al are pptd. The filtrate is evaporated to dryness, 1 drop of HCl and 20 ml. of abs. EtOH are added. HCl is passed in for 15 min., 40 ml. of Et<sub>2</sub>O are added, the ppt. is collected and washed with 1:4-EtOH-Et<sub>2</sub>O, and the filtrate + washings are evaporated to dryness. The residue is dissolved in dil. H<sub>2</sub>SO<sub>4</sub>, the solution evaporated to dryness, and the residue ignited and weighed as R. T.  $Li_2SO_4$ .

Determination of copper, antimony, magnesium, and tin in special aluminium alloys. G. B. BROOK, G. H. STOTT, and A. C. COATES (Analyst, 1938, 63, 110—111).—The alloy is dissolved in NaOH and the Sb determined iodometrically in the solution; Cu and Mg are determined in the insol. residue, the latter after pptn. as 8-hydroxyquinoline salt. In a second sample Sn is determined iodometrically after reduction with Sb and HCl. E. C. S.

Wetting measurements [for minerals] as a physico-chemical method of analysis and for characterising materials and processes. P. A. REBINDER (Zavod. Lab., 1937, 6, 1371–1376).—The general principles of wetting and methods of measuring the degree of wetting are discussed. A table is given showing measurements of contact and hysteresis angles of various minerals, *e.g.*, quartz, calcite, barytes, in the systems (a) solid mineral-H<sub>2</sub>O-C<sub>6</sub>H<sub>6</sub>, and (b) solid mineral-H<sub>2</sub>O-air. D. G. Separation of mineral mixtures in a pulsating air stream. K. K. LIANDOV (Inst. Mech. Obra. Polez. Iskop. "Mechanobr," 1935, 1, 481—507).—In tests on barite-dunite, quartz-anthracite, and galenaquartz mixtures in a Richards-type pulsator the time for separation varied with the depth of layer and decreased with the difference in d of the minerals to be separated. The optimum results were obtained with 420 pulsations per min. CH. ABS. (e)

Sublimation method for obtaining pure metals from ores. P. S. LEBEDEV (Sborn. Trud. Moskov. Inst. Stal, 1935, 5-91).-Mn was prepared from an ore containing  $MnO_2$  78.70,  $Fe_2O_3$  2.36,  $SiO_2$  8.64,  $Al_2O_3$  1.6, CaO 3.17, MgO 1.68,  $P_2O_5$  0.52, and  $SO_3$ 0.71% by treatment of briquettes made from the ore alone, or containing lampblack, with Cl<sub>2</sub> or HCl at 850-1230°. Almost 100% yields of MnCl<sub>2</sub> and FeCl<sub>3</sub> were obtained in  $\frac{1}{2}$  - 6 hr. in presence of C. In absence of C the yield was 50-90%. Addition of NaCl to the charge retarded chlorination. Electrolysis of molten MnCl<sub>2</sub> at 700-800° with 2.24-5.8 v. gave pure Mn. The same method was used in preparing FeCl<sub>3</sub>, NiCl<sub>2</sub>, CrCl<sub>3</sub>, AlCl<sub>3</sub>, and TiCl<sub>4</sub> from pure oxides or from the crude Khalilov Fe-Ni orcs. The reaction between  $Fe_2O_3$  and  $Cl_2$  is reversible. With excess of  $Cl_2$ ,  $FeCl_3$  is formed at 400-500°. With excess of O<sub>2</sub>, FeCl<sub>3</sub> forms Fe<sub>2</sub>O<sub>3</sub>, even below 100°. Fe<sub>2</sub>O<sub>3</sub> and HCl give FeCl<sub>3</sub> at  $>100^{\circ}$ . In presence of C, FeCl<sub>2</sub> is formed at 500—1100°. C accelerates the reactions of NiO, Cr<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, and Al<sub>2</sub>O<sub>3</sub> with Cl<sub>2</sub> at 700-1000°. FeCl<sub>3</sub> is partly reduced to FeCl<sub>2</sub> by H<sub>2</sub> at  $<100^{\circ}$ , and the reaction is complete at 200-300°. Reduction of FeCl<sub>2</sub> is complete at 675°. CO reduces FeCl<sub>3</sub> to FeCl<sub>2</sub> and COCl<sub>2</sub> at 200—300°. It does not reduce FeCl<sub>2</sub> at 600°. NiCl<sub>2</sub> is reduced rapidly by H<sub>2</sub> at 360°. CrCl<sub>3</sub> is reduced by H<sub>2</sub> to CrCl<sub>2</sub> at 450° and to Cr at  $>1100^{\circ}$ . MnCl<sub>2</sub> is reduced by H<sub>2</sub> to Mn at 1150-1200°. Сн. Авз. (е)

Application of metallographic theory to the refining of metals. H. NISHIMURA (Suiyokaishi, 1935, 8, 851-858).—A discussion. Probable ternary diagrams to be applied in the removal of impurities from pure metals are explained.

CH. ABS. (e) Measurement of the surface tension of molten metals and its technological application. J. A. KLJATSCHKO (Zavod. Lab., 1937, 6, 1376—1382).— The measurement of the  $\gamma$  of molten metals and alloys by plate-adhesion and drop-wt. methods is described and the apparatus used is illustrated. The vals. of  $\gamma$  for Al, Mg, Zn, Cd, Pb, Hg, and certain Al alloys were measured at various temp. The results are considered to be of importance in investigating and controlling metallurgical processes, and particularly in foundry practice. D. G.

Developments in production of malleable castings. VIII. Annealing and malleableising. IX. Annealing furnaces. X. Alloy additions. H. H. SHEPHERD (Iron Steel Ind., 1937, 10, 515– 519, 621–624; 11, 35–38, 47–51).—VIII. Graphitisation theories are reviewed.

IX. The chief characteristics of annealing ovens, the relative merits of coal, pulverised coal, town's gas, and oil as fuel, the effect of heat-treatment on the properties of malleable Fe, and graphitisation are discussed.

X. The advantages and disadvantages of Cu as an alloying element, and the effect on the physical and mechanical properties of additions of Mo, Ni, Cr, Cu + Cr, Al, and Ti, are discussed. R. B. C.

Technical and economic problems of pressure die-casting [of metals]. W. MULLER (Giesserei, 1937, 24, 602—607, 623—630).—The development of die-casting machines and their application to the various alloys, and materials used for moulds, are discussed. Notes on pickling, plating, and lacquering of die-castings are given. R. B. C.

Casting properties of non-ferrous alloys. F. HOHNE (Giesserei, 1937, 24, 589—593).—Mouldfilling capacity, the tendency to segregation, and the effect of impurities on the casting properties are discussed. R. B. C.

Moulding of chemical kettles. P. R. RAMP (Iron Age, 1937, 140, No. 14, 22–25).—A method of moulding kettle castings which gives improved service life is described. R. B. C.

Study of die-design changes for improvement of soundness and uniformity of [metal] test-bars. G. L. WERLEY (Proc. Amer. Soc. Test. Mat., 1937, **37**, I, 223-254).—The development of various types of dies suitable for the production of standard test-bars for the Amer. Soc. Test. Mat. programme on exposure tests is described. Data showing the effect of die design on the physical properties of Zamak 3 and 5 are tabulated. R. B. C.

Ultrasonic method of testing metals. N. F. OTPUSCHTSCHENNIKOV (Zavod. Lab., 1937, 6, 999– 1002).—Results of testing metal blocks for defects are described. R. T.

Resistance-welding widened by tube control. E. H. VEDDER and J. W. DAWSON (Iron Age, 1937, 140, No. 19, 28—33, 81—82, No. 21, 44—49).—Srot-, butt-, projection-, and seam-welding, and the factors influencing quality and costs, are reviewed. The advantages resulting from the accurate control afforded by electron-tube timers are discussed in relation to practical examples. R. B. C.

Modern refrigeration needs modern metallurgy. W. MIKULAS and L. A. PHILIPP (Met. Prog., 1937, 32, 755—760).—Metals used for the various parts of refrigerating plant, e.g., leaded bronze for compressor bearings, are discussed. Specified thicknesses are tabulated for Ni, Cr, Cu, Zn, and Sn on various base metals. R. B. C.

Stress-strain diagram of repeated load tests. S. HIGUCHI (Tech. Rep. Tohuku, 1937, 12, 397— 406).—From a stress-strain diagram obtained by repeated load tests it is concluded that the mechanical properties of test materials, such as yield points, breaking stress, etc., cannot be determined directly by a load-deformation or an outer moment-angle of torsion diagram as in the case of a statical test, since certain serious corrections are necessary. The stress at any point in a test-piece for repeated loading is shown to be determined by a load or an outer moment (including its acceleration), the frequency of the load or outer moment, and the characteristic properties with respect to the natural vibration of the test-piece. Mathematical examples showing the manner in which the true relation of stress and strain may be deduced are given. P. G. McC.

Effect of bending on the tension-extension curve [of metals]. F. UEBEL (Arch. Eisenhüttenw., 1938, 11, 329-333).—Eccentric loading of the testpiece introduces a bending force which is shown mathematically to cause a lowering of the yield point, especially when the ratio (R) of the extension of the stretched side to the mcan extension is low (~0.1), and an earlier departure from Hooke's law. A graph gives the correction applicable to the observed yield point for different vals. of R. A. R. PE.

Alteration of the crystalline state of metals tested under alternating stress as shown by X-ray diagrams. F. WEVER, M. HEMPEL, and H. MÖLLER (Arch. Eisenhüttenw., 1938, 11, 315— 318).—A soft 0.02% C steel under alternating load showed a distinct change in the crystal lattice, so that points on the X-ray diagram broadened and coalesced, when the load was above the alternating stress limit. The change is believed to occur shortly before fracture and is observed only in the neighbourhood of the latter. When the load was slightly below the limit changes were observed in a few crystals, whilst loads well below the limit had no effect (cf. B., 1936, 841). A. R. PE.

Estimation of intergranular surfaces and volumes in metals. H. F. KAISER (Met. & Alloys, 1938, 9, 23-26).—Assuming that the grains of a crystal aggregate are all small, regular, equal-sized, and space-filling polyhedra, an equation is derived which expresses the vol. of intergranular material in terms of certain measurable quantities. The estimation of the relative amount of insol. impurity (e.g., oxide) in a metal which will be required at any given grain size to form a complete envelope about the grains, and other such practical problems, can be solved by means of the equation. P. G. McC.

Stiffness or flexure test [for wire etc.]. H. L. MACBRIDE (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 146—159).—The Tour-Marshall stiffness-testing machine is described. Data obtained with this apparatus for various materials, *e.g.*, Ni wire and 67/33 Cu-Zn strip, are given. R. B. C.

Measuring elastic drift [in metal]. R. W. CARSON (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 661-674).—Spring elements in precision instruments are subject to appreciable errors as a result of elastic drift, or deviations in elastic deflexions occurring with continued time under a const. load. A highly sensitive recording electronic micrometer developed to measure deflexions of spring members without disturbing the load deflexion is described. Results of tests on, e.g., heat-treated Be-Cu strip show that drift continues indefinitely at a decreasing rate as long as the load remains. R. B. C.

New equipment for creep tests [on metals] at elevated temperatures. P. G. MCVETTY (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 235-257).—A creep-testing machine developed by the Westing-

house Electrical and Manufg. Co., enabling 12-60 tests to be made at different stresses in the same furnace, is described. Creep curves for Ni-Cr-Mo steel at 500° under stresses of 8000, 12,000, 20,000, and 30,000 lb./sq. in. are given. R. B. C.

Temperature coefficient of tensile creep rate [in metals]. J. J. KANTER (Amer. Inst. Min. Met. Eng., Tech. Publ. 863, 1937, 20 pp.; Met. Tech., 1937, 4, No. 8).—A self-diffusion theory of secondary creep is proposed, embracing the principles of the Dushman-Langmuir theory of solid diffusion. An equation is suggested whereby the rate of tensile creep may be related directly to the physical and structural characteristics of the solid metal.

R. B. C.

Fatigue properties of non-ferrous sheet metals. C. H. GREENALL and G. R. GOHN (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 160-194).-Data are given for 9  $\alpha$ -brasses, Ni-Ag, phosphor-bronze, Be-Cu, Cu-Ni-Si, Cu, Everdur, Ni, Monel, and Al alloys. Ni-Ag sheet (0.015-0.017 average grain size) has a higher endurance limit than material of larger grain size. Dispersion-hardening of  $\alpha$ -brass by addition of Ni silicide increases this limit; cold-work raises it, but not in proportion to the increase in tensile strength. Age-hardening increases the endurance limit of Monel K, Al alloy 175, and Be-Cu alloys. The endurance limit-tensile strength ratio for the alloys investigated varies from 0.136 to 0.403, depending on composition, heat-treatment, and amount of cold-work. Ni and alloys rich in Ni have the highest endurance limit; for heat-treated Cu-base alloys, e.g., Be-Cu, and cold-worked phosphor-bronze C, the vals. are about the same. R. B. C.

Radiotechnical method of studying the relation between temperature and the modulus of elasticity and fatigue limits of metals. L. N. TOMILINA (Zavod. Lab., 1937, 6, 1409—1412).—Longitudinal and torsional oscillations are excited in a sample of metal of cylindrical shape the diameter of which is small compared with its length. The frequencies of the oscillations are determined by radiotechnical methods from which the elastic consts. are calc. Fatigue tests can be carried out at various temp. and the method has the advantage that the same sample can be used for several tests. The apparatus is illustrated. D. G.

Fatigue machine for testing metals at elevated temperatures. F. M. HOWELL and E. S. HOWARTH (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 206— 217).—The specimen tested forms part of a cantilever beam one end of which is fixed in an electrically heated furnace. While the specimen is entirely within the furnace the deflected beam assembly extends outside the furnace wall and is revolved in a circle by a variable eccentric driven at 3600 r.p.m. Close control of the temp. (up to 316°) of the specimen is possible. Fatigue data obtained at 149°, 204°, and 260° for Alcoa 17 S-T wrought Al alloy are given. R. B. C.

Testing of heat-refractoriness of metals and alloys. A. M. BORZDIKA (Zavod. Lab., 1937, 6, 1086-1097).--Refractoriness is determined from the wt. increment after heating in air, together with examination of the surface for local corrosion. R. T.

Heat-treatment and structural hardness [of metals]. L. GUILLET (Génie Civil, 1937, 111, 473-476).—Age-hardening is discussed with reference to steel, Cu-Ni-Al, Cu-Ni-Si, Ni-Be, etc. R. B. C.

Testing wear-resistance [of metals]. V. F. LORENTZ (Zavod. Lab., 1937, 6, 1116-1123).-Methods are discussed. R. T.

Emission of latent energy due to previous coldworking when a metal is heated. H. QUINNEY and G. I. TAYLOR (Proc. Roy. Soc., 1937, A, 163, 157—181).—A differential method involving the use of two similar specimens, one cold-worked and the other annealed, is described. By measuring the temp. difference when the specimens are heated in a pair of identical furnaces the % of cold-work originally done on the specimen released in the form of heat is determined. For Cu 7%, Al 9%, and brass (70/30) 15.8% are found. A calorimeter furnace is described and similar results are obtained. The sp. heats of Cu, Al, Ni, Fe, and steel are deduced.

G. D. P. Corrosion and corrosion-resistant metals and alloys. V. V. KENDALL (Met. & Alloys, 1938, 9, 21-22, 26).—An abstract of the A.S.T.M. symposium on corrosion-testing procedure and its standardisation. P. G. McC.

Corrosion in petroleum refineries. S. I. VOLF-SON (Zavod. Lab., 1937, 6, 862—865).—Methods of testing apparatus for corrosion are described.

R. T.

Thin layers of tin and other metals. IV. Corrosion by oils. P. J. HARINCHUIZEN and D. A. WAS (Proc. K. Akad. Wetensch. Amsterdam, 1938, 41, 62-67; cf. B., 1937, 408).—The rates of corrosion of thin films of Fe, Sn, and Cd (deposited on glass by high-vac. evaporation) in lubricating oils at 96° have been determined. Protective films are formed on Sn and Fe, but not on Cd. The rate of corrosion is greatly increased by the presence of  $H_2O$ . Measurements of the rates of corrosion of Sn, Fe, and Cu in salad oil at room temp. show that protective films are formed on Sn and Fe, but not on Cu.

E. S. H. Influence of acids, washing powders, chemical sterilisers, and refrigerating brines on metals. O. F. HUNZIKER (Proc. 8th Ann. State Coll. Wash. Inst. Dairying, 1935, 102–109).—Corrosion problems in the dairy industry are reviewed. CH. Abs. (e)

Corrosion of metals in solutions considered as an electrochemical phenomenon. W. J. MÜLLER (Chim. et Ind., 1938, 39, 31-39).-A review.

Report of the Wire Test Committee [of the American Society for Testing Materials]. ANON. (Proc. Amer. Soc. Test. Mat., 1937, 37, I, 117— 150).—Preliminary details are given of a programme of corrosion tests, commenced in 1934, on wire fencing, barbed wire, chain-link fence, etc., composed of a variety of materials, e.g., Zn-coated Cu steel, exposed at various places representative of industrial, urban, and seaside, atm. conditions. R. B. C.

Laws and theories of dry corrosion [of metals and alloys by gases at high temperatures]. G. VALENSI (Mét. et Corros., 1937, 12, 161–173, 195–198).—A review. R. B. C.

Surface state and corrosion [of metals]. U. R. EVANS (Mét. et Corros., 1937, 13, 182–185).—Work carried out at Cambridge is reviewed. R. B. C.

Equipment of laboratories for study of corrosion. F. B. SMOLIANSKAJA (Zavod. Lab., 1937, 6, 1124—1132).—Apparatus is described. R. T.

Differential aëration currents in corrosion. U. R. Evans and T. P. HOAR (J.S.C.I., 1938, 57, 23).—Differential aëration currents appear to play an important part in producing localised corrosion in some practical cases; in others their influence is slight or non-existent. Bengough and Wormwell's demonstration (B., 1937, 1355) of the ultimate breakdown of the initial protection at the H<sub>2</sub>Oline is important. The Teddington "film-distribution theory" has much in common with views long held at Cambridge; the part played by cathodically formed alkali and the possibility that  $O_2$  may act either as stimulator or inhibitor is recognised in both laboratories.

Protection from corrosion by colloidal graphite. F. PAVELKA (Kolloid-Z., 1938, 82, 215— 226).—The cataphoretic mobility of colloidal graphite ("Kohydrol") (I) is  $2.4 \times 10^{-4}$  cm./sec. (mean of 5 determinations). Fe sheet in contact with (I) becomes more readily wetted by oil, whence it is inferred that adsorption occurs. Rates of corrosion of Fe in 0.1- and 0.01N-HCl have been measured in presence and absence of 0.1% of (I), which affords considerable protection. The protection is increased by coupling the Fe with Pd or Cu to form a galvanic element. An explanation is offered. F. L. U.

Analysis of certain alloys by Glazunov's electrographic method. J. TEINDL (Chem. Listy, 1938, 32, 43—48).—Glazunov's method (B., 1932, 1121) is applied to analysis of Sb, Pb, Sn, Cu, Bi, Ni, Ag, Zn, and Al alloys. R. T.

Use of chromic acid in electrolytic etching of iron and steel. M. BAEYERTZ (Trans. Amer. Soc. Met., 1937, 25, 1185—1197).—An etching technique which can be successfully applied to ordinary and alloy steels and to stainless Fe–Cr and Fe–Ni–Cr alloys is described, with illustrations. The sample is made the anode in an electrolyte consisting of 10% aq.  $CrO_{a}$ . R. B. C.

Distribution of current density in electrolysis of copper sulphate. A. GLAZUNOV, A. KUKLA, and J. SVOBODA (Chem. Listy, 1938, 32, 48—52).—The thickness and uniformity of a Cu deposit on Ag are measured by covering the plate with wax, removing the wax at the region under examination, and conducting electrolysis with the plate as the anode. The voltage rises sharply when the Cu deposit is dissolved. It is thus found that the thickness varies, in particular when the [Cu"] of the electrolyte is low relatively to the c.d., and is least at points most distant from the anode. R. T.

E. S. H.

Electroplating copper from ammoniacal solutions. E. A. VUILLEUMLER (Month. Rev. Amer. Electroplaters' Soc., 1936, 23, No. 2, 44–50; cf. A., 1932, 705).—Good deposits of Cu were obtained with a Cu-NH<sub>3</sub> complex salt solution. The solution deteriorates on keeping in contact with Cu, or on adding Cu<sub>2</sub>O, but may be rectified by adding conc. aq. NH<sub>3</sub> or (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. A Cu<sub>2</sub>O film on the cathode causes an unsatisfactory deposit. CH. ABS. (e)

Electroplating copper on plaster of Paris. Y. V. CHIANG and C. P. FAN (Ind. Res., China, 1935, 4, 451-454).—It is best to paint the plaster surface with Cu powder (100-mesh) suspended in shellao and then plate Cu from an acid CuSO<sub>4</sub> solution at 0.4 amp./sq. in. CH. ABS. (e)

Production of adherent copper deposits on austenitic chromium-nickel steels. H. T. SHIR-LEY (J. Electrodep. Tech. Soc., 1937—8, 14, 47— 48).—The steels are subjected to 3 or 4 cycles of a treatment comprising cathodic reduction in  $H_2SO_4$ solution and subsequent immediate plating in an acid sulphate bath for 15—20 sec. The c.d. in the plating operation is important. C. E. H.

Rapid determination of boric acid, zinc, and iron in zinc electrolyte. V. F. CHOTZIALOVA (Zavod. Lab., 1937, 6, 1020—1021).—Zn, Al, and Fe are pptd. by Na<sub>2</sub>CO<sub>3</sub>, the filtrate is made exactly neutral to Me-orange, 10 ml. of 66% invert sugar are added, and the solution is titrated with 0·1N-NaOH (phenolphthalein), whence the  $H_3BO_3$  content is derived. Zn and Fe are determined in the ppt. by the usual methods. R. T.

Cadmium-plating. W. P. BARROWS and K. D. WILLIAMS (J. Amer. Soc. Naval Eng., 1936, 48, No. I, 59-67).—Operating conditions for low- and highconcn. Cd-plating baths are given. If Cd-plated parts are stored without air circulation a black discoloration occurs, due to the decomp. of salts left in rinsing. Gases given off by electrical insulation will corrode Cd. Zn plate does not show these effects. Alloy deposits with Cd 10 and Zn 90% have a slightly longer life than has either constituent alone. CH. Abs. (e)

Chromium-plating in baths containing fluorides. D. SOSSIMOVITSCH and E. KIRITSCHENKO (Mem. Inst. Chem. Ukrain. Acad. Sci., 1937, 4, 277— 292).—At c.d. of 2—4 amp./sq. dm. at 20—25° good Cr deposits were obtained by using 0.8—1.6 g. of HF per litre. At 6 amp./sq. dm. 1.4—1.6 g. of HF per litre were used. The nature of the deposit was independent of [CrO<sub>3</sub>] (250—350 g./litre). Addition of  $H_2SO_4$  to a fluoride bath decreases the current yield. Cu, brass, and Ni may be satisfactorily plated from HF baths. The resultant Cr deposits were stable in moist air or 3% aq. NaCl. Cr-plating on an under layer of Cu or Cu-Ni gave deposits which were more resistant to corrosion than those on Fe.

Effect of sodium fluoride on the bright-plating range of chromium in a chromic acid plating bath. E. CURSCHMANN and H. HEINRICH (Month. Rev. Amer. Electroplaters' Soc., 1936, 23, No. 2, 52-55).—The use of 8 g. of NaF per litre instead of the customary 2.5 g. of  $H_2SO_4$  per litre in a Crplating bath gave an approx. 3-fold increase in the bright-plating range and a 50% increase in current efficiency at 45°. <5 g. of NaF per litre produced frosty deposits. The current efficiency decreased with rising temp. (35-55°). The bright-plating range was widest at 45°. CH. ABS. (e)

Relations between the surface state of electrolytic chromium, its structure, and its mechanical properties. M. CYMBOLISTE (Compt. rend., 1938, 206, 247—249).—Dull deposits correspond with structures B and C, or with structure A (cf. B., 1937, 1069) if the crystallites are large with few vertical inclusions. Bright deposits consist of very small crystallites, contain numerous vertical inclusions, and may be uneven. Surface irregularities are due to inclusions, or to simultaneous deposition of different structures, which give rise to abnormal orientation of the crystallites. Such irregularities cause variation of hardness and loss of mechanical strength.

A. J. E. W.

Stripping of chromium electrodeposits for thickness measurement. S. G. CLARKE (J. Electrodep. Tech. Soc., 1937—8, 14, 39—46).—The thickness may be determined with an accuracy of  $\pm 25\%$  from the time of gas evolution when the plated article is immersed in a cold solution of HCl + SbCl<sub>3</sub>. Alternatively, the Cr may be removed by means of hot 5% H<sub>2</sub>SO<sub>4</sub> and the loss in wt. determined.

C. E. H.

Electrolytic polishing of aluminium. P. JAC-QUET (Compt. rend., 1937, 205, 1232—1235; cf. A., 1936, 687).—Polishing of Al anodes occurs on electrolysis, using an electrolyte prepared by addition of  $Ac_2O$  to aq. HClO<sub>4</sub>, at 45—50°, with a c.d. of 3—5 amp. per sq. dm. The method can be used for specimens too thin for polishing by other methods. The use of the process in metallographical examination of Al is discussed. A. J. E. W.

Testing oxide coatings on aluminium. ANON. (Proc. Amer. Soc. Test. Mat., 1937, 37, I, 261— 272).—Methods for determining coating thickness, e.g., resistance to abrasion and electrical breakdown voltage, are described. Data obtained by cooperating laboratories when applying the abrasive air-blast method to identical samples are compared.

R. B. C. Production of copper-aluminium alloys by electrolysis of aluminium dross. A. I. SHELEZ-NOV and B. N. MAXIMENKO (Legk. Met., 1935, 4, No. 6, 18-26)—Al alloys containing Cu 0.91-1.5, Si 2.26-3.64, and Fe 0.58-2.04% were produced by electrolysing in a fused salt bath mixtures of Al<sub>2</sub>O<sub>3</sub> and Al dross from foundries. CH. ABS. (e)

Electrolytic production of magnesium-aluminium alloys from a fused cryolite bath. A. M. ROMANOVSKI and J. K. BERENT (Legk. Met., 1935, 4, No. 6, 27-40).—Although MgO is sol. in molten cryolite up to 15%, its electrolysis is impractical as Al forms the principal deposit and the electrolyte is decomposed. CH. ABS. (e)

Microscopical measurements of metallic coatings. C. E. HEUSSNER (Month. Rev. Amer. Electro-

H. J. E.

platers' Soc., 1936, 23, No. 1, 5-23).—The thickness of electrodeposits and of anodic oxide films on Al is determined microscopically. Instructions for preparing the specimen for measurement are given.

CH. ABS. (e) Adhesion of electrodeposits. W. R. MEYER (Month. Rev. Amer. Electroplaters' Soc., 1936, 23, No. 2, 5—37).—A comprehensive review of factors affecting adhesion. CH. ABS. (e)

Electrolytic colouring [of metals] by means of molybdenum sesquioxide. H. KRAUSE (Oberflächentech., 1938, 15, 11–12).—Coatings of  $Mo_2O_3$ may be deposited electrolytically on Al, Fe, Zn, Sn, Pb, or Cd from an  $(NH_4)_2MoO_4$  solution. Various patents relating to the process are reviewed and the effects of addition agents investigated. Brown, black, and in certain cases iridescent colours are obtained. C. E. H.

Waste-heat boilers.—See I. Low-temp. bituminous coke in metallurgy. Fuel control in the Fe and steel industry. Corrosion in petroleum refineries.—See II. Bauxite clays. TiO<sub>2</sub> from Ti slags.—See VII. Glass strains. [Use of] immersion cell. Materials for clay-machinery parts. Steel-makers' refractories. Foundry refractories.—See VIII. Portland cement in blast furnaces.—See VIII. Portland cement in blast furnaces.—See IX. Polarographic analysis.— See XI. Painting galvanised Fe. Prep. of steelwork for painting.—See XIII. Rubber-lined vessels.—See XIV. Soil corrosion.—See XVI. Preventing corrosion in distilleries.—See XVIII. Milk and metals. Pb dissolved from solder by milk. Steel cheese vats. Metal cheese moulds. Dairy plant.—See XIX.

See also A., I, 124, Prep. of single-crystal wires of metals of high m.p. 132, Constitution of the intermetallic phases NaZn<sub>13</sub>, KZn<sub>13</sub>, KCd<sub>13</sub>, RbCd<sub>13</sub>, and CsCd<sub>13</sub>. Intermetallic compounds of the type Mg<sub>2</sub>Sn. Crystallo-chemistry of MgZn<sub>2</sub>-MgAg<sub>2</sub> alloys. Pptn. of the  $\beta$ -phase on tempering an Al-2.7% Mg alloy. Diffusion and v.p. of Zn in brass. Au-Al system. Solid solubility of Hg in Ag and in Au. Spectrography of ternary Pb alloys. 133, System Fe-Mn-Si. Conduction of electricity and diffusion in semi-metallic alloys (Cu<sub>2-x</sub>Se). Fe-C alloys. X-Ray investigation in system Mn-P. 137, Rapid determination of Au in Au sols. 139, Thermodynamics of solid bodies [Cd-Au and -Cu alloys]. 141, System Fe-FeS-MnS-Mn. 144, Relation of cathodic c.d. to structure of electrodeposited metal. Co-deposition of metals of unlike valency. 159, Spectrographic determination of Au in alluvial deposits. 160, Apparatus for calorimetry.

## PATENTS.

Manufacture of iron. H. A. BRASSERT & Co., LTD., H. A. BRASSERT, and F. P. COLCLOUGH (B.P. 475,345, 12.2.36).—The ore is smelted with fluxes such that the CaO: SiO<sub>2</sub> ratio in the slag is proportionately decreased below 1.15 as the Al<sub>2</sub>O<sub>3</sub> content falls below 15%, e.g., Al<sub>2</sub>O<sub>3</sub> 10%, CaO: SiO<sub>2</sub> = 0.875—1.1. F. M. L. Dephosphorisation and desulphurisation of steel. Soc. D'ELECTRO-CHIM., D'ELECTRO-MÉTAL-LURG., ET DES ACIÉRIES ELECTR. D'UGINE, ASSEES. of FONDERIA MILANESE DI ACCIAIO VANZETTI (B.P. 476,483, 9.4.36. It., 11.4.35).—The P content is reduced from 0.06 to 0.025% and the S from 0.055 to 0.03% by projecting a powdered mixture of Na<sub>2</sub>CO<sub>3</sub> 5 and BaO<sub>2</sub> or MnO<sub>2</sub> 1.65 g./metric ton of steel into the metal as it is poured in a thin stream.

L. C. M. Cementation of steel and alloy steels. A. DEUTZMANN (B.P. 475,359, 14.5.36. Ger., 28.5.35).— Steel is quenched from 900° in a paste of kieselguhr and oil containing an org. N compound, *e.g.*, NH<sub>2</sub>Ph, and then reheated at 720—900° and quenched in H<sub>2</sub>O. F. M. L.

Apparatus for heat-treating steel. C. J. COBERLY, ASST. to KOBE, INC. (U.S.P. 2,067,436, 12.1.37. Appl., 11.4.34).—Long bars or pipes, especially perforated pipes, are heated in short sections at a time in two stages, preferably by electric induction, the first stage having automatic control of the heat, whether electric or not, by loss of permeability. Quenching is effected by fluid whirling in an annular space between the piece and a sleeve, and means are provided to prevent fluid which strays inside the pipe from reaching the hot zone. B. M. V.

Production of (A) metal [steel] faced with metal such as copper, (B) metal-clad iron or steel. T. B. CHACE (B.P. 475,573 and 475,644, [A, B] 14.2.36. U.S., 14.2.35).—A steel billet is provided with a rim to form a mould, the surface of which is coated with Ni powder on to which is cast (A) Cu, or (B) a bronze containing Mn, Ni, and > 3% Si. F. M. L.

(A) Copper-antimony or copper-bismuth coated ferrous metals. (B) Rubber adherent article. (C) Corrosion-resisting rubber-coated article. E. C. DOMM, Assr. to NAT. STANDARD CO. (U.S.P. 2,039,067-9, 28.4.36. Appl., [A] 8.7.35, [B, C] 19.7.35).--(A) A ferrous-metal article, (B) a Zn, Cd, Sn, or Pb article, or (C) a galvanised Fe article, is plated with As, Sb, or Bi, above an intermediate Cu plate in (A) and (C), then coated with a rubber mix, and finally heated under conditions which vulcanise the rubber. A. R. P.

Increasing the resistance to heat of alloys containing iron and aluminium with or without chromium. HERAEUS-VACUUMSCHMELZE A.-G. (B.P. 475,828, 17.8.36. Ger., 24.9.35).—Scaling of heating elements made of an alloy of Fe with Al 2—12 and Cr  $\Rightarrow$  35% is prevented by immersion in aq. Na<sub>2</sub>CO<sub>3</sub>, NaOH, or Ca(OH)<sub>2</sub> followed by heating at 400—600°. F. M. L.

Machine elements of high resistance to corrosion fatigue. N. CHRISTMANN (B.P. 477,982, 1.4.36). —Steel containing 0.05—0.30% of Zr, >0.30% each of Al and/or Ti, and >5% each of one or more of Ni, Co, Cr, W, V, Mo is claimed. [Stat. ref.] B. M. V.

Iron alloys suitable for electrical resistances. UNITED STEEL Cos., LTD., and T. SWINDEN (B.P. 476,115, 8.6.36).—The use of alloys containing Cr 6·1-30, Al 3-12, and C 0·07-0·2, with Ti >5%

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(<3 times the C content), or with part of the Ti replaced by one or more of the metals V, Zr, Nb, and Ta, so that Ti/3 + V/3 + Zr/6 + Nb/6 + Ta/10 = C, is claimed. L. C. M.

[Steel-strip] cores for dynamo-electric machines. BRIT. THOMSON-HOUSTON CO., LTD. (B.P. 475,717, 17.2.37. U.S., 18.2.36).—Strip with an equiaxed-crystal structure, most of the crystals of which are so oriented that an edge and a face are parallel to the edge of the strip, is obtained by normalising following a heavy reduction by coldrolling. F. M. L.

(A) Chromium steels. (B) Alloy steels used for welding and welded joints. ELECTRO METAL-LURG. Co., Assees. of R. FRANKS (B.P. 475,895--6, 29.5.36. U.S., [A] 8.6.35, [B] 6.6.35).—The steels contain: (A) C  $\geq$ 1, Cr 12-35 (15-35), N 0·2-0·65 (0·2-0·4), and Ni and/or Cu 0·25-3 ( $\geq$ 2·5)%; (B) C  $\geq$ 0·5, Cr 2-30, W and/or Mo 0·5-2·5 ( $\geq$ 1·5)%, and Nb <8 times the % C and  $\geq$ 10 times the % C + 1·5%. F. M. L.

Welding method. GEBR. BÖHLER & Co. A.-G. (B.P. 476,413, 19.4.37. Austr., 18.4.36).—The use of Fe alloys containing C >0.3 (0.12), Cr 5—25 (12), Mn 3—16 (11), Ni 3—27 (20), and Mo 0.3—6 (1), with (or without) one or more of the elements Co, W, V, Ta, Ti, Zr, and Si >3 (W 2)%, for welding nonaustenitic Fe alloys is claimed. L. C. M.

Manufacture of fusion-welded [coated steel] articles. BABCOCK & WILCOX, LTD., Assees. of H. J. KERR (B.P. 469,074, 2.3.37. U.S., 9.5.36).— Steel plates are coated with a corrosion-resistant layer of Cr steel by heating them to redness and depositing the Cr alloy on the surface by means of a series of welding rods carried by a gang head; the coated article is then rolled until the alloy layer is 0.03 in. thick. A. R. P.

Electrolytic coating of metals [steel]. FORD MOTOR Co., LTD. (B.P. 475,848, 17.2.37. U.S., 16.5.36).—The articles are parkerised by passing them continuously through a  $H_3PO_4$  bath so that two are immersed at the same time while an a.c. is passed between them. F. M. L.

Fluids for use in magnetic tests for detecting surface flaws or cracks [in iron and steel]. C. A. BLAKER (B.P. 475,383, 4.1.37).—Use is made of a fine suspension of Fe in CCl<sub>4</sub>, prepared by spraying 1 pt. of molten Fe into 15—20 pts. of CCl<sub>4</sub>. F. M. L.

Detection of flaws in magnetisable bodies [e.g., steel rails]. W. C. BARNES and H. W. KEEVIL (B.P. 475,369, 6.6.36. U.S., 8.6.35).—The rail is subjected to a magnetic flux and then tested for residual magnetism. F. M. L.

Froth-flotation agents [for minerals]. FRANCO WYOMING OIL CO. (B.P. 471,861,9.3.36. U.S.,20.3.35). —CS(NHPh)<sub>2</sub> (I) is dissolved in 20 pts. of  $4:1 H_2SO_4$ and the solution poured into 50 pts. of  $H_2O$  to ppt. a derivative of (I) which is a good frother and a promoter for the flotation of Cu sulphide minerals depressed with CN'. A. R. P.

Extraction of metals from oxide ores and the like. H. D. ELKINGTON. From N. V. MAATS.

VOOR ZWAVELZUURBEREIDING V./H. G. T. KETJEN & Co. (B.P. 475,254, 23.4.37).—Oxide ores of metals having a heat of combustion < that of Fe, e.g., Co, Ni, Cu, are heated in a rotary furnace in a reducing atm. containing regulated amounts of steam so that only the required oxide is reduced in a given time at a given temp.; then C is deposited on the reduced metal by cooling to  $< 400^{\circ}$  in a carbonaceous atm., thereby forming a couple and thus ensuring rapid dissolution of the metal when the material is treated with a suitable solvent. F. M. L.

Roasting [sulphide] ore. B. M. CARTER and H. F. MERRIAM, Assrs. to GEN. CHEM. CO. (U.S.P. 2,065,563, 29.12.36. Appl., 6.1.32).—Finely-divided sulphide ore is roasted while falling through air; after leaving the brick shaft furnace with hopper bottom, the gases and cinder dust pass upward through a wasteheat boiler by which the temp. is lowered so that a metallic cyclone collector may follow. B. M. V.

Treatment of liquid slags and similar materials. C. H. SCHOL (B.P. 476,409, 25.3.37. Ger., 27.3.36).—An apparatus for producing dry, porous, foamed slag is claimed. L. C. M.

[Manufacture and refining of] lead alloys. GOODLASS WALL & LEAD INDUSTRIES, LTD., and W. T. BUTCHER (B.P. 476,223, 8.8.36).—Alloys of Pb with, e.g., As, Sb, Ag, Te, or Bi are prepared by fluxing molten Pb with a mixture of Pb halide (e.g., PbF<sub>2</sub>) and the metal sulphide; more electropositive metals, e.g., Li, Na, Mg, Al, Zn, or Sn, may be removed from Pb alloys by treating the molten alloy with flux containing Pb halide and PbS. (Cf. B.P. 474,410; B., 1938, 286.) L. C. M.

Apparatus for sweating out fusible metals. W. F. EPPENSTEINER, ASST. to AMER. METAL Co., LTD. (U.S.P. 2,066,257, 29.12.36. Appl., 6.12.34).— A conveyor draws the articles through a preheating and a heating chamber, and discharges them into a trommel. Superheated steam is admitted to the heating chamber and is drawn backwards through the preheater, air being admitted at intervals to permit the temp. of the steam to fall. In the heater separation of the fusible metal is effected without agitation, and in the trommel with strong agitation. B. M. V.

Methods of uniting metals. BRIT. THOMSON-HOUSTON CO., LTD. (B.P. 476,375, 12.7.37. U.S., 16.7.36).—Bimetal sheet (e.g., of Cu or Cu alloy coated with Ag) is produced by amalgamating the surfaces of the two elements, then pressing them at 1000—40,000 (3000) lb./sq. in. between plattens heated to 110°, and finally removing excess of Hg by heating at 100—220°. L. C. M.

Recovery of precious metals from solutions. E. L. FRANCIS. From TUBE GOLD EXTRACTORS (PROPRIETORY), LTD. (B.P. 476,458, 12.10.36).— Au is pptd. from cyanide solutions by treatment with porous charcoal powder which has been impregnated by treatment with Hg or Zn vapour under pressure. L. C. M.

Production of metal carbides. FOLLSAIN SYND., LTD., and N. SAINDERICHIN (B.P. 471,792, 9.1.36).— Finely-divided Fe, or a mixture thereof with W, Cr, or their ferro-alloys, is heated at  $1200^{\circ}$  with a 100:15:10-30:5 mixture of finely-divided charcoal, KOH, MnO<sub>2</sub>, and NH<sub>4</sub>Cl to form carbide powders for making sintered alloys. A. R. P.

Production of very hard substances of high mechanical resistance. P. MARTH (B.P. 478,016, 5.10.36).—Difficultly fusible carbides, nitrides, silicides, and borides of metals or non-metals (or the constituents to form them by synthesis) are heated to above the m.p., e.g., at  $< 3400^{\circ}$ , in presence of at. H produced by an arc between electrodes of W, Mo, or like metal. >5% of an oxidised compound of a more fusible metal, e.g., Co, Ni, Fe, Cu, Mn, Ag, with a reducing agent (C) may be present. B. M. V.

Treatment of materials containing tantalum and/or niobium. W. W. TRIGGS. From Soc. GÉN. MÉTALLURG. DE HOBOKEN (B.P. 476,557--8, [A] 4.5.36, [B] 5.5.36).--(A) Fe, Mn, and Sn are removed by volatilisation from Ta-Nb concentrates by heating the crushed and briquetted material at 750--1000° in a mixture of Cl<sub>2</sub> with 5--10 (6) vols. of H<sub>2</sub>. (B) Material containing, e.g., (Ta + Nb)<sub>2</sub>O<sub>5</sub> 18% with TiO<sub>2</sub>, Fe, Mn, Sn, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, CaO, and MgO is mixed with C and reduced at 1400° in an arc furnace; a slag containing the CaO, MgO, Al<sub>2</sub>O<sub>3</sub>, etc. with (Ta + Nb)<sub>2</sub>O<sub>5</sub> only 0.4%, and an alloy containing Ta + Nb 37% are obtained; the alloy is treated with aq. H<sub>2</sub>SO<sub>4</sub> (d 1.07--1.16) and then with aq. H<sub>2</sub>SO<sub>4</sub> + HF to remove Fe, Mn, Sn, and Si, and the residue roasted at 800--1000°, yielding an oxide concentrate containing >95% of (Ta + Nb)<sub>2</sub>O<sub>5</sub>, suitable for reduction to metal. L. C. M.

Testing of (A) metals (C) metal articles, for defects. (B) Flaw detection. (A, B) A. H. DAVIS, jun., (c) H. C. KNERR and C. FARROW, Assrs. to STEEL & TUBES, INC. (U.S.P. 2,065,118-9 and 2,065,379, 22.12.36. Appl., [A] 13.8.32, [B] 30.6.33, [C] 30.1.32).-(A) A non-magnetic but conducting tube is passed as core through an exact pair of exciting coils connected in opposition and excited with a.-c. Any lack of symmetry in the currents induced in the tube is revealed by a search coil symmetrically placed between the exciting coils. (B) Apparatus for forms of metal other than tubes is described. (c) The search coils are wound with the exciting coils thus making two transformers, and out of balance is detected by a thyratron valve or other means. If the article is also magnetic it is rendered effectively non-magnetic by the provision of d.-c. coils having a sufficient no. of amp.-turns to produce saturation.

B. M. V. Materials for rustproofing metals. BLACK-WELL, HAYES, & CO., LTD., and C. L. M. BROWN (B.P. 476,006, 3.3.37).—Solutions containing salts of Fe, Cu, and Sb with a compound obtained by treating an alkylcyclohexanol with aq. NaNO<sub>2</sub> + aq. H<sub>2</sub>SO<sub>4</sub> are used; e.g., a solution containing CuSO<sub>4</sub>,5H<sub>2</sub>O 2, saturated aq. FeSO<sub>4</sub> 1.5, saturated aq. SbCl<sub>3</sub> 1.5, H<sub>2</sub>O 60, and a 4% solution of nitrited 2-methylcyclohexanol in EtOH 2 pts. may be employing for "browning" gun barrels. L. C. M.

Veneering of metallic articles. M. W. KELLOGG Co. (B.P. 475,712, 6.2.37. U.S., 18.2.36).—A coated metal article is produced by depositing on a metal base a metal having a composition different from that of the base. No sp. metals or fluxes are named. The coating is deposited by maintaining an electric arc between a fusible electrode and the base, the end of the electrode being maintained under a blanket of flux. F. M. L.

Casting of easily oxidisable metals [magnesium]. K. F. WAGNER (B.P. 475,541, 13.2.37. Ger., 13.2.36).—A measured amount of molten Mg is pressure-cast in a permanent mould in an inert atm. F. M. L.

Impregnation of castings [aluminium and magnesium] metallic and other metallic objects. H. SUTTON and L. F. LEBROCQ (B.P. 475,889, 28.5.36). —Articles having pores, cracks, or voids are rendered impervious by immersion in an aq. solution of a silicate, an alkali phosphate, tungstate, carbonate, or bicarbonate, and a corrosion inhibitor, *e.g.*, a sol. chromate. —F. M. L.

Apparatus for recovery of values from [scrap] aluminium. A. F. BAUMBAUER (Assee.) and W. CULVER (U.S.P. 2,068,640, 26.1.37. Appl., 5.8.35).— Scrap Al is converted into  $Na_2Al_2O_4$  and  $H_2$  by the action of aq. NaOH in a gas generator, the solution is diluted, and the pptd.  $Al_2O_3$  washed by decantation in thickeners. The NaOH thus diluted is evaporated for use again. B. M. V.

[Aluminium] alloys for bearings. H. C. HALL (B.P. 470,248, 11.11.35 and 25.1.36).—The alloys contain Sn + Sb 1.5—8 (Sn : Sb < 2 : 1), Ni + Mn, V, Co, Cr, Mo, or W 0.8—4.8 in all (Ni + Mn : others < 1 : 1), Mg > 1, and Si > 1%; e.g., a suitable alloy contains Sn 5.8, Sb 1, Ni 1.7, Mn 0.75, Mg 0.35, Si 0.4, and Fe 0.3%. F. M. L.

[Aluminium] bearing alloys. H. C. HALL (B.P. 472,248, 19.12.35. Addn. to B.P. 470,248; cf. preceding abstract).—The alloys contain 1.5—8% of metals of low m.p. ( $<\frac{2}{3}$  of which is Sn and the remainder preferably Sb), together with > 3% of hardening elements, e.g., Cu, Ag, Ni, Mn. A preferred alloy contains Sn 5, Sb 0.8, Cu 1.5, Ag 0.3, Ni 1, Mn 0.2, Mg 0.4, Si 0.3, and Fe 0.3%. F. M. L.

Aluminium alloy. NIHON KAKO KABUSHIKI KAISHA, and Y. MATUENAGA (B.P. 475,373, 27.6.36).— The alloy contains Mg 2—5, Zn 6·5—14, Ni  $\Rightarrow$ 2, Fe  $\Rightarrow$ 1·5, Si 0·1—1, Mn and/or Mo  $\Rightarrow$ 1·5, Co  $\Rightarrow$ 1%, together with 2·5% in all of at least one of the following: V, W, Ti, Li, Be. F. M. L.

Improving the resistance to corroding agents of aluminium-base alloys. I. G. FARBENIND. A.-G. (B.P. 476,627, 8.6.36. Addn. to B.P. 432,351 and 450,832; B., 1935, 1000; 1936, 1163).—Alloys containing Mg 3—16 (<6.5)%, after homogenising and quenching, are reheated in a saline bath at 190— 450° (depending on the Mg content) until uniform segregation of  $\beta$ -particles throughout the basic  $\alpha$ -crystals has occurred. L. C. M.

Electrolytic descaling and/or cleaning of metals [steel]. J. F. HINSLEY (B.P. 475,929, 23.5.36).—Steel plates are subjected to simultaneous anodic and cathodic treatment by means of electrodes moving over the surface, the detached scale being shaken off. F. M. L.

Apparatus for electroplating metallic articles. BRIGHTSIDE PLATING CO., LTD., and J. KRONSBEIN (B.P. 475,204, 9.7.36).—A method is claimed for automatically removing articles from the bath by a rotating drum attachment. F. M. L.

Galvanic deposition of copper from aqueous solutions of copper salts. GALVANOCOR A.-G., Assees. of M. SCHLÖTTER (B.P. 475,830, 14.9.36. Ger., 13.9.35).—Cu may be deposited at high c.d. by adding small amounts of  $CrO_3$ ,  $H_2O_2$ , or  $HClO_4$ to the ordinary acid sulphate bath or to aq.  $Cu(NO_3)_2$ ,  $Cu(ClO_4)_2$ , or  $C_6H_4(SO_3)_2Cu$  containing an excess of  $HClO_4$ . Phenols or colloids may be added to reduce the  $\gamma$ . A. R. P.

**Operation of galvanic tin-depositing baths.** SIEMENS & HALSKE A.-G. (B.P. 476,405, 20.2.37. Ger., 10.7.36).—In order to avoid dissolution of the Sn<sup>II</sup> and the consequent spongy deposit, the c.d. is increased as fresh anodes are introduced into the bath and then allowed to fall slowly; e.g., if 103 anodes are used with a total current of 1800 amp., the first anode introduced is loaded at 200, and as each of the first 9 is introduced, the current is increased by 200 amp., then kept const. while the remaining anodes are added, thus gradually lowering the c.d. A bath containing Sn<sup>IV</sup> 25 and free NaOH 2.5 g./litre is used at 65—70°. L. C. M.

Anodising of aluminium and its alloys. ELECTRO-METALLURG. RES. CO., LTD., S. WERNICK, and V. F. F. HENLEY (B.P. 476,161, 29.4.36).—A bath containing  $H_2SO_4 \ge 25$  (15—22)% (vol./vol.) and  $Al_2(SO_4)_3 \ge 25$  g./litre is used at  $\ge 18$  (12—13) v./24—27.5°. L. C. M.

[Pouring nozzle for] ensuring regular casting of metals. Soc. D'ELECTRO-CHIM., D'ELECTRO-MÉTALL., ET DES ACIÉRIES ELECTR. D'UGINE (B.P. 475,401, 10.6.37. Fr., 31.3.37).

Furnace with helical hearth. Casting materials under vac.—See I. Fuels for use in welding etc. Lubricant compound [for metal surfaces].—See II. Extrusion device.—See V. Glass-metal seals. Joining ceramic bodies to metals etc.—See VIII. Slag blocks etc.—See IX. Induction-furnace ladle.—See XI. Degreasing metal.—See XII. Coating metal etc.—See XIII.

### XI.—ELECTROTECHNICS.

Electric oven with a ceramic resistance. S. M. Dorogov (Zavod. Lab., 1937, 6, 869—872).— Apparatus is described. R. T.

Simplified apparatus for electrolysis with a mercury cathode. A. L. VOROBIEV (Zavod. Lab., 1937, 6, 891).—Apparatus is described. R. T.

Polarographic analysis. H. HOHN (Chem.-Ztg., 1938, 62, 77-81).—The principle of the method, apparatus, and technique are described. The determination of ZnO in lithopone, of small amounts of Cu, Pb, and Cd in Zn, and of Ni and Co in steels are described to illustrate the method. L. S. T. Applications of X-rays to industrial problems. J. R. TOWNSEND and L. E. ABBOTT (Metal Progr., 1936, 29, No. 2, 64-70).—A discussion. CH. ABS. (e)

Electric breakdown of solid and liquid insulators. A. VON HIPPEL (J. Appl. Physics, 1937, 8, 815—832).—The Paschen law for gases cannot be extrapolated to apply to liquid and solid dielectrics, in which the chief breakdown phenomenon is cumulative impact ionisation by electrons. The subject is discussed with reference to the behaviour of alkali halides and glasses. J. W. S.

Apparatus for annealing etc. Electrotor meter [for dusts].-See I. Recording H2O in coal gas. CH4 detectors. Oil-testing apparatus.-See II. Measuring thermal transmission of fabrics. Cable and condenser papers.—See V. Analysis of  $H_2SO_4$ -AcOH mixtures and of acetates. Determining CN' solutions. Determining MgCl<sub>2</sub> in electrolyte.—See VII. Oven for porcelain and glass. Glass strains. [Use of] immersion cell. Determining softening point of enamels. Talc porcelain. Pyrometry and refractories.—See VIII. Rocking arc furnace for cast Fe. Etching Fe and steel. Magnetic dispersion in steel. X-Ray analysis of steels. Determining slag inclusions in steel. Determining Cu in Cr-Cu steels, and Ni in steel. Determining Al and Al<sub>2</sub>O<sub>3</sub> in steels. Determining Cu in ores. Obtaining pure metals from ores. Determining Cd in Zn and its alloys. Magnetic properties of pure Ni. Polishing Al. Testing oxide coatings on Al. Determining Al<sub>2</sub>O<sub>3</sub> in Al-bronze. Colouring metals. Measuring elastic drift in metal. Radiotechnical study of metals. Welding. Cu-plated Cr-Ni steel. CuSO<sub>4</sub> electrolysis. Cu- and Mg-Al alloys by electrolysis. Cu-, Cr-, and Cd-plate. Analysis of Zn electrolyte. Measuring metallic coatings. Adhesion of electrodeposits. Electrographic analysis of alloys.-See X. Electrodialysis of soils. Titrating soil suspensions .-See XVI. KOH from distillery slop.-See XVIII. Determining  $p_{\rm H}$  of milk. Treating horse chest-nuts etc.—See XIX. Electrocathodic puri-fication of H<sub>2</sub>O. Cathodic protection of aqueducts.-See XXIII.

See also A., I, 133, Conduction of electricity in semi-metallic alloys ( $Cu_{2-x}Se$ ). 144, Relation of cathodic c.d. to structure of electrodeposited metal. Co-deposition of metals of unlike valence. 150, Prep. of HCN by the electric arc. II, 94, Electrolytic substitution in naphthols.

#### PATENTS.

Continuous high-temperature electrothermal (A) furnace, (B) process. G. C. Cox (U.S.P. 2,068,447—8, 19.1.37. Appl., [A] 30.3.33, [B] 14.11.36).—Material is forced upwards through an annular furnace (wider at the top than at the bottom) through charging, heating, and cooling zones, the middle one being electrically heated. The solid material charged should include loose material which, when in the top layer, will provide thermal insulation. Fluid reactants may also be injected. B. M. V.
Electrically heated [induction] apparatus and method of operating. G. A. PATTERSON, ASST. to NAT. ANILINE & CHEM. Co. (U.S.P. 2,052,649, 1.9.36. Appl., 10.9.32).—In apparatus for heating by induction, means are provided for selectively varying the location of the heat applied, the area heated, and the amount of heat generated. The method is designed especially for heating stills etc. containing liquids, whereby considerable heat can be applied to the part of the vessel in contact with liquid, leaving the rest only slightly heated.

J. S. G. T.

Superheating induction furnace [ladle]. J. R. WYATT, Assr. to AJAX ELECTRIO FURNACE CORP. (U.S.P. 2,067,110, 5.1.37. Appl., 29.3.34).—The metal after pouring and refining is poured through a passage arranged to produce a hydrostatic head to prevent pinch effect, and while therein is subjected to electromagnetic heating. B. M. V.

Suspension of electrodes for electrical furnaces. NORSKE A./S. FOR ELEKTROKEM. IND. (B.P. 478,556, 2.7.37. Norw., 8.7.36).—Means for forming and suspending electrodes of the self-baking type are described. B. M. V.

Apparatus for increasing the intensity of flaming arcs. M. E. GLEICK (U.S.P. 2,068,795, 26.1.37. Appl., 24.6.36).—Light-reflecting plates of asbestos coated with a metallic powder are utilised. B. M. V.

Thermostat. W. A. RAY, Assr. to GEN. CON-TROLS CO. (U.S.P. 2,066,738, 5.1.37. Appl., 30.4.35). —An electrical switch operated by bimetal strip with permanent magnets and electromagnets to produce a snap action is described. B. M. V.

Electrolytic condensers. HYDRAWERK A.-G. (B.P. 469,729, 25.1.36. Ger., 28.1.35).—Terminal wires connected to the condenser plates are made of the same metal (Al) as the plates. J. S. G. T.

Electric resistances. STEATIT-MAGNESIA A.-G. (B.P. 478,390, 25.11.36. Ger., 26.11.35).—The resistance comprises an insulating support, a conducting layer, and a protective film applied in a liquid state; to the last is added metallic or other conductive powder at the points where electric contact is desired. B. M. V.

Electrical insulation. B. TOWNSHEND, Assr. to JOHNS-MANVILLE CORP. (U.S.P. 2,068,208, 19.1.37. Åppl., 18.1.35).—Chrysotile asbestos has its insulation resistance improved by interaction with 3% of a H<sub>2</sub>O-sol. soap, the insol. reaction product being uniformly distributed over the fibres. B. M. V.

[Vinyl resin] electric insulating materials for conductors and the like. BRIT. THOMSON-HOUSTON CO., LTD. (B.P. 470,380, 8.3.37. U.S., 7.3.36).—Compositions having low dielectric losses and power factor are prepared by incorporating a Pb oxide (5) and C black (5) with a polymerised vinyl halide (52) and a plasticiser  $[(C_6H_4Me)_3PO_4]$ (38 wt.-%). S. M.

Electric cable. R. J. WISEMAN, Assr. to OKONITE Co. (U.S.P. 2,068,940, 26.1.37. Appl., 23.6.34).—A conventional rubber-insulated cable (any no. of phases) is enclosed in pressure-resisting metal pipe which is filled with  $N_2$  and He under elevated pressure, the gas being allowed to permeate any protective coatings and to come in contact with the rubber insulation. B. M. V.

Magnetic separation. F. R. JOHNSON, Assr. to EXOLON CO. (U.S.P. 2,065,460, 22.12.36. Appl., 20.5.33).—An apparatus for the separation of feebly magnetic and non-magnetic particles comprises a rotor and pole pieces shaped so as to produce magnetic fields with local concn. towards the rotor. The rotor is run at such speed that the non-magnetic material leaves the drum at a zone 65—45° above the horizontal plane. B. M. V.

Magnetic separator and process of separation. R. H. STEARNS, Assr. to MAGNETIC MANUFG. Co. (U.S.P. 2,067,548, 12.1.37. Appl., 5.10.31).—The non-magnetic constituent is allowed to pass through a conveyor belt-screen of magnetic material (suitably excited by electromagnets) and the magnetic constituent is removed from the belt at a remote point by vibration from a polygonal roller or by washing. B. M. V.

Production of [nickel] electrodes having a large surface area for use in [alkaline] electric accumulators. E. LANGGUTH (B.P. 469,453, 24.1.36. Ger., 24.1.35).—Adhesive Ni oxides are produced on a Ni anode by electrolysis of an electrolyte containing conc. primary alkali salts of multivalent acids, e.g., NaHCO<sub>3</sub>, or a solution of borax with added H<sub>3</sub>BO<sub>3</sub>. CO<sub>2</sub> produced by the electrolysis is returned to the electrolyte by means of NaHCO<sub>3</sub>. J. S. G. T.

Primary batteries. Soc. ANON. LE CARBONE (B.P. 478,396, 23.1.37. Fr., 3.3.36. Addn. to B.P. 435,141; B., 1936, 157).—A semipermeable inert wall is placed between the main sol. electrode and the bottom auxiliary electrode; the lower compartment thus formed preferably contains a smaller proportion of the material added for solidifying the electrolyte. B. M. V.

Manufacture of electric storage batteries. S. G. S. DICKER. From N. V. PHILIPS' GLOEI-LAMPENFABR. (B.P. 478,274, 17.7.36).—In a series of low-current cells having bipolar common plates and only one pair per cell, the plates are formed of a mixture of rubber and graphite and are provided with an asphalt frame by painting with a solution of asphalt; they are interleaved with cotton or glass wool or the like impregnated with electrolyte and are assembled together like a filter-press. The pack is placed in a rather larger mould with asphalt cast around to form a case. The electrolyte is a solution of Pb salts. B. M. V.

Treatment of freshly-pasted storage-battery plates. C. C. Rose, Assr. to WILLARD STORAGE BATTERY CO. (U.S.P. 2,068,434, 19.1.37. Appl., 17.4.36).—The plates are dried and a film of PbCO<sub>3</sub> is formed on the surface by impingement of a flame containing  $CO_2$ , to render them non-sticky so that they may be stacked. B. M. V.

Incandescence lamp. R. M. ZABEL, Assr. to HYGRADE SYLVANIA CORP. (U.S.P. 2,067,134, 5.1.37. Appl., 21.9.35).—A W-filament lamp is provided with a coating of  $\text{KNO}_3$  on the interior surface of the bulb and with a reversible getter of  $\text{H}_2\text{O}$  which is effective throughout the life of the lamp, e.g.,  $\text{Ca}(\text{OH})_2$  baked at 500° for 5—10 min. *in situ*. B. M. V.

Electric incandescence lamps. M. IMURA (B.P. 477,758, 19.7.37).—A reflector of Ca or Mg is placed above the filament within the bulb; it also functions as a collector of  $H_2O$  and  $O_2$ . B. M. V.

Electron-discharge devices. M. HARMAN (B.P. 469,558, 27.1.36. Austr., 25.1.35).—A layer of small particles of opaque or semi-opaque material, e.g., C, is rendered translucent or transparent by an incident beam of electrons. J. S. G. T.

Combinations of electric-discharge devices with materials excited to luminescence by the electric discharge. GEN. ELECTRIC CO., LTD., and J. T. RANDALL (B.P. 469,731-2, [A, B] 27.1.36).---(A)  $Cd_3P_2O_5$  (prep. described) activated by an impurity, e.g., Mn (as chloride), is used as the luminescent material. (B) The corresponding compounds are monoclinic MgWO<sub>3</sub> and Pb (as nitrate). J. S. G. T.

(A) Cathode-ray tubes. (B) Light-sensitive electron-discharge tubes. V. and A. ZEITLINE, and V. KLIATCHKO (B.P. 478,121 and 478,238, [A] 11.5.36, [B] 13.6.36. Fr., [A] 9.5.35, [B] 13.6.35).---(A) The screen has both fluorescent and photo-sensitive properties (materials not specified), the former property being used when receiving and the latter when transmitting television. (B) The apparatus comprises a photo-sensitive screen, an electron mirror, a fluorescent screen, and two grid electrodes. B. M. V.

[Cathode-ray] electrode structure. S. F. ESSIG, Assr. to RADIO CORP. OF AMERICA (U.S.P. 2,065,570, 29.12.36. Appl., 24.2.32).—To form a light-sensitive mosaic surface, an insulating base is coated with an easily reducible metallic (Ag) compound, heat is applied to cause formation of metal particles separated from each other, these are then coated with alkali metal (Cs), and the excess is removed from between the particles by heat. B. M. V.

Phototube. M. C. TEVES, ASST. to RADIO CORP. OF AMERICA (U.S.P. 2,066,081, 29.12.36. Appl., 13.3.35. Ger., 26.3.34).— $O_2$  is introduced into the bulb after evacuation, and by means of a discharge Ag<sub>2</sub>O is volatilised from a cathode rod of Ag-Mo and deposited on a semicylindrical Cu anode; the  $O_2$ is then removed by evacuation and Cs or the like admitted and vaporised with reduction of the Ag on the anode. B. M. V.

Fluorescent material. MARCONI'S WIRELESS TELEGRAPH Co., LTD. (B.P. 471,190, 28.2.36. U.S., 28.2.35).—The luminescent efficiency, e.g., in cathoderay tubes, of synthetic willemite is increased by treating the finely-powdered material with an alkaline solution, e.g., 5N-aq. NH<sub>3</sub>, for 24 hr. The distorted surface layer of the individual particles is thereby replaced by an undistorted layer. I. C. R.

Fluorescent screens. S. T. HENDERSON (B.P. 475,582, 22.5.36).—A screen for affording white light from cathode-ray tubes comprises a mixture of non-activated  $\text{ZnWO}_4$  or  $\text{CdWO}_4$  40—70,  $\text{ZnB}_2\text{O}_4$  60—30, and  $\text{ZnSiO}_3 < 10\%$ .

Light-sensitive cell. E. PRAETORIUS and J. E. STEWART (U.S.P. 2,055,017,22.9.36. Appl.,28.12.32). —A cell comprising a pair of spaced Pt contact members fused to a glass support and covered with a thin layer of Au, with Se bridging the members, is claimed. J. S. G. T.

Piezo-electric crystals. SIEMENS & HALSKE A.-G. (B.P. 472,148, 27.1.37. Ger., 27.1.36).—Adherent electrodes of soft metals, e.g., Pb, Sn, Cd, Bi, or alloys thereof, are deposited (Schoop process) on the crystals, and connexions are soldered thereto by means of a lower-m.p. solder. Preferably the softmetal film is restricted to the neighbourhood of an oscillation node, the remainder of the crystal electrode surface being metallised with a precious metal.

J. S. G. T. Selenium cell. A. CHRISTY, Assr. to G.-M. LABS. INC. (U.S.P. 2,066,611, 5.1.37. Appl., 10.12.32).—A photo-voltaic cell for a photometer or the like, needing no source of energy other than the impinging light, comprises a mild-steel base, a layer of the mixed selenides of Cu and Fe, a layer of Se, and a conducting transparent covering, *e.g.*, of As, over all. B. M. V.

Dry electric rectifiers. N. V. PHILIPS' GLOEI-LAMPENFABR. (B.P. 469,610, 24.1.36. Ger., 11.3.35. Addn. to B.P. 378,444).—The electrical conductivity of the Sc electrode used in accordance with the prior patent is increased by admixture of very finelypowdered conducting substances, e.g., PbS, Sb<sub>2</sub>S<sub>3</sub>, CuS, ZrN, TiN, V<sub>2</sub>O<sub>3</sub>, or Co<sub>2</sub>O<sub>3</sub>, of grain size 1 $\mu$ ., and the insulating intermediate layer, e.g., of collodion or shellac, is applied as a separate layer to one of the electrodes. [Stat. ref.] J. S. G. T.

Measurement of ion concentration. G. KENT, LTD., Assees. of E. D. DOYLE and G. A. PERLEY (B.P. 477,849, 6.7.36. U.S., 11.1.36).—For the continuous assay of liquid flowing in a conduit the sample is taken in the form of drops to prevent short-circuit, the potential of the test cell is connected in opposition to the p.d. of a standard cell, and the difference is despatched to the control electrode of a thermionic valve, and the output of the valve to one arm of a Wheatstone bridge. B. M. V.

Apparatus for measuring the concentration of solutions. F. H. MACKENZIE, Assr. to AMER. CHEM. PAINT CO. (U.S.P. 2,068,499, 19.1.37. Appl., 5.3.35).—Current from a.-c. mains or a transformer is supplied to spaced electrodes and, besides the voltmeter or ammeter graduated in concn., there are variable resistances to compensate for temp. and for the nature of the solvent. B. M. V.

[Electrostatic] cleaning of gases. C. B. THORNE (U.S.P. 2,064,960, 22.12.36. Appl., 5.3.32).—In an electrical precipitator having a negative discharge electrode with corona, and a positive collecting electrode, the gas is first passed in contact with the latter, its direction then suddenly changed, and its speed of flow reduced. It is then passed through the corona on the negative electrode and a portion of the clean ionised gas is introduced into the feed gas. The electrodes are preferably co-axial tubes, the inner (negative) one being provided with fins, B. M. V. Means for detecting electrically the presence of gas in mines and other places. OLDHAM & SON, LTD., and H. HOLT, jun. (B.P. 477,827, 30.4.36). —The light from an exposed electric filament excited by const. current is affected by presence of firedamp, the light falls on a photo-electric cell, and that controls a relay which lights a warning lamp. The whole, including an accumulator and barreter, is contained in a hand safety lamp. B. M. V.

Rotary kiln control. Casting materials under vac. Pyrometers.-See I. Lubricating etc. compositions. Purifying oily liquids.-See II. glass. Glass-metal seals. Fe-Tempering coated ceramic bodies.—See VIII. Coating steel. Fe resistance alloys. Detecting flaws in steel etc. Testing metals. Cleaning metals. Veneering articles. Very hard substances. Electroplating articles. Cu- and Cr-plate. Sn-de-positing baths. Anodising Al and its alloys. Cores for dynamo-electric machines. Welding. -See X. Moulded fibre-containing articles.--See XIII.-Destroying living organisms.-See XXIII.

## XII.-FATS; OILS; WAXES.

Refining fish and aquatic animal fats. A. SERGEEV (Maslob. Shir. Delo, 1935, 11, 551-553).— Albuminous and mucilaginous substances are pptd. with 0.5% oak-bark extract. CH. ABS. (e)

Compounds and enzymes adsorbed on the surface of fat globules. G. SCHWARZ and O. FISCHER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 559—561).—The protein isolated from cream after many washings with 0.9% aq. NaCl and centrifuging was different from casein, albumin, and globulin. This protein contains the Schardinger enzyme and it was possible to purify it by adsorption on Al(OH)<sub>3</sub> and elution with aq. K<sub>2</sub>HPO<sub>4</sub>. The efficiency of the enzyme is associated with the presence of this protein. W. L. D.

Fatty acids and glycerides of solid seed fats. III. Seed fat of Madhuca (Bassia) latifolia (mowrah fat). T. P. HILDITCH and M. B. ICHA-PORIA. IV. Seed fat of *M. butyracea* (phulwara butter). W. J. BUSHELL and T. P. HILDITCH. V. Shea butter. T. G. GREEN and T. P. HILDITCH (J.S.C.I., 1938, 57, 44-48, 48-49, 49-53).-III. A specimen of neutralised mowrah fat (from the seeds of M. latifolia, Sapotaceæ) contained palmitic 23.7, stearic 19.3, oleic 43.3, and linoleic acid 13.7 wt.-%. The fat contained 2.1% of unsaponifiable matter and 1.2% of fully-saturated glycerides (mainly dipalmitostearin) (cf. Dhingra et al., B., 1933, 513). The neutral fat was separated into three portions of varying solubility in COMe2, each part being analysed for component acids and, after hydrogenation, for tristearin content. The glycerides present in each portion were estimated from the data so obtained, and it was shown that, approx., the whole fat was made up of : dipalmitostearin 1, "oleo"-dipalmitin 1, "oleo "-palmitostearin 27, palmitodi-" oleins " 41, and stearodi-" oleins " 30 mol.-% (" oleo "- and " olein " denote glycerides of either oleic or linoleic acid). Up to about 5% of tri-unsaturated glycerides FF (B.)

may also be present. The fat conforms to the "evenly-distributed" type of mixed glycerides characteristic of seed fats. The proportions of palmito- and stearo-di-" oleins" are close to those calc. by apportioning the unsaturated acids in the ratio of the palmitic and stearic acids present in the whole fat, and combining each increment of unsaturated acids separately with the latter to give mono- and di-unsaturated glycerides; the monounsaturated glycerides occur, however, as far as possible in the trebly mixed form (" oleo "-palmitostearins).

IV. The component acids of phulwara butter were mainly palmitic (56.6) and oleic (36.0), with minor amounts of stearic (3.6) and linoleic acid (3.8 wt.-%) and possibly traces of myristic acid. The high content of palmitic acid and very low content of stearic acid are noteworthy. The fat also contains more fully-saturated glycerides than is usual in a seed fat with the observed proportions of saturated and unsaturated acids. Chief glyceride components were about 62% of "oleo"-dipalmitins and about 23% of palmitodi-" oleins," with subordinate amounts of tripalmitin (~8%) and, probably, "oleo"-palmitostearins (~7%).

V. A specimen of neutralised shea butter contained palmitic 5.7, stearic 40.4, oleic 50.0, and linoleic acid 3.9 wt.-%. The component glycerides were approx. stearodi-"oleins" 45, oleodistearins 35, palmitodi-"oleins" 10 mol.-%, with about 5% each of palmitostearins and of tri-"olein." Minor proportions of oleopalmitostearins may also be present. The fat is of the characteristic "evenly-distributed " type, although the amounts of the fully-saturated and tri-unsaturated components are somewhat > usual for a component fatty acid mixture containing the observed proportions of saturated and unsaturated acids. The circumstance that, in a no. of fats recently studied by these methods, the linoleic acid has been shown to be mainly present in di-unsaturated glycerides, and almost absent from the monounsaturated glycerides, is shown to be merely a necessary consequence of the operation of the "rule of even distribution," linoleic acid being a minor component and oleic acid a major component in all the fats in question.

Preparation of pure fatty acids from fats, in particular from castor oil. M. JAKEŠ and J. HÖKL (Chem. Listy, 1938, 32, 15—22).—The generally applied methods of prep. of fatty acids fail in presence of OH-acids, owing to ester and lactone formation, which are shown to take place in the case of ricinoleic acid, to yield a variety of products (ricinoleolactone, ricinoleylricinoleic acid and its lactone). R. T.

Determination of unsaponifiable matter in oils and fats. Sub-Committee of Analytical Methods Committee on Methods of Soap Analysis (Analyst, 1937, 62, 863—864; cf. B., 1933, 434).—The specified amount of KOH (*loc. cit.*) is sufficient in cases of high sap. val. even when the max. specified wt. of oil is taken. This wt. of oil is sufficient for all ordinary purposes, but the amount may be increased provided that the vols. of reagents and solvents are increased in the same proportion.  $Et_2O$  is preferred to light petroleum as being suitable for all oils. E. C. S.

Detection of rancidity in fats and edible oils. K. SPORZYŃSKA (Przemysł Chem., 1938, 22, 3—8).— Fats containing H<sub>2</sub>O or composed of glycerides of saturated acids yield chiefly ketonic, whilst unsaturated acids yield aldehydic, products when exposed to the action of light, heat, and O<sub>2</sub>. Rancid fats are those which give a dark blue coloration with KI and starch paste, a positive Kreis reaction, a positive reaction with o-OH·C<sub>6</sub>H<sub>4</sub>·CHO, and contain >1·4% of free solid or >0.5% of liquid fatty acids. R. T.

Index of rancidity [of fats] and influence of extraneous substances. G. CURLI (Annali Chim. Appl., 1937, 27, 519—523).—Issoglio's method (A., 1916, ii, 401) of determining the index of rancidity of fats is recommended. The index is increased by addition to the fat of benzoate, salicylate, and, to a greater extent,  $CH_2O$ . F. O. H.

Improved Kreis test. W. P. WALTERS, M. M. MUERS, and E. B. ANDERSON (J.S.C.I., 1938, 57, 53-56).—A new test is described in which CCl<sub>3</sub>·CO<sub>2</sub>H dissolved in amyl acetate is substituted for the mineral acids used in previous Kreis tests. The phloroglucinol used is dissolved separately in amyl acetate. These modifications make the reaction proceed in one phase, with the result that the colour can be measured directly either on the Lovibond tintometer or the Zeiss photometer. Atm. O2 is an important factor in the formation of the Kreis coloured substance. The reaction in the new test cannot be allowed to proceed to completion because of the formation of a secondary yellow colour, and therefore the conditions of concn. of reactants, temp., and the time taken for the test have been stipulated. The test is superior to preceding Kreis tests both in accuracy and sensitivity, and this is most marked in the stage of early oxidative spoilage in fats.

Semi-micro-butyric acid value. IV. F. T. VAN VOORST (Chem. Weekblad, 1937, 34, 804-806).—More precise details are given for carrying out this determination (cf. B., 1937, 150). The method can be applied to butter biscuits, cakes, sweetmeats, hard and soft cheese, chocolate milk, milk chocolate, cream toffee, and cream pudding powders, details being given in each case. S. C.

Oiticica oil. A. MACHADO and A. S. PEIXOTO (Revista Chim. Ind., 1937, 6, 464-466).—Oiticica oil heated at 250° for 10 min. gives CO<sub>2</sub> and a *ketone* (I), presumably formed from  $\alpha$ -couepic acid (cf. Kappelmeier, B., 1936, 67). Gelling of the oil is attributed to formation, by loss of H<sub>2</sub>O, of unsaturated hydrocarbons from (I), with subsequent polymerisation. F. R. G.

Substitution of tung oil. H. F. D. BROOKES (Paint Manuf., 1936, 6, 36—37).—A discussion. Oiticica oil is the only oil suitable as a 100% substitute for tung oil. CH. ABS. (e)

Relations between the constants of wood oil. E. D. G. FRAHM and D. R. KOOLHAAS (Rec. trav. chim., 1938, 57, 79–89).—Relations between the n of samples of fresh oil from *Aleurites montana* and the diene no., bromometric I val., Wijs I val., and the dispersion are given. The effect of the acid val. and diene no. on the time of gelatinisation is also given. Ageing by polymerisation decreases the diene no., I val., and dispersion linearly with the n; thus it is possible to obtain the fresh oil const. of any oil by extrapolation to the fresh-oil curve. K. W. P.

Safflower oil. J. S. REMINGTON (Paint. Manuf., 1936, 6, 50—52).—The properties of the oil as a drying oil are given. Its great advantage is its low acid val. Stand oil made from it makes excellent interior enamels. In the bleached condition it could be used for artists' colours, as a salad oil, and in soap manufacture. CH. ABS. (e)

Separation of oil from sunflower-seed pulp with water. A. GOLDOVSKI (Maslob. Shir. Delo, 1935, 11, 530—534).—The oil yield increased with rise of temp. of the  $H_2O$  added to the pulp up to 40°, and decreased progressively at higher temp. Small additions or KOH or HCl decreased the yield; salt had no effect. CH. ABS. (e)

Preparation of stand oils from sunflower oil. E. STOCK (Farben-Ztg., 1938, 43, 134).—Various factory procedures for the heat-bodying of sunflower oil (after preliminary removal of mucilage by simple heating or by the use of bleaching earths) are detailed. S. S. W.

Effect of variety, maturity, and soundness on certain soya-bean seed and oil characteristics. J. F. O'KELLY and M. GIEGER (Assoc. Southern Agr. Workers, Proc. XXXIV—XXXVI Ann. Conv., 1933— 5, 460).—Seed of the Laredo variety usually contained less crude fat and crude protein, and more crude fibre, N-free extract, and ash, than did other varieties. It also had a higher n and I val. Beans harvested before maturity contained more fat, protein, and fibre, considerably less N-free extract, and slightly less ash than did mature beans. Decomp. of the beans was accompanied by a considerable increase in the fat and protein, a slight increase in ash and fibre, and a considerable decrease in N-free extract.

Сн. Авз. (е)

Constituents of sapucainha oil. T. KARIYONE and Y. HASEGAWA (J. Pharm. Soc. Japan, 1934, 54, 141—145).—Sapucainha oil, from *Carpotroche* brasiliensis, had  $d_{20}^{20}$  0.9503, m.p. 22°, f.p. 13—15°,  $[\alpha]_{50}^{20}$  +54.2°, acid val. 17, sap. val. 195, I val. 101. A small quantity of cryst. phytosterol, m.p. 121°, and a crude fat acid, m.p. 43°,  $[\alpha]_{50}^{20}$  +56.4°, acid val. 214, I val. 109, were obtained on saponification. Pure chaulmoogric acid (I) (m.p. 68°; acid amide, m.p. 102°) was obtained by repeated recrystallisation of the latter from 70% EtOH. Hydnocarpic acid (m.p. 58°; acid amide, m.p. 105—106°) was obtained from the mother-liquor of (I). CH. ABS. (e)

Physical and chemical properties of cocklebur (Xanthium commune, Britton) oil. L. TUSSING and R. E. DUNBAR (Proc. S. Dakota Acad. Sci., 1935, 15, 14–16).—Extraction of ground cocklebur yields  $4\cdot63$ — $7\cdot45\%$  of oil, depending on the solvent used. Successively greater amounts were obtained in the following order: (CH<sub>2</sub>Cl)<sub>2</sub>, petroleum, COMe<sub>2</sub>, CCl<sub>4</sub>, CHCl<sub>3</sub>, CS<sub>2</sub>, and C<sub>6</sub>H<sub>6</sub>. CH. ABS. (e) Fatty oil from the fruit Juglans manshurica wax. J. V. BRANKE and A. A. KOMISSARTSCHUK (Bull. Far East. Branch Acad. Sci. U.S.S.R., 1935, No. 14, 85—103).—The fruit kernels contain 57— 58% of oil ( $d_{15}$  0.9275,  $n_D^{so}$  1.4790, acid val. 0.78, sap. val. 188.1, ester val. 187.57, I val. 158.16, unsaponifiable matter 0.53%). The composition of the fat acids was : palmitic 2.9, stearic 0.6, oleic 18.69, linoleic 76.27, and linolenic acid 2.24%. CH. ABS. (e)

Temperature [of formation in vivo] as a modifying factor in the composition of oils. P. BALAVOINE (Arch. Sci. phys. nat., 1937, [v], 19, Suppl., 83—84).—The I val. of nut oils is the highest for nuts grown under cold, wet climatic conditions. Fats from cold-blooded animals also give higher I vals., and a variation with the prevailing temp. is observed in fats from different parts of the same animal. A. J. E. W.

Characteristics of some reputed cod-liver oils. R. H. COMMON (Analyst, 1937, 62, 784– 786).—The following data are tabulated for 18 oils sold for stock-feeding :  $d_{10.6}^{10.6}$ ,  $n_D^{40}$ , free fatty acids, sap. val., I val. (Wijs), blue val., unsaponifiable matter, I val. and nature of the unsaponifiables, fluorescence in ultra-violet light. The last indicates addition of mineral oil (bright blue fluorescence); sperm oil appears greenish-blue, but unless >50% is present the colour is masked by the bright grassgreen fluorescence of shark- or cod-liver oil. Sharkliver oils are detected by vac.-distillation at 260°, and passing dry HCl into a solution of the distillate in COMe<sub>2</sub>, when characteristic crystals of squalene hydrochloride separate. Certain of the oils tested contained mineral, sperm, or shark-liver oil. J. G.

Vitamin-A content of grayfish-liver oil. (Squalus sucklii). L. I. PUGSLEY (Progr. Repts. Biol. Bd. Canada, 1937, No. 34, 3—7; cf. B., 1937, 807).—The -A content of the oil ranged from 1350 blue units per g. in small specimens to 8260 units in oil from pregnant females, which were the heaviest specimens. The colour, blue units per g., and  $\epsilon$ val. from month to month are tabulated. E. C. S.

Fish oils. V. Effect of various treatments on rate of oxidation of pilchard oil. O. F. DENSTEDT and H. N. BROCKLESBY (J. Biol. Bd. Canada, 1936, 1, No. 6, 487-496; cf. B., 1936, 159).-Pilchard oil has a shorter inductive period and a greater rate of oxidation than other drying oils. Polymerisation by heat prolongs this period and diminishes the rate of oxidation, whilst polymerisation by ultra-violet light shortens the period, increases the rate of oxidation, and reduces the total O absorbed. Refining increases the susceptibility to oxidation. Treatment with dry SO<sub>2</sub> eliminates the induction period. The influence of driers, mineral pigments, and antioxidants on the rate of oxidation of the oil was studied. CH. ABS. (e)

Contamination of whale oil with fuel oil. E. R. BOLTON and K. A. WILLIAMS (Analyst, 1938, 63, 84-93).-100 g. of the oil are saponified with NaOH in purified methylated spirit, and the unsaponifiable matter is extracted from the digest with petroleum spirit (5 extractions). The extract is thoroughly washed with dil. aq. EtOH and aq. alcoholic alkali successively, and the unsaponifiable substances are then subjected to a second saponification and extraction as laid down in the official method (cf. B., 1933, 434). The extract is treated with  $Ac_2O$ , in which fuel oil is insol. in the cold and is recognisable as brown, oily droplets, distinct from sterol acetates. These are removed if present by further addition of  $Ac_2O$ . The fuel oil is separated from the  $Ac_2O$  solution of sterols etc., taken up in light petroleum, washed, and determined by weighing. 0.015% of fuel oil added to whale oil is recovered to the extent of 50—70\%. A further confirmatory test of the presence of fuel oil, based on chromatographic analysis, is also described. E. C. S.

Fatty oils of smoked fish. E. TAKAHASHI and Y. MASUDA (J. Agric. Chem. Soc. Japan, 1938, 14, 19—27).—The acid val., n, and I val. of herring oil increased after smoking, and there was a large increase in free fatty acid, whilst  $O_2$  absorption, peroxide val., and Kreis test were very small compared with those of non-smoked fresh oils. After hydrolysis the mixed fatty acids of smoked oils had no antioxygenic properties, and the unsaponifiable matter when added to fresh oil showed a tendency to increase oxidation of the latter. J. N. A.

Separation of the highly unsaturated acids of fish oils by molecular distillation. E. H. FARMER and F. A. VAN DEN HEUVEL (J.S.C.I., 1938, 57, 24-31).—The mixed esters of the more highly unsaturated acids contained in cod-liver oil, Japanese sardine oil, and cod-halibut-liver oil can be conveniently and expeditiously separated into fractions which are homogeneous as regards the chain-length of the component acids by distillation at about 10-4 mm. in a mol. still of the Waterman type. The theoretical factors involved in the separation of the numerous and diverse fatty acids which occur in the oils are discussed and the limits of successful operation indicated. The highly unsaturated acids isolated by the Li soap-COMe<sub>2</sub> procedure from the total mixed acids of the oils are converted into their Me esters and distilled once as a whole to segregate oxidised material and impurities and twice fractionally according to the systematic procedure described. In this way the esters of the  $C_{16}$ ,  $C_{18}$ ,  $C_{20}$ , and  $C_{22}$  acids are isolated in good yield in separate fractions and the  $C_{24}$  and higher acids in a fifth fraction not yet examined. No significant difference has been detected between the fractions finally isolated from the mixed acids of the three different fish oils. The C22 fraction from cod-liver oil has exactly hexaene unsaturation and appears to consist of the ester of a single substance, docosahexaenoic acid,  $C_{22}H_{32}O_2$ . The  $C_{20}$ ,  $C_{18}$ , and  $C_{16}$  fractions, on the other hand, have unsaturation corresponding with 4.87, 2.7, and 1.3 double linkings respectively, and each consists of a mixture of two or more acids of the same chainlength but of different degrees of unsaturation. None of the ester fractions finally isolated, or of the fractions obtained intermediately, shows exaltation of the mol. refraction, and all show a straight-line relationship between the refractive index and the H<sub>2</sub> val. The strict observance of the latter relationship affords an empirical criterion of the freedom from heat-isomerisation of the acids or esters, and it is shown that the unsaturated acids previously isolated from sardine oil all display some degree of exaltation of the mol. refraction and few conform to the linear  $n-H_2$  val. relationship. The various acids isolated by Farmer and Webb (unpublished) and by Toyama and Tsuchiya (A., 1935, 960 *et seq.*) are discussed in this connexion.

Deodorised train oils. WITTKA (Allgem. Oel- u. Fett-Ztg., 1938, 35, 11—12).—Simple and inexpensive heat-treatment (no details given) of fish or whale oils suffices to produce odourless oils, capable of yielding odourless soaps. The plant lends itself to the production of oils for soap-making, oleines, or paint oils. Other (unspecified) processes are available for the deodorisation of train oil soap stock. E. L.

Chemical engineering trends in the soap industry. O. H. WURSTER (Chem. Met. Eng., 1938, 45, 16-20) .- Discoloration of soap due to impurities and rancidity is prevented by the use of stainless-steel or Ni equipment and antioxidants, e.g., NHPh,. Processes for the continuous saponification of fats and oil by NaOH with recovery of glycerin (I) are being developed. Of those in operation, one uses an accelerator, but without recovery of (I); in another, saponification is carried out under pressure, with flashing-off of H<sub>2</sub>O and (I) into a vac. chamber, leaving anhyd. soap. Continuous fatsplitting, with the separation of fatty acids by distillation, and the choice of the appropriate acid for soap required, has possibilities. Countercurrent operation has increased the (I) content of spent soap liquors to 10-11%. The use of FeCl<sub>3</sub> instead of  $Al_2(SO_4)_3$  as a coagulant, and of HCl for  $H_2SO_4$  for neutralisation, leads to economy in NaCl for saltingout. The best material for (I) evaporators is Ni-Cr cast Fe. D. K. M.

Properties of the sodium soap prepared with hardened oils. Y. KAWAKAMI (J. Electrochem. Assoc. Japan, 1935, 3, 389—394).—Oils from soya bean, rice, soya, and chrysalide, having I vals. of approx. 70, give toilet and laundry soaps with properties similar to those of tallow soap, although their turbidity points are lower. Hardened fish oils (I val. 60—65), if mixed in a suitable amount with other fats and oils, can be used without producing any disagreeable effect. CH. ABS. (e)

Catalytic effect of aromatics on the keeping properties of perfumed soaps. H. J. HENK (Seifens.-Ztg., 1938, 65, 8).—A no. of aromatic substances (ionone, linalool, BzOH, etc.) are classified according to their pro- or anti-oxidant propensities. E. L.

Disinfecting soaps. E. STEPANCOVSKI and M. E. RODRÍGUEZ (Rev. farm., Buenos Aires, 1935, 77, 460—465).—Common soaps and most medicinal soaps have no microbicidal power. Afrodol soap shows some activity. A 5% CH<sub>2</sub>O soap destroyed *Esch. coli* in 5 min., but not always microbes of higher resistance. CH. ABS. (e)

Soaps containing silver. A. FOULON (Seifens.-Ztg., 1938, 65, 92-93).-Methods of incorporating active Ag are reviewed; the finest possible state of division, and even distribution of the Ag or of its difficultly sol. derivatives, are important in order to obtain good disinfecting power without discoloration. E. L.

Metallic soaps. I. H. W. CHATFIELD (Paint Manuf., 1936, 6, 70—72).—The prep. and properties of metallic soaps are discussed. Pb naphthenate driers have better drying properties than linoleates, although their induction period is longer. CH. ABS. (e)

Filling of soft soaps with Tylose. K. OTTO (Seifens.-Ztg., 1938, 65, 91).—Practical hints on the manufacture of suitable soap base (which must be finished rather more alkaline than usual) are given. E. L.

Solvation of soaps and turbidity of soap solutions in relation to temperature. B. TIUTIUN-NIKOV and A. TSCHERNITSCHKINA (Maslob. Shir. Delo, 1935, **11**, 545—547).—Stearic and palmitic soap solutions form insol. ppts. at 0.25% concn. at lower temp. than do the 0.5% solutions. Oleic, *iso*oleic, rosin, naphthenic, and castor oil soaps lower the temp. at which stearic and palmitic soap solutions form insol. ppts. CH. ABS. (e)

Reports of the Sub-Committee on Methods of Soap Analysis. IV. Determination of free alkali and silica in silicated soaps. V. Determination of rosin in soaps (Analyst, 1937, 62, 865-868, 868-870).-IV. Free caustic alkali is empirically determined by adding 10 g. of the soap in thin shavings to 100 ml. of neutral industrial EtOH at 70°, allowing the residue to settle, and titrating 50 ml. of the clear liquid at 70° to phenolphthalein until the pink colour just disappears. The insol. residue is used for the determination of free alkali due to CO<sub>3</sub>" and SiO<sub>3</sub>" by washing with EtOH, dissolving in H<sub>2</sub>O, and titrating to Me-orange. No method for combined alkali is recommended, but a method for the determination of total free and combined alkali, based on removal of fatty acid with Et<sub>2</sub>O after acidifying with a known vol. of  $H_2SO_4$ , and titrating the excess of the latter, is described. For the determination of SiO<sub>2</sub> present as alkaline silicates the standard method of the American Chem. Soc. (B., 1937, 365) is recommended.

V. McNicoll's method (J.S.C.I., 1921, 40, 124T) is recommended for adoption in preference to Wolff's as modified by the Committee of the American Chem. Soc. (*loc. cit.*). E. C. S.

Determination of fatty and other organic acids, unsaponified fat, and unsaponifiable material in soap. V. G. RAVITSCH (Zavod. Lab., 1937, 6, 822—823).—The calorific val. of the soap under analysis is compared with that of Na oleate, and the content of org. material is calc. therefrom as oleic acid. The differences between the org. acid content as determined by this and the standard method vary by from -0.9 to 0.21% for a no. of soaps.

R. T.

Microchemical analysis of coloured specks and crystalline occlusions in soap bars. H. K. ALBER and C. J. RODDEN (Ind. Eng. Chem. [Anal.], 1938, **10**, 47–50).—The application of microchemical methods to industrial problems is illustrated by the analysis of heterogeneous particles in soap bars. Attempts to apply macro-methods failed, but the use of micro-methods enabled the disturbances occurring during manufacture to be eliminated. The main constituent of the cryst. inclusions in the soap proved to be  $Na_2SO_4$ . A micro-Pt filter boat, made by piercing the bottom of the ordinary C and H boat with holes and filling with a layer of Pt sponge, permitted 7 quant. determinations to be carried out on a 1.3-mg. sample. L. S. T.

Determination of combined carbon dioxide in soaps and other detergents. L. B. HITCHCOCK and R. E. DIVINE (Oil & Soap, 1938, 15, 8—10).—A simple, rapid, volumetric method for the determination of combined  $CO_2$  in soaps, soap powders, "50%liquid NaOH," etc. is described : the gas liberated by acidification (HCl) of the material within a closed, partly-evacuated system consisting of a reaction flask connected to an absorption flask (each supplied with a tap funnel for admission of reagents) is absorbed in a measured amount of an alkaline absorbing solution (equal vols. of N-NaOH and N-BaCl<sub>2</sub>), the excess of which is titrated with standard NaHCO<sub>3</sub>. E. L.

Changing trends in detergents. W. C. GANG-LOFF (Oil & Soap, 1938, 15, 14-17).—Various types of the new detergents (Igepons etc.) are briefly discussed. E. L.

Liquid fuel from vegetable oil. Lubricating oil.—See II. Sulphonated oils in paper coating.— See V. Corrosion of metals by oils.—See X. Train oil for paint. Tung oil.—See XIII. Examining bakery products containing fat. Effects of Cu and Fe on milk fat. Butter fat. Identifying coconut fat in cheese. [Products from] low-grade coffee.—See XIX.

See also A., II, 82, Determination of linoleic acids. 83, Prep. of ketones from higher fatty acids. 97, Prep. of  $\beta$ -sitosterol. 112, Determination of diene val. III, 209, Determining component acids of butter fat. 210, Fatty substances of Japanese wild bees and their combs. 214—8, Vitamins.

#### PATENTS.

Substitute for butter intended for use in tropical regions. C. ELLIS, Assr. to ELLIS-FOSTER Co. (U.S.P. 2,054,072, 15.9.36. Appl., 10.9.30. Renewed 2.5.35).—The protein-free anhyd. product comprises a homogenised mixture of medicinal mineral oil (e.g., Nujol, 4 pts.) and hydrogenated (vegetable) oil (e.g., 1 pt. of hardened cottonseed oil, m.p.  $60^{\circ}$ ) with colouring matter and flavouring as desired. NaCl is (preferably) incorporated by grinding it in the mineral oil, or by previously absorbing it on a floating agent (e.g., maize pith), which maintains it in suspension in the fat product. E. L.

Degreasing of [metal and like] non-absorbent articles. W. E. BOOTH, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 469,675, 30.1.36).—In order to remove soap, grit,  $H_2O$ , etc. which interfere with solvent-degreasing, the metal etc. articles are pretreated with a relatively non-volatile oil (e.g., Diesel) which is miscible with the solvent employed in the subsequent degreasing operation. E. L. Apparatus for extraction of [whale] oil. E. F. HEYERDAHL (B.P. 477,636, 17.9.36).—Whale meat or the like is placed in a perforated drum rotating on a horizontal axis in a digester. There is continuous discharge of pulp from above the bottom to an oil separator, and also a return pipe from the bottom of the separator back to the drum used to return old liquor under the residual pressure in the former to a new charge in the drum before it is closed. B. M. V.

Extraction of cashew nut-shell oil. W. JEFFERIES, and PEIRCE, LESLIE & Co., LTD. (B.P. 472,195-6, 28.8.36).-(A) Unshelled cashew nuts are made to travel in a single submerged layer through a tank of heated cashew nut-shell oil, by means of an endless conveyor belt travelling over two sprocket wheels situated within the tank and provided with transverse ribs on its outer surface which drag the nuts through the confined space between the belt and a false bottom situated a little above the heated bottom of the tank. This false bottom is curved upwards at the outlet end of the tank, so as to facilitate the drainage and discharge of the nuts at an outlet above the level of the oil in the tank. (B) Scraper gear comprising a no. of parallel endless chains fitted with transverse scraper blades and travelling over sprocket wheels fitted within the tank are arranged so as to scrape the floor of the tank over its whole width, and so transfer any dirt or sediment to a sump at one end of the tank. E. L.

Heat-treatment of fatty oils in contact with steam. J. STEWART (B.P. 477,717, 7.10.36).—The oil is circulated in a closed cycle between the treater and an external heater.  $H_2O$  vapour is withdrawn and circulated by a steam jet or by the pump used for charging. B. M. V.

Soap. A. J. LORENZ, ASST. to LEVER BROS. Co. (U.S.P. 2,060,228, 10.11.36. Appl., 18.6.31).— Irradiated ergosterol (or other sterol) is incorporated in ordinary toilet soap (e.g., during crutching) to yield a product having beneficial dermatological properties. E. L.

Soap-cooling presses. H. SIMON, LTD., H. C. LEDGER, and J. GRAHAM (B.P. 477,701, 17.7.36).— Construction of a  $H_2O$ -cooled wall is described.

B. M. V. B. M. V. Testing and restoring the effectiveness of detergent baths. F. H. MACKENZIE, Assr. to AMER. CHEM. PAINT Co. (U.S.P. 2,068,498, 19.1.37. Appl., 12.1.35).—Of a solution of Na<sub>2</sub>CO<sub>3</sub> and soap the electrical conductivity and the longevity of foam (produced by air injection) are measured and the solution is allowed to settle to enable suspended

B. M. V.

Manufacture of a water-softening cleanser. B. O. CRITES, Assr. to CLIMALENE Co. (U.S.P. 2,065,117, 22.12.36. Appl., 19.4.33).-45-65 pts. of a normally solid, soapmaking fatty acid ( $\langle 98 \rangle_0$  of free acid) is melted (at 50°) with 35-45 pts. of Na<sub>4</sub>H<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub>;3H<sub>2</sub>O and 2-10 pts. of Na<sub>3</sub>PO<sub>4</sub>, the mixture being agitated until pebble-like masses are

matter to be measured. After decantation, soap and

soda are added to bring the bath to the desired

standard.

formed; these are afterwards disintegrated to dustless granules. B. M. V.

Removing volatile matter from liquids.—See I. Lubricants.—See II. Vitamin prep. Highvac. distillation.—See XX.

# XIII.—PLASTICS; RESINS; PAINTS; COATING COMPOSITIONS.

Plastic materials. H. BURRELL (Mech. Eng., 1937, 59, 917—922).—The types available, *e.g.*, Bakelite, and their applications are reviewed.

R. B. C.

Development of organic plastics. W. Voss (Papier-Fabr., 1938, **36**, 25–29).—A survey of recent developments in the uses of synthetic resins and cellulose esters for lacquers and moulding compounds. D. A. C.

Catalysis of polymerisation reactions. R. E. VOGEL (Chem.-Ztg., 1938, 62, 51—53).—The technical applications of gaseous, liquid, and solid catalysts and inhibitors are discussed in relation to the production of synthetic plastics. J. S. A.

Plastics : applications and methods of testing. T. S. TAYLOR (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 5-21).—A lecture. R. B. C.

Design problems of moulded plastic parts. D. M. BUCHANAN (Mech. Eng., 1937, 59, 907—913).— An illustrated practical discussion. R. B. C.

Processing of plastic masses and their properties. E. PALLAS (Gummi-Ztg., 1938, 52, 219– 222).—A review. S. M.

Grinding and polishing of plastics. F. OHL (Oberflächentech., 1937, 14, 183–185).—Practical details are given. C. E. H.

Iodine value of shellac. R. W. ALDIS (Analyst, 1937, 62, 792).—In view of the fact that certain consumers of shellac have obtained high I val. by using glacial AcOH without dilution, attention is directed to the earlier work on this determination. The A.S.T.M. specification (1930, p. 299) has been found satisfactory. J. G.

Polystyrene. ANON. (Brit. Plastics, 1938, 9, 477–478).—The properties, mol. structure, methods of application, and the available commercial varieties of polystyrene and the methods of forming and polymerising the monomeride are outlined.

J. W. CR.

Production of hard coumarone resins. R. LIEBETANZ (Seifens.-Ztg., 1938, 65, 103).—The dark sol. resins found in the distillation residues from benzol that has only been washed with dil.  $H_2SO_4$  are converted into pale, hard resins by treating the residues (in which sufficient solvent remains or is added if needed) with 6—8% (calc. on the resins) of cone.  $H_2SO_4$ . E. L.

Systematic method for evaluating lacquer plasticisers. C. F. SILLECK and W. H. GARDNER (Paint, Oil & Chem. Rev., 1937, 99, No. 26, Reprint, 5 pp.).—Properties required in plasticisers are reviewed and an evaluating procedure is recommended. S. M. Train oils in paint films. F. OHL (Oberflächentech., 1938, 15, 31-33).—Only the polymerised oils are of any use for protective films. The general properties (drying time,  $H_2O$ -resistance, and hardness) are improved by incorporating artificial (Albertol) resins, by exposing the oil to summer sunshine, and by irradiation. Some experiments are recorded in which the linseed oil component of a modified phenolic resin was gradually replaced by a fish oil; the products were slow-drying and had high  $H_2O$ -permeability even when the mixtures were cooked at 300°. S. M.

Oil-free binder for cheap ["flatting "] paints. E. STOCK (Farben-Chem., 1938, 9, 14).—The Zn salt of rosin acids is pptd., dried, and mixed with refined petroleum. The binder thus produced can be ground with the usual body colours, whilst the gloss and elasticity of the resultant paint may be improved by adding small quantities of linseed oil varnish. D. A. C.

Grinding and paint media. W. BROWN (J. Oil Col. Chem. Assoc., 1937, Buxton Conf. No., 51— 54).—Dry grinding of pigments, production of paste and liquid paints, and the "flushing" of aq. pigment pastes with oil are briefly discussed. S. M.

Use of protective coatings. W. HUSSE (Allgem. Oel- u. Fett-Ztg., 1938, 35, 12—15).—The substitution of other pigments for Pb pigments in rust-protecting paints and the consequent changes in the vehicle necessitated thereby are discussed. E. L.

Flow of paints. E. J. BOND (J. Oil Col. Chem. Assoc., 1937, Buxton Conf. No., 59-61).—The flow and levelling properties of paint films are distinguished and the control of each is briefly discussed. S. M.

Painting of galvanised iron. J. S. REMINGTON (Paint Manuf., 1936, 6, 94-95).-New galvanised surfaces should be left unpainted for 3-4 months to allow roughening of the surface. A Zn-dust paint which is easily mixed and requires no subsequent grinding consists of Zn dust 80 and ZnO 20%, incorporated with 20% of a mixture of raw linseed oil 80 and turpentine 15 pts., together with Co linoleate. CH. ABS. (e)

Preparation of steelwork for painting. H. B. FOOTNER (J. Oil Col. Chem. Assoc., 1937, Buxton Conf. No., 34-44).—Descaling in hot 5% H<sub>2</sub>SO<sub>4</sub> followed by washing and immersion in hot 2%H<sub>3</sub>PO<sub>4</sub> containing 0.3-0.5% of Fe is recommended and details are given. The plates should receive one coat of a primer as soon as they are dry; painting the warm surface improves the adhesion, penetration, drying, and abrasion-resistance of the film. The primer should contain 60-65% of pigment and bodied linseed or tung oil as medium; flow is improved by addition of graphite and. Fe oxides to the usual Pb<sub>3</sub>O<sub>4</sub> content. Removal of mill-scale mechanically, by weathering, and by pickling is discussed. S. M.

Paints for breweries. W. GÜNTHER (Farben-Ztg., 1938, 43, 184—185).—A general review is given of the requirements of such paints, and the suitability of current types of paint for use in breweries is indicated. S. S. W. Wetting and settling of pigments. V. G. JOLLY (J. Oil Col. Chem. Assoc., 1937, Buxton Conf. No., 55—58).—In consequence of limited flocculation red Fe oxide paints possess a structure which retards both settlement of the pigment during storage and close packing of the deposit, which remains soft; the upper liquid is clear. Green paints more usually gave a hard deposit which is attributed to the disappearance of the protective envelopes around the particles; the upper layer is cloudy as the finest particles do not settle. S. M.

Properties and uses of pigments and assistants. ANON. (Farben-Chem., 1938, 9, 8—11).—Data for some blue pigments and dyes are tabulated.

D. A. C.

Colours as catalysts. M. POLANYI (J. Oil Col. Chem. Assoc., 1937, Buxton Conf. No., 3—9).— Catalysts function by reducing either the chemical inertia of the mols. or the distance between them so that the transfer of atoms is facilitated. In the oxidation-reduction of vat and other dyes inertia is avoided by substituting for the transfer of atoms processes which involve only electrolytic dissociation and the transfer of electrons. Illustrative examples are given. S. M.

Effect of cleaning solvent and printing ink vehicle on offset rubber blankets. M. OGURA and K. NAKAZIMA (Res. Bull. Govt. Printing Bur., Tokyo, 1937, No. 3, 21-36).-The swelling of offset blankets in various org. solvents is determined by measuring the elongation of  $1 \times 4.5$  cm. strips. Solvents with the greatest volatility cause the least damage to the blanket owing to their rapid evaporation; thus, of four types of mineral oils examined, petrol was the most suitable as a washing medium, owing to its high volatility and low swelling degree, whilst of the org. solvents C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> is recommended. Of the ingredients of the printing-ink vehicle which may be deposited in the blanket during the washing operation, mineral oils and fatty acids produced the greatest swelling. D. A. C.

Properties of commercial petroleum products as detergents for removal of inks. M. OGURA, T. KASUGAI, and K. NAKAZIMA (Res. Bull. Govt. Printing Bur., Tokyo, 1937, No. 3, 7—20).—The evaporation rates and solvent power of petrol, kerosene, light oil, and mineral spirit on lithographic varnish are investigated, as well as the solubility changes of the varnish during drying. D. A. C.

Action of moulds on ink in writing. C. A. MITCHELL and D. R. WOOD (Analyst, 1938, 63, 111).— The  $NH_2Ph$  dye in blue-black ink on parchment documents faded in 2 years to yellowish-brown as a result of the growth of moulds. A *Penicillium* and an *Aspergillus* were isolated. E. C. S.

Composition of American steam-distilled wood turpentine and method for its identification. T. C. CHADWICK and S. PALKIN (Proc. Amer. Soc. Test. Mat., 1937, 37, II, 574—581).—The compositions of steam-distilled wood turpentine and gum spirits are compared. Methods for detecting PhCHO (as the 2:4-dinitrophenylhydrazone) and fenchyl alcohol (as the acid phthalate) in wood turpentine are given. These substances are absent from gum spirits. R. B. C.

Pine oil produced in Latvia and its purification. R. LIEPINŠ (Acta Univ. Latviensis, Lauk. Fak., 1930, Ser. I, 83—99).—Fractions of b.p.  $<150-153^{\circ}$ are removed first. The residue is then treated at  $>100^{\circ}$  with powdered CaO or soda-lime. Better results were obtained by using Na<sub>2</sub>O<sub>2</sub> (30 g. per kg. of crude oil). CH. Abs. (e)

Tung oil as raw material for varnishes and synthetic resins. III. Conclusion. E. FON-ROBERT (Paint Manuf., 1936, 6, 45–48; cf. B., 1936, 607).—A review of the applications of tung oil and of the use of oiticica oil as substitute. CH. ABS. (e)

Fundamental properties of oils in films. J. L. KING (J. Oil Col. Chem. Assoc., 1937, Buxton Conf. No., 45-49).—Adoption of the T-shaped formula for glycerides (cf. Jordan, B., 1934, 333) is criticised; the E-form is preferred from compressive forcearea data of unimol. films. S. M.

Trends in industrial finishes. W. KRUMB-HAAR (Chem. Met. Eng., 1938, 45, 9—11).—Recent developments in the use of resins and nitrocellulose for coating ferrous articles are reviewed. D. K. M.

Oil-free lacquers. F. KOLKE (Farben-Ztg., 1938, 43, 133).—In view of German shortage of drying oils, the use of synthetic plasticising materials in place of linseed oil etc. in paints is advocated. The requirements of such "oil-free" paints (excluding spirit varnish, cellulose lacquers, chlorinated rubber) are outlined, and their limitations (restriction to interior use, non-availability as clears, unsuitability for floor paints, etc.) are indicated. S. S. W.

Chemical detection of synthetic resins [etc.] used in varnishes. H. WAGNER and H. SCHIRMER (Farben-Ztg., 1938, 43, 131–133, 157–158).— General information is given on solubility, miscibility, behaviour under filtered ultra-violet light, and reaction to the Storch-Morawski test of the various products concerned, and a series of analytical procedures covering, respectively, the following types of synthetic resin : coumarone, aldehyde, ketone, urea-CH<sub>2</sub>O, phenol-CH<sub>2</sub>O, alkyd, rosin-maleic anhydride, vinyl, also chlorinated rubber, cellulose esters and ethers are detailed. S. S. W.

Varnishes for machinery. E. STOCK (Farben-Chem., 1938, 9, 7, 12—14).—The properties, composition, and origin of some protective varnishes for Fe and wooden machine parts are described. D. A. C.

Appliance for testing elasticity of paint and varnish films. E. J. GOLDENSCHTEIN and A. M. LAZAREV (Zavod. Lab., 1937 6, 982—986).—Apparatus is described. R. T.

Refrigerator enamels. A. JONES (Paint Manuf., 1936, 6, 78-79).—Lactic acid is extremely active in breaking down paint films. In general, an oil undercoat and a 4-hr. synthetic oil enamel are suitable because of easy brushing and quick settingup of the films. The urea and glyptal types of resins are sprayed. Precautions in applying films are reviewed. CH. ABS. (e) Formation of sediment in japan driers. A. A. KRAEFF (Verfkronick, 1935, 8, 180–181).—Sedimentation is frequently due to crystallisation or flocculation of the drier from a supersaturated solution, or to pptn. of oxidised fatty acids or their salts.

Wax-containing gloss, staining, and polishing media for wood, synthetic materials, and lacquered surfaces. L. IVANOVSZKY (Farbe u. Lack, 1938, 29-30, 41-42, 55-56).—Paste and liquid types for floors, linoleum, plastic wood, furniture, etc. are described, the components discussed, and the prep. of an automobile polish is outlined. S. M.

Colloid grinding.—See I. Plastic bitumen compounds.—See II.  $\eta$  of cellulose ester solutions. Transfer papers.—See V. Bingham plastometer.—See VIII. Polarographic analysis [of pigments].—See XI. Sunflower stand oil. Train oils. Metallic soaps.—See XII. Caseinfilmed leather.—See XV. Soil corrosion.—See XVI. N'garo.—See XX.

See also A., II, 116, Phthalocyanine-like pigments.

#### PATENTS.

Manufacture of moulded fibre-containing articles. ALBERT PRODUCTS, LTD. (B.P. 469,583, 5.11.36. Ger., 5.12.35).—Fibrous material containing long fibres is impregnated with an aq. solution (a catalyst such as  $NH_3$  may be added) of hardenable phenol-alcohols obtained by alkaline condensation of a phenol with  $CH_2O$ . Hardenable phenol– $CH_2O$ resins may be added to bind free  $CH_2O$ . The moulded products have superior  $H_2O$ - and electrical surface-resistance and heat-stability. J. W. CR.

Manufacture of material and articles from resinous substances. N. A. DE BRUYNE, and DE HAVILLAND AIRCRAFT CO., LTD. (B.P. 470,331, 31.1.36).—A composite material comprising a reinforcing material (cellulosic fabric) impregnated with a resinous or thermoplastic substance (phenol- or urea-CH<sub>2</sub>O resin, cellulose acetate, acrylic esters) is subjected, during or after solidification of the impregnant, to a tensile stress (2000 lb./sq. in.)  $\leq$ the max. stress which it is liable to meet in service.

S. S. W.

Thermoplastic moulding. J. W. MACKLIN (B.P. 477,398, 26.5.36).—Molten cellulose acetate or the like is applied to a metal article by injection into a mould through a no. of apertures so distributed that the pressure of the entering fluid does not disturb the core-article. B. M. V.

[Moulding compositions from waste] cellulosic material. F. H. SMYSER, Assr. to GEN. ELECTRIC Co. (U.S.P. 2,056,810, 6.10.36. Appl., 13.9.34).—Bagasse, sawdust, etc. are autoclaved with an alkali solution of adjusted concn. and temp. until an acid reaction is obtained; resins are pptd. on the fibres, which are removed, washed, dried, and hot-pressed with a phenol-aldehyde resin. S. M.

Moulding powder. E. H. BALZ, Assr. to PLASKON Co., INC. (U.S.P. 2,056,442, 6.10.36. Appl., 23.2.34). —Regenerated cellulose is impregnated with a thin, mobile condensation product of urea and aq.  $CH_2O$ (in mol. proportion of 1:1.05-1.55) and dried at <60°. An accelerator (e.g.,  $Bz_2O_2$ ) may be added which develops acidity at the moulding temp. The moulded products are very transparent. J. W. CR.

[Urea-formaldehyde] resinous materials and processes for hardening and moulding them. A. M. HOWALD, Assr. to PLASKON CO., INC. (U.S.P. 2,056,453, 6.10.36. Appl., 26.5.28).—Urea-CH<sub>2</sub>O resins prepared in aq. alkaline solution are accelerated with reagents, e.g.,  $\beta$ -bromohydrocinnamic acid and *iso*dibromosuccinic anhydride, which develop acidity by internal rearrangement only on heating, *i.e.*, at the moulding temp. The resins, to which fillers, colouring matter, etc. may be added, are stable on storage and the mouldings are free from shrinkage and warping. J. W. CR.

[Urea-formaldehyde] moulding powders and method of moulding them. A. M. HOWALD, Assr. to PLASKON CO., INC. (U.S.P. 2,056,454, 6.10.36. Appl., 26.9.30).—Urea is treated with aq. CH<sub>2</sub>O in the mol. proportion of approx. 1:2, at  $>65^{\circ}$  and  $p_{\Pi}$  6—7, the  $p_{\Pi}$  of the initial condensate is adjusted to about 6, the product dried at about 60°, and a reagent (urea) added to fix free CH<sub>2</sub>O and to adjust the mol. proportion of urea: CH<sub>2</sub>O to 1:1.5—1.75. A fusible resin (e.g., of PhOH-CH<sub>2</sub>O or glyptal type) is advantageously added as plasticiser, and dissolved in it is an org. acid (e.g., H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> or tartaric) which is solid at ordinary but molten at moulding temp. J. W. CR.

**Urea plastics.** A. M. HOWALD, Assr. to PLASKON Co., INC. (U.S.P. 2,056,456, 6.10.36. Appl., 3.12.31). —Hardening of urea-CH<sub>2</sub>O moulding compositions is accelerated by addition of aromatic acid peroxides  $(e.g., Bz_2O_2)$  which develop acidity at moulding temp.  $(105-180^\circ)$  but are ineffective at  $<105^\circ$ . J. W. CR.

Manufacture of a composite article [bonded with urea-formaldehyde resin]. A. M. HOWALD, Assr. to PLASKON CO., INC. (U.S.P. 2,056,457, 6.10.36. Appl., 24.12.31).—Open-textured felted fibre (e.g., pulp board) is impregnated with the thin, mobile condensation product of urea and aq. CH<sub>2</sub>O in mol. proportion of approx. 1:1.5 (formed at temp.  $>35^{\circ}$ and  $p_{\rm H} 5$ —6, the reaction being arrested short of the resinous stage), dried at temp.  $>80^{\circ}$ , and finally moulded, e.g., at 140° and 1 ton/sq. in., to fuse and resinify the condensate and consolidate the mass. The products resemble porcelain and are resistant to H<sub>2</sub>O and to impact. J. W. CR.

[Urea-formaldehyde] plastic materials. A. M. HOWALD and J. L. RODGERS, jun., ASSTS. to PLASKON Co., INC. (U.S.P. 2,056,459, 6.10.36. Appl., 10.8.33). —Fibrous, non-hygroscopic cellulose esters (nitrate and acetate) are impregnated with the thin mobile reaction product of urea and aq.  $CH_2O$ , and the product is dried to give a porous mass which can be moulded and extruded or dissolved in a varnish solvent (e.g.,  $OH \cdot [CH_2]_2 \cdot OMe$ ) to give a coating composition. The products are  $H_2O$ - and fireresistant and detonation-proof. J. W. CR.

Manufacture of potential [urea-formaldehyde] resins. A. M. HOWALD, Assr. to PLASKON Co.,

Сн. Авз. (е)

INC. (U.S.P. 2,056,460, 6.10.36. Appl., 16.4.34).— Urea (1 mol.) is combined with aq.  $CH_2O$  (1.05—1.55 mols.) having lower acidity than  $p_{\rm H}$  5, at <30°, until the reaction product solidifies to a crystal magma. The latter is disintegrated and dried (45—60°) in an air current, an org. acid added to adjust the  $p_{\rm H}$  to approx. 5, the mixture dehydrated at 100—110° (heating must be stopped short of infusibility), and further dried at  $> 60^\circ$ . J. W. CR.

Manufacture of moulded articles from urea and formaldehyde. A. M. HOWALD, Assr. to PLAS-KON Co., INC. (U.S.P. 2,056,461–2, 6.10.36. Appl., [A] 14.9.34, [B] 24.9.34. Can., [A] 13.9.29, [B] 11.2.29). —Moulding compositions which are stable on storage, *i.e.*, do not lose flowability, are prepared by mixing dry, fusible, urea-CH<sub>2</sub>O condensation products with (A) a solid org. acid (e.g., tartaric) in a relatively non-volatile plasticiser (e.g., an aldehyde resin), (B) an accelerator which is latent at ordinary temp. but at moulding temp. (90–130°) generates sufficient acidity to accelerate hardening (e.g.,  $\beta$ -bromohydrocinnamic acid and *iso*dibromosuccinic anhydride).

J. W. CR.

Moulding [urea-formaldehyde] resinous materials. J. L. RODGERS, jun., and A. M. HOWALD, Assrs. to PLASKON CO., INC. (U.S.P. 2,056,436, 6.10.36. Appl., 25.2.32).—Urea-CH<sub>2</sub>O moulding compositions (made, *e.g.*, by impregnating fibrous cellulose fillers with thin, mobile, slightly acid, aq. solution of lowtemp. condensed product, and drying at  $< 80^{\circ}$ ) are heated and mechanically worked at  $> 95^{\circ}$  until as free as possible from absorbed air; they are then warmed throughout to a putty-like mass and moulded. The flow period of the moulding operation is thus reduced. J. W. CR.

Production of polymeric esters of the acrylic acid series. E. I. DU PONT DE NEMOURS & Co., and H. J. BARRETT (B.P. 478,309, 13.7.36).—Polymerised CH<sub>2</sub>:CH·CO<sub>2</sub>Me or CH<sub>2</sub>:CMe·CO<sub>2</sub>Me (I) is heated with an alcohol having b.p. > that of MeOH, preferably in presence of an alkaline alcoholysis catalyst. Interchange of radicals is effected. Among examples (8), the polymeride of (I) (100) dissolved in PhMe (400) is mixed with Bu<sup>8</sup>OH (74) and heated under a distilling column. A solution of Na (4·9) in MeOH (50 pts.) is added over 17 hr. and the binary mixture of PhMe and MeOH removed. The product is a resin containing 74% of the polymeride of CH<sub>2</sub>:CMe·CO<sub>2</sub>Bu<sup>8</sup> and 26% of the polymeride of (I). It is compatible with linseed oil whereas the polymeride of (I) is not. K. H. S.

Manufacture of shaped articles from polymerisable organic liquids. P. H. HULL, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 469,564, 27.1.36).—Shaped articles (sheets, rods) are made from org. liquids (e.g., Me methacrylate) containing the group  $CH_2$ ·CX·, where X = H or an org. radical, by placing the monomeric liquid (which may contain the polymeride in solution) in a vertical mould, the sides of which are kept apart by distance pieces, heating by a stream of hot gas impinging on the mould bottom (the top of the mould is thus never hotter than the bottom), and enclosing the mould in an autoclave. The thinner upper liquid fills the

shrinkage voids formed in the more rapidly polymerising lower liquid and enables flawless products to be obtained. J. W. Cr.

Preparation of (A, B) resin, (C) cellulose ether, (D) polyvinyl resin, and (E) cellulose ester, compositions. M. L. MACHT and A. F. RANDOLPH, Assrs. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,056,793-7, 6.10.36. Appl., 26.4.34).-Moulding compositions are prepared by kneading (A) hard, dry, comminuted, polymerised Me methacrylate resin (with plasticiser, lubricant, and pigments if desired), (B) hard, dry, comminuted, thermoplastic resin of the polymerised acrylic and alkylacrylic ester type (with plasticiser if desired), (c) a cellulose ether and plasticiser, (D) a polyvinyl resin and plasticiser, (E) a cellulose ester and plasticiser, until homogeneous masses result, which are then broken down to granular J. W. CR. form.

[Phenol-formaldehyde] synthetic resins. K. Loos, Assr. to J. HIRSCHMAN (U.S.P. 2,058,475, 27.10.36. Appl., 20.5.30).—To obtain transparent products from resins produced in presence of NaOH etc., there is added to the PhOH-CH<sub>2</sub>O condensate in the fusible state 5—15% of a H<sub>2</sub>O-insol., high b.-p. plasticiser, *e.g.*, triacetin, which delays hardening while complete dehydration proceeds. S. M.

Manufacture of phenol-formaldehyde resins. G. H. WILDER, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,058,649, 27.10.36. Appl., 5.6.36).— Discoloration during manufacture, and on subsequent exposure to heat or light, is reduced by adding to the reaction mixture a  $H_2O$ -sol. ferrocyanide, e.g.,  $K_4$ Fe(CN)<sub>6</sub>, and salicylic acid, and carrying out the condensation and dehydration in N<sub>2</sub>. S. M.

Production of oil-soluble phenol-aldehyde resins which are capable of being hardened. H. HÖNEL, Assr. to BECK, KOLLER & Co., INC. (U.S.P. 2,058,797, 27.10.36. Appl., 21.11.32).--A phenol in which only two reaction-favourable positions (viz., o-, o-, p-,) are unoccupied and carrying at least one higher hydrocarbon radical as substituent having  $\leq 3$  saturated C atoms is heated at moderate temp. with mol. excess of CH<sub>2</sub>O in presence of an alkaline condensing agent which is subsequently neutralised. Heating is continued until interaction is complete, when the temp. is raised (e.g., to  $>100^{\circ}$ ) to give a hardenable, oil-sol. resin which can be further heated with substantially neutral varnish raw materials or waxes. In an example, p-tert.-butylphenol is heated with aq. CH<sub>2</sub>O in presence of NaOH for several days at 35-45° and the product neutralised and heated at a higher temp. to give a clear resin. J. W. CR.

Production of homogeneous [resinous] reaction masses. BECK, KOLLER & Co. (ENGLAND), LTD. (B.P. 479,350, 31.7.36. Austr., 1.8.35 and 29.7.36). —Phenols having <2 of the particularly reactive positions (o and p to OH) unoccupied but at least one of the m-positions occupied by a substituent containing <2C (total <4C) are condensed with CH<sub>2</sub>O at low temp. with strong alkalis, which are afterwards eliminated; the products react readily with substances of high mol. wt. which (1) contain CO<sub>2</sub>H groups (resin acids, fatty acids), or are (2) substantially neutral substances of (a) aliphatic nature rich in O, e.g., castor oil, or (b) aromatic, hydroaromatic, or mixed aliphatic-aromatic nature, e.g., coumarone or phthalic resins, or (3) are aliphatic neutral substances, e.g., drying oils, waxes. In this way hardenable artificial masses which do not exude the substance of high mol. wt. during the hardening process and are suitable as bases for coatings, moulded articles, impregnating agents, etc. are obtained. The *m*-substituents may be saturated and unsaturated O-free and O-containing hydrocarbon radicals and alkoxy-groups, e.g.,  $3:5-C_6H_3MePr^{\beta}\cdotOH$  or *m*-OH· $C_6H_4\cdotOBu$ . R. G.

Production of potentially reactive phenolic condensation products. F. KURATH and O. A. CHERRY, Assrs. to ECONOMY FUSE & MANUFG. CO. (U.S.P. 2,056,280, 6.10.36. Appl., 30.7.34).—A phenol is condensed with  $CH_2O$ ,  $(CH_2)_6N_4$ , etc. in presence of both  $NH_3$  and a small proportion of a fixed base, *e.g.*, CaO; the oily resinous layer is incorporated with a filler and hot-pressed in presence of a substantial part of the condensing agent. S. M.

Manufacture of resin or balsam prepared with the aid of a reaction-modifier. C. ELLIS, Assr. to ELLIS-FOSTER CO. (U.S.P. 2,056,656, 6.10.36. Appl., 17.10.27).—The reaction products of an acidic gum, e.g., rosin, or castor oil, a polyhydric alcohol (glycerol), and a straight-chain, aliphatic, dibasic acid (adipic) are claimed; a drying oil (linseed) may also be incorporated. In the text the properties of alkyd resins (modified and unmodified) are controlled by addition of bases, e.g., CaO, urea, NH<sub>2</sub>Ph, to the reaction mixture. Many examples are given.

S. M.

Production of resinous condensation product. I. ROSENBLUM (U.S.P. 2,064,950, 22.12.36. Appl., 11.4.34).—A polyhydric alcohol, e.g., glycerol, and a high mol. wt. fatty acid, e.g., a drying oil acid, in proportion to form the mono-ester, are heated with an inorg. acid, e.g.,  $H_3BO_3$ ,  $H_3PO_4$ , etc., a dicarboxylic aliphatic acid (maleic), and a condensate of the phenol-aldehyde type and also a small proportion of org. Zn salt to form a resin sol. in toluol.

B. M. V.

Composition [for plastics, paint coatings, etc.] and method of manufacture. W. J. KOENIG (U.S.P. 2,058,596, 27.10.36. Appl., 7.12.32).— Oxidised drying oil(s) having conjugated double linkings is (are) condensed (at 70—175°) with oxycyclic org. compounds (cyclo-hexanol or -hexanone), the mixture is cooled, suitably shaped, and then hardened (at 45—150°) in absence of  $O_2$ , giving a flexible, alkali-resistant product suitable for plastic cements and paint coatings (for flexible sheets).

S. S. W.

Production of synthetic resins [from aliphatic aldehydes]. G. W. JOHNSON. From I. G. FARBEN-IND. A.-G. (B.P. 470,280, 20.2. and 29.6.36).—An aldehyde ( $C_{2-4}$ ) is heated in presence of primary or sec. alkylamines or aralkylamines etc., e.g., NH<sub>2</sub>Me, CH<sub>2</sub>Ph·NH<sub>2</sub>, C<sub>5</sub>H<sub>5</sub>N, or their salts with weak acids, as condensing agents; the product is heated at 80— 250° with HCO<sub>2</sub>H and/or an inorg. condensing halide, e.g.,  $AlCl_3$ . Glycerol etc. and resin acids may be added to the reaction mixture. 9 examples are given. S. M.

(A, B) Production of [oil-modified] alkyd synthetic resins. C. S. FARMER (B.P. 470,471-2, 13.2.36).--(A) A drying oil is heated at  $280-300^{\circ}$ under pressure with a polybasic acid or its anhydride and H<sub>2</sub>O, and the product condensed with a polyhydric alcohol (glycerol) which may be partly esterified. (B) H<sub>2</sub>O required in (A) is provided by dehydration in situ of castor oil. S. M.

Production of resinous condensation products. I. ROSENBLUM (U.S.P. 2,056,211, 6.10.36. Appl., 12.7.30. Renewed 31.10.34).—In the process of U.S.P. 1,969,761 (B., 1935, 736) the  $o-C_6H_4(CO)_2O$  is replaced by an aliphatic polybasic acid, *e.g.*, malic or maleic. S.M.

Titanium pigments. BRIT. TITAN PRODUCTS Со., Ltd. (В.Р. 470,266, 11.2.36. U.S., 11.2.35).—А Ti sulphate solution containing < 30 g. of Ti (calc. as  $TiO_2$ ) per litre is treated with just sufficient of an acid-binding compound of an alkali or alkaline-earth metal or of NH3 to ppt. (as Ti hydrates) substantially only the Ti present by neutralising H<sub>2</sub>SO<sub>4</sub> bound to Ti (not to Fe or other bases), leaving < 0.2 mol. of unneutralised  $H_2SO_4$  per mol. of  $TiO_2$ ; the pptd. Ti(OH)<sub>2</sub> is washed and then redissolved (in acid in presence of an added sol. compound of Tim), and the solution hydrolysed, after any necessary adjustment of concn., the final ppt. being washed and calcined as usual. The neutralisation may be carried out in stages, in which case an alkali forming an insol. sulphate is used; e.g., Ca(OH)<sub>2</sub> is added, pptg. the major part of the active H<sub>2</sub>SO<sub>4</sub> before any Ti is pptd. Ti pigments substantially free from impurities (Fe, Mn, V, Cr) are obtained. S. S. W.

Manufacture of titanium pigments. (A) A. J. RAVNESTAD, (B) W. F. WASHBURN and F. L. KINGS-BURY, (A) Assr. to TITAN Co., INC., and (B) to TITAN-IUM PIGMENT CO., INC. (U.S.P. 2,055,221-2, 22.9.36. Appl., [A] 11.11.31, [B] 2.2.35. Nor., [A] 13.11.30).--(A) Ilmenite (etc.) is decomposed with insufficient  $H_2SO_4$  to form Ti(SO<sub>4</sub>)<sub>2</sub> from all the Ti present, H<sub>2</sub>O is added until the TiO<sub>2</sub> content is 150-250 g./litre, and the product hydrolysed with addition of an "initiator" which is an alkali, but the quantity used is too small to disturb the metastability of the solution. (B) Ti(SO<sub>4</sub>)<sub>2</sub> solution containing excess of  $H_2SO_4$  is partly pptd. by neutralisation with, e.g., Na<sub>2</sub>CO<sub>3</sub>, the ppt. redissolved by agitation, and the product mixed with a slurry of CaSO<sub>4</sub> and hydrolysed; the pptd. Ti pigment is washed and calcined.

S. M.

Dispersion of pigments in oil. A. H. STEVENS. From UNITED COLOR & PIGMENT CO., INC. (B.P. 469,559, 27.1.36).—A mixture of an aq. pigment pulp and (linseed) oil is converted into a pigment-inoil dispersion by kneading with a dispersing and oilwetting agent, comprising a non-OH amine containing at least one alkyl radical ( $\langle C_3 \rangle$  (monoamylamine), condensed, if desired, with (soap-forming) carboxylic or sulphonic acids or their derivatives (ricinoleic acid). S. S. W. Facilitating the dispersion of pigments in aqueous emulsions of organic substances containing protein. IMPERIAL SMELTING CORP., LTD., Assees. of D. L. GAMBLE and L. D. GRADY, jun. (B.P. 472,001, 1.7.36. U.S., 2.7.35).—The use of alkali (Na) hexametaphosphate or pyrophosphate (2 wt.-% incorporated with the pigment) as dispersion agents in such emulsions is claimed. Latex and case in paint products are claimed. S. S. W.

Lead pencils. EAGLE PENCIL Co., Assees. of I. CHESLER (B.P. 471,340, 27.7.36. U.S., 14.8.35).— Pencil leads, formed by extruding a mixture of graphite and a binder through dies and calcining, are immersed in a bath of a wetting and penetrating agent (a sulphonation product of an oil, a grease, petroleum, fatty alcohol, or of a naphthol) readily miscible with the  $H_2O$ -sol. glue commonly used in encasing leads in wooden sheaths, the leads being then allowed to drain and tumbled in heated sawdust; an improved bond is claimed. S. S. W.

Elastic body [from olefine sulphides] for coating metal and other uses. W. W. DUECKER and C. R. PAYNE, ASSTS. to TEXAS GULF SULPHUR CO. (U.S.P. 2,056,836, 6.10.36. Appl., 4.9.34).—A mixture of an olefine sulphide (25 pts.) and S (75) is simultaneously converted into a rubber-like body and bonded directly to metal by heating with a halide of Hg, Cu, Ag, or Pb (2.5). An accelerator, *e.g.*, diphenylguanidine, and ZnO are also added. S. M.

Coated [metallic] articles. F. R. TATE. From PLASTERGON WALL BOARD CO. (B.P. 478,588, 20.7.36). —A conjoint polymeride of vinyl chloride and a vinyl ester of a lower fatty acid is caused to adhere to metal by a first coat of liquid phenol-aldehyde-alkali resin (condensation arrested short of the solid-forming point) thinned in a solvent of high b.p. (>140°, e.g., a phenol) and blended with another very adherent resin (e.g., phthalic anhydride-glycerol-fatty acid). The first coat is heated to remove solvent and polymerise it before the main coat is applied. B. M. V.

Transfers [for decorating glass, enamelled iron, or ceramic ware]. E. R. Box, F. E. KER-RIDGE, and JOHNSON, MATTHEY & Co., LTD. (B.P. 471,219, 2.5.36).-The design is printed by the silkscreen process with a paste comprising the pigment, a flux, and a medium on to a plasticised cellulose acetate film gummed on to a backing paper; the medium consists of a solution of cellulose nitrate and castor oil in amyl lactate, and the parts of the screen outside the stencil boundaries are stopped off with a solution of cellulose acetate and  $o-C_6H_4(CO_2Et)_2$  in COMe<sub>2</sub>, which, on drying, leaves a film insol. in the medium. To apply the transfer to the ware the backing paper is soaked off and the thin film of cellulose acetate on which the design is printed is floated on to the article, which is then dried and fired until the colour matures. A. R. P.

Composition for coating aircraft to prevent ice formation. H. S. FREEMAN, W. PERRY, and G. J. H. JEFFS (B.P. 471,272, 17.4.37).—A mixture (prepared by mixing aq. solutions, evaporating to dryness, and grinding the residue to powder) of NaCl or MgCl<sub>2</sub> (3 pts.), Na or K silicate (2 pts.), and borax (1 pt.) is incorporated in a liquid paint vehicle comprising white fillers (china clay, Paris-white, asbestine) and/or pigments (white-Pb, ZnO) ground into a solution of gum thus and linseed or castor oil in white spirit, and 2% of citronella oil is added.

S. S. W.

Coating composition for porous surfaces. M. F. MONBIOT, and BRIT. RAYOPHANE, LTD. (B.P. 471,440, 23.3.36).—A composition for rendering fabrics or other fibrous materials chemically resistant and impervious to moisture, air, etc. comprises a solution in volatile org. solvent (e.g.,  $C_8H_6$ ) of chlorinated rubber (preferably of high  $\eta$ ) 25—45%, resin (e.g., dammar, alkyd, or coumarone) 15—40, plasticiser 15—25, and wax (high-melting refined paraffin wax) 10—15. J. W. CR.

Printing and coating papers for use as wrappers, particularly for food products. R. A. HAYWARD (B.P. 471,338, 8.6.36).—A smooth-surface paper is given a background coating consisting of a  $H_2O$ -colour paste having an adhesive vehicle ( $H_2O$ content must be insufficient to cause expansion and wrinkling of the paper), then dried, the coated surface decoratively printed with an oil-base ink, and preferably a film of wax applied to the printed side. A suitable background-coating composition is prepared by heating together starch and  $H_2O$  and adding lithopone, glycerin, a pigment, and a preservative. The coated papers are odourless and have effective sealing properties. J. W. CR.

(A, B) Manufacture of [oleaginous] compositions [suitable for coatings, plastics, etc.]. W. J. KOENIG, Assr. to SLOANE-BLABON CORP. (U.S.P. 2,058,597—8, 27.10.36. Appl., 22.12.34).— Oxidised drying oils having conjugated double linkings are hardened at > room temp. by condensing with ( $\Delta$ ) an oxy-heterocyclic compound [e.g., furfuraldehyde or o-C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>O], or (B) an oxy-cyclic terpene (e.g., terpineol or fenchyl alcohol). It is stated in the specification that raw oils can be similarly treated. J. W. CR.

Nitrocellulose coating composition containing blown China wood [tung] oil. (A) E. A. DANIELS and (B) L. A. DONOVAN, (A) Assr. to (B) and to A. G. RUBOVITS (U.S.P. 2,056,832, 6.10.36. Appl., 22.1.34). —If tung oil is blown with air or  $O_2$  at 100—280° in presence of S it becomes insol. in EtOH and compatible with the usual nitrocellulose lacquers; the composite films are resistant to EtOH. Their production is claimed. S. M.

Pigmentation of cellulose ester solutions. H. R. CHILDS, Assr. to EASTMAN KODAK Co. (U.S.P. 2,059,088, 27.10.36. Appl., 22.1.36).—Dry pigment  $(TiO_2)$  is ground with a small portion of dry cellulose ester (acetate) and the product is incorporated (with an intermediate dispersion in solvent, if desired) into the cellulose ester solution (a spinning solution) to be pigmented. The dry-grinding time is such that the pressure required to pass the pigmented solution through a candle filter does not increase during  $2\frac{1}{2}$  hr. continuous filtration, and that further dry grinding does not increase the  $\frac{9}{0}$  ash in the filtered solution. S. S. W.

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Production of transparent colours in lacquers. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 479,025, 25.6.36).-Lacquers based on chemically drying film-forming ingredients, e.g., linseed oil, wood oil, or condensation products of polyhydric alcohols, are transparently coloured by incorporating dyes which are substantially insol. in such ingredients by dissolving the dyes in aliphatic monohydric alcohols having  $\langle C_3, e.g., CH_2Ph OH, glycol mono- or di$ alkyl ethers, glycol monoesters or glycol monoalkylether esters of fatty acids. Among examples (5), the Cr compound of the dye

4 : 2 : 6-NO<sub>2</sub>·C<sub>6</sub>H<sub>3</sub>(NH<sub>2</sub>)·SO<sub>3</sub>H (I) → 1-phenyl-3-methyl-5-pyrazolone (5–10) is dissolved in CH<sub>2</sub>Ph·OH (100) and added to a mixture of linseed oil stand oil (600) and lacquer benzine (II) (400 pts.); orange transparent coatings which can be dried up to 100° are obtained on metals. Similarly the salt of dicyclohexylamine and the dye o-NH<sub>2</sub>·C<sub>6</sub>H<sub>4</sub>·SO<sub>3</sub>H  $\rightarrow$  1-(2'-sulphophenyl)-5-pyrazolone-3-carboxylic acid (5-10) is dissolved in  $OH \cdot [CH_2]_2 \cdot OAc$  (100) and added to a condensation product of  $o - C_6 H_4(CO)_2 O$ , glycerol, and linseed oil (400) and a 3:1 mixture of (II) and turpentine (600 pts.); the lacquer can be safely annealed up to 130° and has good transparency and fastness to light. Other dyes are the salt of Cu phthalocyaninetrisulphonic acid with C<sub>17</sub>H<sub>35</sub>·NH<sub>2</sub> (blue-green), the cyclohexylamine salt of Anthraquinone Violet (violet), and the salt of Rhodamine B with the Cr compound of the dye (I)  $\rightarrow$  CH<sub>2</sub>Ac·CO·NHPh (red). K. H. S.

Coating composition [containing vinyl resins]. E. W. REID (U.S.P. 2,052,658, 1.9.36. Appl., 12.12.31. Cf. U.S.P. 1,935,577; B., 1934, 806).— A resin produced by the conjoint polymerisation of a vinyl halide (chloride) and an ester of a lower aliphatic acid (acetate) is dissolved in, e.g., COMe<sub>2</sub>-PhMe, and a plasticiser, e.g., o-C<sub>6</sub>H<sub>4</sub>(CO<sub>2</sub>Bu)<sub>2</sub>, is added. S. M.

Manufacture of pigmented coating com-positions. W. E. CHARLTON, R. HILL, E. E. WALKER, R. B. WATERS, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 478,323, 16.7.36).—Pigments are incorporated in a lacquer or varnish solvent together with esters CH2; CMe CO2R or a mixture of such esters with esters  $CH_2:CR' \cdot CO_2R$  and with 0.25 - 5 wt.-% of an acid  $CH_2:CR' \cdot CO_2R$  (R = alkyl or cycloalkyl and R' = H or Me). Among examples (11),  $CH_2:CMe \cdot CO_2Bu^{\alpha}$  (197) and  $CH_2:CMe \cdot CO_2H$  (3) are polymerised with  $Bz_2O_2$  (1) on the steam-bath for 1 hr., and then heated at 110° for 15 hr.; the interpolymeride (40) is dissolved in PhMe (80) and ballmilled with TiO<sub>2</sub> (20 pts.) to a uniform mixture. The interpolymerisation may also be carried out in solvents. The coatings on wood, metal, or other surfaces obtained from the products are distinguished by a high gloss. K. H. S.

Ornamental coating of surfaces. J. H. L. GALUSZKA (B.P. 471,225, 10.8.36. Denm., 18.9.35).-Surfaces to be decorated are coated first with varnish (e.g., resin-containing oil type) which while still fluid is partly or wholly coated with a decorative varnish (cellulose derivative or spirit type) containing a volatile org. solvent. The ornamental effect which is produced by the evaporation of the solvent can be varied, e.g., by varying the propertion of solvent,

adding modifying substances (e.g., petrol, paraffin oil), or by regulating solvent evaporation. [Stat. ref.] J. W. CR.

Manufacture of moulded articles containing metallic inserts. GEN. ELECTRIC Co., LTD., and W. HARRISON (B.P. 480,184, 24.9.36).

Cooling etc. plastic substances. Drying apparatus [e.g., inked web].—See I. Bitumin-Drying ous compositions.--See II. Halogenated phthalocyanines.-See IV. H2O-resistant fibre. -See V. Waterproof fabrics.-See VI. Glass building block. Safety and laminated glass. Refractory bodies.—See VIII. Coating plaster. Plaster board. Artificial lumber. Finishing floors.—See IX. Insulating materials.—See XI. Metallic soaps.—See XII. Halogenated diene polymerides. Rubber-like masses.—See XIV. Plastic masses.—See XV. Tree surgery.—See XVI.

## XIV.—INDIA-RUBBER; GUTTA-PERCHA.

History and importance of vulcanisation accelerators. M. BÖGEMANN (Angew. Chem., 1938, 51, 113-115).

Velocity of combination of caoutchouc with sulphur during vulcanisation. Z. KARPINSKI (Przemysł Chem., 1938, 22, 8-12).-The vulcanisation coeff.  $k = t^{-1} \log [S/(S - X)]$ , where S and X are, respectively, the amount of free and combined S at R. T. time t.

Force-extension curves and anomalies in the solidity of rubber (latex). H. HINTENBERGER and W. NEUMANN (Naturwiss., 1938, 26, 13) .---The adiabatic force-extension curve of dried latex shows a sharper change in direction than that of other types of rubber. This is due to the more sudden onset of crystallisation in consequence of higher purity. The isothermal load-extension curve depends on the period of loading. X-Ray diagrams show that for a smaller load, but greater extension, no crystallisation occurred, whereas for a larger load, but smaller extension, very definite crystallisation occurred. Greater loading with its crystallising effect hinders the flow and increases solidity. A. J. M.

Anomaly in the elastic behaviour of indiarubber. A. N. PURI (Proc. Nat. Acad. Sci. India, 1937, 7, 45-51) .- The val. of Young's modulus measured dynamically was about twice that measured statically for all loads, and the rigidity calc. from the former agree very closely with the vals. determined experimentally under dynamic conditions. No explanation of the anomaly was found. N. M. B.

Rubber in compression. Increasing the resistance to abrasion and cutting of rubberlined vessels, chutes, etc. C. MACBETH (Bull. Rubber Growers' Assoc., 1938, 20, 15-16).-Metalbacked rubber surfaces with increased resistance to cutting and abrasion are obtained by vulcanising the rubber to the metal and then bending the metal so as to put the rubber coating under superficial compression. With ball-mill linings so prepared cuts do not gape or tend to extend, and the life is approx. 5 times that with ordinary rubber linings. For wet ball-mills as used for cement there is little prospect, however, of equalling the life (18 months) commonly given by steel linings. D. F. T.

Model of the rubber molecule, using tetrahedral instead of spherical "atoms." R. REIN-ICKE (Chem.-Ztg., 1938, 62, 31—32).—The C atoms are placed at the centres of cubes in edge-contact, and their fields of force are represented by the inscribed tetrahedra defined by face-diagonals of the cube. A. R. PE.

Rubber solvents and substances which lower the viscosity of rubber cement. B. V. FABRIT-ZIEV, G. N. BUIKO, and E. A. PACHOMOVA (Kosh.-Obuvn. Prom., 1935, 14, 514—518; cf. B., 1936, 32).— The  $\eta$  of rubber solutions is lowered by alcohols, the effect increasing in the order  $Pr^{\beta}OH$ , Bu°OH, EtOH, Pr°OH, *iso*-C<sub>5</sub>H<sub>11</sub>.OH, and MeOH. C<sub>5</sub>H<sub>5</sub>N and COMe<sub>2</sub> produce a smaller effect. (CH<sub>2</sub>·OH)<sub>2</sub> and C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub> have an insignificant effect. 1—5% of H<sub>2</sub>O raises  $\eta$  considerably. For alcohols the max. lowering of  $\eta$  is at a concn. of 2—3%. The lowering depends on the pretreatment of the rubber solution. The  $\eta$ of the latter increases during storage. The velocity of gel formation in self-vulcanising cements depends on the nature of the  $\eta$ -depressing ingredient. Addition of 3 wt.-% of EtOH to such cements is recommended. CH. ABS. (e)

Viscosity of rubber solutions. L. G. AKOB-JANOV (Caoutchouc et Gutta-Percha, 1937, 34, 251— 253, 286—288, 327—328, 349—350; 1938, 35, 3—4, 36—37).—A review. Various methods for the measurement of  $\eta$  are described, including those employing the types of apparatus devised by Engler, Ostwald, Lépétov and Constantinov, Hoeppler, Kaempf, and Volarovitsch. Comparative results are quoted for several of the methods and also for smoked sheet, kok-sagiz, and synthetic rubber. D. F. T.

Polymerisation of butadiene and production of artificial rubber. K. ZIEGLER (Chem.-Ztg., 1938, 62, 125—127).—The practical methods for effecting the polymerisation and their probable chemical mechanism are reviewed. D. F. T.

Rubber-like properties of a synthetic product (oppanol) towards X-rays. R. BRILL and F. HALLE (Naturwiss., 1938, 26, 12—13).—Oppanol (I) gives a typical X-ray thread diagram when stretched, and a diagram characteristic of an amorphous substance when unstretched, resembling rubber in this respect also. Whilst the diagrams for stretched natural and artificial rubbers have small identity periods, the latter for (I) is 18.5 A. The mol. of (I) is probably chain-like and spiral, not zig-zag as in the case of rubber. A. J. M.

Characteristic properties of artificial rubbers. E. FLEURENT and P. BARY (Bull. Soc. chim., 1938, [v], 5, 91-97).—Artificial rubbers (I) (defined as highly elastic substances capable of being substituted wholly or partly for natural rubber) can conveniently be divided into two groups with d > 1 and < 1, respectively. Of the latter, only natural rubber (II) goes completely into solution in PhMe, the (I) (Bunas) giving solutions containing undissolved swollen granules. Whereas (II) exhibits only a feeble

fluorescence in ultra-violet light, (I) give a marked blue fluorescence. The (I) with d > 1 contain considerable proportions of Cl or S. The S-containing compounds (Thiokol, Perdurens) burn with formation of SO<sub>2</sub>, whereas the Cl products (Neoprenc) char without melting. D. F. T.

Industrial uses for rubber. H. L. TRUMBULL (Chem. Met. Eng., 1938, 45, 4—8).—A review of the improvement of rubber, of the part played by catalysts, antioxidants, accelerators, and pigments, and of synthetic and chlorinated rubbers and rubber hydrochloride, and of some applications, is given.

D. K. M. Rubber-bitumen mixes.—See II. Detecting resins etc. in varnishes.—See XIII.

#### PATENTS.

**Preparation of chemical compounds [halogenated diene polymerides].** W. H. CAROTHERS, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 2,067,172, 12.1.37. Appl., 6.3.33).—Halogenation of polymerised (mono)halogenated  $\alpha\gamma$ -dienes, especially β-chloro- $\Delta^{\alpha\gamma}$ -butadiene (I), gives products which, according to the degree of halogenation, are useful either for the prep. of synthetic rubbers of improved flexibility on storage or for coating, adhesive, moulding, etc. compositions. Examples illustrate the chlorination of plastic polymeride of (I) in CCl<sub>4</sub> or CHCl<sub>3</sub> in presence or absence of sunlight to give products containing 3 and 2—3 Cl per unit mol. Higher chlorinated compounds are obtained from plastic or elastic polymerides by prolonged treatment with Cl<sub>2</sub> in ultra-violet light. N. H. H.

Preparation of (A, B) thiazyl derivatives, (C) thiazyl dithiocarbamates [vulcanisation accelerators]. H. I. CRAMER, Assr. to WINGFOOT CORP. (U.S.P. 2,064,782-4, 15.12.36. Appl., [A] 7.4.34, [B] 11.4.34, [O] 14.11.34).—The interaction of 1-halogenoarylenethiazoles of the C<sub>6</sub>H<sub>6</sub> and C<sub>10</sub>H<sub>8</sub> series (containing NO<sub>2</sub>) with salts of (A) N-hydroaromatic, (B) N-furfuryl-, and (C) N-hydrofurfuryl-dithiocarbamic acids gives compounds of val. as vulcanisation accelerators. *E.g.*, interaction of 1-chloro-5-nitrobenzthiazole (I), CS<sub>2</sub>, dicyclohexylamine, and NaOH in EtOH at the b.p. gives the compound,  $NO_2 \cdot C_6H_3 < \frac{N}{S} > C \cdot S \cdot CS \cdot N(C_6H_{11})_2$ , m.p. 188–189°.

Similar compounds are described from (I) and cyclohexylethyl-, m.p.  $146-147^{\circ}$ , di- $\alpha$ -furfuryl-, m.p.  $93-95^{\circ}$ , and ditetrahydro- $\alpha$ -furfuryl-dithiocarbamic acid, m.p.  $116-118^{\circ}$ . H. A. P.

[Accelerators for] vulcanisation of rubber. WINGFOOT CORP. (B.P. 475,220—1 and 475,453, [A, B] 13.11.36, [C] 4.11.36. U.S., [A] 10.2.36, [B] 23.7.36, [C] 30.6.36).—The use of vulcanisation accelerators (A) of acyl derivatives and carbamates of 1-arylthiazyl hydroxymethyl sulphides, (B) of halogenoalkyl thioethers of 1-thiolarylthiazoles, and (C) of compounds of Zn salts of 1-thiolarylthiazoles with NH<sub>3</sub> and amines is claimed. Examples are: (A) the acetate, m.p. 70—77°, benzoate, m.p. 65—75°, phenylcarbamate, m.p. 162—165°, and a-naphthylcarbamate, m.p. 180.5°, of 1-benzthiazyl hydroxymethyl sulphide (I) [prepared by interaction of CH<sub>2</sub>O with mercaptobenzthiazole (II) in aq. NaOH]; (B) 1benzthiazyl chloromethyl, m.p. 127—128° [from (I) and PCl<sub>3</sub>], and  $\beta$ -chloroethyl sulphide, dimorphic, m.p. 167—169° and 238—239° [from the Na salt of (II) and C<sub>2</sub>H<sub>4</sub>Cl<sub>2</sub>]; (c) compounds of Zn benzthiazylmercaptide (1 mol.) with (CH<sub>2</sub>·NH<sub>2</sub>)<sub>2</sub> (3 mols.), m.p. 178—179°, cyclohexylamine (2 mols.), m.p. 73—160° (decomp.), NH<sub>3</sub> (1 mol.), mixed amylamines (2 mols.), tetrahydro- $\alpha$ -furfurylamine (2 mols.), piperidine (1 mol.), m.p. 195—200°, and NH<sub>2</sub>Bu<sup>a</sup> (1 mol.).

H. A. P.

Antioxidants. W. L. SEMON, ASST. to B. F. GOODRICH CO. (U.S.P. 2,067,686, 12.1.37. Appl., 2.6.33).—Rubber is preserved by incorporating 0.1— 5% of an aromatic *p*-diamine, NHR·Ar·NHR' (Ar = arylene, R, R' = alkyl or aralkyl). The use of *p*-C<sub>6</sub>H<sub>4</sub>(NH·CH<sub>2</sub>Ph)<sub>2</sub>, and rubber compositions containing it, are claimed. A. H. C.

Production of foam from aqueous dispersions of rubber. DUNLOP RUBBER CO., LTD., E. A. MURPHY, E. W. MADGE, S. D. TAYLOR, and D. W. POUNDER (B.P. 471,899, 11.3.36).—Uncoagulated foams are produced continuously by introducing an aq. dispersion of rubber and a gas (air) into a vessel with foaming mechanism and permitting the intimate mixture to leave the vessel. Additional substances (gelling agents, stabilisers, etc.) may be introduced at any stage. Apparatus is claimed. D. F. T.

Production and use of rubber-like masses. BECK, KOLLER & CO. (ENGLAND), LTD., Assees. of F. BITTERICH (B.P. 471,215, 3.4.36. Ger., 3.4.35).— Hardenable phenol-aldehyde resin, which is sol. in hydrocarbons, is mixed (e.g., by kneading or in solution) with rubber, synthetic rubber, gutta-percha, or balata and the mixture heated (e.g., at 100—180°). Vulcanising agents may be incorporated and the products moulded or utilised as bonding agents in the manufacture of laminated materials (e.g., pasteboard). J. W. CR.

Production of porous [hard rubber] compositions. DUNLOF RUBBER CO., LTD., D. F. TWISS, and R. W. HALE (B.P. 472,193, 2.7.36).—Porous ebonite is produced by incorporating excess of S in rubber and, after vulcanisation to the hard condition, removing the surplus S (and other sol. ingredients) by solvents etc. D. F. T.

Production of marked rubber goods. W. L. KAUFFMANN, 2nd, Assr. to LOVELL MANUFG. Co. (U.S.P. 2,060,576, 10.11.36. Appl., 11.7.32).—Rubber (on wringer rolls, to indicate movement and direction) is marked by applying to the surface sufficient excess of S and heat to produce a permanent coloured pattern. D. F. T.

Heat-treating commodities.—See I. Dithiocarbamates.—See III. Waterproof fabrics. Rubbered fabrics.—See VI. Coating plaster. Soundproofing.—See IX. Rubber-coated articles.—See X. Elastic body.—See XIII.

# XV.-LEATHER; GLUE.

Unhairing action of amines. R. H. MARRIOTT (Stiasny Festschr., 1937, 245-250).—The influence of methylamines on the chemical attack of keratin (I) by alkaline solutions depends on their effect on the production of S-containing reducing agents from (I). The S atoms are not present in (I) in the form of a simple cystine (II) grouping. There is a marked difference in the effect of NaOH and Ca(OH)<sub>2</sub> on depilation when acting on (I) in presence of amines. NaOH cannot break down (II) because it does not form complex NH<sub>2</sub>-compounds as does Ca(OH)<sub>2</sub>. A configuration with cross-linkings between and along the polypeptide chains is given which allows one of the S atoms to behave differently from the other three and explains its removal by cold, dil. alkali. D. B.

Chemical reactions in the degradation of keratin by reduction. G. VáGó (Stiasny Festschr., 1937, 407—418).—Technical liming systems are divided into those in which protein hydrolysis and those in which reduction of keratins predominates. A theory is sought to explain the action of both types. It is shown that keratin hydrolysis with sulphides is a reversible adsorption and reduction process and that the free protein chains are subject to an osmotic swelling in the alkaline solution. Na<sub>2</sub>S<sub>2</sub> results as an oxidation product and the mode of action of polysulphides is explained. A formula is developed which allows the beginning of the hair damage in sulphidecontaining limes to be calc. from the [SH'] and [OH']. D. B.

Microbiological study of collagen and elastin. F. O'FLAHERTY (Stiasny Festschr., 1937, 276–281). —The influence of aërobic and anaërobic bacteria from salt-cured hides and tannery soak-waters on collagen and elastin is studied by noting the degree of tissue liquefaction, the % N dissolved, the % of NH<sub>2</sub>-N produced, and by histological investigations. A considerable difference exists in the extent to which the proteolytic bacteria from hide attack elastin and collagen tissues. For several strains, elastin gave a greater NH<sub>2</sub>-N content than collagen. D. B.

Chemistry of collagen. III. Basic aminoacids of various collagen preparations. J. H. HIGHBERGER (J. Amer. Leather Chem. Assoc., 1938, 33, 9–15; cf. B., 1936, 1169).—The amounts of basic NH<sub>2</sub>-acids present in different samples of collagen are recorded. No significant differences between samples of collagen from different parts of the corium or from different hides were observed. The total basic N, calc. from the amount of NH<sub>2</sub>-acids, was somewhat > the Hausmann figure derived from the same material. D. P.

Swelling of structured proteins. Influence of reticular tissue on swelling of collagen in alkaline solutions. D. J. LLOYD and G. STOCKALL (Stiasny Festschr., 1937, 232-239).—In NaOH and Na<sub>2</sub>S solutions fresh rat tendons start to swell at  $p_{\rm H}$ 10.5; swelling then reaches a max. at  $p_{\rm H}$  11.7, then diminishes, and again rises, ending in disintegration at N concn. In Ca(OH)<sub>2</sub> solutions swelling is less and equilibrium is not reached in 1 week. Young fresh tendons gave less swelling than older ones in NaOH solutions. Drying reduces subsequent swelling in NaOH or Ca(OH)<sub>2</sub>. NaOH or Na<sub>2</sub>S weakens the reticular tissue and gives greater subsequent swelling in acid solutions. Ca(OH)<sub>2</sub> weakens reticular tissue only slowly. D. B. Soaking of sun-dried deer skin. (MISS) W. B. PLEASS (Stiasny Festschr., 1937, 339-348).—The efficiency of soaking has been assessed from the microscopical appearance of the pelt after liming. Plain H<sub>2</sub>O is unsatisfactory for soaking. A well-limed pelt may be obtained by (a) soaking for 2 days in 5% aq. NaCl and liming for 2—4 days in a lime liquor containing 0.1% of Na<sub>2</sub>S crystals, or (b) soaking for 1—2 days in 0.1% aq. Na<sub>2</sub>S crystals and liming for  $\Rightarrow$  5 days in a straight lime liquor. Great difficulty is found in efficiently unhairing the pelt without over-liming. D. B.

Soaking of sun-dried hides and skins. I. (MISS) W. B. PLEASS (J. Soc. Leather Trades' Chem., 1937, 21, 599-612).—Sun-dried hides are efficiently soaked when kept for 3 days in aq. NaCl (5%), aq. NaNO<sub>3</sub> (2%), or a 1% solution of NaHSO<sub>3</sub> (at  $p_{\rm H}$  1·5) as shown by microscopical examination of sections. Sun-dried goatskins, however, require 3 days' immersion in aq. NaCl (10%), Na citrate (0·13%), KClO<sub>3</sub> (1%), NaNO<sub>3</sub> (1%), and Na<sub>2</sub>CO<sub>3</sub> (0·5%), or mixtures of NaCl, NaNO<sub>3</sub>, and Na<sub>2</sub>CO<sub>3</sub> (0·5—1% of each). Na<sub>2</sub>S is not recommended for soaking as it separates the fibres too much. Photomicrographs are reproduced. D. W.

Report on practical tests on salting [of raw skins] in 1936. W. GRASSMANN and W. HAUSAM (Ledertech. Runds., 1937, 29, 57–63, 65–70).—Raw calfskins were preserved better by rock-salt treated with  $C_{10}H_8 + Na_2CO_3$  than by evaporated salt similarly treated, and the % of undamaged skins was still further reduced by using ZnO-treated salt. The hair was more difficult to remove from the latter skins and the grain was duller in the finished leather. Comparative tests were made with salt treated with  $C_{10}H_8 + Na_2CO_3$ , and two types of Illig paper impregnated with NaCl +  $C_{10}H_8 + Na_2CO_3 + "Merpin"$  or "Preventol new." Skins preserved with the papers were free from any bad odour. Calfskins should be salted with  $\leq 40-50\%$  of NaCl +  $C_{10}H_8$  (calc. on their green wt.). Skins salted with 50% of NaCl contained  $36\cdot36\%$  of NaCl on their dry wt. Sheepskins should not be preserved with  $C_{10}H_8$ -treated NaCl as it is responsible for the development of a brownish-red stain on the wool. Ordinary NaCl treated with Na<sub>2</sub>CO<sub>3</sub> or ZnO does not produce such stain. D. W.

Problems of fresh hide preservation. F. STATHER and H. HERFELD (Stiasny Festschr., 1937, 381-389).-A review of the results obtained by the German Research Association. In brining, the uptake of salt is independent of brine concn. in the first hr. of its action, and nearly reaches its max. in 12 hr. The max. amount of salt taken up increases with increased brine concn., shows a moderate increase with rise of temp., is practically independent of  $p_{\rm H}$ , and is the same in grain and flesh layers. In salting on the flesh, a complete penetration is obtained in 24 hr. and is independent of the coarseness of the salt and  $p_{\rm H}$ . The preservation is due to the checking of bacterial growth by dehydration, which is greater in salting than in brining. In salting, dehydration increases with increased time of action, but is independent of the coarseness of the salt and addition of NaHSO<sub>3</sub> or Na<sub>2</sub>CO<sub>3</sub>. In brining, the intensity of dehydration is dependent on the concn. of the used brine. There is a latent period in the action of bacteria. It is essential to form a saturated salt solution in the hide to suppress the development of micro-organisms. The influence of the curing on the proteins of the hide and the finished leather is discussed and the importance of cool storage stressed. The curing effects of NaCl, NaF, Na<sub>2</sub>SO<sub>4</sub>, MgCl<sub>2</sub>, MgSO<sub>4</sub>, and CaCl<sub>2</sub> are studied. All except NaF and Na<sub>2</sub>SO<sub>4</sub> gave greater collagen decomp. than NaCl. D. B.

"Secretage" of the nap of rabbit skins. L. MEUNIER and (MME.) S. PIERRET (Stiasny Festschr., 1937, 259—265).—This secret process, which gives the firmness necessary in rabbit skins for hat-making, consists in deamination, resulting from the action of nitrous acid on keratin, and a complementary pseudo-tannage, resulting from the action of a Hg salt on the deaminised keratin. The latter process can be produced with benzoquinone. Photomicrographs show that there is a rising up of the epithelial scales, forming hooks capable of giving felting. D. B.

Preparation of an extract of enzyme bating materials for analytical purposes. A. K. VLČEK (J. Soc. Leather Trades' Chem., 1937, 21, 612—615).— An apparatus is described for extracting the bating material with 0.7% aq. NaCl. D. W.

Characteristics of enzymes of the pyloric cæca of cod and haddock. [Application to leather bating.] W. W. JOHNSTON (J. Biol. Bd., Canada, 1937, 3, 473-485).—A dried prep. of the pyloric cæca had proteolytic activity with a max. at the same  $p_{\rm H}$  as that of trypsin, some lipolytic activity, and a low peptic and rennet, but no amylolytic, activity. The enzymes behave similarly to those of a commercial bate and of hog pancreas in their action on casein, collagen, elastin, and olive oil. A moderate amount of autolysis of the cæca before drying does not seriously affect activity. E. C. S.

Fractional extraction of pine bark. V. NEMEO (J. Soc. Leather Trades' Chem., 1938, 22, 19–27).— Different samples of medium-quality Czechoslovakian pine bark, containing 10% of tans, were ground and then extracted first with a small quantity of cold distilled  $H_2O$  at 5—20°, and then with hot  $H_2O$  to remove the remaining sol. matter. It is shown that the non-tans were removed more quickly than the tans by the preliminary cold extraction. Final liquors were obtained having a tans : non-tans ratio of up to 3.5:1 (original material 1.49:1) and representing a loss of >54% of the total tannin content. Addition of  $H_2C_2O_4$  during the first extraction does not give such good results. D. P.

Tannage in strongly alkaline liquors. G. REZABER (Stiasny Festschr., 1937, 356-365).—It is necessary to use strong liquors because loss of tan and oxidation are serious in old and weak liquors. The effects of NaOH and borax on crude quebracho and chestnut extracts and their tanning properties are studied. Borax is preferable to NaOH with quebracho, because the  $p_{\rm H}$  is not raised so much, tan does not oxidise, and on subsequent neutralisation with acid only the original insolubles are produced instead of twice as much with NaOH, but it does not give the same increase of yield of leather or decrease in H<sub>2</sub>O-sol. matter. Treatment of chestnut with alkali has less effect. It is concluded that the use of borax to solubilise quebracho is of interest. Employed in combination with alum, this tannage gives an excellent leather, low in H<sub>2</sub>O-solubles and very resistant to wear, but rather permeable to H<sub>2</sub>O.

D. B.

Reversibility of basic chrome sulphate tannage. G. D. McLAUGHLIN and D. H. CAMERON (Stiasny Festschr., 1937, 240—244).—Basic Cr sulphate tannage is a typical reversible adsorption reaction. The Cr fixed by hide substance in this tannage is reversed by mere dilution of the tanning system with  $H_2O$ . When chrome leather containing no free chrome or free acid is agitated with  $H_2O$  in a closed system, both chrome and acid are set free and diffuse into the  $H_2O$ . If untanned hide powder is introduced it combines with the freed chrome and acid until equilibrium between all the components of the system is reached. D. B.

Silica tannage. A. T. HOUGH (J. Soc. Leather Trades' Chem., 1938, 22, 71—74).—Hide substance is rapidly tanned by colloidal  $SiO_2$ , the solution showing no tendency to ppt. and elog the skin. So-called silicic acid does not cause deterioration of the finished leather. D. P.

Theories of the metaphosphoric acid tannage. C. RIESS (Stiasny Festschr., 1937, 366-369).—This form of tannage fails in one of the most important criteria of a true tannage because it dries up hard. This is prevented by sufficient salt addition (N-NaCl or  $-H_2SO_4$ ). It differs from Al tannage because pelt remains unswollen in conc. HPO3. Unlike metaphosphate tannage, pelt treated with Ål salt + NaCl swells in AcOH. The tannage is intermediate between that of Al and Cr. Al salt + NaCl and metaphosphate + NaCl are intermediate between pickling and tanning. Hide powder after meta-phosphate tannage has no acid-binding power, proving that a salt-like combination of the HPO3 with the free NH2-groups exists. The HPO3 incapable of removal by washing is = the acid-binding capacity. Metaphosphate tannage is regarded as a multiple-salt formation with polyphosphoric acids.

D. B.

Quantitative analysis of mixtures of strong and weak acids, buffer and neutral salts, with special reference to leather and tanning extracts. I. W. F. BARKER, E. H. ROHWER, and S. G. SHUTTLE-WORTH (J. Soc. Leather Trades' Chem., 1938, 22, 2—19).—Mathematical formulæ are deduced for determining the amounts of weak acids and the mobility of their anions, small proportions of strong acids and buffer salts, and the approx. amounts of neutral salts and the ionisation consts. of the weak acids in mixtures, from conductometric titrations with HCl and NaOH. D. P.

Comparative values of tanning extracts. J. A. WILSON (Hide and Leather, 1936, 91, 24-25, 33).-Data are recorded for the time of complete penetration,  $p_{\Pi}$  vals. of final liquors, and g. of tannin per 100 g. of hide substance for pieces of bovine hide and tannin conens. from 0.5 to 6%. For extracts used separately the decreasing order of tannin fixation was: cutch, chestnut, hemlock, oak, bisulphited quebracho, valonia, wattle, raw quebracho, myrobalans. Results for mixtures were in general agreement with the same order, sulphite cellulose falling between chestnut and sulphited quebracho. In general, tannin fixation decreases with decreasing rate of penetration. Decreasing  $p_{\Pi}$  (5-3) increases tannin fixation but also slows up penetration. CH. ABS. (e)

Combination of the tanning constituents of sulphite-cellulose extracts with hide substance. A. MIEKELEY (Stiasny Festschr., 1937, 266-275). The amount of combined tanning constituents is obtained by subtracting the sum of the % H<sub>2</sub>O and % hide substance from 100, and the acid-binding capacity by shaking the air-dry leather powder with  $0.1N-H_2SO_4$  for 3 hr., filtering, and titrating the filtrate. The tans combine with the basic groups of the hide powder and reduce its acid-binding capacity nearly in proportion to the quantity taken up. Thus this last factor affords a method of determining tans in absence of other tanning materials which combine with the basic groups of the hide powder. Vegetable tans have only a slight influence on acid-binding capacity. In tanning with a 1:1 mixture of mimosa and sulphite-cellulose extracts, the take up of the last-named was not influenced, but that of the mimosa extract was < with mimosa extract alone. The take up of the cellulose extract is retarded when the ratio of tan to hide substance is not small.

D. B.

X-Ray spectrographic studies of tanning processes. I. Alterations produced in the collagen diagram by vegetable and chrome tanning. J. H. HIGHBERGER and H. J. KERSTEN (J. Amer. Leather Chem. Assoc., 1938, 33, 16—26).—From various X-ray powder photographs it is concluded that both vegetable and chrome tanning result in a loss in definition of the interference corresponding with the side-chain spacing and the 2.8 A. spacing. The loss of definition increases with the amount of tanning agent fixed, both with Cr compounds and gallotannic acid, and results finally in the disappearance of the 2.8 A. spacing. When leather is detannised the original fibre structure of collagen is restored. D. P.

Phagocytosis of bacteria induced by tanning agents. F. C. THOMPSON and J. GORDON (Stiasny Festschr., 1937, 390—395).—Opsonins are substances which act on bacteria so as to render them capable of being engulfed by leucocytes, *i.e.*, promote phagocytosis, and produce agglutination of the bacteria. Examples are normal serum, gallotannin, Fe<sup>III</sup>, Cr<sup>III</sup>, Al<sup>III</sup>, and Th<sup>IV</sup> salts, and silicic acid. It is pointed out that the order of decreasing opsonic effect is that of decreasing tanning power. Opsonins act on the protein part of the bacteria, giving an "insol." combination which is resistant to washing. Agglutination is protein pptn., or simply a "salting out" if it occurs without opsonising effects. Tanning agents do not discriminate between harmful bacteria and body proteins. D. B. Does the extensibility of [tanned] skin depend on the wet-work or the tannage? V. CASABURI (J. Soc. Leather Trades' Chem., 1938, 22, 74—77).— Left halves of several skins tanned with citric acid, alum, and soda are compared with the right halves tawed in a normal manner. The former leather contained more  $Al_2O_3$ , was more resistant to hot  $H_2O$ , and had the same area as the latter. Neither crust nor dyed leather showed any reduction in area on storage. D. P.

Behaviour of leather tanned with wattlebark tannin towards organic solvents. R. O. PAGE (Stiasny Festschr., 1937, 282-288).-Leather tanned with a purified wattle-bark extract that was sol. in all the solvents used was decomposed by them in the following order of diminishing effectiveness : HCO<sub>2</sub>H, MeOH, EtOH, COMe<sub>2</sub>, H<sub>2</sub>O, AcOH, Pr<sup>g</sup>OH, and EtOAc. This is approx. the order of decreasing polarity as shown by the dielectric consts. EtOAc removes only the free H<sub>2</sub>O-solubles, showing that the remaining tannin is combined with the hide. In extraction with H<sub>2</sub>O and AcOH there is a break separating the combined H<sub>2</sub>O-solubles from the combined tannin. Tannage with wattle-bark tannin takes place in solution in HCO<sub>2</sub>H, H<sub>2</sub>O, and AcOH, in all of which hide powder swells, but not in COMe<sub>2</sub> or EtOAc. D. B.

Buffer index of [vegetable-tanned] leather. A. COLIN-RUSS (J. Soc. Leather Trades' Chem., 1937, 21, 631-643).—The characteristic buffer index is given by  $\phi = 100A/\log (F''/F')$ , where F' and F'' are the g.-hydrion contents of the leather before and after acidification, and 100A is the % of acid added to the leather. Both the acidity and true buffer index are necessary in judging the durability of a leather exposed to the effect of acid. D. W.

Differential aspect of acidity in [vegetabletanned] leather. A. COLIN-RUSS (J. Soc. Leather Trades' Chem., 1937, 21, 628-630).—A new term, viz.,  $\delta p_{\rm H}$ , *i.e.*, the  $p_{\rm H}$  of the "clinging layer" or the liquid filling the interstices and clinging to the fibre surfaces when leather is saturated with H<sub>2</sub>O, is discussed.  $\delta p_{\rm H} = 2\cdot8$ —3·0 is the min. at which the leather will not deteriorate. D. W.

Assessment of photomicrographs of vegetabletanned sole leather. (MISS) G. O. CONABERE (J. Soc. Leather Trades' Chem., 1937, 21, 616-628).— The method of assessment of quality suggested by Marriott (B., 1934, 372, 727) is expounded and illustrated by photomicrographs. The factors considered are: boldness, fullness, straightness, and delineation of the fibre bundles, orderliness, angle and compactness of the fibre weave, splitting up of fibre bundles into fibres and fibrils, and the separation of the last two from each other. D. W.

Factors which affect the absorption of water by new and worn sole leathers. E. W. MERRY (Stiasny Festschr., 1937, 251-258).—The grain layer of a sole leather has very high vals. for  $Q_{15}$ ,  $Q_{24}$ , "free H<sub>2</sub>O," and % loss on soaking, but a limiting val. for H<sub>2</sub>O-sol. matter content. Repeated soaking leads to (a) an increase in  $Q_{15}$  and  $Q_{24}$ , which approaches the free H<sub>2</sub>O, (b) a decreased soaking loss, G G (B.) and (c) only a slight change in free  $H_2O$ . Dry wear causes a decrease in  $Q_{15}$ ,  $Q_{24}$ , free  $H_2O$ , and soaking loss, due to loss of the grain layer. Wet wear causes an increase in  $Q_{15}$  and  $Q_{24}$ , a decrease in soaking loss, and very little change in free  $H_2O$ . In applying physical tests to worn leathers in order to judge the quality of the original leather, the one of most val. is the free  $H_2O$ . In leathers which have had fair treatment during wear this should not exceed a limiting val. of 35. D. B.

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Spue on glazed kid leather. R. M. KOPPEN-HOEFER (J. Amer. Leather Chem. Assoc., 1938, 33, 27-31; cf. Moore, B., 1937, 475).—Analyses of spue and of the fat from the corium of normal and spued areas of crust kidskin leathers are recorded. The epidermal lipins cannot be concerned in spue production as the latter contains no unsaponifiable matter. Spue consists approx. of 45% of free fatty acids and 55% of triglycerides. Methods of spue control are discussed. D. P.

Detection of sulphur in chrome leather. L. WEIDENFELD (Collegium, 1937, 625-626).— Leather is boiled with 2% alkaline Na<sub>2</sub>SO<sub>3</sub> and the liquor cooled and mixed with a solution of NaN<sub>3</sub> in 0·1N-I, or the leather may be extracted with CCl<sub>4</sub>, the solvent evaporated, and Hg added, followed by the NaN<sub>3</sub> dissolved in I solution. In presence of S, N<sub>2</sub> is liberated by both methods. D. P.

Preparing a water-resistant casein film on leather. A. USATSCHEV, A. OBSHORIN, and N. USATSCHEV (Kosh. Obuvn. Prom., 1935, 14, 507— 508).—The casein-pigment film is united to the leather by applying a cover film of a solution of a basic Cr salt in formalin, drying slightly, applying a second layer of the same solution, and finally adding a casein solution (H<sub>2</sub>O 100, casein 3·3, alizarin oil 0·5, formalin 3·3 pts.). The leather is then covered with an adhesive containing a chrome solution (basicity 45— 48%, 5—6 g. of Cr<sub>2</sub>O<sub>3</sub> per litre) and 40 c.c. of formalin per litre of chrome solution. CH. ABS. (e)

Control in manufacture of gelatin and glue. C. H. STUPHOLME (Food Manuf., 1938, 13, 46).— The speed of hydrolysis of collagen into gelatin depends on  $p_{\rm H}$ . Max. swelling occurs at  $p_{\rm H} 2.4$  and 11.6, and min. swelling at  $p_{\rm H} 4.7$  and 7.7. The rate of hydrolysis of collagen is least in the  $p_{\rm H}$  range 4.7— 6.0 but rapid at  $p_{\rm H} 3.0$ —4.0. Decomp. of gelatin is max. outside the  $p_{\rm H}$  range 3.0—8.0. Hydrolysis during evaporation is least at the isoelectric point,  $p_{\rm H} 4.7$ . Gelatin for ice cream should have high jelly strength at  $p_{\rm H} 6.3$ , and glue must be raised to  $p_{\rm H} 7$ to give max. adhesive power. W. L. D.

Purest colloids and the connexion between electrochemical constitution and colloid behaviour. W. PAULI (Stiasny Festschr., 1937, 289-306).—An account of the modern theory of electroeratic colloids. D. B.

Adhesives from urea.—See III. Antiseptic power of salts.—See VII. N'garo.—See XX.

See also A., II, 120, Colour reaction of tannic acid.

## PATENTS.

Depilatories. P. M. WEINHOLD (B.P. 478,176, 21.6.37. Switz., 23.6.36).—A depilatory of the plucking type comprises glucose (adhesive) 210 pts., maize flour 20, and white beeswax 8 pts., boiled together for 15 min. with agitation. B. M. V.

Manufacture of synthetic tanning agents. G. W. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 478,280, 20.7.36 and 8.2.37).-Substances sol. in H<sub>2</sub>O obtained by interaction of CH<sub>2</sub>O with phenolor naphthol-sulphonic acids are after-treated with phenols or naphthols free from SO<sub>3</sub>H, CO<sub>2</sub>H, or ·SO<sub>2</sub>·; the second products, which are insol. in  $H_2O$ , are thus dispersed and rendered colloidally sol. In addition an interaction of urea and CH<sub>2</sub>O may be carried out either before or during the after-treatment. Among examples (5), a mixture of m- and p-cresol (450) is sulphonated with  $H_2SO_4$  (450) at 100° and condensed with 30% aq.  $CH_2O$  (210) and neutralised until the reaction mixture (10 g.) requires 10-11 c.c. of N-NaOH for complete neutralisation; urea (120) in  $H_2O$  (120) is condensed at  $35-40^{\circ}$  with aq.  $CH_2O$  (200), neutralised as above, and added to the mixture. Cresols (216) and aq.  $CH_2O$  are again added and the mixture is kept at  $30-35^{\circ}$  until the  $CH_2O$  has disappeared. disappeared. The tanning agent so obtained has a marked plumping action and yields leather of pale colour fast to light. K. H. S.

Production of tanning agents. F. G. A. ENNA, and MONSANTO CHEMICALS, LTD. (B.P. 478,839, 15.10.36).—An aromatic hydrocarbon, phenol (cresylic acid), or carboxylic acid is mixed with about 10% of urea, a derivative  $[CS(NH_2)_2, CS(NHPh)_2, guanyl$  $urea], or a substance <math>(CN \cdot NH_2)$  which will give urea or its derivatives under the reaction conditions; the mixture is sulphonated and then treated with an aldehyde  $(CH_2O)$  followed by neutralisation. Lightcoloured liquids are obtained which are of val. in the production of white leathers possessing improved fastness to light. R. G.

Tanning processes and materials therefor. A. H. STEVENS. From HALL LABS., INC. (B.P. 471,753 and 471,811, [A] 9.3.36, [B] 10.3.36).—(A) Hides are treated with a bating enzyme and a H<sub>2</sub>O-sol. meta-, pyro-, or poly-phosphate at  $p_{\rm H}$  7.4. (B) A tanning prep. is obtained by mixing tanning extracts, *e.g.*, mimosa, sulphite-cellulose waste, with a Na polyphosphate containing 75—85% of NaPO<sub>3</sub> and 25—15% of Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub>. D. W.

Preparation of iron-tanned leather. I. G. FARBENIND. A.-G. (B.P. 470,530, 24.7.36. Ger., 13. and 24.12.35).—Unhaired hides and skins are treated with solutions of complex Fe compounds which contain in the complex org. substitution products of  $NH_3$  [e.g., urea,  $(CH_2)_6N_4$ ,  $NH_2Ac$ ], and a weak (aliphatic) acid, with or without a subsequent treatment with synthetic tanning agents. D. P.

Shoe filler. A. THOMA, ASST. to NORTH AMER. HOLDING CORP. and PARSHAD HOLDING CORP. (U.S.P. 2,056,236, 6.10.36. Appl., 20.8.32).—Ground cork, sawdust, etc. are incorporated with a dispersion of a resin, e.g., WW rosin, in a semi-fluid hydrocarbon, e.g., vaseline. Aq. sulphonated castor oil, soap solution, tapioca, etc. may also be added. S. M.

Manufacture of leatherboard product. N. E. BROOKES. From G. O. JENKINS Co. (B.P. 470,951, 16.11.36).—Fe tannate inks are removed from leatherboard, which has been made from scrap leather, by bleaching with  $H_2C_2O_4$  or its K or Na salt, P oxy-acids, arsenic acids, etc. The leather may be treated either in its disintegrated state or after sheeting. D. A. C.

Production of plastic masses from organic colloids [gelatin and glue]. I. G. FARBENIND. A.-G. (B.P. 478,271, 17.7.36. Ger., 17.7.35).—Plastic masses not containing cellulose are made from hydrophilic albuminous org. colloids to which are added an aliphatic amine of straight chain  $< C_6$ having its solubility in H<sub>2</sub>O increased by a group containing OH, e.g., the product of interaction of stearamide and (CH<sub>2</sub>)<sub>2</sub>O or of C<sub>12</sub>H<sub>25</sub>·OH and (CH<sub>2</sub>)<sub>2</sub>NH. Such amines or their mixtures are employed to soften gelatin or glue films and thus prevent them becoming brittle in dry air. K. H. S.

Adhesives. HENKEL & Co. G.M.B.H. (B.P. 479,316, 18.1.37. Ger., 3.4.36).—H<sub>2</sub>O-sol. sulphonic acids of polysaccharides or cellulose ethers, their salts or derivatives, are mixed with starch or protein derivatives to improve the resistance to putrefaction and give products of high  $\eta$  and adhesive power even in relatively high dilution. R. G.

Manufacture of bleached dry dextrin composition. A. A. HALDENSTEIN, ASST. to NAT. ADHESIVES CORP. (U.S.P. 2,056,575, 6,10.36. Appl., 11.5.33).—Dextrin (I) or other starch-conversion product is either subjected to a fine spray of aq.  $H_2O_2$ or added to a solution of  $H_2O_2$  in a non-solvent for (I), e.g., glycerol. S. M.

Cooling etc. substances [e.g., glue].—See I. Phenolic CH<sub>2</sub>Cl compounds.—See III. Azo dyes. —See IV. Adhesives.—See XVII.

## XVI.—AGRICULTURE.

Solonetz soil B-horizon mixtures for terrace building. H. F. MURPHY (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 481).— These B-horizons have a higher dispersion coeff. and lower Ca: Na ratio than adjacent surface horizons of normal type. Mixtures of surface and B-horizon soils are more erosive than normal surface soils.

CH. ABS. (p)

Chemical composition of soils of Texas. G. S. FRAFS and J. F. FUDGE (Texas Agric. Exp. Sta. Bull., 1937, No. 549, 87 pp.).—Analyses, nutrient vals., and classification of these soils are recorded. A. G. P.

Soils of the phaneropodsolic group in western Oregon. C. C. NIKIFOROFF (Soil Sci., 1937, 44, 447-465).—Three types of these soils, groundwater podsols, glei-meadow podsols, and grey forest soils, are described and their formation is discussed.

A. G. P.

Occurrence of selenium and seleniferous vegetation in Wyoming. I. Rocks and soils of Wyoming : relation to the selenium problem. S. H. KNIGHT. II. Seleniferous vegetation in Wyoming. O. A. BEATH (Wyoming Agric. Exp. Sta. Bull., 1937, No. 221, 64 pp.).—I. Sources of Se in soils are examined.

II. Application of aq.  $K_2Se_2O_3$  or  $Na_2Se_2O_3$  to soil caused accumulation of Se in surface layers. Nontoxic seleniferous shale became toxic after growth in it of typical weeds indigenous to toxic soils. The Se from the weeds was dispersed in soils by leaching.

A. G. P.

Moisture contents of German soils in relation to climatic conditions. W. LAATSCH (Ernähr. Pflanze, 1938, 34, 37–38).—Rates of evaporation of  $H_2O$  from soils in different districts are calc. and discussed with other meteorlogical data in relation to crop yields and process of soil formation. A. G. P.

Black soils of Yugoslavia. A. J. STEBUTT (Ernähr. Pflanze, 1937, 32, 376–379).—The soils described are in some cases of chernozem types whereas others are derived from lacustrine deposits (smonitza soils). Of the latter, two classes are distinguished according to whether or not additions of silty matter are still being made. The agricultural uses of these and of certain black alkaline soils are discussed. A. G. P.

Soil acidity. II. Relation between soil acidity and soil physics. S. KÜHN (Bodenk. Pflanzenernähr., 1937, 6, 7—37; cf. B., 1933, 118).—The difference between  $p_{\rm H}$  (KCl) and  $p_{\rm H}$  (H<sub>2</sub>O) is high in alkaline and low in approx. neutral soils, reaches a secondary max. in soils of approx.  $p_{\rm H}$  5.5, and diminishes in those of still greater acidity. It is directly related to the plasticity of clay and is due to differences in clay dispersion rather than to the state of "unsaturation" of the soil or to H<sup>\*</sup> exchange effects. The difference,  $p_{\rm H}({\rm CaCl}_2) - p_{\rm H}({\rm H}_2{\rm O})$ , depends, not on the state of dispersion of the clay, but on an anion-exchange action in which sparingly sol. PO<sub>4</sub>", humate, or carbonate is formed. A. G. P.

Change of oxidation-reduction potentials of water-logged soils. IV. Effect of proteins and carbohydrates. K. SHIBUYA, H. SAEKI, and K. RYU (J. Agric. Chem. Soc. Japan, 1938, 14, 35-42; cf. B., 1937, 1097).—Addition of mannitol to soils of sandstone and shale origin, humus loam, and lateritic clay caused a rapid decrease in E during early stages of H<sub>2</sub>O-logging, but there was a gradual rise later. When casein was used there was a very large decrease in E and practically no rise later. The changes in E depend also on whether mannitol or casein is added to soils containing aërobic or anaërobic organisms. The effect of adding  $(NH_4)_2SO_4$  is similar to that produced by casein, but the depression is not so large. J. N. A.

Oxidation-reduction capacity and intensity in waterlogged soil. M. B. STURGIS (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 71—72).—Toxic or inhibitory factors developed in soils examined during wet, cold conditions and disappeared slowly at higher temp. and with good drainage. The redox potential was not lowered by addition of fresh org. materials. In presence of excess of  $H_2O$ ,  $NO_3'$ ,  $NO_2'$ , and  $SO_4''$  were reduced and much Fe and Mn appeared in the soil solution;  $H_2O$ -sol. P diminished. Addition of K and Ca salts increased the amount of P remaining in solution in presence of Fe and Mn. Reduction of  $SO_4^{\prime\prime}$  yielded acid-sol. but not  $H_2O$ -sol. S<sup>''</sup>. Oxidation and nitrification in these soils after drainage is probably delayed by the redox potential remaining too high for growth of the organisms until the active Fe and Mn sulphides have been oxidised. CH. ABS. (p)

Soil stabilisation with emulsified asphalt. C. L. MCKESSON (Can. Eng., 1936, 70, No. 6, 5–10).— The asphalt is carried into and around the colloidal clay particles, making them resistant to capillary  $H_2O$ . The amount of emulsion required is based on the fines contained in the soil. Tables and charts of results are given. CH. ABS. (e)

Soil-corrosion studies, 1934. Butuminous coatings for underground service. K. H. LOGAN (J. Res. Nat. Bur. Stand., 1937, 19, 695—740; cf. B., 1937, 792, 566, 268).—No inherently superior protective coating material for pipe-lines has been found. The performance of any material varies with the soil conditions. Distortion is affected by the shrinkage and relative density of the soil. Coal-tar base coatings absorb less  $H_2O$  and have better insulating properties than those with asphalt bases, but are more affected by soil stresses. Asbestos appears to be the best reinforcement material. J. W. S.

Solubility of iron and phosphorus in soils and in chemical precipitates as affected by the acidity of the extracting solution. H. J. HARPER and H. A. DANIEL (Assoc. Southern Agric. Workers, Proc. 34-36th Ann. Conv., 1933-5, 236-238).-The total P extracted from soil by successive treatments with 0.2N-H2SO4 rapidly reaches an equilibrium level. With more dil. solutions of acid the amount of P removed per extraction is much smaller and the total amount of P removed by repeated extractions only slowly approaches that obtained in a single extraction by 0.2N-acid. Very few soils examined yielded appreciable amounts of Fe to the 0.2 x-acid; such soils converted sol. PO<sub>4</sub><sup>'''</sup> into a form unavailable to plants. Freshly pptd. Al and Mn phosphates dissolve readily in 0.5N-AcOH, but FePO, dissolves only slowly. Soils containing Fe sol. in acids at  $p_{\rm H}$  1-2 convert PO<sub>4</sub>" into insol. forms. CH. ABS. (p)

Colloidal properties of soil-organic matter. L. D. BAVER and N. S. HALL (Missouri Agric. Exp. Sta. Res. Bull., 1937, No. 267, 23 pp.).-The potential of colloidal humus, measured by migration velocity, is approx. 50% of that of a clay. The migration velocity of humus saturated with various cations decreased in the order: Li = Na > K > H > Ca> Ba; the  $\eta$  of the various systems was in the order: Ba > Ca > H > Na > Li > K. Complete dispersion or flocculation of Li-, Na-, and K-humus, e.g., by HCl, BaCl<sub>2</sub>, or CaCl<sub>2</sub>, was attained only with difficulty; flocculation by dehydration with MeOH or EtOH was impossible. Thiv in small concns. flocculated H-humus, but with large proportions redispersion due to reversal of charge occurred. The energy of adsorption and release of cations was of the same order as that in colloidal clay. Colloidal humus behaves as a highly hydrated suspensoid. Hydration is the principal factor controlling the stability of bivalent humus sols. The high energy of adsorption of Mg and its low flocculating power in respect of humus may be related to the formation of Mg-solonetz soils. Reversibility of dehydrated Ca-humus is > that of H-humus and explains the migration of org. matter to great depths in pedocal soils. A. G. P.

Physicochemical reactions between organic and inorganic soil colloids as related to aggregate formation. H. E. MYERS (Soil Sci., 1937, 44, 331-359).—Admixture of org. with mineral soil colloids results in changes in  $\eta$  which are influenced by the amount of org. matter added by the cations present, and by the nature of the soil colloid. Addition of org. colloids to mineral colloids, finely-divided quartz, orthoclase, or Al<sub>2</sub>O<sub>3</sub> diminishes the baseexchange capacity of the system by > the calc. amount. In presence of increasing amounts of org. colloids the cataphoretic velocity of clay soils increases to a max. and subsequently declines. A chemical combination between org. and mineral colloids, notably under acid conditions, is indicated. Org. colloids whether saturated with Ca" or with H are much more effective than clay colloids in binding soil particles together to form aggregates. Stable aggregates are formed only after drying. Drying followed by re-moistening does not appreciably alter the exchange capacity of org. colloids; their favourable influence on stable aggregation is probably related to the low degree of dispersion after drying. Dried Ca-org. colloid is more highly reversible in  $H_2O$  than is dried H-colloid. A. G. P.

Scheme of analysis for the organic matter fraction of soils and composts. C. N. ACHARYA (Proc. Soc. Biol. Chem., India, 1938, 3, 21).—Ordinary methods for the determination of cellulose, lignin, etc. are unsuitable for use with soils. For hemicelluloses the total furfuraldehyde content is determined by the author's  $SnCl_2$ -phloroglucinol method. Cellulose is found by alternate treatments of the soil with acid hypochlorite and alkaline  $Na_2SO_3$ , certain corrections being applied. Lignin is determined by treatment with 72% H<sub>2</sub>SO<sub>4</sub> for 15 hr. at 15—20°, a correction being applied for the associated nitrogenous fraction. L. D. G.

Soil borer. B. RAMSAUER (Ernähr. Pflanze, 1938, 34, 47–49).—The borer permits sampling successive depths of soil in sequence. A. G. P.

Pore-space determination [of soil] as a field method. W. C. VISSER (Soil Sci., 1937, 44, 467— 479).—The method (apparatus described) depends on the calculation of the free air space in soil from measured changes in vol. with alterations of pressure. A. G. P.

Electrodialysis of soils. II. Polarographic current-voltage curves. A. N. PURI and R. C. HOON (Soil Sci., 1937, 44, 399-408; cf. B., 1937, 705).—Such curves for exchangeable bases in soil are of the same type as those for salt solutions. Exchangeable bases in soils are probably combined chemically with, rather than adsorbed on, the clay particles. A. G. P. Electrometric titration of soil suspensions. O. WEHRMANN and R. BALKS (Bodenk. Pflanzenernähr., 1937, 6, 1—7).—Excess of Ba(OH)<sub>2</sub> is added to the suspension and titrated electrometrically with  $H_2SO_4$ . Vals. so obtained are correlated with Kappen's " $y_1$ " vals., the ratio between the two being somewhat wider in light than in heavy soils. A. G. P.

Evaporating the water with burning alcohol as a means of determining moisture content of soils. G. J. BOUYOUCOS (Soil Sci., 1937, 44, 377— 383).—The weighed soil sample (20—25 g.) is placed in a metal cup having a perforated base to form a layer approx. 0.5 in. deep. MeOH is poured over the soil, and when drainage has practically ceased the remaining MeOH in the soil is burned. The process is repeated until the residual soil attains const. wt. Towards the end of the drying process the soil attains a temp. of approx. 130° in the central portion and 160° near the walls. Org. matter and combined H<sub>2</sub>O in soil are not affected by the burning process in soils containing <11% of org. matter. A. G. P.

Physical characteristics of soils. I. New methods of measurement. A. N. PURI (Soil Sci., 1937, 44, 481–487).—Apparatus for determining the cohesion, Brinell no., and erosion rates of soils is described. A. G. P.

Absorption spectrum of humic acid in solutions. W. FRÖMEL (Bodenk. Pflanzenernähr., 1937, 6, 93—119).—Absorption curves of solutions of humic acid from various sources in 1% aq. NaOH and aq. NaF are recorded and discussed. A. G. P.

Cellulose decomposition in synthetic and natural soils. M. R. MADHOK (Soil Sci., 1937, 44, 385—397).—In sand-bentonite media decomp. of cellulose by soil organisms was facilitated by a slightly acid initial reaction. NaNO<sub>3</sub> proved a better source of N and induced a higher bacterial population than did  $(NH_4)_2SO_4$ . In the early stages of decomp. fungi were prominent, but were later replaced to a considerable extent by bacteria. Development of fungi was more rapid in acid and that of bacteria in neutral or alkaline media. Differences in fertiliser treatment did not influence the development of cellulose-decomp. microorganisms. A. G. P.

Influence of light and heat on formation of nitrate in soil. S. A. WAKSMAN and M. R. MADHOK (Soil Sci., 1937, 44, 361–375).—Exposure of soil to sunlight did not affect the rate of nitrification of native N or of added  $(NH_4)_2SO_4$ . The apparent increase in the amount of  $H_2O$ -extractable  $NO_3'$  in soil after drying results from the greater ease of extraction following drying rather than from production of  $NO_3'$  during the drying process. A. G. P.

Influence of artificial irradiation on oxidation of ammonia and formation of nitrate in soil. S. A. WAKSMAN, M. R. MADHOK, and A. HOLLAEN-DER (Soil Sci., 1937, 44, 441-446).—Ultra-violet irradiation of soil destroys certain types of bacteria, notably nitrifying organisms. Photochemical production of  $NO_3'$  in soil was not observed. A. G. P.

Photochemistry of nitrogen fixation and resemblance between nitrogen fixation and carbon assimilation. N. R. DHAR, E. V. SESHA- CHARYULU, and S. K. MUKERJI (J. Chim. phys., 1937, 34, 756—763).—From the results of field trials and experiments *in vitro* (cf. B., 1936, 421, 707, 898) it is concluded that N fixation is greater in light than in darkness, and that light is utilised for it in the same way as in C assimilation. The required energy can also be provided by the oxidation of energy-rich material. F. L. U.

Availability of nitrogen undervarying moisture conditions in the soil. I. Lateritic tea soil. Y. D. WAD and S. GHOSH (Proc. Soc. Biol. Chem., India, 1938, 3, 1—12).—N changes were studied under laboratory conditions for 16 weeks, in 2-in. soil layers given 11 different manurial treatments. Moist conditions tended to suppress nitrification and favour ammonification. Deficient moisture favoured accumulation of total N. L. D. G.

Water as a growth factor [for plants]. H. KELLER (Bodenk. Pflanzenernähr., 1937, 6, 37–47). —Relations between the crit.  $H_2O$  content and the supply of soil- $H_2O$  to plants are examined. The significance of certain physical properties of soils, of climatic conditions, and of the nature and age of the plant is considered. A. G. P.

Continuous supply of water to plants as an indispensable condition of high yields. N. S. PETINOV and P. S. BELIKOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 17, 499—502).—The depth distribution of  $NO_3'$  in soils with and without supplementary watering and treatment with  $NH_4NO_3$  is examined. Best results with wheat were obtained with a sustained  $H_2O$  supply and additions of fertiliser in successive fractions during the season as supplements to a preliminary application before sowing.

A. G. P.

Effects of variation in soil-water content on growth of certain species of plants. W. W. WIGGIN (Ohio Agric. Exp. Sta. Bimo. Bull., 1937, 22, [188], 136—141).—The influence of auto-irrigation, of surface mulching, and of incorporation of org. matter on the development, root/shoot ratio, and flowering period of plants and on the rate of rooting of cuttings is examined. A. G. P.

Soils and fertilisers. E. J. RUSSELL (J. Roy. Agric. Soc., England, 1937, 98, 391–435).—A review, covering manuring, drainage, cultivation, reclamation, and liming of soils. W. L. D.

Importance of potassium sulphate as fertiliser. V. N. PROKOSCHEV (Kalii, 1937, 6, No. 4, 29–38).— Experiments with potatoes, clover, barley, oats, flax, and beetroot are described, comparing the effects of  $K_2SO_4$  and KCl as fertilisers on sandy soils. In general,  $K_2SO_4$  is superior when there is a deficiency of S in the soil, but the effect of KCl can be improved by adding  $Na_2SO_4$ ,  $K_2SO_4$ , or S. For N-K fertilisers, with  $K_2SO_4$ , better results are obtained when N compounds other than  $(NH_4)_2SO_4$  are used. Cl has an adverse effect on the starch content of potatoes.

D. G.

Use of kraft-cellulose paper bags for transport and storage of potash fertilisers. D. I. BELIAI (Kalii, 1937, 6, No. 5-6, 27-33).—Ordinary 4or 5-ply kraft paper bags are unsuitable for 40% and 95% KCl fertilisers on account of  $H_2O$  absorption and caking difficulties. 5-ply bags impregnated throughout with bitumen are very satisfactory. Weakening of the bags is due to  $H_2O$  absorption and not to KCl. Bags impregnated with ammoniacal Cu salts of naphthenic acids are considerably more  $H_2O$ -resistant than bitumen-impregnated bags, but the CuO weakens the paper. D. G.

Potassium, and not water, limits crop yields on marsh soils. A. R. ALBERT (Wisconsin Agric. Exp. Sta. Ann. Rept. [1933-4], Bull., 1935, No. 430, 51-53).—The marsh soils responded to K, and to P if applied with K. Liming did not affect yields. CH. ABS. (p)

Loss of plant nutrients from peat soil. B. D. WILSON and E. V. STAKER (Cornell Univ. Agric. Exp. Sta. Mem., 1937, No. 206, 16 pp.).—Loss of Ca by leaching from these soils was > that of any other nutrient, and in fallow soils was > the combined loss in drainage  $H_2O$  and crop in cropped soils. Loss of P was very small. Cropping conserved Mg and S.

A. G. P. Does fluorine in phosphatic fertilisers endanger public health? P. H. PHILLIPS, E. B. HART, and G. BOHSTEDT (Wisconsin Agric. Exp. Sta. Ann. Rept. [1933—4], Bull., 1935, No. 430, 125—127).— The F content of crops from soils receiving P fertilisers containing F over a long period was >2 mg. per kg. (hay). Cows receiving food containing 1 g. of F daily showed no injury. Public health is not endangered by the F in P fertilisers. CH. ABS. (p)

Humus content and absorption properties of test fields after 14 years' treatment with fertilisers. A. A. HOVDEN (Tids. Kjemi, 1938, 18, 7-9).—Examination of soils from fields treated, respectively, with artificial fertiliser and dung, for 14 years, and from an untreated control, show little difference in humus content or base-exchange properties. M. H. M. A.

Manuring of pastures. R. H. LUSH (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 409-410). -Liming with 2 tons of oyster shell per acre gave 7.7% more hay but no increase in milk yield. 200 lb. each of NaNO<sub>3</sub> and superphosphate gave a 40% increase in hay and 29% increase in milk yield. 150 lb. of CaCN<sub>2</sub> after a complete manure the previous year gave 67% more hay and 95% more milk. Data are supplied for similar results on hill and woodland pastures, and improvement of the mineral content of hay from manuring is described. The val. of pasture tests in milk production is discussed. W. L. D.

Fertilised and rotationally grazed pastures prove highly productive. G. B. MORTIMER, E. TRUOG, D. S. FINK, and F. T. BOYD (Wisconsin Agric. Exp. Sta. Ann. Rept. [1933-4], Bull., 1935, No. 430, 45-48).—Over a 5-year period, N fertilisers increased the yield and N content of grasses and improved the general condition of the soil. Yields were increased even in drought seasons. CH. ABS. (p)

Development and deterioration of roots in relation to growth of pasture plants grown with different fertiliser and cutting treatments. W. A. LEUKEL (Ann. Rept. Florida Agric. Exp. Sta., 1934, 33—34).—The % N in stems and roots of grasses varies inversely with the frequency of cutting. The % K and P is higher in stems of more frequently cut grasses. Variations in the % K were < in that of N or P. CH. ABS. (p)

Cobalt content of some Nelson [New Zealand] pastures. H. O. ASKEW and P. W. MAUNSELL (New Zealand J. Sci. Tech., 1937, 19, 337—342).— Healthy pastures contained more Co than did those associated with bush sickness. Top dressing with CoCl<sub>2</sub> increased and liming diminished the intake of Co by pasture grasses. The latter effect was not sufficient to render Co dressing ineffective. The Co content of pastures decreased sharply at the end of the season. A. G. P.

Microbiological aspects of decomposition [in soil] of clover and rye plants at different growth stages. J. L. LOCKETT (Soil Sci., 1937, 44, 425-439).-Young plants contain relatively high proportions of EtOH- and Et2O-sol. matter, carbohydrate, protein, and sol. ash. These constituents diminish and cellulose, hemicellulose, and lignin increase in proportion as the plants age. Rates of decomp. of plant materials in soil are max. at stages at which the H<sub>2</sub>O-sol. matter contents are highest and when the  $H_2O$  content of soil is moderate. In the early stages of decomp. NH<sub>3</sub> accumulates, reaching a fairly const. level which is maintained until the rate of decomp. of the plant material declines. At this stage nitrification begins. Incorporation of plant material with soil increases its population of bacteria, fungi, and Actinomyces, the influence of young being > that of mature plants, and that of clover > that of rye. The nos. of cellulosedecomp. organisms are greatest in soils treated with young clover, and less in those receiving young rye, whereas with mature plants the nos. are  $\Rightarrow$  in untreated soil. A. G. P.

Reliability of the "picric acid test" for distinguishing strains of white clover in New Zealand. N. G. For and E. O. C. HYDE (New Zealand J. Agric., 1937, 55, 219-224).—Close correlation is established between the agronomic val. of clover strains (field trials) and results of the Pethybridge picric acid test for cyanogenetic glucoside contents. A. G. P.

Fertilisation of lucerne on alkaline calcareous soils. W. T. McGEORGE and J. F. BREZEALE (Arizona Agric. Exp. Sta. Bull., 1936, No. 154, 26 pp.). —On these soils lucerne responds to K and P fertilisers, but does not need applications of N. Better results are obtained by drilling the fertiliser than by additions to irrigation  $H_2O$ . Unsuitable mechanical conditions (puddling) in soils more than counteract the beneficial effects of fertilisers. Lucerne dressed with  $PO_4^{\prime\prime\prime}$ shows an increased nutrient val. A. G. P.

Feasibility of ensiling lucerne by the A. I. V. method. G. BOHSTEDT, W. M. BEESON, I. W. RUPEL, E. B. HART, H. STEENBOCK, W. H. PETERSON, H. R. BIRD, and E. B. FRED (Wisconsin Agric. Exp. Sta. Rept. 1933-4, Bull., 1935, No. 430, 113-116).— The ensilage was prepared with acid additions at the rate of 90-120 litres of 2N-HCl-H<sub>2</sub>SO<sub>4</sub> (4:1) per ton of lucerne. When fed to cows milk and butter-fat yields were approx. the same as when a normal ration was given, but the vitamin-A content of the fat was doubled and the carotene content increased by 50%. During silage-feeding, the alkali reserve of the blood diminished by 14.5%, but no injurious effects on health were observed. In urine, fixed CO<sub>2</sub> decreased,  $p_{\rm H}$  fell from 7.6 to 5.9, and the ratio of NH<sub>3</sub>-N to total N increased by 1—11%. Use of acid in ensilage did not restrict bacterial growth, and loss of nutritive val. was small. The silage contained 0.95% of lactic acid. CH. ABS. (p)

Distribution and variation with maturity of dissolved solids, sucrose, and titratable acidity in the sorghum stalk. E. K. VENTRE and S. BYALL (J. Agric. Res., 1937, 55, 553-562).—In nearly all varieties the total solid and sucrose (I) contents of the juice increased with advancing maturity, max. increases occurring in the third and fourth internodes. The coeff. of apparent purity of the juice is paralleled by its (I) content. If juice is to be used for crystallising (I), removal of bottom internodes is preferable to topping. If syrup of lower coeff. of purity is to be prepared, topping is recommended since this diminishes the tendency to crystallisation. A. G. P.

Treatment of seed grain for extra-early sowing. K. NOZDRATSCHEV (Bull. Ukrain. Sci.-Res. Inst. Grain Culture [Dept. Phytopath.], 1935, No. 1, 78—86).—Early sowing in frozen soil favours infestation of wheat, barley, and oats with external smut. Treatment of spring wheat seed with  $CH_2O$ , As preps., or Paris-green causes germination injury. Cu carbonate gives satisfactory results.

Сн. Авз. (р)

Treatment of vernalised spring wheat seed with mordants. E. FOMIN and K. NOZDRATSCHEV (Bull. Ukrain. Sei.-Res. Inst. Grain Culture [Dept. Phytopath.], 1935, No. 1, 66—76).—Vernalisation increases infestation with bunt. Treatment of seed with 0.1% CH<sub>2</sub>O in the second moistening in the vernalisation process gives best control. As compounds lower the germinative capacity.

CH. ABS. (p)Soil temperature and effect of fertilisers on yield and quality of spring wheat. V. V. BUTKE-VITSCH (Compt. rend. Acad. Sci. U.R.S.S., 1937, 17, 47-49).-The grain yield of wheat increased with soil temp. in the range 20-35° both in unmanured soils and in those receiving P and K. When N was applied also the temp. effect was reversed. The % of total and protein-N in the grain increased with rising temp. irrespective of the inclusion of N in the fertiliser mixture. The % P in grain increased with rising temp., especially when N was added to the soil. Nitrification and the production of easily hydrolysable N in these soils was optimal at  $35^{\circ}$ . At >  $26^{\circ}$  the amount of H<sub>2</sub>O-sol. P in soil tended to decrease, probably through assimilation by micro-organisms. The optimum temp. for salt absorption by plants was 23-25°. The bearing of these observations on A. G. P. fertiliser practice is indicated.

Death of plants caused by low temperatures. H. WARTENBERG (Ernähr. Pflanze, 1937, 34, 21-27). —Seeds germinated in aq. KCl withstood low temp. better than those germinated in  $H_2O$ . The tendency of the outer  $H_2O$  film of the seed to supercooling is a notable factor in cold-resistance. Washing seeds after germination in KCl eliminated the increased resistance to subsequent low-temp. treatment. Pretreatment with salts of tervalent bases was less effective than with those of univalent bases in increasing cold-resistance. A. G. P.

Phosphatic fertilisation of rice under submerged conditions. L. C. KAPP (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 73—74).—Applications of superphosphate (500 lb. per acre) increased the P content but not the final yield of rice. The soil solution contained very small amounts of available P which were not appreciably increased by application of P fertilisers. Heavy dressings of Ca(OH)<sub>2</sub> produced healthier plants without diminishing their P contents or growth.

Сн. Авз. (р)

Effects of calcium arsenate on rice. A. H. MEYER (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 241).—When applied to a silt loam Ca arsenate at the rate of 25 lb. per acre diminished rice yields by 20%, and by 60% at 200 lb. per acre. 1000 lb. per acre prevented growth. Fertiliser applications did not counteract these toxic effects. CH. ABS. (p)

Effect of green manuring, alone and in combination with phosphatic fertilisers, on yield and phosphate content of paddy (unhulled rice). D. V. BAL (Nagpur Univ. J., 1936, No. 2, 43-47).— Addition of N to soil by green manuring with "sann" increased the yield of paddy, the effect being enhanced by supplementary use of P fertilisers. The P content of the seed was decreased by green manure alone, but increased when green manure + P was applied. A. G. P.

Fertilisation of vegetable plants with potash. S. S. RUBIN (Kalii, 1937, 6, No. 5-6, 40-44).--Experiments with tomatoes, cabbages, and cucumbers are described. Optimum yields of tomatoes are obtained when the K is added during two periods, viz., when flowering commences and before the fruit is picked, the yield being almost doubled compared with results obtained when the full dose is added before planting. Ripening is accelerated and the quality of the fruit improved. With cabbages, the fertiliser should be added when the heart begins to be formed. Pot experiments with cucumbers show a 26.9% increase in yield due to K. D. G.

Potato-seed treatment in Wyoming. G. H. STARR (Wyoming Agric. Exp. Sta. Bull., 1937, No. 222, 52 pp.).—Comparative trials with Hg,  $CH_2O$ , and proprietary preps. are described. In controlling *Rhizoctonia* and scab the efficiencies of Hg and  $CH_2O$ were not greatly different. Treatment of soil with inoculated S,  $(NH_4)_2SO_4$ , or superphosphate did not materially affect the prevalence of the diseases.

A. G. P.

Effect of potassium on resistance of potato leaf to frost and *Macrosporium*. S. F. SCHUBIN and O. G. SCHUBINA (Kalii, 1937, 6, No. 7, 38-40). —Tests show that the resistance of potatoes to frost is greatly increased by treatment of the soil with fertilisers containing K. This is applied before the potatoes are planted. K also prevents the fungoid disease *Macrosporium*, particularly in humid and hot climates when the disease is most destructive.

D. G.

Influence of wart disease on magnesium metabolism of potatoes. A. NEMEC (Ernähr. Pflanze, 1936, 24, 413—416).—The ash of affected tubers and the % Mg and K therein was < and the % Ca > in that of healthy tubers. The ratios MgO/K<sub>2</sub>O and MgO/CaO were also lower in diseased tubers. A. G. P.

Movement of salt (alkali) in lettuce and other truck beds under cultivation. W. T. McGEORGE and M. F. WHARTON (Arizona Agric. Exp. Sta. Bull., 1936, No. 152, 438).—Salt movements under various conditions of ridge cultivation in irrigated soils are examined. Salt concn. is least in furrows and highest in the centre of ridges. Nitrates, chlorides, and sulphates of Na, K, Ca, and Mg show the greatest mobility, K being least mobile since its movement depends largely on base-exchange reactions. Movement of PO<sub>4</sub>"' is negligible unless sol. P fertilisers are applied; it is facilitated by applications of Ca(NO<sub>3</sub>)<sub>2</sub>. Applications of NH<sub>4</sub> phosphates are followed by appreciable lateral movement towards ridge centres and notably downward movement into subsoil. Crowned-ridge cultivation gives best results since salt concn. is low at the shoulders where plants are located. A. G. P.

Effect of fertilisers on yield and potassium content of sugar beet. I. A. SIROTSCHENKO (Kalii, 1937, 6, No. 4, 38-40).—The effect of fertilisers in crop-rotation experiments on the yield and quality of the beet is discussed. Application of farm manure to the preceding winter corn crop does not lower the effect of P-N fertilisers, but that of P-K fertilisers is reduced; the total K in sugar beet is considerably increased by fertilisers, but the sol. K content is much smaller if the previous corn crop is manured. The sol. K is increased if N-P fertilisers are used. D. G.

Potash fertilisers and sugar-beet quality. E. N. ALEXEEVA (Kalii, 1937, 6, No. 7, 35-38).---The effect of K fertilisers, particularly KCl, on sugar beet is discussed. K fertilisers do not increase the harmful N content, viz., the  $NH_2$ -acids, of the beet, but KCl tends to increase the sol. ash content of the roots. KCl should be added during the second half of the vegetation period, *i.e.*, when the plant has a max. sugar content. The K increases the hydrocarbon content and lowers the sol. N, whilst the Cl decreases assimilation of N from the soil. The sugar content is increased. D. G.

Influence of daily introductions of nitrogen and phosphorus on accumulation of hydrophilic colloids by sugar beet. V. P. Porov (Compt. rend. Acad. Sci. U.R.S.S., 1937, 17, 63-65). —Fractional applications of N during the growth of beet increased the "coeff. of colloidality" to extents which were directly related to the frequency of the fractional additions, the total amount of N added being the same in all cases. Similar applications of P produced similar effects whether given alone or in conjunction with N. The  $\eta$  of the sap diminished with the frequency of the N additions and increased with that of P. When N and P are given simultaneously the influence of N on  $\eta$  predominates. The sugar content of roots increased steadily with the frequency of P additions, but reached a max. with an intermediate frequency of N treatments. Applications of N and P in the later stages of growth diminished the amount of harmful N in the roots.

A. G. P. Colloid-chemical composition of sugar beet as determined by time of introduction of nutrient substances. V. P. POPOV (Compt. rend. Acad. Sci. U.R.S.S., 1937, 17, 65-68).-With sand-cultured beet, applications of N in excess of the basal supply were most effective if given when 7—8 pairs of leaves were fully developed. P was most effective at the 9-10-pair stage and K gave best results when applied still later. Max. effects of complete nutrient mixtures resulted from applications at the 20-pair stage. Fractional distribution of N + P + K over the growing period caused an increase in " coeff. of colloidality" which varied directly with the frequency of application; in no case, however, did it reach the level obtained by applying the whole of the fertiliser at sowing. The sugar content of beet benefited most from K applications when these were made late in the growth period. P was most effective in this respect when applied at the 8-pair leaf stage.

A. G. P.

Nutritive media for sugar beet in sand and water cultures. F. UKRADIGA and A. OLEX-LJUK (Compt. rend. Acad. Sci. U.R.S.S., 1937, 17, 491-494).—A suitable nutrient solution (composition given) is described. A. G. P.

Migration of potash in sugar-cane leaves. M. KENJO (Int. Sugar J., 1938, 40, 33).—Analysis of separate leaves of individual cane stalks, taking samples from the lower end of the stalk and proceeding to those at the top, showed that the amount of  $K_2O$ in cane leaves increases according to their height on the stalk, the youngest always containing the most. It appears therefore that as the new leaves develop their K content migrates upwards, from leaf to leaf, in successive stages, to an extent dependent on the supply of available  $K_2O$  in the soil. J. P. O.

Effect of sunlight on utilisation of nitrogen and potash by [sugar] cane. R. J. BORDEN (Int. Sugar J., 1938, 40, 33—34).—When an attempt is made to overcome the effect of continued periods of overcast or cloudy weather by increasing the amount of available N and K in the soil, the cane has an inferior juice quality, due to its higher  $H_2O$ content, which was proved to be increased under these conditions by supplying N and K<sub>2</sub>O. Possibly, therefore, better juices might be obtained under inferior light conditions by being less liberal with these plant foods. J. P. O.

Effect of defoliation on sugar accumulation in successive joints of the cane plant. M. YAMA-SAKI and H. ARIKADO (Int. Sugar J., 1938, 40, 34).— Removal of the bottom third of the green leaves has no effect on the size or sugar content of the joints, even of relatively young cane. Removal of the middle third of the leaves reduces the sugar concn., not only in the middle joints, but also in the lower ones. Removal of the leaves from the top third of the green leaf crown reduces both the size and the sugar content of the top joints and of all the lower ones. Only one variety of cane was investigated, namely POJ 2725. J. P. O.

Root-nodule bacteria of wild leguminous plants in Wisconsin. O. A. BUSHNELL and W. B. SARLES (Soil Sci., 1937, 44, 409–423).—Nodule organisms from 44 legumes are examined and a tentative classification is suggested on the basis of cross-inoculation tests. A. G. P.

Asparagus fertiliser experiment on Long Island. P. H. WESSELS and H. C. THOMPSON (Cornell Univ. Agric. Exp. Sta. Bull., 1937, No. 678, 16 pp.).—Growth response to N was > that to other fertilisers. KCl was superior to  $K_2SO_4$ . A. G. P.

Utilisation of potash dressings by hop plants. H. SCHWAB (Ernähr. Pflanze, 1936, 32, 373-376).— Yields of dried hops were increased by application of K fertilisers (up to 110 lb. of  $K_2O$  per acre), but the aroma of the product was best when moderate dressings were given. A. G. P.

Irrigation requirements of cotton and grain sorghum in the Wichita Valley, Texas. C. H. McDowELL (Texas Agric. Exp. Sta. Bull., 1937, No. 543, 32 pp.).—Yields are examined in relation to field conditions, total rainfall, and irrigation levels. A. G. P.

Nitrogenous fertilisers on cotton and maize. R. KLYKENDALL (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 476—477).—The efficiency of N fertilisers applied before planting was in the descending order, NaNO<sub>3</sub>, NH<sub>4</sub>NO<sub>3</sub>, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, CaCN<sub>2</sub>, cottonseed meal. CH. ABS. (p)

Machine placement of fertiliser for cotton. H. P. SMITH, H. F. MORRIS, and M. H. BRYOM (Texas Agric. Exp. Sta. Bull., 1937, No. 548, 52 pp.).— Fertiliser placed within 1 in. of the seed diminished germination. Placement to the side and below seed level gave best results. The total no. of plants obtained was slightly increased by placing a fraction of the total fertiliser application in the soil immediately above the seed. A. G. P.

Fertiliser experiments with cotton on heavy irrigated soils. G. STATEN and D. A. HINKLE (New Mexico Agric. Exp. Sta. Bull., 1937, No. 248, 16 pp.).—Field trials are recorded. Farmyard manure gave consistently higher yields than fertiliser treatment. Manurial treatment did not affect the prevalence of *Verticillium* wilt. A. G. P.

Relation of fertiliser treatments to the mineral nutrients in sap and tissue of the cotton plant. W. R. PADEN (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv. 1933—5, 473—474).— The Na content of the sap was markedly increased by treatment of soil with NaNO<sub>3</sub>, whereas application of Ca(NO<sub>3</sub>)<sub>2</sub> only slightly increased the Ca content. The total K, Na, and Ca of plants were increased to a greater extent by NaNO<sub>3</sub> than by  $Ca(NO_3)_2$  in cases where the Ca was > the K content of the plants. Where the K was > the Ca content the salts produced similar increases in yields of cotton. Electrodialysis of fresh plant tissue removed K, Na, Ca, and Mg in amounts descending in the order named, during the first hr. The amount of Mg removed was small until removal of Ca was nearly complete, and was greatest after 3—5 hr. A general correlation exists between the order of removal of cations from soil colloids by electrodialysis, the order of intake of nutrients by plants, the order of removal from plant tissue by electrodialysis, and the electromotive series.

Сн. Авз. (р)

Nutrient-deficiency symptoms in certain plants. H. P. COOPER (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 80— 81).—Mg deficiency, as indicated by the proportion of red leaves on cotton plants, varied with fertiliser treatments in the descending order : NaNO<sub>3</sub> > Calnitro =  $(NH_4)_2SO_4 > CaCN_2 > urea > ammoni$  $ated superphosphate > Ammophos > <math>(NH_4)_2SO_4 +$ basie slag. Leaching of Mg from soil is accentuated by NO<sub>3</sub>', and diminished by Ammophos, which effects pptn. of insol. Mg phosphates. CH. ABS. (p)

Cultivation of carob tree in Cyprus. O. NOURI (Cyprus Agric. J., 1937, 32, 109—116).— Soil requirements and cultural treatment are described. Analytical data are recorded. A. G. P.

Colocasia (taro). S. G. WILLIMOTT (Cyprus Agric. J., 1936, 31, 94—108).—The nature, cultivation, composition and nutrient val. of taro root, the characteristics of the starch grains, and the manufacture of poi are described. A. G. P.

Tomato fertiliser experiments on Long Island. J. D. HARTMAN, P. WORK, and P. H. WESSELS (Cornell Univ. Agric. Exp. Sta. Bull., 1937, No. 676, 12 pp.).—Effects of varying proportions of fertilisers and of farmyard manure are compared.

Ā. G. P.

Apple tree physiology in relation to soil conditions. T. A. KRASNOSELSKAJA-MAXIMOVA, T. V. KULAGINA, K. I. ORLOVA, L. N. FILIMONOVA, and N. V. TSCHUGREJEVA (Compt. rend. Acad. Sci. U.R.S.S., 1937, 16, 469—472).—Leaves of apple trees grown in a leached chernozem soil showed higher ash contents, absorbed more  $H_2O$  after drying, contained sap of lower  $p_{\pi}$  and higher osmotic pressure, and exhibited higher chlorophyll and frequently lower catalase activity than did those grown on a solodised chernozem. A. G. P.

Potassium content of soil beneath a straw mulch. I. W. WANDER and J. H. GOURLEY (Science, 1937, 86, 546-547).—Soil under mulched apple trees has a high available K content to a much greater depth than non-mulched soil. Fruit trees grown under this system would not need applications of K even on K-deficient soils. L. S. T.

Effect of copper sulphate on yield and quality of oranges. W. E. STOKES (Assoc. Southern Agric. Workers Proc. 34—36th Ann. Conv., 1933—5, 476—477).—Applications of  $CuSO_4$  (2—3 lb. per tree) eliminated die-back in citrus trees and markedly increased yields of fruit. The sample of  $CuSO_4$  used contained small amounts of Fe, Ni, Pb, Al, Ag, Mg, and Ca. CH. ABS. (p)

Use of water by Washington navel oranges and marsh grapefruit trees in Salt River Valley, Arizona. K. HARRIS, A. F. KINNISON, and D. W. ALBRECHT (Arizona Agric. Exp. Sta. Bull., 1936, No. 153, 441-496).—Removal of  $H_2O$  by the trees from various depths of soil is examined in relation to timing and extent of irrigation. A. G. P.

Effect of fertilisers on Elberta peach fruits [in storage]. M. M. MURPHY, jun. (Assoc. Southern Agric. Workers, Proc. 34-36th Ann. Conv., 1933-5, 562).—When stored at const. temp. fruit from unmanured trees showed highest transpiration rates, highest % solids in juice, and firmest flesh. Fruit from trees receiving P and K with varying amounts of N had a smaller transpiration rate and loss of wt. in storage; the firmness of flesh increased with the amount of N given. When the whole of the mixed fertiliser was applied in early spring transpiration rates of stored fruit were lower, the % solids in juice was higher, and the flesh firmer than when the N fertiliser was applied at other times of the year Variation in the proportion of K in the mixed fertiliser produced no uniform effects on the fruit characteristics examined. CH. ABS. (p)

Absorption of selenium by citrus and by grapes. W. M. HOSKINS (Science, 1938, 87, 46–47).—Data for the Se content of soils, citrus fruit, and grapes sprayed with aq. "Selocide,"  $(KNH_4S)_5Se$ , are recorded. L.S.T.

Plant chlorosis caused by calcareous soils. J. L. VIDAL (Compt. rend., 1937, 205, 1092—1094; cf.A., 1912, ii, 1088).—FeSO<sub>4</sub> and citric acid are applied after pruning to chlorotic vines grown on calcareous soil and the roots of the plants are treated with aq. citric acid. In both cases increased chlorophyll production takes place, indicating the inability of the plants to utilise the Fe in the soil. A. L.

Chemical weed killers. V. Relative toxicity of selected chemicals to plants grown in culture solution: use of relative growth rate as a criterion of toxicity. W. H. COOK (Canad. J. Res., 1937, 15, C, 520-537; cf. B., 1938, 90).-Methods of determining toxicity are examined. Among highly toxic, but not less active, herbicides the order of toxicity is the same whether the substance is sprayed over the plant or applied to the culture solution. The period between application of the herbicide and death of the plant diminishes as the dosage is increased, within a limited range, but varies with the nature of the substance and is unrelated to the order of toxicity. Amounts of herbicide < the lethal dosage seriously restrict growth of plants, but this restriction cannot be used as a measure of toxicity. Growth rate-dosage curves (recorded) indicate that mortality occurs when the growth rate falls to approx. -2.4% daily. The intake of NaClO3 by plants increased with the concn. in the nutrient, but the abs. amount entering the plant represents a small but approx. const. proportion of that present. A. G. P.

Further selection experiments with Derris malaccensis. C. D. V. GEORGI and G. L. TEIK (Malay. Agric. J., 1938, 26, 4–17; cf. B., 1937, 959). —D. malaccensis, var. Sarawakensis, and two other types of the species, each grown in two different soils, showed considerable variation in the wt. of root per plant and in the content of  $Et_2O$  extract, but comparatively little in the % of rotenone in the extract, which was, on the average, 14.2, 5.7, and 3.5%, respectively. R. S. C.

**Derris uliginosa.** J. N. MILSUM (Malay. Agric. J., 1938, 26, 18—19).—A cultivated sample of D. uliginosa, Benth. (true name D. trifoliata, Lour.), contained 5.02% of Et<sub>2</sub>O extract, including 0.47%of rotenone, and is economically valueless. Its appearance is described. R. S. C.

Volatility and rate of evaporation of insecticides. I. OKUNEVSKI and V. CHACHAEVA (Med. Parasitol. Parasit. Diss. [Moscow], 1934, 3, 82—91). —For use as fumigants  $CCl_4$  and  $C_6H_6$  possess suitable volatility at ordinary temp. Substances with b.p. 120—180° can be used only at high temp.

Сн. Авз. (р)

Determination of pyrethrin I in commercial insecticides containing pyrethrum or pyrethrum extract. D. A. HOLADAY (Ind. Eng. Chem. [Anal.], 1938, 10, 5—6).—Removal of unsaturated substances by COMe<sub>2</sub> and CHCl<sub>3</sub> enables Wilcoxon's method (B., 1936, 1177) to be used for the determination of pyrethrin I in pyrethrum powders. F. N. W.

Smut-controlling fungicides: methods of treatment with mordants. E. FOMIN and K. NOZDRATSCHEV (Bull. Ukrain. Sci. Res. Inst. Grain Culture [Dept. Phytopath.], 1935, No. 1, 27–41).— Paris-green, anhyd. CuSO<sub>4</sub>, Ca arsenite, and Cu carbonate were highly toxic to bunt, when applied to the seed as dusts. For wet treatments,  $CH_2O$ , mercurised PhOH, and NH<sub>2</sub>Ph were the most satisfactory. External smut is effectively treated by means of sawdust or peat saturated with  $CH_2O$ .

Сн. Авз. (р)

Anemone "rust" or browning. ANON. (Seale Hayne Agric. Coll. Dept. Plant Path., 11th Ann. Rept., 1934, 30—34).—Soils carrying the disease contained an unduly high proportion of available P in respect to that of K. CH. ABS. (p)

Inverted spray mixtures and their development in reference to codling-moth control. J. MARSHALL (Wash. Agric. Exp. Sta. Bull., 1937, No. 350, 88 pp.).—An inverted spray mixture is one in which the suspended solid initially wetted by H<sub>2</sub>O becomes wetted by oil prior to or at the moment of impact on the sprayed surface. Inversion of As preps. is effected by substances, e.g., soaps or other fatty acid compounds such as diglycol oleate, which promote oil-wetting of particles normally pre-ferentially wetted by  $H_2O$ . Inversion by univalent soaps is probably due to the formation of oil-sol. or oil-wettable bi- or ter-valent soaps. Inversion markedly increases the amount of solid deposited by prolonged spraying. Hydrophilic colloids, e.g., NH<sub>4</sub> caseinate, and also ZrSO<sub>4</sub> stabilise inverted As preps. Salts of bi- or ter-valent metals invert oil-in- $H_2O$  emulsions when these are stabilised by univalent

soaps, and promote oil-wetting of arsenate particles. Inverted preps. are more effective in controlling codling-moth larvæ and slightly less ovicidal than the normal types. Details of prep. and use of inverted As sprays are given. Oleates of  $NH_4$  or  $N(C_2H_4 \cdot OH)_3$ gave best results. A. G. P.

Fusarium wilt of cotton. C. D. SHERBAKOFF and G. M. STONE (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 583).—A correlation is indicated between the  $p_{\rm H}$  and/or the org. matter content of the soil and the development of wilt, low acidity and low org. matter being associated with high incidence of wilt. CH. ABS. (p)

Dissemination of bacterial leaf-spot of cotton. F. M. ROLFS (Assoc. Southern Agric. Workers, Proc. 34-36th Ann. Conv., 1933-5, 589).—The disease, caused by *Bact. malvacearum* is disseminated in drainage  $H_2O$  from infected fields. Sol. salts, notably  $Na_2CO_3$ , in soil destroy the organism. CH. ABS. (p)

Use of borax in control of brown-heart of turnips. E. CHITTENDEN and L. G. L. COPP (New Zealand J. Sci. Tech., 1937, 19, 372—376).— Admixture of borax (I) (10 lb. per acre) and superphosphate (II) with seed injured germination. Topdressing with 20 lb. of (I) per acre prior to sowing, or drilling ground limestone, (II), and (I) with the seed, gave best results. A. G. P.

Effect of boron, manganese, and zinc on control of apple measles. H. C. YOUNG and H. F. WINTER (Ohio Agric. Exp. Sta. Bimo. Bull., 1937, 22, [188], 147—152).—Internal necrosis, indistinguishable from "measles," is largely due to deficiency of B. The course of development of the disorder in sand-cultured apples grown with B-deficient nutrients is examined.

A. G. P.

Pear midge: orchard studies and control. F. G. MUNDINGER and F. Z. HARTZELL (New York State Agric. Exp. Sta. Tech. Bull., 1937, No. 247, 75 pp.).—The period during which spraying can give effective control is limited to 1—4 days, viz., after the arrival of the majority of the flies, but before eggs are deposited. Nicotine sulphate incorporated with CaO-S, summer oil, Bordeaux mixture, or soap gave best results. Nicotine dusts were less effective. Lethane (org. thiocyanates) gave promising results. A. G. P.

Twig lesions as a source of early spring infection by the pear-scab organism. J. R. KIENHOLZ and L. CHILDS (J. Agric. Res., 1937, 55, 667-681).—CaO-S is active in "burning out" twig pustules, but on tender-skinned varieties cannot be applied, without damage, after the young fruit is exposed. Dormant spraying with CaO-S reduced primary spore nos. and subsequent sprays were correspondingly more effective. A. G. P.

Cherry aphid (Myzus cerasi, Fab.). E. H. ZECK (Agric. Gaz. New South Wales, 1937, 48, 216– 218).—Dormant spraying with tar distillates gave better results than a "red" oil as an ovicide.

A. G. P. Determination of oil deposit on sprayed foliage. L. H. DAWSEY and J. HILEY (J. Agric. Res., 1937, 55, 693—701).—Disc samples of fresh leaves are extracted (continuous method) with light petroleum for 2 hr. After evaporation of the solvent the extracted matter is dried at 110° and weighed. Blank determinations of the petroleum-sol. matter of the leaves are made. A. G. P.

Effect of cobalt drench on milk production of cows at Morton Mains. J. K. DIXON (New Zealand J. Sci. Tech., 1937, 19, 343—344).—Use of Co drenches did not significantly increase the milk yield of cows on pasturage which caused bush sickness in sheep. A. G. P.

Testing crushing strength of granules.—See I. Uses for  $H_2SO_4$ .  $NH_4NO_3$  and Leuna nitrate. Decomp. of rock phosphate. Dolomite.—See VII. Spring herbs. Maize fodder.—See XIX. Rotenone in *Derris* and cubé roots.—See XX. Sewage sludge as fertiliser.—See XXIII.

See also A., I, 157, Volumetric determination of  $PO_4^{\prime\prime\prime}$  in soils. III, 249–250, Determination of  $P_2O_5$ , Cl, and S in plant materials etc.

#### PATENTS.

Treatment of seeds, bulbs, tubers, and roots. G. E. HEYL (B.P. 479,331-2, [A, B] 2.7.36).-(A) Seeds, roots, etc. are coated with rubber latex containing alkali diphosphate as preservative and a flavouring material, e.g., fruit juice, to impart a selected flavour to fruit subsequently obtained therefrom. (B) A similar coating, applicable to flowering plants, contains a dye, e.g., Tartrazine, Violet R.S., and an org. substance, e.g., ionone, and is designed to modify the colour and odour of flowers produced. A. G. P.

Tree surgery. H. L. GERHART, Assr. to STAND-ARD OIL CO. (U.S.P. 2,051,840, 25.8.36. Appl., 31.10.35).—Polymerisation of certain asymmetric or branched-chain olefines (CMe<sub>2</sub>:CH<sub>2</sub>) gives viscous, plastic, resinous solids ("viscoresins") which are essentially saturated and hence biologically inert and are also extremely "tacky," stable to light, temp., and moisture, do not harden on exposure, have high adhesive powers, and are suitable for tree surgery and grafting compositions. Such compositions, e.g., viscoresin (5), beeswax (1), petrolatum wax (2), and mineral lubricating oil (1) (suitable as a grafting wax), or viscoresin (2), beeswax (5), and petroleum naphtha (5 pts.) (suitable for spraying), may be treated with insecticides, fungicides, or dyes. The prep. of suitable resins is detailed. R. F. P.

Insecticides. RÖHM & HAAS CO. (B.P. 478,604, 20.8.36. U.S., 27.9.35).—Polyhalogen derivatives of neutral esters containing not more than one halogen in any radical, e.g., esters derived from monohalogenated acids and dihydric alcohols or monohalogenated alcohols or dibasic acids and monohalogenated alcohols, are treated with inorg. thiocyanates in presence or absence of solvents. In the examples  $(CH_2)_8(CO_2:[CH_2]_2:O:[CH_2]_2Cl)_2$  (104), NaCNS (45), COMeBu<sup> $\beta$ </sup> (50), and Cu (1 g.) are heated at 100° for 48 hr., diluted with H<sub>2</sub>O, and extracted with Et<sub>2</sub>O and  $C_6H_6$ ; the oily product (75 g.) is 5.9% of the (CNS)<sub>1</sub>and 85.6% of the (CNS)<sub>2</sub>-derivative, which is dispersed in H<sub>2</sub>O 1:800 and used as an insecticidal spray.

 $\begin{array}{c} \mathrm{CH}_2(\mathrm{CO}_2\text{-}[\mathrm{CH}_2]_2\text{-}\mathrm{O}\text{-}[\mathrm{CH}_2]_2\text{-}\mathrm{CNS})_2 \text{ is similarly obtained} \\ \mathrm{in } 94\% \text{ yield and used dispersed in } \mathrm{H}_2\mathrm{O} \text{ at } 1:1900. \\ \mathrm{K. \ H. \ S.} \end{array}$ 

Insect repellent and exterminator. G. G. WITTWER and M. H. BEAKES, Assrs. to AMER. CYANAMID Co. (U.S.P. 2,071,484, 23.2.37. Appl., 6.4.33).—A composition comprising pyrethrum extract, a diaryl-substituted (e.g., dixylyl-)guanidine, and a fatty acid dissolved in an org. solvent, e.g., naphtha, is claimed. D. M. M.

[Germination cabinet for] forcing of seed plants. G. PERIN (B.P. 478,403, 5.3.37. Belg., 5.3.36).

Mixtures containing O derivatives of hydrocarbons.—See III. Fertilisers. Use of preps. containing NH<sub>3</sub> and KNO<sub>3</sub>.—See VII. Combating vermin.—See XXIII.

# XVII.-SUGARS; STARCHES; GUMS.

Drying of sugar beets with superheated steam. G. S. BENIN and M. S. PLACHOTNIK (Nauch. Zap. Sach. Prom., 1934, **11**, Book 49, No. 11, 12—25).— Drying with superheated steam gave poor results. Raising the temp. of the steam produced caramelisation. Combined drying with steam and dry air gave but little better results. CH. ABS. (e)

Sugar beet storage in a carbon dioxide atmosphere. M. Z. CHELEMSKI and F. P. VOITENKO (Nauch. Zap. Sach. Prom., 1934, 11, Book 49, No. 11, 1—11).—Preservation in  $CO_2$  was satisfactory in laboratory tests and on a semi-factory scale.

CII. ABS. (e)

Determination of sugar content in dry cossettes. I. B. MINTZ and A. K. KARTASCHOV (Nauch. Zap. Sach. Prom., 1934, 11, Book 54, No. 10, 1-12).—H<sub>2</sub>O digestion of the unchopped material is made at 55—60°. Higher temp. increases the solubility of optically active non-sugars. With a const. moisture content in dry cossettes the determination of sugar by the Sachs-Le Docte method is recommended. Because of the presence of a large amount of optical non-sugars in dry cossettes the Herzfeld-Clerget method is recommended (factor 142.47). The sample for the determination of reducing sugars must be clarified with neutral Pb acetate. CH. ABS. (e)

**Operation of sugar-beet diffusers.** A. I. VOSTOKOV and I. P. LEPESCHKIN (Sovet. Sach., 1935, No. 5, 18—23).—It is proposed to charge the diffusers with shavings so as to leave a free space which, by its position, will play the rôle of an intermediary vessel. The productivity of the diffusion battery is maintained by increasing its rate of flow. CH. ABS. (e)

Conditions for preserving diffusion juice. M. Z. CHELEMSKI, I. I. SCHAICHET, and I. E. GLUCHOVSKI (Nauch. Zap. Sach. Prom., 1934, 11, Book 49, No. 11, 47–57).—The losses of sugar in diffusion juices are 0.001-0.0015% per day. The colour of the juice slowly increases and Ca salts accumulate in second-carbonatation juices. For better preservation the alkalinity of a filtered defecated juice should be 0.5-0.6%. Juices are best treated by ordinary hot defecation and double carbonatation.

CH. ABS. (e)

Continuous clarification of [sugar-]cane juices, using the Fortier clarifier. F. J. CASABLANCA (Int. Sugar J., 1937, 39, 467—469).—This clarifier consists of a rectangular tank, 9 ft.  $\times$  24 ft., the front part of which (18 ft. long) has a bottom formed by two inclined planes, connecting with a central scroll conveyor. In the remaining 6 ft. of length the bottom of the tank is at right-angles to these planes; it is semi-circular, and forms the mud-well or thickener. This semi-circular bottom is provided with a ribbon scroll, which pushes the mud out through the bottom outlet. Above the mud-well, outside the clarifier, is a small juice heater through which the juice has to pass before being discharged into the clarifier. Conc. muds and remarkably clear juice are said to be obtained with this continuous apparatus. J. P. O.

Rapid determination of the phosphate in [sugar-]cane juices. B. E. BEATER (Int. Sugar J., 1938, 40, 30-31).—The modified molybdate method described previously (B., 1933, 600) has been shortened, and is now recommended for the determination of the amount of  $P_2O_5$  actually interacting with the CaO in clarification. The refractory nature of the POJ 2878 juice, attributed in the past to its low PO<sub>4</sub><sup>'''</sup> content, does not appear to be more noticeable with this than with the juices of other canes.

J. P. O.

Use of "Collactivit" in sugar manufacture. K. ZERT (Z. Zuckerind. Czechoslov., 1937, 61, 375—376; Int. Sugar J., 1937, 39, 480).—The use of  $H_2SO_4$  carbons is by no means novel, but none so far described has found application in the sugar industry. This is to be attributed in the first place to their acid character, causing a lowering of the  $p_{\Pi}$  of the juice, even in fairly strongly buffered juices. If the acid C be previously neutralised or made alkaline most of its decolorising power is lost. Further, their full effect is only to be realised if they are made where they are to be used, since deterioration occurs. In some localities also suitable sawdust is unobtainable, and wastewater disposal sometimes presents difficulty.

#### J. P. O.

Sweetening-off of an activated carbon filterpress. I. F. ZELIKMAN and A. I. SITSCHKARENKO (Nauch. Zap. Sach. Prom., 1934, 11, Book 45, No. 7, 37-49). CH. Abs. (e)

Treatment of first-carbonatation juice with activated carbon. I. F. ZELIKMAN and A. I. SICHKARENKO (Nauch. Zap. Sach. Prom., 1934, 11, Book 54, No. 10, 45—50).—Treatment with C gives better results than treatment of second-carbonatation juices. After the treatment the C is exhausted by adsorption of non-sugars and mineral salts. A cheap, non-revivifiable C is recommended for use.

CH. ABS. (e)

Suggestions on chemical control of raw sugar factories for preparing our (Cuban) official methods. A. M. MASCARO (Rev. cubana azuc. y alcohol, 1935, 1, 295—299).—A crit. survey of operating conditions and of methods of sampling and analysis. CH. ABS. (e)

Determination of water content of sugar by the carbide method, with a Bonvech apparatus. N. N. KUDELIA (Zavod. Lab., 1937, 6, 1026– 1027).—The use of the Bonvech apparatus is described. R. T.

Turbidity in sugar products. VI. Generalised method and formulæ for determination of colour and turbidity in coloured media. F. W. ZERBAN and L. SATTLER (Ind. Eng. Chem. [Anal.], 1938, 10, 9—13; cf. B., 1937, 828).—Mathematical. L. S. T.

Essential principles of sugar storage. I. F. ZELIKMAN and A. S. REISER (Nauch. Zap. Sach. Prom., 1934, 11, Book 51, No. 13, 1-42).--A discussion. CH. ABS. (e)

Manufacture of caramel from starch. P. S. KING (Ind. Center, China, 1934, 3, 319–323).— Starch is saccharified by dil. HCl under pressure. The resulting sugar is heated at  $120-130^{\circ}$  with a suitable catalyst, e.g.,  $(NH_4)_2SO_4$ ,  $(NH_4)_2CO_3$ ,  $NH_4Cl$ ,  $Al_2(SO_4)_3$ , or CaCl<sub>2</sub>. CH. ABS. (p)

Complex utilisation of seaweed and obtaining mannitol from White Sea seaweed. V. K. NIZOVKIN and N. SKROZNIKOVA (Trans. VI Mendeléev Congr. [1932], 1935, 2, Pt. I, 782—783).—Laminaria saccharina, L. digitata, Dumarystia, Alaria esculenta, and Fucusi contain 10, 10, 7—10, 0.2—2.5, and 0.0— 0.9% of mannitol, respectively. Direct extraction of air-dried seaweed with 80—95% hot EtOH was more effective than H<sub>2</sub>O extraction. CH. ABS. (e)

Starch manufacture. H. NOUVEAU (Chim. et Ind., 1938, 39, 40—44).—The properties of starches and their commercial conversion products are described. The extraction of potato starch has been improved by the mechanisation of all stages; the yield is much higher, but the quality lower because starch grains of different sizes are no longer separated. E. A. F.

Changes during starch gelatinisation. S. WOODRUFF (XLIV Ann. Rep. III. Agric. Exp. Sta. [1933-4], 1935, 252-255).—The removal of H<sub>2</sub>O from cooked starch, (a) by pptn. with EtOH and (b) by freezing the gelatinised paste, defrosting, and squeezing H<sub>2</sub>O from the spongy residue, is described. The product from either method of treatment could take up H<sub>2</sub>O, but the resulting gels differed from native starch gels. The gel texture was coarser, particularly after employing method (b). The products from (a) and (b) were thrice repptd. from EtOH and re-formed into gels with no apparent loss in gel-forming power. During the EtOH pptn. the gelatinised starch became optically active again. The products from (a) and (b) were opaque to polarised light. CH. ABS. (e)

Part played by phosphoric acid in starch degradation. K. SCHMORL (Mühlenlab., 1938, 8, 1-6).—Present knowledge of the enzymic degradation of starch is reviewed.  $PO_4^{\prime\prime\prime}$  (I) is an essential constituent of all natural starch, and enables it to form paste. Acid phosphates may catalyse starch hydrolysis. Alcoholic fermentation falls into two stages, (I) being used up in the first and regenerated in the second stage. A reaction scheme is given involving addition and removal of (I), and accounting for intermediate products actually isolated. (I) plays the part of a co-enzyme. E. A. F. B.-p. elevation of solutions. Evaporation. Cleaning evaporator tubes with fermented molasses.—See I. Combustion of bagasse.—See II. Dehydrated EtOH.—See III. Starch in paper.— See V. Sucrose in sorghum stalk. Sugar beet and cane. Taro [starch].—See XVI. KOH from distillery slop. Sugars in champagne. Sucrose inversion. Glycerol from sugar.—See XVIII. Utilising skim- and butter-milk. Thermophiles. Mineral constituents of honey. Zn in maple products. Determining sugars in chocolates. Wood-sugar yeast as food. Molasses in silage. Solidified molasses. Cattle fodder from bagasse screenings. Potato-starch meal. [Starch from] horse chestnuts etc.—See XIX. N'garo.—See XX.

See also A., III, 209, Milk sugars.

#### PATENTS.

Apparatus for utilising furnace gases in the reclaiming of bone black and like materials. N. R. ANDREWS (U.S.P. 2,064,813, 22.12.36. Appl., 24.4.33).—Used char from a sugar refinery is reconditioned in continuous vertical retort tubes with 3 stages of heat-treatment: (1) preheating by combustion gases that have passed completely through a steam boiler in the refinery, (2) finish heating by gases that have passed part of the way through the boiler, (3) cooling by air. The feed of char is caused to be  $\infty$  the steam vaporised in the boiler; finer adjustment is attained by varying the proportion of (1) and (2) gases, and safety controls are embodied.

B. M. V.

Adhesive [starch] substances. HENKEL & Co. G.M.B.H. (B.P. 478,299, 10.7.36. Ger., 14.12.35 and 6.5.36).—Starch adhesives are improved by adding carboxylic acid salts of cellulose aralkyl or alkyl ethers, e.g., carboxylic acids of cellulose benzyl or hydroxybenzyl ether or cellulose-glycollic (I) or -lactic acid as their K, Na, or N(C<sub>2</sub>H<sub>4</sub>·OH)<sub>3</sub> salts. In the example, the Na salt of (I) (from cellulose and CH<sub>2</sub>Cl·CO<sub>2</sub>H) is mixed with an equal wt. of a swellable starch, from which a paste is made. K. H. S.

Basket for centrifugals.—See I. Adhesives. Dextrin composition.—See XV. Food product from molasses etc.—See XIX.

## XVIII.-FERMENTATION INDUSTRIES.

Experiments on top fermentation. I. Natural history of a brewery top fermentation. L. R. BISHOP. II. Function of wort flocculum in affecting attenuation and yeast behaviour. III. Effect of rousing on attenuation and yeast behaviour. IV. Effect of yeast type on attenuation and yeast behaviour. V. Effect of fermentation vessel design on attenuation and yeast behaviour. L. R. BISHOP and W. A. WHITLEY (J. Inst. Brew., 1938, 44, 69-73, 73-84, 85-87, 125-135, 136-139).-I. Wort-sediment particles provide nuclei for the evolution of gaseous CO<sub>2</sub>, produced in solution by the yeast during fermentation even though the wort be already supersaturated.

The gas evolution produces "volcanoes" in the deposited sediment and yeast, the ascending bubbles carrying the yeast upward. This yeast, to extents dependent on circumstances, is in turn carried into suspension for active fermentation and removed from suspension to the head, where gas bubbles coated with yeast cells form a stable foam. The tendency of yeast to "clumping" probably depends on the readiness with which it is carried into the head. The phases discussed are copiously illustrated photographically.

II. Addition of, e.g., sterilised malt dust, cooler sludge, coarse turbidity, Ca phosphate, pumice, or bentonite to fermenting wort of original gravity (O.G.)  $\neq$ 1050 produces a "sediment action" characterised by increased racking gravity and yield of top yeast and by decreases in suspended and sedimentary yeast. With wort of O.G. 1025 lower racking gravity may result. The sediment action is due to coarse sediment, partial removal of which by dropping (laboratory scale) gives increased fermentation, whilst its complete removal may result in boiling fermentation. The colour of the sediment presents a possible method of brewery control. The explanation of sediment action is probably physical, though the presence of crystals of Ca phosphate may be important.

III. Working on the laboratory scale, there appears to be no evidence for a sp. action of  $O_2$  brought about by rousing. The influence of rousing would appear to be a mechanical stirring of the yeast into suspension, permitting active fermentation, and the same effect can be achieved by air,  $O_2$ , or mechanical means.

IV. Of the top yeasts examined, those with the greatest tendency to rise early to the top gave incomplete attenuation, less yeast remaining in suspension for active fermentation and less sedimentary yeast forming. The yeast samples, being mixtures, tended to segregate during fermentation, this being confirmed by using "top" (head) yeast from successive fermentations for successive pitchings throughout one series of fermentations and sedimentary yeast throughout another; the effect on attenuation is especially well-marked when the dropping system is used to remove added sediment. Acidification of wort or washing of yeast has little effect on yeast behaviour.

V. Vessel size has little effect, but its depth affects the proportion of yeast rising to the head. The % attenuation is greatest with worts of low original gravity, and marked differences in behaviour (attenuation, yeast in suspension, top yeast) are noted with vessels of differing shape (inverted cone, cone, cylinder). Maintenance of yeast in suspension favours increasing attenuation. Such a proceeding has practical disadvantages, but a similar result is obtained without disadvantage when the wort circulates around slightly sloping plates suspended in the liquid, the yeast settling on these and offering a large active surface whilst allowing bright racking.

I. A. P.

Economy of spraying green malt with nitric acid. HAUSMANN (Kvas, 1934, 62, No. 19).— Malting losses are smaller and a greater extractability of malt is obtained. CH. ABS. (e)

Preservative principles of hops. XIX. (3) Adsorption of hop antiseptics on wort colloids. T. K. WALKER and A. PARKER (J. Inst. Brew., 1938, 44, 140-163; cf. B., 1938, 311).-Loss of humulon (I) by adsorption on wort-sediment increases with the amount of coagulated and pptd. nitrogenous material present, and depends on the efficiency with which this is removed. If, however, removal of the sediment precedes addition of (I), the loss is much reduced. With varying additions of (I) to a given wort, a linear relationship exists between (I) retained in wort and that removed on the sediment. The loss, approx. 60% of the (I) added, is little affected by the original gravity of the wort. Lupulon and  $\beta$ -soft resin give similar results, but the adsorption losses are somewhat greater. I. A. P.

Inversion of sucrose during mashing and wort boiling. K. SCHREDER, R. BRUNNER, and R. HAMPE (Woch. Brau., 1938, 55, 49–54, 57–59).— During wort-boiling, the inversion of sucrose, which is catalysed by H<sup>\*</sup>, follows the law of unimol. reactions. The velocity coeff. for wort is > are those found for buffered (OAc' or PO<sub>4</sub>''') solutions. The temp. coeff. for the reaction (70–100°) is approx. 3. The % inversion is independent of the sugar concn. Inversion during mashing is due largely to invertase action and its intensity varies with the mash process, whilst the % inversion increases with the sugar concn. The mash inversion exceeds that during boiling.

I. A. P.

Colorimetric determination of individual amino-acids during manufacture of beer. H. LUERS, F. STRICKER, and E. SCHILD (Woch. Brau., 1938, 55, 33-36, 41-45).—The methods available are critically discussed. Cystine and oxyproline could not be detected in wort. Of the other NH2acids investigated, tyrosine (I), arginine (II), and tryptophan (III) may be satisfactorily determined colorimetrically, though it is possible that some effect on colour may be excrted by the simpler pep-The high curing temp. of dark malts causes a tides. marked decrease in NH2-acids, particularly (III) (melanoidin reaction), but the temp. effect with pale malts is slight. Mashing experiments indicate the complexity of mash changes involving NH<sub>2</sub>-acids, the various enzyme types being variously affected by the mash conditions. NH2-acids diminish during fermentation at differing rates due to absorption by yeast, the effect being intensified by active cell formation (e.g., with low seeding rates). (I) and (II) increase again during storage, but (III) further diminishes. I. A. P.

Determination of air and carbon dioxide in beer. P. P. GRAY and I. M. STONE (Ind. Eng. Chem. [Anal.], 1938, 10, 15—19).—A pressure method for determining CO<sub>2</sub> and air in packaged beer and carbonated beverages is further (B., 1936, 389) described. An average recovery of  $94\%_0$  of air in bottled beers can be obtained by the method at  $25^\circ$ . A method for the regular calibration of pressure gauges by comparison with a specially-constructed Hg manometer has been developed. L. S. T.

Stability number [for beer]. F. KUTTER (Woch. Brau., 1938, 55, 45-47).—The beer at 20-25° is examined at 3-day intervals for cloudiness (nil, faint, definite) and deposit (nil, faint, definite), observations extending over 30 days. From the results a factor is determined, expressing the stability of the beer. I. A. P.

Sampling methods for [brewery] biological process control. I. JANENSCH (Woch. Brau., 1938, 55, 54—55, 59—62).—Directions are given for taking samples for analytical purposes of wort, yeast, beer, brewing liquor, air, filter pulp, and disinfectants, and for examining piping and transport vessels.

I. A. P.

Colorimetric determination of oxidation-reduction potential and its application to brewing practice. S. LAUFER (Amer. Brewer, 1936, 69, No. 1, 15—22, 24—25).—The technique of determining  $r_{\rm m}$  in the course of fermentation is described. Fermented wort remains in the reduced condition at approx.  $r_{\rm m}$  9 as long as it is out of contact with air. The latter raises the potential rapidly. CH. ABS. (e)

Determination of total acidity of wines. M. E. JIMENEZ DE ABELEDO (Anal. Asoc. Quím. Argentina, 1937, 25, 81—94).—Change of  $p_{\rm H}$  of wines on addition of NaOH is followed electrometrically. Phenolphthalein gives too high vals. for acidity of coloured wine, but phenol-red is recommended as satisfactory. F. R. G.

Irregularities and sophistications of port wines. J. C. BOTELHO (Ann. Chim. Analyt., 1938, [iii], 20, 33—40).—Total, volatile, and fixed acidities have been determined for white (100 samples) and red (200) port wines. The factor fixed acidity/ volatile acidity (both as tartaric acid) should be < 3 for genuine wines of this type, a lower val. being obtained with diseased wines or those sophisticated by alkali treatment. I. A. P.

Medicinal wines. A. LEAL (Publ. Pharm., S. Paulo, 1935, 1, No. 1, 7—9).—The orange juice should be partly neutralised with  $CaCO_3$  to a residual acidity of 10 g. per litre (calc. as  $H_2SO_4$ ); the reducing sugars are determined and the EtOH yield is calc. therefrom. Previously inverted sugar is added at the rate of 2 kg. per 100 litres of juice, for each 1% of EtOH, in order to obtain a fermented juice containing 14% of EtOH. Selected cultures should be used for fermentation. CH. ABS. (e)

Effects of certain metals and alloys on claretand Sauterne-type wines made from vinifera grapes. E. M. MRAK, L. CASH, and D. C. CAUDRON (Food Res., 1937, 2, 539—547).—The min. addition of salts of Al, Ca, Cr, Cu, Fe<sup>II</sup>, Fe<sup>III</sup>, Pb, Ni, Ag, Sn<sup>II</sup>, Sn<sup>IV</sup>, and Zn required to produce changes in appearance and flavour after 1—280 days' storage is recorded. Most of these metals caused turbidity, which in some cases disappeared during storage, and most of them caused the wines to have a definite MeCHO odour after a sufficient period of storage. All caused changes in taste. The effect of adding metals and alloys in the form of turnings is also described. E. C. S.

Characteristics of an organism causing spoilage in fortified sweet wines. H. C. DOUGLAS and L. S. MCCLUNG (Food Res., 1937, 2, 471-475).- The organism forms sediments varying from granular to flocculent and composed of long, slender, intertwined filaments, more or less segmented. The optimum  $p_{\rm H}$  is 4·1—4·3, the optimum temp. 20—25°, and the EtOH tolerance 22 vol.-%. Lactic acid and AcOH are produced by its growth in wine, and in some cases gas is evolved. E. C. S.

Micro-methods for analysis of vinegar. G. GHIMICESCU (Mikrochem., 1937, 23, 217-234).—A summary of methods for the micro-determination of total acidity, volatile and fixed acids, lactic, malic, and total tartaric acid, bitartrate, K, Ca, EtOH, dry extract, glycerol, ash, alkalinity of ash, Cl', the total, inorg., and org. SO<sub>4</sub>" and PO<sub>4</sub>", reducing sugars, total Fe, Fe<sup>III</sup>, Fe<sup>II</sup>, H<sub>3</sub>BO<sub>3</sub>, total SO<sub>3</sub>", and free SO<sub>2</sub>. J. S. A.

Wine, brandy, and vitamins. E. BARBET (Mem. Soc. Ing. Civ. France, 1937, 90, 498—514).—Brandy is enriched in vitamins by maceration with yeast, and the product may be mixed with unfermented juice. The production of high-quality spirit is discussed and suitable reduced-pressure plant described, with especial reference to the production of materials appropriate for export to tropical countries. I. A. P.

Sugars in champagne production. H. E. GORESLINE and F. M. CHAMPLIN (Ind. Eng. Chem., 1938, 30, 112—113).—No difference could be detected in the flavour, aroma, and carbonation of dry finished champagne when cane, beet, glucose (I), and anhyd. (I) sugar or commercial invert syrup was used as substrate, but slight differences were evident when these sugars were used to sweeten lots of champagne which had been fermented with the same sugar. A 6:4 combination of sucrose and (I) gave good results, with slightly > the usual body. E. C. S.

Manufacturing-control methods for determination of sulphur dioxide in alcoholic beverages. L. V. TAYLOR, jun., R. H. LUECK, and C. L. BEARDSLEY (J. Assoc. Off. Agric. Chem., 1937, 20, 610-617).—The Monier-Williams, direct-distillation, A.O.A.C. steam-distillation, and Ripper methods are compared; the first is the only method which under the conditions of the experiments is universally applicable to alcoholic and carbonated beverages.

J. G.

Determination of methyl alcohol in [ethyl] alcohol and [ethyl-]alcoholic beverages. II. O. ANT-WUORINEN and E. KOTONEN (Z. Unters. Lebensm., 1937, 74, 273—281; cf. B., 1935, 424).— Two modifications of the original method (cf. loc. cit.) are described for use with materials containing 0.05— 2.5 and 0.01—0.25 mg. of MeOH per c.c., respectively. The extinction coeff. of the re-formed fuchsin solution is not strictly  $\propto$  the [MeOH], and the exact relations are graphically recorded. The MeOH contents of specimens of cognac, whisky, and rum were 0.047— 0.106, 0.001—0.013, and 0.006—0.010 mg. per c.c., respectively. E. C. S.

Amylo-process for alcohol manufacture. T. S. CHEN (Ind. Center, China, 1934, 3, 64-67).-Yeasts and bacteria isolated from various "dopes" used for EtOH manufacture in China are described.

CH. ABS. (r)

Production of glycerol from [fermentation of] sugar. F. M. HESSE (Rev. cubana azuc. y alcohol, 1935, 1, 282—283).—Max. yields of glycerol (I) and aldehyde (II) are obtained from fermentation of sugar solutions in presence of the max. quantity of Na<sub>2</sub>SO<sub>3</sub> which the yeast can tolerate. The max. rate of fermentation of an 8.55% sugar solution to (II) in presence of 4.27% of NaHCO<sub>3</sub> was reached in 2.5 hr. The (II) produced was converted into alcohol and AcOH. Equal amounts of (I) and AcOH were formed. CH. ABS. (e)

Prevention of corrosion in a distillery. L. P. WEINER (Chem. Met. Eng., 1938, 45, 32-33).-Spent mash contains 0.25% of lactic acid and is consequently corrosive. Materials of construction are: for screens, stainless steel or Cu; for presses, stainless-steel, bronze, and Ni-resist castings; for rotary drum dryers, 5% Ni steel with outlet fan of 18:8 stainless steel; for evaporators, cast Fe with Cu steam chest and Cu or brass piping; for storage bins for dried feed at 54°, Fe sheets; for conveyors, muntz metal. D. K. M.

Separation of potash from cane-molasses distillery slop by electrodialysis. K. UCHIDA and S. CHIN (J. Electrochem. Assoc. Japan, 1935, 3, 283—288).—Methods are described; passage of  $CO_2$ into the catholyte is desirable. CH. Abs. (r)

Dehydrating EtOH. Detecting sorbitol.—See III. Enzyme adsorbates on fat globules.—See XII. Paints for breweries.—See XIII. Fish enzymes.—See XV. Hop plants.—See XVI. Starch degradation.—See XVII. Milk-phosphatase. Whey utilisation. Yoghourt. Caseins. Wood-sugar yeast as food. Determining lactic acid in fruit products [wines].—See XIX. Musty water.—See XXIII.

### PATENT.

Gas separation [for breweries]. A. H. BAER, Assr. WORTHINGTON PUMP & MACHINERY CORP. (U.S.P. 2,068,221, 19.1.37. Appl., 4.10.34).—Liquid  $CO_2$ , e.g., that recovered from brewing vats (cf. U.S.P. 2,018,594; B., 1936, 758), is separated from other liquids by stratification and the partly stripped air is supercooled to recover further  $CO_2$ . B. M. V.

## XIX.-FOODS.

Determination of quality of grain, and of flour obtainable therefrom, by tests on meal. A. FORNET (Mühlenlab., 1938, 8, 5—10).—Meal, being intermediate between grain and flour, is suitable for testing the quality of both; it has been little used hitherto, owing to lack of uniformity. Uniform meal is obtained by milling lightly, sieving through 000 gauze, and re-milling what remains on the sieve, until all passes through. The product is subjected to Pekar, grading, doughing, fornetograph, and baking tests. E. A. F.

Flour-mill insects and their control. G. A. DEAN, R. T. COTTON, and G. B. WAGNER (U.S. Dept. Agric. Circ., 1937, No. 390, 40 pp.).—Fumigation practice, notably with HCN and chloropicrin, is described. A. G. P. Examination of bakery products containing fat. J. GROSSFELD (Z. Unters. Lebensm., 1937, 74, 284– 291).—Employing the Grossfeld-Peter methods for the determination of *iso*oleic acid and for hardened oil and margarine (cf. B., 1935, 159), a procedure is outlined for determining the approx. composition of the fat used for manufacturing the bakery product,  $\geq 100$ g. of material being required. The procedure is varied according as much or little fat is present. A case of the use of petroleum in these products is reported. E. C. S.

Bacterial spoilage of bread during storage. V. HAVANTO (Suomen Kem., 1938, 11, B, 4).— Spoilage in bread is due to varieties of *B. mesentericus*, those strains which liquefy gelatin most rapidly being the most active in spoilage of bread. The activity is  $\infty$  the protein content of the flour, and may be prevented by addition of HCl to  $p_{\rm H} 5$ . Starch is rapidly hydrolysed to dextrins, which are later converted into maltose, the latter being finally fermented to EtOH via glucose. The sickly odour of spoiled bread is due to higher fatty acids volatile in stream (probably isohexoic acid). Towards the end of the spoilage process an aromatic odour develops, probably due to higher fatty acid esters formed from EtOH present. M. H. M. A.

Colloid chemistry of glutin. W. SIMON (Chem.-Ztg., 1937, 61, 877—879).—According to the osmotic determination of M, the glutin mol. consists of 20 glutose mols. These are thought to be united by residual valency in four rows of five, the fibrils thus formed further uniting into micelles. The  $\eta$  of glutin and of its complete and partial degradation products is calc. on this basis, and agrees well with experimental results. E. A. F.

Heat economy in dairies. V. BRUDNY (Proc. XIth World's Dairy Cong., Berlin, 1931, 3, 420–423).—The storage and softening of boiler feed- $H_2O$  is described. The  $H_2O$  purification takes place in the storage tanks and the boiler is free from scale and priming solids. This ensures const. pressure of live and exhaust steam, so that by semi-automatic valves and other devices the use of heat in milk processing is const. within narrow limits. W. L. D.

Modern methods of control of market milk. E. B. ANDERSON (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 303-307).-Control is chemical and bacteriological. The Gerber method is used for determination of fat, the fat column being read at 55-60°. Total solids are calc. from the d, determined by tested lactometers. Various methods of determining the acidity of milk are discussed. The plate-count, coliform, and reductase tests are described. Preference is given to the last owing to its simplicity and low coeff. of variation. Of the pathogenic organisms, the count of  $\beta$ -hæmolytic streptococci only is of most importance. The phosphatase test is used for determining the efficiency of W. L. D. pasteurisation.

 the growth of an excessive no. of bacteria and contamination with pathogenic organisms. Counts on standard agar show too great a variation but better results are obtained from tryptone-glucose skim-milk agar counts with incubation at 32° for 48 hr. The direct microscopical count and methylene-blue reductase test are being more widely recognised. Bottle tests for odour and taste and filter tests for macroscopic dirt are also used. W. L. D.

Control of the milk supply [in Northern Ireland]. P. CLERKIN and J. HOUSTON (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 335— 338).—Bacteriological standards for grading milk are given both as regards count and reduction time. Samples can be transported in ice boxes and are tested when 11 hr. old, time in a refrigerator not being counted. No test is made on samples >16 hr. old. The technique of bacteriological tests is given in detail. There are 3 grades of raw milk (A, B, C), and B and C may be pasteurised, the efficiency of which process is controlled by the phosphatase test. All milk is subject also to control of composition.

W. L. D. Clarification and filtration of milk. K. KELLER (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 336—338).—If the milk is to be pasteurised, centrifugal clarification and filtration are of equal val. Centrifuges running at 7000—8000 r.p.m. separate 5 times as much slime as those running at 4000 r.p.m. The slime contains casein, fat, and mineral matter and the loss of these from milk may lower its val. appreciably as well as modify its physical properties. W. L. D.

Storage of milk products with oxygen under pressure (Hofius method). MOHR (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 348-355).-Milk was successfully stored for 3 weeks in containers under 8 atm.  $O_2$  pressure at  $> 8^\circ$ . The milk kept well even when the pressure decreased to 2 atm. On storage at 15-20° milk kept for 2-3 days only, but pasteurised milk kept for <14 days. Increase in bacterial count was slow at the start but rose to a max. in 3-4 weeks. The activity of bacteria is not completely inhibited by pressure. B. coli decrease during storage. Long storage causes a malty flavour to develop and creaming properties are impaired. Rennetting properties and the unsaturation of the milk fat were not changed. No H<sub>2</sub>O<sub>2</sub> was formed in the milk. W. L. D.

Effect of time, temperature, and contamination on keeping quality of milk. A. FOURNIER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 19-28).—A coeff. of purity derived by subtracting the wt. of solid impurity from 100 g. of milk is introduced. A coeff. of fermentation, or the no. of g. of developed lactic acid per litre, is also suggested. Attempts are made to connect these two coeffs., but temp. is another variable. Acidity is  $\alpha$  to temp. irrespective of the amount of solid impurities present. W. L. D.

Influence of raw materials on construction of dairy plant. P. GRASSI (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 493–496).—In view of the deleterious effects of traces of Cu on the storage qualities of some dairy products, the use of Cu and its alloys, even when Sn-plated, is not advisable for the manufacture of plant for milk processing and manufacture of milk products. Al and glass-lined plant is preferable. W. L. D.

Raw material for construction of dairy plant and utensils. J. LEMOINE (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 480—486).—The uses of wood, glass, glass-lined steel, Sn-plated Fe, Al, Ni, and stainless steel are described. The corrosionresistance of metals decreases in the order : stainless steel, Sn-plated Cu and Fe, Al and its alloys, Ni and its alloys, Zn. The action of detergents on, and the use of, various metals in different parts of the plant are discussed. W. L. D.

Milk and metals. R. SELIGMAN (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 489-493).— The effect of traces of Al, Cu, Ni, Sn, Ag, Cr, and of various alloys, on the flavour and keeping quality of milk is discussed. The action of detergents and milk on metals is examined in the light of modern knowledge, and the development of the manufacture of dairy plant with special reference to the k of metals is described. W. L. D.

Influence of metals on milk and milk products. G. SCHWARZ and O. FISCHER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 52—58).—Traces of heavy metals, especially Cu and Fe, injure the quality of milk and milk products. Analytical methods are described for the determination of Cu and Fe in milk products. Traces of Cu cause a pronounced discoloration of sour-milk cheese and a rough method for its detection based on this property is described.

W. L. D.

Effects of copper and iron on milk fat. W. STOCKER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 58—60).—Adding 0·1 p.p.m. of Cu as lactate to cream gave a metallic taste which was prevented by the growth of pink yeasts but not by lactic acid bacteria. The fat of such cream showed needleshaped crystals in the globules. In carrying out the reductase test, traces of Fe and Cu, especially Cu, prolonged the reduction time, but this time was reduced to half by adding pink yeast. W. L. D.

Influence of some aluminium alloys on taste of milk. Their resistance to corrosion and use in dairy plant manufacture. J. KRENN (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 477---480).—In laboratory tests, raw and pasteurised milk did not develop a metallic taste after being in contact with various Al alloys. The taste of cream and butter was not affected. 2% aq. NaOH and cooling-brines corrode and pit, and lactic acid slowly dissolves, the metals. Such alloys are not suited for acid milk products, but can be used for storing sweet milk and cream. W. L. D.

Amount of lead dissolved by milk from tinplating and soldered joints. J. GANGL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 29-34),— The natural Pb content of milk is  $1 \times 10^{-5}$  g. per litre. The average Pb content of market milk is  $11.4 \times 10^{-5}$  g. per litre. This is due to contamination from Sn coatings rich in Pb, soldered joints, and utensils.

**Н** H (B.)

The Pb content of milk is  $<5.0 \times 10^{-5}$  g. per litre if the tinplating contains <1% and solderings <10%of Pb. W. L. D.

Improving the quality of milk and butter (in Esthonia). M. JARVIK (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 379—383).—Milk is graded according to quality and paid for on that basis. The reductase test is used to separate the milk grades into those which will reduce methyleneblue in <20 min., 2 hr., and  $>5\frac{1}{2}$  hr., respectively. Butter control has improved quality by ensuring standardisation and uniformity of H<sub>2</sub>O content, flavour, and texture. W. L. D.

Development of refrigerating plants for dairying purposes. R. BREHM (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 416–419).—The development of refrigeration for dairies has increased the working economy of such plants, and the change from  $CO_2$  to NH<sub>3</sub> has increased refrigerating capacity by >20% and, in the case of storage plants, by >80%. W. L. D.

Transport of raw milk in tanks. K. HORAK (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 334—335).—Besides adding to ease of handling, the bacterial count of milk bulked in road and rail tanks is < that in churns. The milk maintains its temp. better in bulk and there is less contact with metallic surfaces. W. L. D.

Transport and treatment of milk at [Italian] pasteurising centres. E. GHEZZI (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 321-324).— Milk cooled to  $6-8^{\circ}$  is collected in motor tanks and usually rises  $2-3^{\circ}$  in temp. before reaching the factory. Three methods of pasteurisation ( $62-63^{\circ}$  for 30 min.,  $74^{\circ}$  for 30 sec., or instantaneous heating to  $85^{\circ}$ ) are officially recognised and used. Problems with pasteurising apparatus, such as the growth of thermophiles at  $55-65^{\circ}$ , are reported. Growth is arrested at  $68-70^{\circ}$ . Higher temp. are favoured, especially in a plate heat exchanger at  $71-74^{\circ}$ .

W. L. D.

Spoilage of milk by thermophilic organisms. WEINSTEIN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 64—69).—The lower keeping quality of holder-pasteurised milk and souring of infants' milk kept hot in Thermos flasks are due to the presence of thermophiles. The development of the organism is described. The active forms multiply at 65° as the vegetative form, which is a rennet-producer. Below 60°, spores form rapidly and at lower temp. spores only are present. Methods of control consist mainly of chemical sterilisation. W. L. D.

High-temperature, short-time pasteurisation [of milk] as a commercial process. A. T. R. MATTICK and E. R. HISCOX (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 344—348).—Experiments with a stassaniser working at 74—74.5° and an A.P.V. plate pasteuriser at 72°, both for 15 sec., proved the close agreement in the performance of the two machines. The destruction of thermodures was of the same order as in the holder process, but thermophiles were more vulnerable at the higher temp. 21 tests on guinea-pigs for tubercle bacilli were negative for all pasteurised milk, although 5 samples of raw milk were naturally infected. The results indicate that this form of processing is satisfactory. W. L. D.

Short-time pasteurisation [of milk]. A. LEMBKE (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 341—344).—Thermoduric strains of *B. coli* cannot be used to test the efficiency of pasteurisers as thermodurability is not const. The heating effects in various zones of the heater are deduced from counts at the beginning and end of the heating period, taking into account the logarithmic law of bacterial destruction. W. L. D.

Control of [milk] pasteurising conditions in Germany. H. BAUER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 307—310).—Three methods of pasteurisation are officially recognised : instantaneous heating to  $< 85^{\circ}$ , short-time heating at 71— 74°, and heating for 30 min. at 62—65°. Plants are licensed and subject to strict and frequent supervision, but no chemical tests are officially obligatory. W. L. D.

II. The apparatus destroys coliform organisms at  $\not< 76^{\circ}$  as well as lactic acid bacteria. The non-acidproducers are not destroyed up to 80°, and temp.  $\not< 85^{\circ}$  are required. The construction of the apparatus is such that after 7 months' service no reinfection of pasteurised milk was caused.

III. Total solids content of milk is not changed, but the creaming capacity is affected especially at the higher temp. Acidity is not lowered nor taste affected, whilst a slight turnipy taste disappeared. The peroxidase is destroyed at a working temp. of 82°. W. L. D.

Milk-phosphatase and the phosphatase test for efficiency of milk pasteurisation. H. D. KAY (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 500—503).—Mammary cells contain an active phosphomonoesterase, type A, which is found as a regular constituent of normal raw milk, in inverse proportion to the functional efficiency of the mammary gland. The amount of the enzyme in milk can be determined and the time-temp. combinations necessary for the destruction of the enzyme are such that its presence in or absence from heated milk forms a valuable criterion of the efficiency of both holder- and flash-pasteurisation. W. L. D.

Chemical composition of milk low in solidsnot-fat. W. L. DAVIES (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 10—14).—Udder infection, drought conditions, end of lactation, and persistence in secreting low-quality milk are the factors associated with the fault. Milk of normal composition maintains its level of constituents within narrow limits, but abnormal milk shows fluctuations. With low solidsnot-fat, Cl' is high and fat, lactose, and protein are low. Low lactose is mainly responsible for low quality. Mastitis and persistently low-quality milk show low casein and much increased globulin and non-protein-N content. End-of-lactation milk shows a normal N distribution but high Cl' and low lactose. Lowquality milk is regarded as normal milk diluted with a liquid (isotonic diluent) similar to lymph serum in composition. W. L. D.

Relationship of composition to quality in goat's milk. J. C. MARQUARDT (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 41-43).—No correlation exists between the score for flavour and the fat and total solids content, but milk with high sugar is of better quality than that with low sugar; flavour deteriorates as NaCl content increases. No correlation occurs between flavour, curd tension, and titratable acidity. W. L. D.

Experimental modification of the chemical composition of milk. H. D. KAY and S. J. FOLLEY (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 38—41).—Administration of thyroxine (I) and cestrogenic hormones (II) causes considerable variations in composition. (I) increases yield, fat, and, to a smaller extent, the solids-not-fat content, especially lactose and total P. (II) increase the fat and, to a greater extent, the solids-not-fat content. No support is given to the suggestion that the effect of (II) is to cause colostrum secretion. W. L. D.

Developments in nutrition of infants. II. T. BAUMGARTEL (Milch. Zentr., 1938, 67, 21-26; cf. B., 1938, 217).—Humanisation of cows' milk, and its modification by addition of ground rice, sugar, and flavouring agents are described. Homogenisation of milk is beneficial. The uses of soured milk preps., citrated milk, and buttermilk are discussed.

W. L. D.

Mongolian milk products. III. Food quality and degree of ripening of Mongolian cheese. M. SAITO and T. TINZEI (Rept. Inst. Sci. Res., Manchoukuo, 1937, 1, 421—433; cf. B., 1937, 1261).— The amount of protein breakdown  $\propto$  the % of H<sub>2</sub>O in the cheese, those having >20% of H<sub>2</sub>O having up to 40% of the N in the H<sub>2</sub>O.sol. form. Cheese having 10—15% of H<sub>2</sub>O were too dry to ripen quickly. The best cheeses were invaded and ripened with *P. rocqueforti*, but some types were not mouldripened. Such mould-ripened products have high NH<sub>3</sub>- and NH<sub>2</sub>-acid-N contents. W. L. D.

Dairy farming and dairy work. J. MACKIN-TOSH (J. Roy. Agric. Soc. England, 1937, 98, 323-347).—A review, including milk composition, milk handling and utensils, and cheese-making.

W. L. D.

Psychological taste test of milk. S. WEISS (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 262—263).—The importance of uniformity in the taste of milk, which is the main property for gauging quality, is stressed. The added psychological effect of an inviting taste is of physiological importance.

W. L. D.

Reliability of flavour judgments with special reference to the oxidised flavour of milk. C. M. TROUT and P. F. SHARP (Cornell Univ. Agric. Exp.
Sta. Mem., 1937, No. 204, 60 pp.).—Comparative tests of the sensitivity of individuals to the taste of NaCl, sucrose, lactose, etc. are recorded. A. G. P.

Statistical methods of detecting added water in milk. A. BECKEL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 469-473).-Single vals. for the amounts of various constituents in milk or of physical data are of no use unless interpreted in the light of their coeffs. of variation determined for a large no. of samples. These vals. are given for % fat, Cl, solids-not-fat, and total solids, d of milk and skim milk, n, and f.p. depression ( $\Delta$ ).  $\Delta$ , n, and % solids-not-fat show the least coeff. of variation and evidence for the presence of added H<sub>2</sub>O is most reliable from these data, especially  $\Delta$ . In comparing the compositions of milk from small herds with large vols. of bulk milk, the coeffs. decreased with increasing milk vol. W. L. D.

Standardisation of methods of determining the  $p_{II}$  of milk and its products. W. MOHR and RITTERHOFF (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 540—544).—The H<sub>2</sub>, quinhydrone, and glass electrodes were tested on milk products. A glass electrode of thick glass capable of withstanding considerable mechanical shock gave the most satisfactory results. Errors due to the action of fat entered into work with the quinhydrone, but did not occur with the glass, electrode, which worked equally well on milk, cream, butter, serum, and cheese.

W. L. D.

Tillmans-Luckenbach method for detecting neutralised milk. Z. LEYKO and H. CIEPLISŃKA (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 511—515).—About 900 samples were examined for evidence of neutralisation by this method (no. of ml. of 0.25N-NaOH to overcome the buffering action of the colloidal Fe filtrate of 100 ml. of milk between  $p_{\pi}$  8.4 and 3.2). The val. for unneutralised milk was always <1 ml. Mixing, high- and low-temp. pasteurisation, homogenisation, and adding 12% of H<sub>2</sub>O did not have a significant effect. The test is claimed to detect neutralised milk added to genuine milk and watered neutralised milk. The val. for milk of 0.4% acidity was <1 ml. W. L. D.

Apparatus for rapid determination of the f.p. of series of milk samples. J. GANGL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 487-492).— The development of the cryoscopic method for milk is described and the importance of ceasing to supercool at the proper temp. is stressed. An apparatus which works almost automatically and prevents errors due to excess supercooling, carries out a determination in <2 min., and can be used for yolk and whites of eggs is described. Methods of checking thermometers are described. The f.p. is the most const. property of milk and the range of variations is reported. W. L. D.

Determination of the depression of f.p. of milk. J. VUKOV (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 565-569).—The thermometer used should have a cylindrical bulb exposing a large area and should read to 0.01°, each 1° covering < 40 mm. of stem. The Hg in the bulb must be < 20 g., otherwise the Hg thread will stick in the stem. Corrections for the acidity of milk are at least only rough approximations and are best omitted. W. L. D.

Refractometry of milk. R.VLÅDESCU (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 563—564).— The serum obtained by mixing 20 ml. of milk with  $1\cdot 2$  ml. of 31% aq. CuSO<sub>4</sub> and  $0\cdot 8$  ml. of 26% aq.  $K_4$ Fe(CN)<sub>6</sub> and filtering is suitable for refractometric measurements. In milk containing 50% of added  $H_2O$ , the decrease in the dipping refractometer readings is  $12\cdot 3^\circ$  as against  $8\cdot 1^\circ$  for the CaCl<sub>2</sub> serum. W. L. D.

Molecular constants for fresh and sour milk samples. G. T. PYNE and J. J. RYAN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 551-552).--Lactose, chlorides, phosphates, and citrates account for 55, 23, 13, and 5%, respectively, of the osmotic pressure of milk. A const., K, embracing the Cl' and sol. PO<sub>4</sub><sup>'''</sup> contents and n of the Pb(OAc)<sub>2</sub> serum, is suggested from:  $K = (R - 15 \cdot 0) + 93/(93 - F) \times$  $[(2 \cdot 2 \times no. of ml. of 0 \cdot 1 n \cdot AgNO_3 per 10 ml. of milk) +$  $<math>(1 \cdot 6 \times no. of ml. of 0 \cdot 1 n \cdot AgNO_3 per 10 ml. of milk)],$ where R = n as dipping-refractometer degrees, F = fat %; the AgNO<sub>3</sub> refers to the equiv. of the Cl and NaOH to that of sol. PO<sub>4</sub><sup>'''</sup> from the oxalate titration. The val. of K is closely const. at  $32 \cdot 51 - 34 \cdot 81$ , even for samples 3-4 weeks old. (Cf. B., 1937, 1260.) W. L. D.

Determination of copper in milk and milk products. J. KRENN (Mikrochem., 1937, 23, 149–159). —Milk products may be ashed dry; milk (first conc. by evaporation) or milk products may alternatively be oxidised destructively by evaporation with  $H_2SO_4$  and treatment with  $HNO_3 + HClO_4$ . The residue is dissolved in dil. HCl, and Ca and  $PO_4^{\prime\prime\prime}$ are pptd. with an excess of aq.  $NH_3$ . The solution is evaporated and the residue dissolved in HCl and treated with  $NH_4CNS + C_5H_5N$ , forming  $[Cu(CNS)_{2,1}(C_5H_5N)_2]$ , which is extracted with  $CHCl_3$ and colorimetered. J. S. A.

Micro-projector for examination of milk and products. G. BOLDUAN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 473-475).—A projector showing high magnification on a screen, enclosed in a box, in daylight, enabling the structure of various products to be examined with comfort, is described. W. L. D.

Identification of coconut fat and skim-milk curd in Brynza cheese. J. MAŠEK (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 451-452).-Thin sections are examined microscopically. Added coconut fat appears as large areas of an oily matrix filled with bunches of needle-like crystals. The no. of crystal nuclei is greater when the fat is mixed into the cheese in the solid state than when liquid. The skim-milk curd has a granular structure and a dull appearance. W. L. D.

Determination of milk protein by the Steinegger method. B. MAYMONE and A. CARUSI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 519—522). —In the volumetric determination of protein by the CH<sub>2</sub>O titration method, the ratio (total N × 6·38) : titration val. varied from 0·391 to 0·556 in the milk of individual cows. The average val. for 79 samples was 0·450+0·002 with a coeff. of variability of 7·3%. Over 20 samples for each of 3 hords gave average vals. of 0.433, 0.466, and 0.459. The factor varies with period of lactation, breed, and individuality of cow. W. L. D.

Volumetric determination of protein in buffalo and sheep's milk. B. MAYMONE and A. CARUSI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 522—528).—Using the  $CH_2O$  titration method, 15 samples of buffalo milk gave an average val. for the ratio (total N × 6·38):  $CH_2O$  titration val. of 0·448 (range 0·408—0·498). For casein determination the factor was 0·488, and for lactalbumin, 0·278. The corresponding vals. for sheep milk were 0·436 (0·394—0·486), 0·490, 0·304. In using this method for milk of different species, the factor for casein (0·490) is the most const. W. L. D.

Variation in the protein content of milk. B. MAYMONE and A. CARUSI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 532—535).—Protein content fluctuates < fat content both in individual and bulk samples. Generally, rises in fat were accompanied by increase in protein. The fat/protein ratio averaged 1.082 (range 0.985—1.268). Less variation in these constituents occurs in the months at the end of lactation. W. L. D.

Relationship between fat and protein in sheep's milk. B. MAYMONE and A. CARUSI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 528—531).— Fat, protein, total solids, and solids-not-fat in the milk of 8 breeds of sheep averaged 7.7, 6.3, 19.7, and 12.1%, respectively. The correlations of constituents with each other are calc. The correlation coeff. of fat and protein is 0.656, as against 0.700 for cow's milk. W. L. D.

Composition of drinking-straws for milk. LONZA-WERKE GES.M.B.H. (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 228—229).—Narrow tubes which are seamless, smooth, and elastic are prepared from regenerated cellulose and can be either transparent or porcelain-white. They withstand sterilisation. W. L. D.

Problems connected with condensing and drying milk. G. R. HOWAT, C. J. JACKSON, and A. A. NICHOLS (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 241-245).-Organisms isolated from canned cream and evaporated milk are described. Two organisms, B. vulgatus, var., and B. cohærens, are responsible for thinning and bitterness in canned cream. Spores of these organisms can withstand a temp. of 115° for 45 min. Black specks in cream are due to FeS or SnS, the cream containing dissolved Fe, Sn, and free H<sub>2</sub>S. The Sn-plating shows either pitting or blackening, due to a closely adherent film on the metal. The solubility of roller-dried milk varies with the speed of stirring and temp. of reconstitution. W. L. D.

Manufacture and storage of [whole-]milk powder. MOHR and RITTERHOFF (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 249—257).— The H<sub>2</sub>O content of fresh powder depends on the R.H. of the drying room. Low steam pressure is more favourable for production of milk powder of high solubility and the ratio of precondensation must be adapted to the speed of the drums. During storage and exposure to the air, the  $H_2O$  contents depends on the temp, and R.H., and if the  $H_2O$  content is  $\Rightarrow 6\%$ , R.H. must be <51. If the powder is pressed to cakes which occupy only  $\frac{1}{3}$  of the space, the rate of absorption of  $H_2O$  is low. Solubility is influenced by R.H. and temp. of storage, and low temp. are advisable. The presence of traces of heavy metals, *e.g.*, Cu and Fe, shortens the storage period. Storage in impermeable containers will cause the  $H_2O$  content to be const. and the storage period can be increased up to 9 months. W. L. D.

Keeping quality of whole-milk powder. E. KELLNER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 245-248).—The factors influencing the development of tallowiness are :  $H_2O$  content, atm.  $O_2$ , heat, light, traces of heavy metals, bacteria, and enzymes. Bacterial spoilage is insignificant in powders of low  $H_2O$  content.  $H_2O$  and  $O_2$  effects can be overcome by reduction of the total surface area by pressure, and keeping quality is enhanced. W. L. D.

Utilisation of surplus milk as powder. G. NICHITA (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 235—244).—The benefits of making milk powder are enumerated and its food val. is stressed. W. L. D.

Solubility of skim-milk powder. H. ALFONSUS (Proc. XIth World's Dairy Cong., 1937, 2, 466-469). -Solubility is better calc. on the % solubility of the protein, or casein, than on that of the total solids, and its determination at  $>60^{\circ}$  is not advisable. Increasing the r.p.m. of the drum or neutralisation with alkalis improves solubility. Neutralisation with Ca(OH)<sub>2</sub>, adding rennet to milk, or making from hot milk reduces solubility. Long-stored powders reconstituted and dried again improve in solubility. Milk powder must be stored in the dry state since absorption of H<sub>2</sub>O lessens its solubility. W. L. D.

Standardisation of bacteriological methods for testing milk powder. A. LEMBKE and K. H. MEEWES (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 504—510).—Three samples of each powder, reconstituted to the composition of the original milk, are used for the tests. Bacterial count is determined on standard agar-lactose at 30° for 48 hr. The coliform test is carried out with a modified McConkey medium. Roller-dried powder must contain  $>10^5$ and spray-dried  $>3 \times 10^5$  bacteria per ml.; *B. coli* must be absent from 1 ml. of either sample. All milk must be pasteurised before drying. W. L. D.

Production and standardisation of methods of analysis of milk powder. E. SAVINI (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 14-15).--Milk powder is prepared from milk without addition of preservative and should be labelled as to its nature as defined by its fat content. Full-cream powder must contain  $\leq 24\%$  of fat. Fat and H<sub>2</sub>O contents must be determined and the H<sub>2</sub>O content must be  $\geq 5\%$ . Methods of analysis should be those adopted for condensed milk. The determination of solubility is important. W. L. D. Utilisation of skim milk and buttermilk [in Italy]. A. FERRARI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 266—269).—Both products can be drunk raw, or used in breadmaking and in the manufacture of half-fat and skim-milk cheese, casein, milk protein, digested protein foods, and milk powder. Lactose is prepared from the whey from cheese and casein manufacture. W. L. D.

Use of skim milk, particularly milk protein, for human nutrition. F. LAMPRECHT (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 270–273).— The prep. and properties of a milk protein (protein 76, ash 7, N-free extract 6.5, and  $H_2O$  9%) from skim milk are described. Its uses as a constituent of bread, cereals, biscuits, and soup and as a sausagebinding material are discussed. W. L. D.

Utilisation of skim milk, buttermilk, and whey [in France]. D. LIZÉE (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 273—274).—Much is used for feeding calves, pigs, and poultry. The main industrial outlet is for casein manufacture. W. L. D.

Preservation of cream for butter manufacture. M. ETCHEGARAY (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 320—322).—Cream supplied to creameries in hot countries is usually in an advanced state of fermentation owing to high temp., long period of transport, and unhygienic methods of milk production. To avoid fermentation of proteins, a straight lactic fermentation is desirable and cultures can be distributed to suppliers so that the lactic acid formed acts as a preservative. The acid can be neutralised before pasteurising the cream.

W. L. D.

Cooling of cream at farms. A. M. STIRLING and H. W. BOUCHER (New Zealand J. Sci. Tech., 1937, 19, 361-372).—Operation and costs of coolers are described. Comparative trials are recorded.

A. G. P.

Sediment in cream. E. L. FOUTS and J. I. KEITH (Assoc. Southern Agric. Workers Proc. 34—36th Ann. Conv., 1933—5, 521).—The cream is diluted with a warm solution of commercial soda ash and filtered through a sediment pad at approx. 76—77°.

CH. ABS. (p)

Neutralisation of cream for butter-making. VI. Factors affecting the  $p_{\rm H}$  of salted butter; relation of  $p_{\rm H}$  to quality of salted butter. F. H. McDowall, J. W. SMITH, and A. K. R. McDowell (New Zealand J. Sci. Tech., 1937, 19, 345—360; cf. B., 1937, 1261).—Neutralisation of cream to a low level of acidity did not improve storage quality of butter, but induced an astringent "soda" flavour in it. Butter from high-acid cream exhibited "soda" flavour at lower  $p_{\rm H}$  than did that from low-acid cream. A. G. P.

Production of choice butter from mixed cream. A. ZEILINGER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 464—465).—Each can of cream is weighed and graded, and the acidity and fat % are determined. Cans of the same quality are bulked and treated as for factory cream. The greatest problem is the fat content of the cream, which tends to be on the low side (<20%); this gives a low yield of butter for the same power consumption per ohurning. Hygienic methods of milk production and cream separation on the farm enhance the butter quality. W. L. D.

Setting and freezing of butter. F. BROCHOT (Lait, 1938, 18, 23-43).—In cold storage of butter, deterioration sets in due to excessive R.H., dusty air, exposure to light, and acidity of butter. Butter from pasteurised cream not contaminated with Cu keeps best. Storage temp. of  $-7^{\circ}$  to  $-10^{\circ}$  are advisable. Data connected with the effect of recharging the chamber with fresh butter and the temp. of the circulating air are given. W. L. D.

Rendering of butter. W. RITTER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 156—161).— The process of melting, boiling, sterilising, and storing the butter fat extends the storage period to 2.5 years. Boiled butter gives a different product from melted butter. In boiling, the lecithin passes from the serum, through the froth, into the fat, but separates again from the fat on cooling. Tallowiness in the stored fat is avoided by avoiding contamination with heavy metals (Cu and Fe) and storing in goodquality tinned or Al containers. W. L. D.

New lactic streptococcus as a constituent of butter starters. T. MATUSZEWSKI, E. PIJANOWSKI, and J. SUPINSKA (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 80-85).-A new streptococcus, S. diacetalactis, can produce lactic acid, Ac2, CHAcMe OH (I), volatile acids, and CO2. Inclusion of this organism in butter starters shows that the best results are obtained in conjunction with S. cremoris and S. paracitrovorus, since a more uniform production of Ac<sub>2</sub> is ensured. A potent starter conferring aroma at low acidities is obtained by inclusion of this organism, but the use of other organisms is advised to resist the action of contaminants and to ensure stability towards the formation of  $Ac_2$  and (I) for > W. L. D. 14 days.

Factors influencing the keeping quality of butter. W. L. DAVIES (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 124-127).-The main factors are acidity of the butter serum, contamination with heavy metals (Cu, Fe), conditions of wrapping and packing, and microbiological action. A low serum- $p_{\mu}$ liberates org. acids (mostly oleic acid) which are more susceptible to oxidation than is the fat. Traces of Cu (<1 p.p.m.) and Fe (<5 p.p.m.) also initiate fat oxidation. Fishiness appears first and is then followed by tallowiness. The physical structure of butter and the concn. of reagents responsible for deterioration at the fat/serum interface play a definite part in the process. Fishiness and rancidity from fat-splitting moulds and ketonic rancidity from dry W. L. D. moulds are described.

Importance of bacteriology of butter on keeping quality. W. STOCKER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 167—170).—The count of lactic acid (I) bacteria in butter varied from 5000 to  $476 \times 10^4$  per g. In butter showing defects due to bacteria the count was higher and the distribution of the organisms different. About 10% of butter deteriorated through bacterial action and contained 98% of the total count as (I) bacteria. Samples containing moulds, fat-splitting bacteria, and proteolytes were low in no. 42% of the samples contained *B. coli*, but samples containing the *aerogenes* type were more noxious. Lactose-fermenting yeasts were present in large nos., causing rancid and bitter flavours. W. L. D.

Keeping quality of butter. M. SCHÄFFLER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 170— 172).—In the manufacture of stored butter the importance of the quality of the milk and cream, the starters, cream ripening and washing, and of the methods of packing and storing the product is stressed. W. L. D.

Butter defects and their prevention. O. F. HUNZIKER (Proc. 8th Ann. State Coll. Wash. Inst. Dairying, 1935, 51—59).—Factors inducing offflavours and other defects in butter arising through faulty handling, pasteurising, ripening, and churning are reviewed. CH. ABS. (p)

Formation and preservation of butter aroma. P. MAZE (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 85-89).—The aroma of French farmhouse butter made from milk without skimming was produced by a natural ripening process which was almost a pure lactic fermentation, but varying with district and breed of cattle. The outcome of this has been the prep. of pure cultures which will give high acidity in cream and the highest amount of aroma production in butter. Churning is regarded as an additional aerobic fermentation in which the reduction products of lactic fermentation are oxidised to aromaproducing compounds. The normal lactic acid bacteria do not produce Ac2 and CHAcMe OH, the formation of which is due to contamination of starter cultures with other bacterial types. Flavoured butter must be stored in the cold and in the dark to prevent biological and chemical actions on Ac<sub>2</sub>. W. L. D.

Influence of oxygen on formation of butter aroma. A. I. VIRTANEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 121—123).—An adequate supply of air increases the amount of CHAcMe·OH in starters, and  $Ac_2$  is not formed from this compound in absence of  $O_2$ . MeCHO is present in traces in some starters. W. L. D.

Development of aroma in butter cultures. K. VAS and J. CSISZÁR (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 114—118).—Conditions influencing the degree of aroma production were examined. Ripening cream at a comparatively low temp.  $(15^{\circ})$ and adding cold cultures  $(12^{\circ})$  in smaller amounts preserved the aroma. Addition of citric acid gave larger and more uniform amounts of Ac<sub>2</sub>. Variations in the degree of aroma produced by mixed cultures are due to the fact that the efficiency in aroma production is defective, or not a predominant property of the pure cultures of streptococci used, and that some types which destroy the aroma are present. Propagation from strong aroma-producing cultures is advised. W. L. D.

Methods for preventing fishiness in butter. W. RITTER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 162-167).—Butter in ripened cream develops a fishy flavour on storage. It is claimed that pasteurising the cream at 90° prevents this deterioration of quality. In experiments (in Switzerland) on pasteurising cream before churning at temp. <90°, fishiness occurred in most cases. Although the high temp. is favourable to quality in that bacteria are destroyed, the effect is chemical since substances of antioxygenic properties are formed in the cream. W. L. D.

Butter scoring at State College, Washington. H. A. BENDIXEN (Proc. 8th Ann. State Coll. Wash. Inst. Dairying, 1935, 64—71).—Butter from sweet or neutralised cream yielded serum of  $p_{\rm H}$  6·2—6·8. Over-neutralisation diminished keeping quality > did under-neutralisation. CH. ABS. (p)

Season variations in the constants of butter fat. M. TORFS (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 172—176).—The sap. val. is highest in winter, falling to average vals. (228) in spring and autumn, and lowest in July. The Reichert-Meissl val. is highest in winter (32) and lowest in summer (28—29). The Polenske and Kirschner vals. show the same variations as does the Reichert-Meissl val. The I val. is lowest in winter (34—36), highest in summer (40—42), and of average val. (38—39) in spring and autumn. The *n* follows the variation in I val. W. L. D.

Control of Belgian butter. M. VAN BRABANT (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 310—314).—Among the other conditions of official grading and control, butter is analysed for  $H_2O$ , Reichert-Meissl val. and *n* of butter fat, and commented on for flavour, odour, and texture, 2 samples per month being submitted from each contributing factor. The  $H_2O$  content must be >16%.

W. L. D.

Control of export butter in Denmark. J. JEN-SEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 384—387).—The keeping quality is determined on weekly samples by storing at 12—14° and expert judging. Analyses for  $H_2O$ , NaCl, appearance of loose  $H_2O$ , mould, and catalase no. are determined. Methods of packing are also examined. W. L. D.

Methods of packing butter. W. RIEDEL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 152— 156).—Changes in stored butter are discussed with special reference to the use and standardisation of (German) wrapping materials. It is claimed that vegetable parchment is slightly permeable to light and that the treatment of parchment with vegetable extracts which renders the paper impermeable to ultra-violet light improves its properties. W. L. D.

Wood containers for foodstuffs. G. W. LACEY (Food Manuf., 1938, 13, 41-45).—Farmhouse butter is packed in unlined kegs or tubs the inner surfaces of which have been scoured with aq. NaCl. The wood contains about 25% of H<sub>2</sub>O. The properties of timber used for boxing butter are described and methods used to overcome woody and toppy taints are discussed. W. L. D.

Influence of butter colour oil and the wrapping material on oxidative deterioration of butter. F. KIEFERLE and A. SEUSS (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 129–133).—The surface colour of butter was examined for black and white components, using special filters with a step-photometer. Loss of  $H_2O$  in the first days of storage increased the black component, but bleaching of colour through oxidation later increased the white component. The increase in the latter varies with the increases in peroxide-O of the outer butter layer. Various wrapping materials tested in this manner showed the superiority of Al foil over cellulose material in preventing surface changes. W. L. D.

Whipping qualities of butter mixes. A. J. GELPI, jun. (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 280—282).—Icecream mixtures made from skim milk-unsalted butter mixtures whip slowly, >10% of butter failing to improve the quality. Dried egg yolk (but not lecithin) facilitates whipping. CH. ABS. (p)

Chemical analysis of butter. BRITISH STAN-DARDS INSTITUTION (B.S.I. Publns. Dept., Spec. No. 769, 1938, 24 pp.).—Routine analytical methods are given in detail. Supplementary special tests are appended. W. L. D.

Methods of determination of diacetyl in butter. Suggestion of a uniform method. W. MOHR and J. WELLM (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 98—104).—A modification of Barnicoat's method (A., 1935, 1516), involving the colorimetric determination of the Ni dimethylglyoxime in CHCl<sub>3</sub> solution, is suggested. The extraction of the coloured ppt. from the H<sub>2</sub>O phase is quant., provided the CHCl<sub>3</sub>: H<sub>2</sub>O ratio is >4%, and the CHCl<sub>3</sub> extract can be dried with Na<sub>2</sub>SO<sub>4</sub> if turbid. >150 ml. of Ac<sub>2</sub> solution are mixed with 2 ml. of 20% aq. NH<sub>2</sub>OH,HCl, 1 ml. of 10% aq. NiCl<sub>2</sub>, and 0.2 ml. of 20% aq. NH<sub>3</sub> for 1 hr. at room temp. and then for 16 hr. at 85—90°, then shaken with 20 ml. of CHCl<sub>3</sub> for 1.5 hr. The CHCl<sub>3</sub> layer is separated and the colour compared with that of known amounts of Ni compound in CHCl<sub>3</sub>. Results accurate to  $\pm 1\%$  are claimed for 0.005 mg. of Ac<sub>2</sub> in 20 ml. of CHCl<sub>3</sub>, or for quantities >0.5 mg. W. L. D.

Effectiveness of cotton-swab methods in bacteriological examination of paper ice-cream containers. M. L. SPECK and L. A. BLACK (Food Res., 1937, 2, 559—566).—Using one moist and one dry swab, 54—96% of bacteria were recovered from inoculated containers, only 4 in 20 examinations yielding < 80%. Two additional moist swabs yielded 10 and 7% further recovery, respectively. The conditions of disentangling swabs are important, and must be specified. E. C. S.

Numbers and types of bacteria isolated from paper ice-cream containers. M. L. SPECK and L. A. BLACK (Food Res., 1937, 2, 567—580).—The types isolated (micrococci, an alkaligenes, a sarcina, a bacillus, and an achromobacter) suggested contamination by sewage pollution. No coliform organisms were detected. Certain containers were heavily contaminated as received from the manufacturer. The standard of 500 organisms per 4 sq. in., proposed for plateware, is probably too lenient for public safety in the case of paper containers. E. C. S. Nutritive value of whey from sheep's milk. B. MAYMONE and A. CARUSI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 276—278).—Whey from sheep's milk contains total solids 11.6, fat 4.5, lactose 4.7, ash 0.38, and protein 1.7%; it has a starch equiv. of 12.8 per 100 lb. Whey from skimmed milk of sheep (total solids 7.0, fat 0.6%) has a starch equiv. of 7.9. 13 kg. of whey correspond with one Scandinavian food unit. W. L. D.

Method of whey utilisation. I. DANCILA (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 265–266).—Whey from the manufacture of (Rumanian) sheep cheese is made into a fermented beverage (jintitza), which also contains some sour milk. The product has fat 3.7% and acidity 1.2%, the latter due to streptococci and lactobacilli. The beverage is claimed to have therapeutic properties. W. L. D.

Utilisation of whey in cheese manufacture. M. SCHULZ (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 295—297).—Sterilised whey can be used in the manufacture of processed cheese. Conc. whey cannot be used unless some of the lactose is separated from it, or, in the original liquid, converted into EtOH by fermentation and recovered by distillation. The albumin can be separated by heat-treatment and incorporated as a wet paste in raw cheese intended for processing. If the salts of whey are modified by base-exchange treatment, they can the more easily act as emulsifiers in cheese processing. W. L. D.

Utilisation of whey by precipitation methods. K. UHL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 297-302).—Whey-protein is the most valuable constituent and its pptn. by electric current, heat, and by absorption on other media is described. By the electrical method the protein is pptd. at a lower temp., in a more digestible form, and with a satisfactory keeping quality as a wet product. Whey of any acidity can be used, but a product of nearly neutral reaction is obtained. W. L. D.

Utilisation of buttermilk and whey [in England]. E. CAPSTICK (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 261—265).—The feeding val. of the two products when produced on the farm or in the small or large creamery is discussed. The problems met with in the condensing and drying of the products in large factories are described. Roller drying of whey has been carried out on the precondensed liquid of acidity >0.20%. Doubleeffect evaporation to give a product with 70% of solids followed by drying under high vac. is economic for daily outputs of >4000 gals. Drying to 40—50% solids content followed by spray-drying is also described. The use of dried products as human foods or supplements to them, or for supplementing animal foods, is described. W. L. D.

Uses of skim milk, buttermilk, and whey. P. RIEDEL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 285—289).—Skim milk can best be used for the manufacture of soft cheese, with or without added fat as cream, or for making sour-milk cheese. Details of the methods of manufacture are given. Whey is conc. to a paste, direct to a cake, or mixed with flour and used for confectionery and baking. W. L. D. Manufacture of fresh and dried whey protein. H. SAUER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 289—291).—Coagulation of whey protein at 95° by blowing in steam gives a valuable product which can be dried in a similar manner to case in. The yield is 0.6-0.7%. The wet product has low keeping quality. Whey of 0.4-0.8% acidity can be used. W. L. D.

Effect of pasteurisation of milk for cheesemaking on the ripening process in the cheese. ORLA-JENSEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 211—213).—Milk which is too pure or slightly pasteurised is not a favourable medium for the growth of lactic acid bacteria necessary for ripening of cheese, and the milk can be improved by addition of a yeast autolysate or milk which has been strongly pasteurised and in which the bactericidal action has been destroyed. Milk for cheese-making should never be pasteurised unless it is known what species of bacteria must be inoculated after pasteurisation in order to give the cheese its sp. flavour.

W. L. D.

Manufacture of cheese from pasteurised milk. J. C. MARQUARDT (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 205-207).—Pasteurisation is intended to kill pathogenic organisms and to prevent spoilage. The score quality of cheese was improved over 2 points by heat-treatment of the milk. It is practically essential to pasteurise milk for the making of cottage cheese and semi-soft cheese can be made equally well from raw or pasteurised milk. The degree of pasteurisation must not alter the creaming and general physical properties of the milk. W. L. D.

Production of the various types of cheese from pasteurised milk. E. SAVINI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 219-223).-Pasteurisation has not been practised for classic types of cheese and it has given poor results for others. This is especially so for long-ripening cheese, but satisfactory results and a more uniform product have been obtained for the types requiring only a short ripening period. Rapid pasteurisation is suitable for raw milk types, but slow pasteurisation in the vat for the half and fully cooked types. The pasteurised product should not be inoculated with a singletype starter but a mixed whey starter or a natural mixture should be used. It is sounder to follow the normal methods of cheesemaking from milk produced hygienically than to adopt pasteurisation. W. L. D.

Pasteurisation of milk for making Emmenthal cheese. H. BURTSCHER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 179–182).—Pasteurisation simplifies cheese manufacture and makes the quality uniform. It has a favourable effect on the formation of holes, but affects the texture, taste, and keeping quality unfavourably and there is more preference for the usual quality from raw milk. It is claimed that, for this cheese, pasteurisation of the milk is not advisable. W. L. D.

Complete and partial use of pasteurised milk in the manufacture of Emmenthal cheese [in Allgau]. J. HANUSCH (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 192—199).—Cheeses were made from mixtures of raw and pasteurised milk during three periods: late winter, early spring, and early autumn. On the whole, cheeses from such milk were of better quality than those made from raw milk, particularly in the autumn. No inhibition of the raw-milk cheese aroma was evident in the pasteurised milk products. Although lactic acid bacteria are considered necessary for the ripening process, the best cheeses were made from mixed milk strongly inoculated with strains of an alkali-producing group of bacteria. The raw-milk cheese lost  $11\cdot1\%$ , and the mixed-milk  $8\cdot2\%$ , in wt. during 5 months' storage. W. L. D.

Emmenthal cheese from pasteurised milk. H. FRÜHWALD (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 185—186).—Short-time pasteurisation at 68—70° serves well for the manufacture, but experience with holder pasteurisation (63° for 20— 30 min.) is doubtful. W. L. D.

Production of hard cheese from holder-pasteurised milk. O. GRATZ (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 189—191).—Bulk milk for hard cheese manufacture cannot be improved by any form of pasteurisation if infected with  $PrCO_2H$ bacteria. Cheese will swell with a count of only 3—4 of these bacteria per kg., and if cows are fed on silage, roots, or other foods containing large nos. of these organisms, the fault will always be present.

W. L. D. Influence of pasteurisation of milk in Cheddar cheese-making. M. C. TAYLOR (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 227-228).-Pasteurisation should be carried out at  $>80^{\circ}$  for >10 sec. Improper pasteurisation fails to eliminate B. coli and gassy curd. The proper development of acidity is necessary, and since the lactic flora from a starter have a clearer field to work in, addition of only 0.75%of starter is sufficient to work the cheese in 5-6 hr. In winter cheese-making, stored milk should be treated with 17 ml. of starter per 100 gals. to shorten the long period usually needed for making in winter. Rennet is added at the rate of 1:9000 at a renneting temp. of 30°. The curd is scalded at 40-45°. The acidity before grinding should be in the range 0.75-0.95%. Perfect control of temp. in the pasteurising process is essential. W. L. D.

Starter cultures in Cheddar cheese manufacture. H. R. WHITEHEAD and G. J. E. HUNTER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 229-230).—Lactic streptococci which can withstand 38° without serious damage to the cells are the most suitable for making cheese starters, but such cultures, when used as starters, suffer sudden failures at times, just as do the mixed cultures, due to the development of bacteriophages. The phages originate in cultures under the influences of the particular conditions under which the organisms are growing. The elimination of this trouble rests on defining the precise conditions favourable or otherwise for the development of phages. W. L. D.

Ripening of Cheddar cheese in N. America. C. D. KELLY (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 203-205).—The main factors involved are bacteria, rennet, and galactase (I). Lactic acid produced by bacteria caused changes in the paracasein and produced the desired  $p_{\rm H}$  for subsequent changes. The pepsin of rennet and the native (I) of milk broke down the milk protein to a range of sol. N compounds, but not to NH<sub>2</sub>-acids and NH<sub>3</sub>. The bacteria affected the final ripening stages in breaking down the N compounds to simpler mols. and producing the flavour of ripened cheese. W. L. D.

Effect of proved sub-clinical mastitis on manufacture and quality of Cheddar cheese. A. T. R. MATTICK, W. L. DAVIES, and D. V. DEARDEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 283—285).—Cheeses were made from bulk milk of cows free from mastitis and from an equal vol. from cows proved to be suffering from sub-clinical mastitis. The complete chemical analyses of the two samples showed that both were normal chemically. Analyses of the cheese when 57 days old are given. The mastitis milk yielded cheese of inferior quality. W. L. D.

Defects in Parmesan cheese when using milk from inflamed udders. P. PARISI (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 294—298).— In cheese-making from the milk of a cow with an inflamed udder difficulties in rennet coagulation as regards time and nature of clotting were met. A spongy partial coagulation occurred at the surface at first and a soft curd was formed later. The cheese ripened very slowly and was of poor texture and flavour.

W. L. D.

Manufacture of cheese from skim milk. G. SCHNEIDER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 291—295).—Skim milk has half the nutritive val. of whole milk. The prep. of soft cheese containing 0, 20, and 40% of fat in the dry matter from skim milk either alone or by addition of cream is described. W. L. D.

Suitability of ensilage milk for manufacture of soft cheeses. F. RIGHTER and MERGNER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 214—217).— Milk from ensiled beet tops is suitable for manufacturing Camembert cheese of good commercial quality. Milking must be carried out in a clean way, the milk strained and cooled at once, and the times of feeding the silage and milking should be as far away from each other as is possible. Little difference was noted in the quality of cheeses made from milk produced from cows fed on washed or unwashed silage. The prevention of contamination of milk by silage bacteria rests on hygienic methods of cowshed management.

W. L. D.

Cheese-making experiments with ensilage milk. J. RODENERRCHEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 217—219).—Milk from good-quality silage is satisfactory for making Tilsiter cheese. Feeding silage containing PrCO<sub>2</sub>H (I) gave over-fermented and split cheese, caused by abnormal slowness of the milk to develop acidity, which could not be overcome by previous ripening or the addition of starters. The cheese-making conditions which had to be adopted were more favourable for the growth of the (I) bacteria. Such milk has an abnormal bacterial distribution, no acidoproteolytic micrococci being present and weak lactic streptococci being predominant. W. L. D. Improvement of cheese quality. U. EFRES (Proc. XIth World's Dairy Cong., Berlin, 1937, 2. 340—346).—Uniformity of product demands standardisation of the methods of manufacture and storage controlled by obligatory tests on the cheese and a uniform central supply of cheese-making reagents. Rigid grading of the cheese in the ripening rooms and in storage is essential. W. L. D.

Different practical methods of preserving cheese. S. FILIPOVIĆ (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 428—430).—The manufacture of Caciocavallo, Albanian, Balg, Somborer, and Croat smoked cheese, made from sheep's milk, is described. The curd of the first-named is cooked at 65° before milling and pressing. The last-named is pressed in small moulds for 12 hr. and smoked for 4—8 days. W. L. D.

Stainless-steel cheese vats. J. KRENN (Lait, 1938, 18, 1—10).—Cheese adheres to the walls of stainless-steel kettles during the cooking process, whereas with Cu kettles the curd parts satisfactorily. The difference is not due to the greater solubility of Cu in milk. The fault occurs with raw, pasteurised, and separated milk at all acidities. Glass surfaces are similar in behaviour to steel, and porcelain to Cu. The roughness of the surface has no effect. The fault is overcome by slight greasing of the surface of the kettles before filling with milk. W. L. D.

Resistance to corrosion of metal cheese moulds. G. SCHWARZ and H. FINZENHAGEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 487— 488).—More metal dissolves from new Zn cheese moulds than from those which have been in long use. The Zn enters both whey and curd, the latter to a depth of 0.5 cm. in 24 hr. The outer layer, 2 mm. thick, contained 120 p.p.m. of Zn. W. L. D.

Influence of permeability to air of wrapping materials on cheese quality. KHEFERLE and A. SEUSS (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 398—401).—Tests on various materials were made with a Schopper air-permeability tester. Pure vegetable parchment (1·1 ml./min.) showed higher permeability to air than substitute parchment (0.75 ml./min.), but all samples showed decreased permeability after exposure to high R.H. Al foil showed higher permeability than greaseproof papers. The outer surfaces of soft cheese were unchanged when wrapped in material of permeability <7 ml./min. Freshly made soft cheese ripened better in wrappers of high permeability. W. L. D.

Chemical analysis of cheese. BRITISH STAN-DARDS INSTITUTION (B.S.I. Publus. Dept., Spec. No. 770, 1938, 14 pp.).—Routine methods and supplementary special tests are described in detail. W. L. D.

Fat determination in cheese. J. GANGL (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 492– 497).—Methods are described. A solvent method suitable for the rapid determination of fat in a large no. of samples consists in dissolving the cheese protein in aq. HCl-ZnCl<sub>2</sub> and the fat in petroleum spirit (b.p. 50–60°). The fat in an aliquot portion of the solution is determined gravimetrically. Results within  $\pm 0.1\%$  are claimed. W. L. D. Methods for investigation of soft cheese. G. SCHWARZ and H. DÖRING (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 561—563).—Methods for determining  $H_2O$ , fat, metallic contamination, acidity,  $p_{\rm H}$ , and ripening capacity are standardised.  $H_2O$  is determined after mixing with sand by drying to const. wt. at 105°. Cu and Fe are determined colorimetrically. W. L. D.

**Production of processed cheese [in Rumania].** I. DANCILA (Proc. XIth World's Dairy Cong., Berlin, 1937, **3**, 3-4).—Emmenthal, Gruyère, Trappist, and sheep's-milk cheese are processed, some  $\frac{1}{4}$ -,  $\frac{1}{2}$ -,  $\frac{3}{4}$ -, and whole-fat cheese being made.

W. L. D.

Preserving processed cheese. W. LUDORFF and A. MÜLLER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 516—519).—Cheese of reasonable keeping quality is produced by using sufficiently high temp. and long periods of processing. A temp. of 85—90° for 15 min. is necessary. When raw cheese mixed with unripe skim-milk cheese was used, gas formation and putrefaction could be avoided by processing at 115°. No preservatives are necessary in such cheese. W. L. D.

Standardisation of composition of processed cheese. K. WINSAUER (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 8—13).—Cheese is melted in presence of emulsifying salts without addition of foreign fats. The name of the original type of cheese should be supplied on the label. Fat content, calc. on the basis of the original quantity of cheese less 3%, should be indicated. Differences exist in the H<sub>2</sub>O content of cheese which can be cut and that for spreading. The amount of emulsifying salts must be >3%. Colouring is permitted, but not the addition of meat and foreign matter. W. L. D.

Production of processed cheese [in Italy] and standardisation of analytical methods. E. SAVINI (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 7-8).—The incorporation of poisonous colouring matter, preservatives, and fats other than butter fat is prohibited. The cheese is named after the predominant cheese of the mixture on which the fat content depends. NaCl must be > 3.5%. Methods for determining H<sub>2</sub>O and fat are gravimetric.

Preparation of yoghourt. E. PIRAUX (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 484–485).—The prep. of small vols. for domestic use consists in boiling the milk, cooling to 45°, and fermenting in a Thermos flask for 4 hr. Cultures are obtainable in 10—15-ml. quantities. About 20 ml. of the fermented milk are held back in the flask to inoculate subsequent batches of milk while the fermented product is cooled ready for short storage and drinking. W. L. D.

Physico-chemical distinguishing reactions of caseins prepared by rennet fermentation and acid precipitation. K. WOLF and M. G. MALM (Stiasny Festschr., 1937, 419–430).—The differences between caseins prepared by means of rennet and by acid pptn. are recorded. They are, respectively: ash, 7.85% (Ca and Ca<sub>2</sub> phosphates and Ca combined with CO<sub>2</sub>H of casein), 0.72%; isoelectric point, 4.82,

4.46; titration curves, the rennet product has the greater buffering action from  $p_{\rm H}$  5.5 to 7.5; secondary reactions, rennet casein combines with alkali more slowly than acid casein, and hydrolytic "secondary reactions" are slower; solubility in borax, insol., sol.; change of solubility on tanning, rennet casein shows a decrease in Cr absorption with increased basicity and acid casein an increase. Rennet casein takes up the more Cr and is the more sensitive to swelling by acids. All these differences are due to differences in ash contents of the two caseins. There is a difference between the caseins due to the sp. action of the rennet fermentation. Rennet casein treated to reduce the ash remains a rennet casein, and acid casein treated to contain Ca phosphate remains an acid-pptd. casein. A casein treated with rennet in aq. NaOH is an acid casein because there D. B. is no combined Ca.

Preservation and storage of hens' eggs. P. F. SHARP (Food Res., 1937, 2, 477-498).—A review. E. C. S.

"Freezer burn" on refrigerated poultry. D. K. TRESSLER (Ice and Refrigeration, 1935, 89, 373—374).—" Burning" results from uneven desiccation in storage, and involves denaturation of proteins, loss of ability to reabsorb  $H_2O$ , and oxidation and subsequent rancidity of fats. Dipping poultry in  $H_2O$  or fat before storage, or use of  $CO_2$  storage, diminishes the defects. CH. ABS. (p)

Cured-meat storage. J. B. FRANCIONI, jun. (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 499).—Dipping smoked meat in 55% EtOH or hot  $H_2O$  prior to storage diminished but did not prevent mould growth. Rubbing with boraxpepper-molasses was also beneficial. Complete prevention was achieved by storing smoked meat in oil, especially refined cottonseed oil. Meat smoked at low temp. for a long period kept better than that smoked at higher temp. for a short time. Storage in an atm. of  $CO_2$  and exclusion of light diminished rancidity. CH. ABS. (p)

Effect of length of time in brine on salt content of hams. J. C. GRIMES, W. E. SEWELL, and G. J. COTTIER (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 498).—Hams were immersed in brine (salometer reading 75) at  $0-1^{\circ}$ . After 49 days the NaCl contents were : flesh side 27.9, centre 4.15, skin side 9.2%. CH. ABS. (p)

Determination of the quality of meat and meat products by their digestibility by pepsin. I. A. SMORODINCEV and A. N. ADOVA (Ukrain. Biochem. J., 1937, 10, 348—350).—The following determinations are suggested : the vol. of 0.5N-alkali required in the CH<sub>2</sub>O titration after pepsin digestion; the N in the undigested residue after digestion for a specified time. P. G. M.

Meat proteins. I. Their composition. K. BECK and J. SCHORMÜLLER (Z. Unters. Lebensm., 1937, 74, 369—382; cf. B., 1937, 1263).—Urea-sol. and -insol. fractions of the proteins have almost identical composition (e.g., Hausmann nos., and tyrosine, tryptophan, and arginine contents). The ash content and I val. of these fractions from horse, sheep, goose, and cod muscle are tabulated. E. C. S.

W. L. D.

Colorimetric determination of creatinine. BAIER and WALTER (Z. Unters. Lebensm., 1937, 74, 281—283).—A modification of the Folin–Jaffé method, in which  $m \cdot (NO_2)_2C_6H_3 \cdot CO_2H$  is substituted for pieric acid (cf. Komm and Leinbrock, Med. Klin., 1936, 32, 1303) is shown to give erratic results when applied to meat extracts. E. C. S.

Improvements in the determination of creatinine by adsorbing interfering impurities on aluminium hydroxide. E. REMY (Z. Unters. Lebensm., 1937, 74, 383—386).—Creatinine (I) is not adsorbed by Al(OH)<sub>3</sub>, whereas most of the coloured substances in meat extract are removed by filtration through Al(OH)<sub>3</sub>, leaving a solution in which (I) may be readily determined. The results are slightly > those obtained by the official Swiss method. E. C. S.

Salt fish. II. Effect of salt concentration on preservation. A. LABRIE and N. E. GIBBONS (J. Biol. Bd. Canada, 1937, 3, 439-449; cf. B., 1937, 613).—8-32 g. of NaCl per 100 c.c. were added to samples of fresh cod-muscle press-juice, which were incubated at 10° and 21°. The relations between time, temp., [NaCl], volatile N, NMe<sub>3</sub> (I), and bacterial growth are recorded. At 21°, 32% of NaCl is necessary to prevent spoilage, whilst 28% will preserve the juice for 35 days. At 10°, 24% of NaCl will preserve the juice for 60-70 days. (I) does not appear until  $(1-2) \times 10^7$  organisms are present per c.e., and it is concluded that (I) is rapidly formed from NMe<sub>3</sub>O when the reduction potential reaches a certain val. Putrid odours in the juice or flesh are due to (I) alone. E. C. S.

Use of selenium in the determination of nitrogen in potato tubers. A. M. SMITH and W. Y. PATERSON (Analyst, 1937, 62, 786—788).—The conclusions of Beet and Furzey (B., 1936, 521) regarding the accelerating influence of Se on Kjeldahl digestions are confirmed. For 1 g. of potato tubers a total digestion time of 30 min. (*i.e.*, heating for 20 min. after the mixture has become clear) with 0.3 g. of Se, 9.7 g. of  $K_2SO_4$ , and 25 ml. of  $H_2SO_4$  is recommended. Larger quantities of Se produce low N results.

Factors affecting colour in carrots. J. C. MILLER, F. D. COCHRAN, and O. B. GARRISON (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 551—552).—The proportion of "off-colour" carrots in winter crops was > in spring or summer crops. Fertiliser treatment and soil- $p_{\rm H}$  were not contributory factors. Good coloration was favoured by growth in light sandy or highly org. soils in which drainage and aëration were adequate. Waterlogging increases the % of off-coloured roots. CH. ABS. (p)

Influence of calcium in cooking-water on mineral content of vegetables. I. NOBLE and E. G. HALLIDAY (Food Res., 1937, 2, 499–503).— The Ca content increases when Ca is added to the cooking-H<sub>2</sub>O. The loss of P is not  $\infty$  the Ca content of the H<sub>2</sub>O. E. C. S.

Types and survival of some micro-organisms in frozen-pack peas, beans, and sweet maize grown in the east [of U.S.A.]. H. F. SMART (Food Res., 1937, 2, 515-528).—The contaminating organisms were mainly soil types of bacteria, yeasts, and moulds, but the predominating types were different for each product. Scalding and keeping for 5-7 months at  $-17.8^{\circ}$  reduced the no. of organisms by 94.6-99.8%, those remaining ( $\geq 10^{\circ}$  per g.) being types destroyed by boiling. E. C. S.

Statistical study of the sampling and analytical errors encountered in analysing apples for lead-spray residues. C. M. SMITH and C. C. CASSIL (J. Assoc. Off. Agric. Chem., 1937, 20, 617-622).-The distribution of Pb among apples from trees sprayed with Pb<sub>3</sub>(AsO<sub>4</sub>)<sub>2</sub> has been investigated by means of the A.O.A.C. electrolytic dithizone method (B., 1934, 379; 1935, 747), the error of which is negligible compared with that of sampling the apples. The dispersion of the individual results is  $\infty$  the magnitude of the residue, and increases when the apples are washed. Frequency curves are given showing the distribution of Pb on apples, and curves also relate the size of the sample of apples and the accuracy of the determination of the Pb residue (cf. B., 1938, 444). J. G.

Losses of vitamin-C during cooking of Northern Spy apples. K. M. CURRAN, D. K. TRESSLER, and C. G. KING (Food Res., 1937, 6, 549-557).--Of the original -C content of 0.11 mg. per g., 25-32% was lost in making apple sauce, most being destroyed during the first 4 min. cooking, and 80% was lost during baking, whilst a further 8% was lost during 48 hr. keeping of the baked product. E. C. S.

Chemical composition of fresh apple juice. H. T. FAWNS and E. J. MARTIN (J.S.C.I., 1938, 57, 60—65).—Nine different apple juices were analysed for total and volatile acid, EtOH, sugar, tannin, total N, Cl', ascorbic acid, total solids, total ash, and the following ash constituents : Na, K, Ca, Mg, Fe, and P. The calorific vals. were calc. The figures obtained, when compared with the corresponding analyses of whole apples, indicate that most of the constituents of nutritional val. in the apple pass into the juice. Tentative suggestions for the examination of commercial samples of apple juice are made.

Citrus wastage trials, 1936. R. M. NATTRASS (Cyprus Agric. J., 1936, 31, 52—56).—Wrapping papers dipped in an I prep. or in Shirlan HB largely prevented wastage in transport and storage. Cellophane wrappers were unsatisfactory, but when pretreated with either fungicide gave promising results. Shirlan was somewhat preferable to I. A. G. P.

Carotene in oranges. A. L. TAYLOR and P. J. WHITE (Ind. Eng. Chem., 1938, 30, 110-111).-The carotenoid pigment content, as determined by Guilbert's method (B., 1935, 78), varied from an average of 1.65 mg. per litre in California Valencias to 0.3% in Florida pineapple oranges and Florida assorted varieties. E. C. S.

Colour reaction of aged juices of acid fruits. I. E. SOLARINO (Annali Chim. Appl., 1937, 27, 525-527).—Lemon and orange juices, preserved by tyndallisation or addition of EtOH, BzOH, SO<sub>2</sub>, or HCO<sub>2</sub>H and kept for 3-5 years, contain a volatile substance (sol. in  $H_2O$ , EtOH, and  $Et_2O$ ; insol. in  $CS_2$ , CHCl<sub>3</sub>, and light petroleum) which gives a

J. G.

reddish-violet colour with benzidine in AcOH-EtOH solution. F. O. H.

Vitamin content of some Indian mangoes. G. B. RAMASARMA (Proc. Soc. Biol. Chem., India, 1938, 3, 16—17).—Vitamin content varied greatly among the 30 varieties tested. The best varieties gave the following figures for -A (as carotene) and -C(as ascorbic acid) : Alfonso 34 and 800, Badami 110 and 598 mg. per kg., respectively. L. D. G.

Fruits of Hawaii: composition, nutritive value, and use. C. D. MILLER, K. BAZORE, and R. C. ROBBINS (Hawaii Agric. Exp. Sta. Bull., 1937, No. 77, 133 pp.).—Analytical data, including vitamin contents (rat tests), food vals., and descriptions of 24 fruits, are recorded. A. G. P.

Market diseases of cantaloups and Honey Dew and Honey Ball melons. J. S. WIANT (U.S. Dept. Agric. Tech. Bull., 1937, No. 573, 47 pp.).—The nature and effects of these diseases and means for their control are reviewed. A. G. P.

Gas- and cold-storage as related to fruit under Annapolis Valley conditions. C. A. EAVES (71st Ann. Rept. Nova Scotia Fruit Growers' Assoc., 1934, 92–98).—Storage in an atm. containing 5–10% of CO<sub>2</sub> at 3.3° preserved apples for 2 months without undesirable changes. Lower temp. (0–1°) and higher  $[CO_2]$  (20%) induced more rapid breakdown.

CII. ABS. (p)

Changes of moisture content of dried fruit during storage. W. B. BROWN (J.S.C.I., 1937, 56, 31-36).—An inexpensive vac. oven and the procedure for the determination of moisture are described. The equilibrium vals. of moisture content of dried fruit and atm. humidity at two temp. are given. The changes of moisture content occurring during an experimental bulk storage of dried fruit are examined.

Colorimetric determination of lactic acid in fruits and fruit products. F. HILLIG (J. Assoc. Off. Agric. Chem., 1937, 20, 605-610).—An aq. extract of the sample containing I c.c. of 50% H<sub>2</sub>SO<sub>4</sub> is extracted as in the author's original method (B., 1937, 489) for 3 hr. In order to prevent foaming, wines are first diluted with EtOH and then evaporated and diluted with H<sub>2</sub>O twice. Results are tabulated for fruit products and wines. J. G.

Determination of sulphur dioxide in fruit conserves. U. BERTOZZI (Annali Chim. Appl., 1937, 27, 539—543).—The SO<sub>2</sub> liberated from the sample by means of a rapid current of air is passed through a porous septum into 0.05N-KIO<sub>3</sub>. The excess of KIO<sub>3</sub> is titrated with Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> solution. The method is rapid and can be used to determine as little as 1 mg. of SO<sub>2</sub>. O. J. W.

Examination of ginger. G. D. ELSDON and C. MAYNE (Analyst, 1937, 62, 836-840).—The outer portions of whole ginger contain much less EtOHand  $\text{Et}_2\text{O}$ -sol. matters than do the inner portions, and since the former may be discarded in order to give a whiter ground product, an opinion based merely on these vals. may not decide between exhausted and unexhausted samples. Where, however, the low EtOH extract is due to natural causes it is usual to find a high  $H_2O$ -sol. extract. The composition of EtOH- and  $H_2O$ -exhausted and unexhausted Jamaica, African, and Cochin gingers, and of the outer and inner portions of several examples of the three types, are tabulated. E. C. S.

Chile pepper. J. ROCA (Anales ist. biol. [Mex.], 1935, 6, 201-211).—The pepper (dried fruit of *Capsicum annuum*, var. *acuminatum*) contains oleoresin 17, protein 18, starch 4, glucose  $4\cdot3$ , fat  $2\cdot7$ , ash  $4\cdot5\%$ , and a trace of alkaloid. The colouring matter is chiefly carotene and xanthophyll with some lycopene or lycopersin. The taste is due to resin constituents and partly to decenovanillylmethylamide and related compounds. CH. ABS. (p)

Microscopical examination of "spring herbs." II. V. MOUCKA (Z. Unters. Lebensm., 1937, 74, 412—420; cf. B., 1936, 472).—Microscopical characters of the buttercup (*Ranunculus bulbosus*) and woodsorrel (*Oxalis acetosella*) are described. E. C. S.

Mineral constituents of honey. II. Phosphorus, calcium, magnesium. H. A. SCHUETTE and D. J. HUENINK (Food Res., 1937, 2, 529–538; cf. A., 1932, 976).—The colour of 35 samples of honey was qualitatively related to the mineral content, especially of Mg, SiO<sub>2</sub>, and P. The Ca contents ranged from 5 to 226 p.p.m., P 23–58 p.p.m., and one specimen contained 126 p.p.m. of Mg. The alkalinity of the ash of honey from various floral sources is tabulated. E. C. S.

Occurrence and determination of zinc in maple products. J. L. PERLMAN and J. E. MENSCHING (J. Assoc. Off. Agric. Chem., 1937, 20, 627-631).--Zn in maple products may be derived from galvanised equipment, and its dissolution is hastened by the prolonged boiling necessary for concn. of the sap, and by the acidity due to fermentation or "souring." Zn is first removed from the partly-digested sample by means of dithizone (I) in CHCl<sub>3</sub> solution in presence of aq. NH<sub>3</sub>, and determined by a modification of the Lang method (A., 1933, 799). Pb, Sn, Cu, Bi, and TI salts do not interfere, but Cd if present gives high results, and Cu combines with (I) to form a very stable complex which is not decomposed by 1% HNO<sub>3</sub>. J. G.

Determination of lead in maple products. J. L. PERLMAN (J. Assoc. Off. Agric. Chem., 1937, 20, 622-627).—Interference with the electrodeposition of Pb after separation with dithizone (I), owing to the presence of excessive quantities of org. matter, has been experienced in the A.O.A.C. method (cf. B., 1934, 379; 1935, 747) and is due largely to decomposed (I). This may be avoided by removal of Pb from a CHCl<sub>3</sub> solution of the Pb-(I) complex by extraction with 1% HNO<sub>3</sub>. Direct electrolysis of the acid extract produced no interference due to Cl' from the CHCl<sub>3</sub>. Sn, Mn, and reasonable amounts of Zn do not interfere, and only 2 hr. are required for a determination (cf. B., 1938, 443). J. G.

Determination of lactose and sucrose in milk chocolate. F. T. VAN VOORST (Chem. Weekblad, 1937, 34, 803—804).—An error of  $0.01^{\circ}$  in the polarimeter reading in the official Dutch method may lead to an error of 0.5% in the sucrose (I) and 0.35% in

the lactose (II) content of milk chocolate. In the preferred method, 5 g. of sample are dissolved in 100 c.c. of warm H<sub>2</sub>O, 1 c.c. of 2N-Zn(OAc), and 1 c.c. of  $N-K_4Fe(CN)_6$  are added, and the solution is made up to 250 c.c. 100 c.c. of filtered solution are treated with 3 c.c. of saturated Na<sub>2</sub>HPO<sub>4</sub> solution, made up to 250 c.c., again filtered, and 100 c.c. of filtrate are boiled down to 40 c.c., treated with 5 c.c. of 1% peptone solution, and the cooled solution is fermented at 30° for 48 hr. with a pure culture of S. cerevisiæ. The solution is then boiled, made up to 100 c.c., and the (II) determined (= x mg.) in 25 c.c. by the Luff-Schoorl method, the (II) content of the original sample being x/2. The (I) content is determined by inversion and determination of fructose before fermentation. S. C.

Determination of sucrose and lactose in chocolates. F. HOEKE (Chem. Weekblad, 1938, 35, 95—97).—Satisfactory results can be obtained by using the polarimetric method and the corrections given in Fincke's tables; alternatively, the reductometric method using Luff's reagent can be used in conjunction with the correction  $1 - 0.00102 \times \text{fat}$ content % - 0.0008 × insol. matter %. In the preferred method the sucrose is inverted by warming at 100° for 30 min. with 0.02x-HCl. S. C.

Fluorine in food products. H. C. LOCKWOOD (Analyst, 1937, 62, 775-783).-The F is separated as  $H_2SiF_6$  by steam-distillation of the alkaline ash of the sample at  $130-150^{\circ}$  in presence of  $H_2SO_4$  and in a current of CO<sub>2</sub> according to a modification of the method of Willard et al. (A., 1933, 242). Distillation is complete in 45 min., when the F may be determined by its fading effect on a Zr-alizarin reagent (cf. Barr and Thorogood, B., 1934, 782). If Mn is present KMnO<sub>4</sub> may be formed on ashing, and the bleaching effect of Cl<sub>2</sub> produced from this must be eliminated by addition of NaNO<sub>2</sub>. Willard's volumetric method (loc. cit.) is suitable for foodstuffs containing >5p.p.m. of F, but addition of 25 ml. of glycerol gives a better end-point than EtOH. F contents of 17 different foodstuffs and 7 chemicals are tabulated, and as a rule are  $\geq 2$  p.p.m. The 5 teas examined, however, contained 10—73 p.p.m., of which 35—53 p.p.m. were present in a 5% infusion (cf. Reid, B., 1936, 811). J. G.

Thermophiles and their importance to canners. L. H. G. BARTON (Food Manuf., 1938, 13, 51-53).—Methods of examining raw materials are described. For the flat-sour type glucose-tryptone agar, for "swells" liver broth, and for  $H_2S$ -formers FeSO<sub>4</sub> agar are used. Methods of testing starch and sugar are given. W. L. D.

Processing the peanut. W. W. Moss (Food Ind., 1936, 8, 123—125).—Fumigation of nuts in the shell with  $(CH_2)_2O$  is advocated. Coconut oil for toasting the nuts should have free acid <0.5% and  $d^{15} > 0.926$ . Rancidity in toasted nuts is caused by enzymes,  $O_2$ , and light. Lipase must be destroyed in processing. CH. ABS. (p) Industrial uses of low-grade coffee. C. H. SLOTTA (Revista Chim. Ind., 1937, 6, 500—503).— The analysis of coffee is outlined and it is suggested that the surplus production of low-grade coffee could

be converted on the plantations into coffee oil for use as a condiment or lubricant, or saponified to yield soap and glycerol, the unsaponified portion providing sitosterol. Caffeine could be produced in excess of requirements, whilst processes for the conversion of the caffeie acid, quinic acid, and trigonelline into  $C_6H_6$ , cyclohexane, and  $C_5H_5N$ , respectively, are possible. The residues consisting of proteins and cellulose could be fermented and used as foodstuffs.

F. R. G. Analysis of coffee infusions. F. W. EDWARDS and H. R. NANJI (Analyst, 1937, 62, 841-851).— Adulteration of coffee with, *e.g.*, chicory is detected in the infusion by deviations in the ratios of extractives to caffeine (I), extractives to ash, and ash to (I). These ratios are established for genuine samples, and limits of 20:1, 7:1, and 4:1, respectively, are suggested, the exceeding of which definitely indicates adulteration. Two methods of calculating the extent of adulteration are given and the methods of analysis outlined. E. C. S.

Occurrence of acetic acid in cacao beans. H. FINCKE and P. NIEMEYER (Z. Unters. Lebensm., 1937, 74, 387—396).—AcOH was detected in the air between the sacks in a cacao store. San Thomé beans contain more AcOH than do those from Acera or Arribaroh. In all varieties the husks contain twice as much AcOH as do the nibs. During extraction with  $Et_2O$  most of the free AcOH is removed, but since it is lost during evaporation of the solvent and drying of the fat, there is no danger of its contributing to the acid val. of the fat (cf. Nottbohm and Mayer, B., 1936, 345). Bound AcOH is also present in the bean. E. C. S.

Determination of total alkaloids in cocoa, and of cocoa matter in flour confectionery. A. E. PARKES and H. A. PARKES (Analyst, 1937, 62, 791).— Since 100 ml. of a 5% solution of PhOH in CHCl<sub>3</sub> will extract 0.23 g. of theobromine in 24 hr. at room temp., it is suggested that this should replace the CHCl<sub>3</sub> used in Moir and Hinks' method (B., 1935, 781). The extracts contain a trace of sugar, and their N content should be determined; after removal of the CHCl<sub>3</sub> by evaporation the PhOH may be volatilised in warm air. J. G.

Standard of cattle-keeping and the physiological stress limit in milk production. F. SCHNEITER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 228-231).—Milk yields in Central Europe have reached a limit of 4000 kg. per cow per year. A slow improvement in the fat content of the milk of mountain cattle has been observed. Research in breeding should pay attention to size of cells, live wt., and the physiological stress limit. Lighter, smallcelled cows are more efficient and cows should be  $\Rightarrow$ 650 kg. in live wt. Other conditions being const., the live wt. may be taken as a measure of the stress limit, with a max. wt. of 650 kg. and a yield coeff. of 7.5-8.5. W. L. D.

Indoor feeding of dairy cows. S. NEUG-SCHWENDTNER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 412—414).—The varieties of homeproduced and other foods used for indoor feeding are enumerated and the requirements of such food discussed. Roughages should make up the bulk of the ration and conc. food should be fed alone always before the feeding of bulky foods. The vitamin and Ca and P contents of foods should be roughly gauged and the latter supplemented by mineral feeding.

W. L. D.

Problem of satiation in feeding dairy cattle. F. SVOBODA (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 168—172).—Nutritive and mechanical satiation are borne in mind. Mechanical or bulk satiation is superimposed on nutritive satiation by addition of such roughage as chopped straw in amounts computed on the total dry matter requirement of the ration. This prevents the premature ballast satiation of the more productive animals. W. L. D.

Application of scientific data to the practice of feeding of dairy cows. C. VOITELLIER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 187— 190).—Food tables and standards should not be rigidly adhered to. Consideration should be given to variations in area of body surface with breed, difference between ordinary and strictly necessary maintenance, influence of age, variations of temp., variations of live-wt., and the need for modifying the production ration to suit rapid gains of live-wt. during pregnancy and of growing in-calf heifers. W. L. D.

Simple methods of calculating rations for cows according to yield. BUNGER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 16—19).—A simplified method of feeding according to yield depends on the calculation of the milk-productional val. of a feed, or the amount of milk which 1 (or 10) kg. of the feed can produce from its average content of digestible protein and carbohydrate. It is taken as a basis that 1 kg. of milk requires 50 g. of digestible protein and 220— 230 g. of carbohydrate for its production. These vals. are listed for common farm foods. W. L. D.

Types of silage in dairy-cow feeding. V. VEZ-ZANI and E. CARBONE (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 172—174).—Three types of silage—A.I.V. and the Italian Cremasco and Albese types—were compared with meadow hay for milk production. The three types were equally superior to hay in their stimulating effect on the mammary gland to cause increases of yield of milk and fat. No change in the taste of the milk was noted. Silages high in H<sub>2</sub>O content caused some loss of body-wt. in the cows. W. L. D.

Danish experiments on hay and silage as foodstuffs for dairy cows. H. W. ESKEDAL (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 196—200).— The nutritive val. of A.I.V. silage is > that of meadow hay by 15% when gauged on a dry-matter basis, and a little > that of molasses silage besides being more uniform and reliable. Cows giving 8 kg. of milk per day could be maintained on hay and turnips, and 1000 kg. of hay can replace 260 food units of concentrates, 26 units of turnips, plus 152 units of straw. W. L. D.

 acids or molasses. When made from young herbage the product is rich in digestible protein and carotene. Dried grass or silage increases the yellow colour of butter fat and the vitamin-A potency. Fat and solids-not-fat are not influenced by feeding these foods, but dried grass may raise slightly the solidsnot-fat. The composition and digestibility of dried grass and silage yield an accurate measure of the feeding val., and both will produce the amount of milk expected from such val. W. L. D.

Food value of the pastures of the Great Hungarian Plains with regard to milk production. J. VON PIUKOVICH (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 157—161).—The pasture is unfenced and difficult to manage and improve. The grass distribution is poor, but yields considerable nutritive val. for its growing period of 100 days. The grass then has a nutritive ratio of 6.2. It is estimated that the yield is 82 kg. of starch equiv. per hectare per annum. W. L. D.

Utilisation of pasture herbage. M. WITT (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 200-205).—The total daily milk yield of 6 cows on 7 hectares of spring pasture could not be increased by >30 litres even if a high-protein additional ration was added. The animals could not use the additional nutritive val. of the ration and could use only its displacement val. Grass rich in protein is utilised to a greater extent if carbohydrates are given as an additional ration. In the period May—Oct., such pasture yielded 6300 lb. of starch equiv. The change of high-yielding cows from indoor to pasture feeding must be made with particular attention to the balance of the total ration. W. L. D.

Introduction of the system of feeding Swedish dairy cattle with home-produced foods. J. AXELSSON (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 90—94).—During the last 20 years the % of the ration obtained from home production has increased from 68 to 76, due mainly to hay and pasture. The milk yield has been raised also. The principles involved are the increase of concn. of the foods and raising the protein to a higher level. W. L. D.

Milk production on home-grown food [Finland]. A. I. VIRTANEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 180—187).—The main principles rest on the increased growing of leguminous plants and the application of the efficient acid method (A.I.V.) for the preservation of fodder crops. Experience with the acid method for the last 8 years is reported. The improvement of the quality and the nutritive val. of dairy products from cows fed such silage is described. W. L. D.

Feeding of dairy cattle on home produce [Italy]. V. VEZZANI (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 174—180).—Sources of food, such as straw and chaff of cereals and legumes, maize by-products, vegetable refuse, tree leaves and branches, vine offshoots, and milling and dairy byproducts, are discussed. Intensive cropping and multiple hay-harvesting can be developed. Ensilage is the best form of fodder preservation as it incurs less loss than haymaking. W. L. D. Influence of feeding home-grown foodstuffs on efficiency of milk production. L. LÖHR (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 134— 142).—A distribution of cultivation on 18 farms of beet 30, cereals 60, and green fodder 10% and the utilisation of these crops or their by-products for milk production show that their utilisation val. on the farm is high. The increase of green fodder to 30% and decrease of roots to 20% also gave high utilisation val. The increased feeding of home-produced food increases the period of useful life of the cow. W. L. D.

Influence of mixed foods containing glycine and urea and low-protein foods on composition and quality of butter and milk. F. RICHTER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 140— 145).—Using a concentrate ration of 80% of oilcake and 20% of wheat bran as control, the substitution of 40% of digestible protein by glycine improved the quality of the milk and butter, but substitution with an equiv. of urea decreased the milk-protein and butter quality. The feeding of low-protein concentrate (40% less of digestible protein) further decreased the amount of milk-protein and butter quality. W. L. D.

Home-produced protein-rich foods. MüLLER-LENHARTZ (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 144—145).—The amount of protein grown on farms can be increased by an increased use of nodule organisms to cause a higher assimilation of N in leguminous plants, by growing leguminous plants in association with other profitable plants, by increased preservation of green fodder as silage, by harvesting at proper times, and by judicious manuring. W. L. D.

Wood-sugar yeast as a protein food for cows. BUNGER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 106—107).—This product contains protein 49, sol. carbohydrates 42, and ash 6% on the dry matter. The protein is as digestible as soya-bean protein and equal to the latter, lb. per lb., for milk production. W. L. D.

Protein requirements of dairy cows for milk production. S. BARTLETT, S. L. HUTHNANCE, and J. MACKINTOSH (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 6—9).—Over 500 cows from 18 farms were paired into 2 groups, one group receiving 0.6—0.7 lb. and the other 0.4—0.5 lb. of protein per 10 lb. of milk for each cow. The two groups did not show any differences in condition, handling properties of skin, milk yield, or in fat and solidsnot-fat contents of the milk. The low-protein groups gave a slightly greater rise in yield when turned out to spring pasture. W. L. D.

Value of marrowstem kale as a home-grown feeding-stuff for dairy cattle. W. NICOLAISEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 148—152).—Various strains show great variation in yield and composition. The leaf contains twice as much protein as the stem. In the best strains, the leaf wt. is 40—50% of the wt. of the total plant. The dry matter contents of leaf and stem average 13.3 and 14.5%, respectively. Winter loss of leaf causes a serious loss of protein, and utilisation of the leaf first and storage of the stems in cold stacks is advised. Types rich in leaves should be bred by selection and consumed first, followed later by strains poor in leaves. W. L. D.

Measures for supporting dairy cattle on homeproduced foods. W. NICOLAISEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 152—154).— Self-sufficiency in home-produced food demands an increase in yield and improvement of quality in all branches of crop-growing, including hay and grass. Cultivated fodder plants give higher yields than does pasture. Pasture should be managed for both hay and grazing. The cultivation of catch crops has to be developed to the highest extent, which means thorough cultivation and manuring. W. L. D.

Feeding of cows with home-produced foods [in Belgium]. F. SMEYERS (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 164—168).—The principles consist in growing large amounts in conc. form, with high digestible protein, which can be stored without loss of protein. Profitable crops are : ensiled clover and other leguminous plants, cow-cabbage, roots, and clover hay. These foods are sufficient for winter use if the daily milk yield is >12—13 litres. Good pasture is necessary only in summer. W. L. D.

Feeding of dairy cows with home-produced food [in Denmark]. A. S. CHRISTENSEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 109— 112).—A cow weighing 500 kg. requires 150 g. of protein to produce 2.5 kg. of milk (= 1 nutritive unit, N.U.). The annual requirement of a cow would be 3000 N.U., of which 25% comes from imported concentrates. It is calc. that raising an extra 20% of protein from roots and 50% from grass would require no conc. supplement for feeding and this effect would be cumulative. W. L. D.

Use of cottonseed meal in rations for dairy cattle. A. H. KUHLMAN, J. I. KEITH, and W. D. GALLUP (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 119—122).—Disorders in cows fed large quantities of cottonseed meal are due to inadequate amounts of vitamin-A and not to a toxic constituent. Other -A-deficient constituents of the ration may enhance the effect. Milk produced on feeding excessive amounts can be used for all the usual purposes, except that some churning difficulties are encountered in buttermaking owing to the hard fat. The cream need not be set, or can be churned at 3° above the usual temp., and more butter colour is required. W. L. D.

Influence of feeding raw and de-bittered vetch seed on composition and quality of milk and butter. F. RICHTER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 145—149).—Feeding raw vetch seed did not affect the  $p_{\rm H}$ , d, or composition of milk significantly, but at the commencement of the feeding period the taste of some samples was affected. Milk from raw seed was more suitable for cheesemaking than that from processed seed. No taste was imparted to butter. Feeding large quantities of seed gave a hard butter, which was slightly softer in the milk from feeding the processed seed.

W. L. D.

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Influence of feeding cows with beet tops treated with copper on the yield and quality of milk. W. LIEBSCHER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 130—134).—To control fungoid diseases, beet leaves may be treated with Cu salts. Three groups of cows were used, viz., one control, one on fermented tops containing 97 p.p.m. of Cu, and one on Cu-free fermented tops. The daily Cu intake was  $0\cdot 3$ — $0\cdot 6$  g. per kg. live wt. No injury to health or effect on the yield and composition of milk was noted. A daily Cu intake of  $0\cdot 63$  g. per 100 kg. bodywt. had a small effect on yield. The Cu in the food did not affect the taste or Cu content of the milk.

W. L. D.

Fishy flavour of milk on feeding beet by-products. W. L. DAVIES (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 8—10).—The following beetfactory residues (% betaine content) are used for feeding dairy stock : beet molasses (5·4), molassed pulp (1·8), beet tops (1·6 in dry matter). The main tertiary metabolite of betaine is NMe<sub>3</sub>O. Traces of this enter milk and react with milk fat to give a fishy flavour. All tertiary N bases are metabolised to NMe<sub>3</sub>O. The prevention of the taint consists in feeding only 2 kg. of molasses, or 4 kg. of pulp, or 25—28 kg. of tops, daily as far away from the subsequent milking as possible. Cows giving abnormal milk should not be fed beet by-products, or their milk should not be mixed with that from normal cows.

W. L. D.

Roughages for winter milk production. J. C. KNOTT (Proc. 8th Ann. State Coll. Wash. Inst. Dairying, 1935, 124—127).—Cull apples, added to material for ensilage, prevent proteolysis and deamidation during the process. Grain rations may be partly replaced by immaturely cut but properly cured hay. CH. ABS. (p)

Dry versus succulent roughage in the dairy ration. O. M. CAMBURN and H. B. ELLENBERGER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 107-108).—The average of 4 trials indicates that cows will balance their needs of  $H_2O$  whether on succulent or non-succulent food and that neither type of food is superior for milk production. Good hay can replace maize silage if the cows have free access to  $H_2O$ . No advantage arises from supplying  $H_2O$ in a succulent food, and the primary val. is the amount of digestible nutrients supplied. Succulents supply variety to the ration. W. L. D.

Influence of fodder on the vitamin-A content of butter. V. STEENSBERG (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 257-261).—The -Acontent of butter varies with the feeding of the cows, and only by the use of fodder rich in carotene (1) and -A can the max. content be obtained in butter. The -A content of Danish winter butter is 5-10 international units (i.u.) per g. The (I) and -Acontent of winter butter can be raised to that of summer butter (14-18 i.u. per g.) by feeding carrots, artificially dried grass, or A.I.V. silage. W. L. D.

Influence of various foodstuffs on butter quality. J. MAGI (Proc. XIth World's Dairy Conf., Berlin, 1937, 2, 133-137).—Large daily rations of turnips, sugar beet, or potatoes causes the formation of a hard, brittle butter of pale colour. The butter fat has a low I val. Large doses of linseed cake improved these qualities. The effects of 90 lb. of turnips were neutralised by feeding 2-3 lb. of linseed cake. W. L. D.

Changes in the physical properties and chemical composition of butter fat on transition from winter to summer feeding conditions. J. GROH (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 127—129).—In the winter to summer change, the dof the fat is const., n increases slowly, the m.p. fluctuates, the Reichert-Meissl and Polenske vals. increase, the sap. val. decreases, the Hehner val. is unchanged, and the I val. rises considerably. Any change was reversed in the change from summer to winter feeding conditions. W. L. D.

Influence of feeding-stuffs on properties of milk for cheese manufacture. H. JÖRGENSEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 199-203).—The effect of variation in methods of feeding, and the foodstuffs used, on the quality of milk for cheese-making is discussed, mostly from the bacteriological viewpoint and the contamination of milk with undesirable bacteria from outside sources. The effect of feeding silage and the varying behaviour of even good-quality milk produced are discussed. W. L. D.

Effect of feeding sugar to cows on the cheesemaking. W. STOCKER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 60—64).—On feeding sugar to cows with a view of increasing the fat and solids-notfat % of the milk, difficulties have been met in making Emmenthal and Tilsiter cheese from the milk. In testing this, the yield and fat decreased and the titratable acidity of the milk, the  $p_{\rm H}$ , rennet coagulation test, and catalase content were unchanged. The bacterial count increased and fermentation tests were less satisfactory, whilst  $PrCO_2H$  (I) fermentation was observed and Tilsiter cheese showed (I) inflation.

W. L. D.

Effect of incomplete milking on fat content of milk. I. JOHANSSON (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 399—405).—The fat content is increased with thorough milking. Reduction of % fat occurs with incomplete stripping, but fat is not reabsorbed from the udder and appears at the next milking. Total and fat yield may be decreased owing to the back-pressure of the milk left in the udder, and this may be marked in high-yielding cows but of no importance in low yielders. In cow testing, milking should be done at regular times with complete stripping before and during the day of test.

W. L. D.

Comparative investigations on the chemical composition of air in cowsheds in central Switzerland. M. DÜGGELI (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 211—217).—The composition is better in summer than in winter, and the permissible  $[CO_2] > 0.25\%$  in most sheds in winter, the vals. being 0.358% as against 0.124% in summer.  $[CO_2]$ depends on the frequency of renewal of the air and the difference between inside and outside temp.  $[NH_3]$  varied from 0 to 0.29 g./100 ml., being higher in winter. Qual. tests for H<sub>2</sub>S were always positive, with higher amounts in summer, but >0.0003%. R.H. varied from 60 to 87%, the increase over that of the outside air being greatest in winter. Temp. exceed the optimum vals. of 15—18° in summer and winter. Air conditions were better in well-aired houses or in those constructed of porous materials, those made of wood ranking first. Low hygienic conditions increase the [NH<sub>3</sub>] and [H<sub>2</sub>S]. W. L. D.

Daily variations in the chemical composition of the air in some Swiss cowsheds. M. DüGGELI (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 209—211).—The R.H., abs. air humidity, temp., and contents of  $CO_2$  and  $NH_3$  did not change significantly in 24 hr. Contrary to opinion, there was no great increase in  $CO_2$  and  $NH_3$  content during the night and ventilation soon restored normal conditions. The max. vals. for temp.,  $H_2O$  vapour, and  $CO_2$  contents occur 3—4 hr. after artificial ventilation has been stopped. W. L. D.

Source of infection of milk with coliform organisms. J. PROKS and E. FUCHSIG (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 44—45).—Many types of the coliform group gain access to cowsheds and digestive tracts of cows by the food. Foods taken directly off the field were free, but mowing, handling, and euring infected the fodder with these organisms. Infection of milk takes places in the milking process and afterwards. The air of cowsheds and other houses is also a source of infection. W. L. D.

Feeding different grades of hay and vitamins-A and -D in concentrated cod-liver oil to dairy calves. E. A. KEYES, H. B. ELLENBERGER, and C. H. JONES (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 112—115).—24 calves were raised from 24 days to 8 months on an economic ration of hay, grain, and vitamin supplement with only a little milk. Good-quality hay is necessary for calf-raising, and with it no vitamin supplement is necessary. Addition of a vitamin supplement to poor hay was advantageous. W. L. D.

Feeding standards for feeding skim milk. BÜNCER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 258—261).—In calf feeding, skim can partly replace whole milk at the 7th week, and in the 10th week almost completely replace it. The quality of such veal is excellent, 80% of experimental calves grading in the top two classes. Young pigs gain rapidly in live wt. with a supplement of 4 litres per day, which is reduced to 2 litres later on.  $\frac{1}{8} - \frac{1}{4}$  litre fed to laying and table hens is beneficial. W. L. D.

Skim milk in animal nutrition. A. PIRROCHI (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 283—285).—Experiments using skim milk as a supplement to starchy foods, usually of the wastecereal type (rice flour, tapioca residues), proved that milk protein could be given in sufficient quantities in this way to growing stock and that the appearance of the animals was satisfactory. W. L. D.

Utilisation of whey as drink for horses. MAJER (Proc. XIth World's Dairy Cong., Berlin, 1937, 2, 274—275).—Horses take willingly to whey and it does not impair digestion. 34 litres of whey had the same feeding val. as 1 kg. of oats. W. L. D. Sheep-milk production and products [in Rumania]. I. DUMITRU (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 386–387).—Sheep 5—8 years old, yielding milk over a period of 75—135 days of a total yield up to 80 litres and giving their max. milk 20—30 days after lambing, are used. The % of fat in the milk ranges from 6 to 13 (mean 9.5) as the lactation period advances. Fermented milk, butter, and cheese are made from it. Analyses of 3 types of cheese (H<sub>2</sub>O content 33—41%, fat in dry matter 45.4—51.6%) are given. W. L. D.

Share of whey in spreading tuberculosis. S. VON NYIREDY (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 292—293).—By feeding to pigs whey obtained from cheesemaking from the milk of tuberculous cows infection with the disease is rare, whilst infection is frequent with skim milk. Laboratory tests have proved that whey contains fewer tubercle bacilli than the original milk. Curd and whey are often free from the bacilli if the milk is not strongly infected. Whey is less dangerous than skim milk in spreading the disease. W. L. D.

Feeding of livestock. C. CROWTHER (J. Roy. Agric. Soc., England, 1937, 98, 348–390).—A review, dealing with grassland produce, protein, fat, vitamins, digestibility, and pig-feeding. W. L. D.

Replacement of mangolds by wet sugar-beet pulp in the ration of fattening bullocks. W. J. WEST (J. Roy. Agric. Soc., England, 1937, 98, 186— 193).—Wet pulp and mangolds contain, respectively, dry matter 15.0, 12.0; protein equiv. 1.0, 0.4; starch equiv. 11.7, 6.2%. One ton of pulp was equal in feeding val. to 1.9 tons of mangolds. It is advisable to give bullocks 2 oz. of CaCO<sub>3</sub> per head per day to supplement the minerals of the pulp. W. L. D.

Production of cattle fodder from bagasse screenings and molasses. H. S. CHATURVEDI (Int. Sugar J., 1937, 39, 487).—Mixings were made of bagasse screenings (25-mesh, air-dried to about 10% of H<sub>2</sub>O), disintegrated groundnut cake, and molasses in the ratio  $1:1-1\cdot5:1\cdot5-2$ . When compressed into cakes weighing about 5 lb. each, the product was capable of withstanding handling during storage and shipment, and of being easily softened by sprinkling by H<sub>2</sub>O. A mixture of bagasse screenings and molasses (1:2) in admixture with half its wt. of protein feed (as oil cake, cottonseed meal, chuni, etc.) is suitable as cattle fodder. J. P. O.

Molasses as a stock feed (manufacture of solidified molasses). H. W. KERR (Int. Sugar J., 1937, 39, 486–487).—Cane molasses imported from Java is being sold in Queensland in solid form at 13/6 per cwt., but could be produced much more cheaply locally. Its process of manufacture would consist in evaporating the ordinary product in a coil vac. pan to a Brix of about 99, and dropping it upon a concrete floor previously lightly coated with oil. After cooling, the solidified mass is cut into strips, coiled up, and wrapped in paper. Molasses fed in the solid form is generally taken by the stock as a lick, and is estimated to have a feed val.  $>_3^3$  that of maize. J. P. O.

Calcium and phosphorus contents of New Mexico range forages. W. E. WATKINS (New Mexico Agric. Exp. Sta. Bull., 1937, No. 246, 73 pp.).— Analyses are recorded. Winter conditions resulted in heavy leaching losses of P and considerable losses of Ca from grasses. The Ca and P requirements for sheep are slightly > those for cattle. A. G. P.

Artificial drying of forage crops. E. D. GORDON and W. M. HURST (U.S. Dept. Agric. Circ., 1937, No. 443, 23 pp.).—Appropriate machinery is described and its operation costs are recorded. In comparison with sun-cured forage the artificially dried material showed slightly better analysis, produced somewhat greater live-wt. increases though these were insufficient to meet the cost of drying, and had considerably greater carotene content.

A. G. P.

Composition of maize fodder grown in drought years. L. D. HAIGH and A. G. HOGAN (Missouri Agric. Exp. Sta. Bull., 1937, No. 390, 6 pp.).—In drought seasons maize contains more protein and less carbohydrate than do normally grown crops. Silage produced from drought crops has approx. the same protein and carbohydrate but higher fibre contents than normal. Effects of fertiliser on crop yields persisted, though to a restricted extent, in drought years. A. G. P.

Preservation of fodders by addition of acids. J. AXELSSON (Lait, 1938, 18, 216-220).—The A.I.V. method for, and the nutritive val. of, A.I.V. silage are described. W. L. D.

Variations in the amounts of acid necessary for the preservation of fodder by the A.I.V. method with reference to the stage of development of the plants. E. M. LAVRIANO (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 142–143).— The amounts of HCl or  $H_2SO_4$ -HCl necessary depend on the type and stage of development of the plants and on the soil conditions. It is imperative to know the buffering capacity of the vegetable tissue since on this val. will depend the amount of acid necessary to carry the  $p_{\rm H}$  of a given wt. of fodder to 3·0–3·5. Leguminous plants generally require twice the amount of acid required by gramineous plants. W. L. D.

**Preservation of green fodder.** Y. KAUKO and Y. VÄLKKILÄ (Kolloid-Z., 1938, 82, 207-215).— The acidity of fresh spinach leaves decreases rapidly with time. A slow decrease is observed during the passage of CO<sub>2</sub> through the material, or after addition of <0.05 mol. of acid (HCl,  $H_2C_2O_4$ , or lactic) per kg. Addition of 0.1 mol. of strong acid per kg. reduces the  $p_{\rm H}$  to 2.5-4.3. Salts of weak acids present in the leaves are completely decomposed by about 0.25 equiv. of HCl per kg., of which 0.06 equiv. is required to decompose the carbonates. Preservation can be attributed to H ions when the  $p_{\rm H}$  is >2.5. Glass electrodes must be used for determining the  $p_{\rm H}$  of green leaves; erroneous vals. are obtained with the H or quinhydrone electrode.

F. L. U. Ensilage of green fodder [in Belgium]. E. PIRAUX (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 154-157).—The ensilage of green material should be done on the young plant, preferably by the acid method. HCl with a low % of HPO<sub>3</sub> is recommended. Considerable hydrolysis of protein and cellulose occurs in the process. W. L. D.

Digestibility and nutrient content of timothy and lucerne when ensiled. J. A. NEWLANDER, H. B. ELLENBERGER, and C. H. JONES (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 145—147).— Both were successfully ensiled, with or without molasses, when the dry matter content was 30-35%. High H<sub>2</sub>O content induces putrefaction and low H<sub>2</sub>O mould growth. Addition of molasses prevents putrefaction in silage of high H<sub>2</sub>O content. Both silages of good quality were highly digestive, the early-cut being more so than later-cut crops. W. L. D.

Stack silage. R. E. HODGSON and J. C. KNOTT (Wash. Agric. Exp. Sta. Bull., 1937, No. 348, 34 pp.).— Analyses and nutrient vals. of stack silage are recorded. With due precautions stack silage may be prepared with approx. 90% of the efficiency of that in the silo, and with similar conservation of carotene. Faulty construction of the stack leads to heavy losses by spoilage and fermentation and to lowered protein digestibility. A. G. P.

Molasses a preservative in soya-bean silage. E. C. ELTING and J. P. LAMASTER (Assoc. Southern Agric. Workers, Proc. 34—36th Ann. Conv., 1933—5, 506—507).—Good silage was obtained with soya beans, cut in early bloom and containing 21.25% of dry matter, mixed with 1% of blackstrap molasses diluted with H<sub>2</sub>O. CH. ABS. (p)

Rough rice for fattening cattle, sheep, and hogs. L. A. WEAVER and H. C. MOFFETT (Missouri Agric. Exp. Sta. Bull., 1937, No. 386, 15 pp.).— Rough rice produces smaller live-wt. increases in fattening animals than does maize: it necessitates approx. twice the protein supplement. Grinding improves the feeding val. of rice. Carcases of ricefed animals were of satisfactory grade. A. G. P.

Toxicity of arrow grass (Triglochin maritima, L.) for sheep : remedial treatment. A. B. CLAWSON and E. A. MORAN (U.S. Dept. Agric. Tech. Bull., 1937, No. 580, 16 pp.).—HCN production in the plant occurs principally in the green portions of leaves and is higher in plants growing under drought conditions. The toxicity of leaves is unrelated to their age, is not affected by sun-drying, but is partly eliminated by autoclaving (12 lb. pressure) for 20 min. Poisoned sheep benefit from injections of NaNO<sub>2</sub>-Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. A. G. P.

Comparison of various forms of milo grain for fattening steers in the southern Great Plains. W. H. BLACK, J. M. JONES, and F. E. KEATING (U.S. Dept. Agric. Tech. Bull., 1937, No. 581, 15 pp.). —Grinding milo, whether as grain or whole heads, increased the % utilisation of nutrients and live-wt. gains in steers when fed *ad lib*. Threshing slightly increased the gains, but not to a profitable extent.

Electric treatment of horse chestnuts and acorns. H. MURAOKA (J. Electrochem. Assoc. Japan, 1935, 3, 289–292).—Horse chestnuts electrodialysed in 0.2% H<sub>2</sub>SO<sub>4</sub>, refined, and dried give an edible starch. Acorns give a similar starch after removal of saponin and aloin (H<sub>2</sub>O 9.44, ash 0.55,

A. G. P.

starch 68·10, protein 7·93, fats and oils 5·5, cellulose 7·38%). Acorn fat, extracted from the starch with  $C_6H_6$ , freed from saponin, colouring matters, and waxes, and dried at 80° is a viscous, faintly yellow liquid,  $d^{12}$  0·9995,  $n^{19}$  1·456, sap. val. 209·33, I val. 5·05, acid val. 15·56, and seems to be edible. Acorn saponin, obtained by electrodialysis at 70° for 6 hr. of the waste liquor from the  $H_2SO_4$  and  $H_2O$  treatment of acorns, has strong foaming properties. The waste liquor from the NaOH and  $H_2O$  treatment, and the catholyte from the saponin prep., when dialysed and then further electrolysed, refined, and dried, gave pure aloin as a yellow powder. CH. ABS. (e)

Nutritive value and feeding effect of marrowstem kale. BUNGER (Proc. XIth World's Dairy Cong., Berlin, 1937, 1, 101—106).—This kale contains 2—3% of crude protein (digestibility 85%), 2—3% of fibre (60%), and 6—7% of N-free extract (90%). The leaf : stem ratio averages unity. The leaf is richer in protein and lower in fibre than the stem. The protein equiv. is 1.7 and starch equiv. 8.0. The plant is hardy down to an air temp. of  $-10^\circ$ . W. L. D.

Antirachitic properties of vetch, oats, and clover hay. V. V. MAKAROV (Probl. of Animal Husbandry, 1935, No. 8, 90–93).—In winter rations for young colts the quantity of clover or vetch-oat hay should not exceed 5% of the total starch equiv. of the ration. The antirachitic properties of the hay are discussed. CH. ABS. (p)

Taste and keeping properties of aromatic pudding meal made from potato starch. W. KRÖNER (Z. Spiritusind., 1938, 61, 29-30, 37-38).-Pure potato meal is almost tasteless even after prolonged storage, whilst maize meal possesses a characteristic flavour due to maize oil and tends to deteriorate. Equal amounts of essences have similar flavouring effects on the meals, the flavour loss on storage being similar in each case. H<sub>2</sub>O content of the meal has little effect on flavour, but NaCl appears to increase deterioration. Attempts to utilise maize oil as a carrier for essences added to pudding meal gave uncertain results, and the mixed meals offered no advantage, but addition of pectin-lactose mixture or cream gave some improvement. Working under proper conditions, dextrin flavour does not develop from pudding meal when used in puddings.

I. A. P.

Uronic acid content of the nitrogen-free extract of feeding-stuffs. G. A. GUANZON and W. M. SANDSTROM (J. Agric. Res., 1937, 55, 581—586).— The uronic anhydride content of the N-free extract of roughages is > that of concentrates. A calc. artificial coeff. of digestibility of feeding-stuffs agrees fairly well with results of feeding trials, but there is more divergence in the case of feeding-stuffs of high N-free extract in which the proportion of uronic acid is high. A. G. P.

Determination of crude fibre. O. RING (Suomen Kem., 1938, 11, A, 12).—A modification of Weende's method is described. M. H. M. A.

Colouring of hen's egg-yolk by paprika feeding. L. BENEDEK (Z. Unters. Lebensm., 1937, 74, 297-302).—The colour of the yolk is determined by extracting with light petroleum- $\text{Et}_2\text{O}-\text{EtOH}$ (96-98%) in equal proportions and comparing with 0.02% aq. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>. In arbitrary units, the colour increased in 20 days from 1.58 to 6.24 in one case, and in 2 days from 8.3 to 25.0 in a second, 2 g. of paprika meal being fed *per diem*. E. C. S.

Mineral constituents of Hungarian spice paprika. I. SARUDI (V. STETINA) (Z. Unters. Lebensm., 1937, 74, 292—296). E. C. S.

Testing the crushing strength of granules.—See I. Food from peanuts.—See II. Lanital fibres.— See V. Milk bottles.—See VIII. Influence of acids etc. on metals. Cu and Al in the dairy industry.—See X. Phulwara butter and shea butter. Semi-micro-PrCO<sub>2</sub>H val. Adsorbates on fat globules. Safflower oil [for salads]. Detecting rancidity of edible oils. Vitamin-A in grayfish-liver oil.—See XII. Taro. Distinguishing test for white clover.—See XVI. Wine etc. and vitamins.—See XVIII. Preservatives.—See XX. Air conditioning in dairies. Purifying foodstuffs with Ag. Wastes and sewage treatment.—See XXIII.

See also A., III, 208, Mineral contents of cow's and mare's milk. Determining  $NH_3$  in milk. 209, Determining component acids in butter fat. Milk clotting. 211, Nutritive val. of heattreated milk. 213, Nutritive val. of gluten. 214-8, Vitamins.

#### PATENTS.

Grinding of cereals by stages and a roller mill therefor. A. TEICHMANN (B.P. 478,159, 12.3.37. Ger., 8.1.37).—Only one pair of rollers is utilised for all stages, the velocity ratio being varied from 1:3 to 1: < 10, stage by stage, preferably by means of infinitely variable gearing. B. M. V.

Conditioning of air in flour mills. R. OSTBYE (B.P. 477,749, 18.5.37. Norw., 19.5.36).—A controlled amount of moisture- and heat-laden air leaving a roller mill or the like is mixed with the entering air to maintain const. conditions in the mill. The main body of the leaving air passes in countercurrent heat exchange with the entering air.

B. M. V.

Manufacture of improved bread product. R. POWERS, ASST. to BORDEN CO. (U.S.P. 2,059,905, 3.11.36. Appl., 1.8.34).—Bread of normal vol. and appearance, but having improved food val., is made from dough containing  $\geq 26\%$  of milk solids-not-fat and 75—90% of H<sub>2</sub>O, based on the flour wt., by mixing for 2—5 times as long as for normal dough and baking at 182—193°. E. B. H.

Casein dryer. F. V. SILVA (U.S.P. 2,067,506, 12.1.37. Appl., 11.5.36).—An inclined cylindrical casing contains a helical conveyor and the drying is effected by a distributed supply of hot air. Drying in two concurrent stages is claimed. B. M. V.

Treatment of egg whites. S. TRANIN (U.S.P. 2,056,082, 29.9.36. Appl., 20.2.33).—A product free from objectionable odour is obtained by removal of undesirable portions of the liquid white (chalazæ

etc.). This is effected by mixing the egg white with approx. 5% of a "culture" consisting of a fermented solution prepared from a flour (e.g., rye) and sugar, which is set aside for 30 hr. until the mixture is acid and the "culture" rises to the top. The egg white is then skimmed and dried in the usual way.

E. B. H.

Sausage manufacture. H. E. ALLEN, Assr. to A. G. MCCALEB (U.S.P. 2,060,160, 10.11.36. Appl., 31.5.35).—Addition of 0.25—1.0% of agar-agar to sausages hinders the loss of H<sub>2</sub>O during smoking and cooking and yields a product free from casing wrinkles. E. B. H.

Production of [artificial] skins or tubes [of animal origin]. NATURIN GES.M.B.H. (B.P. 471,566, 22.5.36. Ger., 23.5.35 and 11.3.36).—A plastic, kneadable, fibrous mass of protein-containing fibrous pastes is extruded through an annular nozzle and the formed tube, which is blown out with gas, is helically withdrawn, simultaneously dried, hardened, and finally separated into ring-shaped skins. Apparatus is claimed. F. R. E.

Manufacture of a powdered product from the mucilaginous substances of eel. T. MAYEHARA (B.P. 471,652, 4.12.36).—A nutriment suitable for people of a lymphatic constitution is prepared by agitating the live eel with  $H_2O$  at 45—50° and removing it from the resulting white, pasty mass. This is then boiled, cooled, frozen, powdered, purified by treatment with Japanese acid clay, dried, and pulverised. E. B. H.

Treatment of fruit juice (A) (grape), (B) [orange]. G. GRINDROD, Assr. to GRINDROD PRO-CESS CORP. (U.S.P. 2,059,788—9, 3.11.36. Appl., 14.2.35).—Processes for preserving fruit juices by rapid preheating of the juice in absence of air, removing dissolved gases in vac., sterilising by steam of high velocity (by jets), and rapid cooling in vac., are described. Flavour, colour, and aroma are, it is stated, not appreciably affected. E. B. H.

Treatment of food products [fruit juices]. S. H. AYERS and C. W. LANG, ASSTS. to CROWN CORK & SEAL CO., INC. (U.S.P. 2,054,066, 15.9.36. Appl., 20.8.32).—Fruit (orange) juice, preserved as described, is stated to be unchanged in flavour and appearance. The juice is squeezed, conc. to 90%of its vol. in vac. (26—28 in.) at low temp., then placed in special valved containers preheated to  $50-60^{\circ}$  in vac. (16—27 in.). Steam at 115—127° is blown in for >15 sec., thus sterilising the juice and heating it to  $100-108^{\circ}$ . The container is first closed by the internal steam pressure and then permanently sealed and cooled in 2 min. to  $43^{\circ}$ .

E. B. H.

Preparation of fruit beverage. G. VERLEY, Assr. to A. VERLEY, INC. (U.S.P. 2,059,828, 3.11.36. Appl., 9.3.36).—A method for preparing a beverage or concentrate with improved keeping qualities from citrus fruit consists in crushing whole fruit, separating oils by centrifuging, rendering the oils free from citral (method given), and adding a stabiliser to the citralfree oils to form, after homogenisation, a stable emulsion for addition as required to the juice or concentrate. E. B. H. Jelly preparations and method of preparing jellies. D. R. THOMPSON and G. H. JOSEPH, ASSTS. to CALIFORNIA FRUIT GROWERS EXCHANGE (U.S.P. 2,059,541, 3.11.36. Appl., 24.9.34).—The rate of setting of confectioners' pectin jellies, intended to be cast in starch or slabs, is retarded by addition of NaOAc, Na citrate, or NaHCO<sub>3</sub>, facilitating the manipulation of the prepared batch. These Na compounds (0.38—0.46% on the finished jelly) may be mixed with the dried pectin, the mixture being standardised for strength and rate of setting by addition of lactose. E. B. H.

Treatment of [edible] nuts in the shell. W. G. Gow, Assr. to C. MAURO (U.S.P. 2,059,787, 3.11.36. Appl., 19.2.35).—Their appearance and keeping qualities are improved by impregnating the nuts with  $SO_2$  (50% in air) and live steam under pressure for 5 min., and then subjecting the shell to ultra-violet rays until it assumes a smooth appearance.

E. B. H.

Treatment of cocoa [cacao] beans. A. LAESSIG (U.S.P. 2,060,581, 10.11.36. Appl., 5.2.34. Ger., 18.2.33).—A continuous process in which the washed beans are steeped in a fermentation liquid for 1—3 hr., aërated and shaken on a sieve, roasted in a vertical, 3-stage, hot-air louvre dryer, and cooled to room temp. is described. E. B. H.

Manufacture of cocoa substitutes. S. EZAKI (B.P. 470,045, 20.8.36).—Oil-rich nuts and beans (e.g., soya, peanut, walnut) are crushed after removal of the shell and interior cuticle, steam-heated for 5—10 min. to remove oil, fermented for 10—15 hr. at 30° after addition of lactic acid bacteria and sugar, dried, and roasted at 100°. E. B. H.

Treatment of coffee. H. P. ANDRESEN (U.S.P. 2,054,689, 15.9.36. Appl., 4.1.34).—Raw coffee, whole or ground, is roasted in an edible oil or fat to retain aromatic principles. The coffee is separated from the fat etc., and a conc. aq. extract of the coffee is emulsified with the oil or fat, using milk as a stabilising agent. E. B. H.

**Treatment** of tea. L. M. WRIGHT (B.P. 472,104, 13.1.37).—Tea is allowed to pass through a container at the angle at which it is best subjected to a spray or mist of terpeneless lemon or orange oil. Apparatus is claimed. E. B. H.

Preparation of nutritive amino-acid preparations. S. MIZUNO, and SANTENDO KABUSHIKA KAISHA (B.P. 475,291, 30.7.36).—Salts of NH<sub>2</sub>-acids with Ca, Na, K, or Mg are combined by heating with a monosaccharide and the free acidity produced is neutralised. *E.g.*, hydrolysed casein is neutralised with CaCO<sub>3</sub> in H<sub>2</sub>O, the product is heated at 75—100° with grape sugar for 1—2 hr., neutralised with Ca(OH)<sub>2</sub>, MgO, KOH, or NaOH, filtered, diluted to standard vol., and sealed in sterilised ampoules. The products have nutritive val. when injected intravenously, subcutaneously, or intramuscularly, but are not irritant. H. A. P.

Production of oats preserve in the form of [fodder] briquettes. S. HALÁSZ (B.P. 472,029, 17.3.37. Hung., 18.3.36).—Oats, freed from dust and foreign bodies, are crushed, moderately steamed, and

compressed into briquettes by high pressure; chopped hay may be incorporated before pressing. E. B. H.

Feeding cake for animals. F. W. GOODE (B.P. 471,559, 27.4.36).—The cake is composed of cereal 25—60, pulse 25—60, and wheat offals 10—30%, and may contain oil-bearing seeds, yeast, salt, molasses, sugar, etc. E. B. H.

Manufacture of food product [from molasses etc.]. G. LEONARD and B. E. ELDRED, Assrs. to SUKRO CORP. (U.S.P. 2,053,871, 8.9.36. Appl., 22.4.35).—A granular material for feeding stock, which does not become sticky on exposure to moist conditions, is prepared by heating an oil-bearing meal (e.g., cottonseed, linseed) with >45% of molasses, maize syrup, or other deliquescent sugar material at about 80°. E. B. H.

Bakers' ovens. Dryer [for beans etc.]. Desiccating liquids.—See I. Butter substitute.— See XII. Wrappers for food products.—See XIII. Vitamin prep.—See XX.

# XX.--MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Pharmacists' training in sterilisation. II. E. DEUSSEN (Arch. Pharm., 1938, 276, 27–39; cf. B., 1930, 393).—Observations made during the teaching of sterilisation are recorded and a course for students is suggested. R. S. C.

Sterilisation of dressings in closed boxes. A. LESEURRE (Bull. Sci. Pharmacol., 1937, 39, 508-513). —Pads of damp cotton wool are placed on top of the dressings in boxes, which are then placed in an autoclave. After 10 min. free steaming, the pressure is raised to 3 kg. Heating is then stopped and the temp. lowered to 125° by blowing in compressed air. After 15 min. the pressure is lowered to atm., and the dressings are sterile. J. L. C.

Chemical sterilisation of medicaments and pharmaceutical preparations. LUHR and GUT-SCHMIDT (Apoth.-Ztg., 1938, 53, 146-148, 161-162, 172-175).—The toxicity of the esters and salts of p-OH·C<sub>6</sub>H<sub>4</sub>·CO<sub>2</sub>H towards cocci and non-sporeforming bacteria is positive, but against spore-forming organisms it is unsatisfactory. 0.5% solutions of chloretone definitely kill non-spore-forming bacteria, but more dil. solutions are uncertain in their action; 0.8% solutions are non-toxic to spore-forming organisms. 10% cardiazole solutions are ineffective against the latter, and the former are killed by cardiazole liquidum. 0.1-0.2% solutions of Zephirol are definitely toxic towards non-spore-forming bacteria, and to the spore-forming organisms when the content is within normal limits. For massive concns. of the latter higher % are necessary.

Preservatives, with special reference to esters of hydroxybenzoic acid. D. J. THENER and J. SCHILLAK (Przemysł Chem., 1937, 21, 329—346). p-OH·C<sub>6</sub>H<sub>4</sub>·CO<sub>2</sub>Et (I), in concess of 0.09%, prevents growth of bacteria and moulds, does not affect the taste or odour of foodstuffs or the medicinal val. of herb extracts, and is not toxic to mammals. The bacteriostatic action of the Me ester is smaller, and it imparts an unpleasant taste to foodstuffs. The low solubility of the Pr ester prevents its use as a preservative. (I) is preferred to any other preservative. R. T.

Penetration of catgut by alcohol. M. RUDER-MAN (Bull. Sci. Pharmacol., 1937, 39, 514—520).— Experiments with gentian-violet as indicator showed that penetration is inversely  $\propto$  [EtOH]. Cold 60% EtOH completely penetrates ordinary catgut in 15 days, whilst 100% EtOH requires 6 months. Et<sub>2</sub>O-extracted catgut was more readily penetrated by higher conces. of EtOH than non-extracted catgut. J. L. C.

Rapid determination of iron in pharmaceuticals with the aid of cupferron and an immiscible solvent. S. M. BERMAN, J. J. CHAP, and D. M. TAYLOR (J. Assoc. Off. Agric. Chem., 1937, 20, 635— 638).—The Fe is pptd. in acid solution with cupferron, the ppt. removed by extraction with CHCl<sub>3</sub>, and the residue after evaporation of the extract ignited to const. wt. and weighed as  $Fe_2O_3$ , or else determined volumetrically. Comparisons with standard methods for 12 common pharmaceutical preps. containing org. matter gave satisfactory results. J. G.

[Determination of] nitroglycerin in mixtures. O. C. KENWORTHY (J. Assoc. Off. Agric. Chem., 1937, 20, 569-571).—A modification of Anderson's aciddistillation method (B., 1932, 622) is recommended. None of the alkaloids normally associated with nitroglycerin affects its recovery, but reduced Fe in tinctures gives high results. J. G.

[Determination of 2:4-]dinitrophenol [in tablets and capsules]. W. F. KUNKE (J. Assoc. Off. Agric. Chem., 1937, 20, 592—598).—The conditions affecting the accuracy of the bromination method have been investigated, and a suggested tentative method is evolved. The quantity of excess Br plays only a subordinate rôle, but too high a bromination period or too low an acid concn. results in an error of 4 and -80%, respectively. No evidence of an explosion hazard was obtained. J. G.

Analysis of zinc phenolsulphonate. M. W. Evans (J. Assoc. Off. Agric. Chem., 1937, 20, 645– 648).—A solution of the sample is heated with excess of 0·1N-I in presence of Na<sub>2</sub>CO<sub>3</sub> for <10 min. in a flask having a stopper moistened with KI to stop loss of I vapours. The cooled solution is then acidified, and the excess of I titrated with 0·1N-Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. The error is 0·2%, and the results are not affected by variations in the amounts of Na<sub>2</sub>CO<sub>3</sub> or of excess I solution used. J. G.

Phenolphthalein studies. I. Colloidal phenolphthalein. B. FANTUS and J. M. DYNIEWICZ (Amer. J. digest. Dis. Nutr., 1936, 2, 721-724).--Colloidal phenolphthalein (I) in solid form is prepared by adding 2.15 g. of (I) dissolved in N-NaOH to 5.0 g. of gelatin dissolved in 50 c.c. of  $H_2O$ , and passing  $CO_2$  over the mixture until the colour is discharged. Citric acid is added to  $p_{\rm H}$  5.5, and the mixture spread on sheets of glass and dried at room temp. It is somewhat more sol. at the  $p_{\rm H}$  prevailing in the human body than is cryst. (I) and is somewhat more active in producing bowel evacuation. CH. ABS. (e) [Determination of] phenolphthalein and acetylsalicylic acid. G. M. JOHNSON (J. Assoc. Off. Agric. Chem., 1937, 20, 598—599).—The former is extracted with  $CHCl_3 + Et_2O$  (2:1) in presence of saturated NaHCO<sub>3</sub>, and the latter with  $CHCl_3$ , after acidification. They are then determined by weighing followed by conversion into the I-compound, and by double-titration, respectively. The results are not entirely satisfactory, but the method (cf. Hitchens, B., 1934, 173) is worthy of further study. J. G.

[Determination of] hexylresorcinol. M. L. YAKOWITZ (J. Assoc. Off. Agric. Chem., 1937, 20, 564—565).—MeOH coloured yellow by addition of Br, heated on the water-bath for 5 min., and decolorised when cool by addition of NaHSO<sub>3</sub> does not consume any Br and may be used in the bromination method for the determination of hexylresorcinol. The average recovery is then  $98\cdot37\%$ . J. G.

[Determination of] benzyl compounds. S. REZNER (J. Assoc. Off. Agric. Chem., 1937, 20, 560-562).—Suggestions for tentative methods for the determination of the n (of solutions in olive oil) and sap. val. are described (cf. A., 1933, 732).

J. G.

Review of the most important methods for examination and evaluation of drugs. A. Mosic (Pharm. Zentr., 1938, 79, 35–40, 81–87).—The following are described : micro-m.p., sublimation, and distillation methods, capillary and drop-capillary analysis, luminescence analysis, and the determination of ash, H<sub>2</sub>O, essential oil, alkaloid, glucoside, tannin, Cu no., NH<sub>2</sub>Cl no., N no., and  $\eta$ . Various biological procedures are outlined. E. H. S.

N'garo. L. VIGNOLI and J. BALANSARD (Bull. Sci. Pharmacol., 1937, 39, 503—507).—Roots of n'garo, *Cissus polpunea*, extracted with light petroleum yielded a phytosterol.  $Et_2O$  yielded a resin and gallic acids. EtOAc extracted tannins and a glucoside, and EtOH a tannin which appears to contain pyrocatechol.  $H_2O$  extracted a gum yielding galactans and arabans. The powdered drug was not toxic to rabbits. J. L. C.

Determination of novatropine and mandelic acid. F. REIMERS (Dansk Tidsskr. Farm., 1938, 12, 25—32).—The partition of mandelic acid (I) between acidified aq. solutions and org. solvents has been studied. Novatropine may be determined by hydrolysis with NaOH, the (I) formed being determined by extraction from acid solution 5—6 times with Et<sub>2</sub>O, followed by evaporation and titration against 0·1N-NaOH and phenolphthalein.

M. H. M. A.

Determination of morphine in opium. R. EDER and E. WÄCKERLIN (Quart. J. Pharm., 1937, 10, 680—730).—Current procedures of determination fail to extract the total morphine (I). Repeated extraction with CaO and  $H_2O$  is necessary. The (I) must be purified from other alkaloids and extractives before an accurate correction factor can be made for the amount of (I) remaining in the mother-liquor on pptn. The crude (I) is obtained by the use of immiscible solvents and is purified by pptn. from  $0.1N-NaOH-EtOH-Et_2O$  solution by NH4Cl under

exactly defined conditions. The pptd. (I) is dissolved in MeOH and directly titrated (Me-red) with 0.1N-HCl. Mannich's reagent  $[1:2:4-C_6H_3Cl(NO_2)_2]$  is not suitable for assaying (I) in opium since it ppts. other substances along with (I). F. O. H.

Pyridine content of tobacco. J. BODNAR and L. NAGY (Z. Unters. Lebensm., 1937, 74, 302—304).— Hungarian tobacco contained >0.004% of  $C_5H_5N$  (I) and (I)-bases. There is no danger of (I) etc. being determined as nicotine. Mild tobacco contained slightly > strong ones. E. C. S.

Oxidation of nicotine with hydrogen peroxide. W. PREISS (Z. Unters. Lebensm., 1937, 74, 314– 318).—The rate of oxidation is at a max. in weakly alkaline solution, and is accelerated by addition of dil. aq. NH<sub>3</sub>. Little nicotine is destroyed when tobacco is treated with  $H_2O_2$ , rutin, lignins, and resins being mainly attacked. E. C. S.

An alkaloid accompanying nicotine as the cause of the slow release of nicotine during steam-distillation. W.PREISS (Z. Unters. Lebensm., 1937, 74, 304—314).—After steam-distillation of many varieties of tobacco with NaOH, further quantities of nicotine (I) can be obtained by a second distillation following a period of keeping in air in presence of strong alkali. The process involves oxidation, since it is hastened by addition of  $H_2O_2$  and can be prevented by exclusion of air. Assuming that Pfyl and Schmitt's MgO distillation method gives preformed (I) only, the new precursor is estimated to amount to 20% of the (I) content of cigar and pipe tobaccos and 10% of that of cigarette tobacco.

E. C. S.

Amount of acids and bases volatile in steam in the semi-solid constituents of tobacco smoke. A. WENUSCH and R. SCHÖLLER (Z. Unters. Lebensm., 1937, 74, 408-411).-The semi-solid constituents of the smoke, collected by the capillary method (cf. B., 1937, 619) from acid-type tobaccos, contained 0.0144-0.0208 mol. of volatile acid and 0.0030-0.0101 mol. of volatile base per 100 g. of tobacco actually smoked, whereas those from alkaline tobaccos contained 0.0110-0.0149 and 0.0135-0.0210 mol., respectively. The volatile acid and base preformed in the tobacco gave no satisfactory correlation with the reaction of the smoke. The higher sol. carbohydrate content of the acid types is responsible for the higher acidity E. C. S. of the smoke.

Gaseous exchange in aqueous suspensions of oriental tobacco. II. A. I. SMIRNOV [with M. G. MOROZ-MOROZENKO] (Z. Unters. Lebensm., 1937, 74, 396—407; cf. B., 1937, 187).—Absorption of  $O_2$ rises to a single max. in the first 15 min., whereas evolution of  $CO_2$  shows several maxima. Addition of quinol (I) results in a twelvefold increase in absorption of  $O_2$ , and (I) also restores the capacity to absorb  $O_2$  of suspensions which have ceased to absorb  $O_2$ . An artificial oxidase of Ca glycollate and Mn(OAc)<sub>2</sub> has a similar effect. The H<sub>2</sub>O extract absorbs less  $O_2$  than does a suspension of the same wt. of tobacco. E. C. S.

Field tests for "Marihuana" (Cannabis) [in cigarettes]. A. VIEHOEVER (Amer. J. Pharm., 1938, 109, 589-591).—A portion of the suspected cigarette is extracted with  $C_6H_6$  for 15—90 sec. in the cold and the extract mixed with 2% alcoholic NaOH. The presence of cannabinol is indicated by the appearance of a pink to red colour within 1—2 min. and the formation of an orange-red solution when the residue remaining after the removal of the solvent is dissolved in aq. NH<sub>3</sub>. COMe<sub>2</sub> forms a violet solution. Biological tests may be performed by treating daphnia with a culture of the residue in H<sub>2</sub>O. E. H. S.

Chemical assay for ergot alkaloids. C. K. GLYCART (J. Assoc. Off. Agric. Chem., 1937, 20, 566— 568).—The Hampshire-Page method (B., 1936, 715) has been adapted to the assay of fluid extracts. The Clifford neutral-wedge photometer may be used for the colorimetric determination of small quantities of ergotoxine (I), and this eliminates the necessity for frequently preparing standard solutions. Unlike (I), ergometrine is not extracted by  $CCl_4$  in presence of aq.  $NH_3$ , and this distinction is made the basis of a method of assay of commercial tablets. J. G.

Determination of small quantities of strychnine. A. G. MURRAY (J. Assoc. Off. Agric. Chem., 1937, 20, 638-645).—The strychnine (I) is pptd. in presence of acid with a solution of  $K_2HgI_4$ , and after filtration the excess of I is titrated with standard KIO<sub>3</sub> in presence of CHCl<sub>3</sub> and < 12% HCl. The recorded errors for 5.01-9.01 mg. of (I) are 0-2.2%. Sucrose, lactose, starch which has been rendered sol. by treatment with HCl, or a small quantity of NO<sub>3</sub>' does not affect either the pptn. or titration; when the excipients present in tablets are unknown, however, it is safest to extract the alkaloid first before pptg. it.

[Determination of] homatropine tablets. E. M. HOSHALL (J. Assoc. Off. Agric. Chem., 1937, 20, 599-602).—The A.O.A.C. tentative method for the determination of atropine in tablets, if slightly modified, is applicable to the determination of homatropine in most commercial tablets containing it or its salts. If gelatin and/or glycerol is present the CHCl<sub>3</sub> extract is extracted with acid, the acid solution made ammoniacal, and extraction is continued as in the original method. J. G.

Determination of berberine in the homœopathic tincture of *Hydrastis canadensis*. W. Awe (Apoth.-Ztg., 1937, 52, 1359—1360).—Neugebauer and Brunner's method (B., 1938, 104) is slightly modified and, by direct pptn. from the final aq. solution with KI, berberine is isolated and weighed as the hydriodide. E. H. S.

[Assay of] aminophylline. L. E. WARREN (J. Assoc. Off. Agric. Chem., 1937, 20, 577-587).—The Emery-Spencer and Self-Rankin (B., 1931, 862) methods for the determination of theobromine give low and erratic results for theophylline, and Bruekeleveen's modification of the former is only moderately satisfactory. The Reimers method (B., 1935, 205, and following abstract) is recommended as a tentative standard, although the results tend to be 0.25-0.6% above theory and the excess may amount to 3%. J. G.

Analysis of aminophylline. F. REIMERS (J. Assoc. Off. Agric. Chem., 1937, 20, 631-635).--

Theophylline (I) is extracted from a weakly acid solution by means of  $CHCl_3 + Pr^{\beta}OH$  (3:1), and  $(CH_2 \cdot NH_2)_2$  (II) may be titrated (bromocresol-green) with acid to  $p_{\pi} 4 \cdot 6$ . Both (II) and  $H_2O$  are removed at 125°, so that the  $H_2O$  may be found by difference. Determinations of (I) obtained by extraction and by difference after drying agree well. Analyses are tabulated (cf. preceding abstract). J. G.

Variations in  $p_{\pi}$  of solutions of diethylbarbituric acid due to pyrazolone compounds. P. ANTONIO (Boll. Chim. farm., 1938, 77, 1-8, 11-14). —The variations of  $p_{\pi}$  with conen. of aq. solutions of veronal, antipyrine, pyramidone, and their mixtures are tabulated and discussed. F. O. H.

Determination of rotenone in Derris and cubé. II. Extraction from the root. H. A. JONES and J. J. T. GRAHAM (Ind. Eng. Chem. [Anal.], 1938, 10, 19-23; cf. B., 1937, 840).—Comparison of the published extraction methods shows that treatment with CHCl<sub>3</sub> at room temp. followed by evaporation of an aliquot part of the filtered extract extracts the rotenone (I) from Derris and cubé roots ground to pass 95% through a 60-mesh sieve. Samples having a ratio of (I) to total extract of >40% require extraction with successive lots of CHCl<sub>3</sub>. Preliminary drying is rarely necessary. F. N. W.

**Pyramidone camphorate.** D. PONTE (Boll. Chim. farm., 1937, 76, 677–678, 681–682).—The curves of initial and final m.p. of mixtures of pyramidone and camphoric acid indicate an anomaly at the equimol. mixture. Crystallisation of the equimol. mixture from  $H_2O$  and EtOH yields products with initial m.p. of 73.5° and 74° and final m.p. of 83.5° and 110°, respectively. Hence commercial preps. are probably mixtures of the two substances, the true compound being prepared by fusion of the equimol. mixture. F. O. H.

Pharmaceutically important arsenic compounds. III. [Fowler's solution.] K. BRAND and E. ROSENKRANZ (Pharm. Zentr., 1938, 79, 65—74; cf. A., 1937, II, 491).—Conductivity measurements and titrations indicate that the As in Liq. kalii arsenicosi, D.A.B. VI, is present mainly as KAsO<sub>2</sub>. E. H. S.

[Citrus] peels in brine. Essential oil content [and] detection of extraction. A. H. BENNETT and F. K. DONOVAN (Perf. & Essent. Oil Rec., 1938, 29, 12-16).—The peel is soaked for 4-5 days in NaCl solution ( $d \ 1.05$ ), packed in " crowns " in brine (d 1.07) (or  $Na_2S_2O_5$  800 g., NaCl 2 kg. per  $\frac{1}{2}$  pipe), and is kept for about 2 months before shipment. More conc. brine is used for half-fruits with immediate shipment. In determining oil content, 8 peels (= 4lemons) are minced and steam-distilled, since Solarino's method of cutting discs yields a high oil index. Lemons, average wt. 162-104 g., collected in June, November, and December had similar oil contents. The skin of pressed peels painted with FeCl<sub>3</sub> (1%) shows broken oil sacs as black pin-points. Commercial samples stored in brine show a progressive loss in oil which may or may not cease after a few weeks, and FeCl<sub>3</sub> continues to indicate pressed peels.

A min. yield of 200—220 g. of oil per 1000 fruit is to be expected from peels in good condition. T. F. W.

Isolated and synthetic perfumes from clove oil: [use of] clove oil as raw material for manufacture of vanillin. R. FORNET (Seifens.-Ztg., 1937, 64, 769—770, 789—790).—The prep. and perfuming properties of eugenol and *iso*eugenol and of their Me ethers and various esters, and the manufacture of vanillin (with notes on the intermediate products of the reaction) are briefly outlined. E. L.

Ylang-ylang and cananga oils. V. G. FOURMAN (Amer. Perfumer, 1936, 31, No. 6, 59-60).—These oils are derived from the same plant; differences are due only to differences in place of production. The following data are recorded for ylang-ylang and cananga oils, respectively:  $d_4^{30}$  0.911—0.958, 0.896— 0.942;  $\alpha$  -27° to -49.7°, -27° to -87°;  $n^{30}$ 1.4747—1.4940, 1.4788—1.5082; ester val. 90—138, 42—94. The oils contain p-C<sub>6</sub>H<sub>4</sub>Me·OMe, linalool, geraniol, eugenol, *iso*eugenol, CH<sub>2</sub>Ph·OH, and various formates, acetates, valerates, and salicylates. Sesquiterpences occur only in the distilled, not the extracted, oils. Uses in perfumery are discussed.

CH. ABS. (r)

Determination of diethyl phthalate in essential oils and in natural and synthetic perfumes. Y. R. NAVES and S. SABETAY (Bull. Soc. chim., 1938, [v], 5, 102-105).-Improved procedures for the K phthalate (I) and Pb phthalate (II) methods are described. In the former the material is refluxed for 1 hr. with 0.5N-KOH-EtOH. After cooling, the pptd. (I) is filtered off, washed with abs. EtOH, and dried at 140°, or, after wetting, at 105-110°. Thus treated the ppt. contains no EtOH. This method is not sp. since other esters giving K salts insol. in EtOH may be present. Hence the identity of the pptd. K salt should be confirmed, e.g., by formation of phthaleins. In the second method the pptd. K salt is dissolved in  $H_2O$  and the phthalic acid pptd. as (II), which is filtered off, washed with cold H<sub>2</sub>O containing AcOH, and dried as (I) above. This method is not sp. since other esters with insol. Pb salts may be present, and the identity of the pptd. Pb salt should be confirmed as for the K salt. The (II) method is recommended for Peru balsam.

## E. G. B.

Testing crushing strength.—See I. Tobacco papers.—See V. Testing ampoules.—See VIII. Perfumed soaps. Vitamin-A in grayfish-liver oil.—See XII. Wine etc. and vitamins. Medicinal wines.—See XVIII. Whey utilisation. Whey and tuberculosis. [Products from] low-grade coffee. Determining alkaloids in cocoa.—See XIX.

See also A., I, 140, Dissociation consts. etc. of pantocaine and novocaine bases. II, 92, Local anæsthetics. 96, Antiseptics from alkylpyrocatechols. 97, Prep. of  $\beta$ -sitosterol.  $\Delta^4$ -Androstene-3: 17-diol. Pregnanetriols. 98, Local anæsthetics. 99, Prep. of  $\Delta^5$ -3-trans-17-dihydroxyætiocholenic acid. 103, Pregnan-3-ol-20-one. Prep. of epiallopregnan-3-ol-20-one. 106,  $\beta$ -Phellandrene. 112, N-Alkylacridones. Aminoand diamino-acridines. 117-8, Alkaloids. 120, Turbidimetric titration of small amounts of nicotine. III, 196, Evaluation of follicular hormone preps. Detection and determination of the hormone of corpus luteum. 225, H<sub>2</sub>O-sol. theophylline compound. 231, Additive product of antipyrine and  $\beta$ -naphthol. 242, Bactericidal organo-mercuriacetates. 214-8, Vitamins.

#### PATENTS.

Manufacture of an organic sulphur compound. J. DELSON, ASST. to FLINT & Co., INC. (U.S.P. 2,067,261, 12.1.37. Appl., 19.1.31).—When S is heated with about 32 pts. of glycerol in a closed vessel at  $130-230^{\circ}$  a solution of an unsaturated thioaldehyde [(?) thioacraldehyde] sol. in H<sub>2</sub>O and with b.p. < 260° is obtained. The product is said to be valuable in the treatment of skin diseases and rheumatism.

R. G.

Manufacture of glucosides from Digitalis purpurea. F. JÄGER, Assr. to RARE CHEMICALS, INC. (U.S.P. 2,068,027, 19.1.37. Appl., 9.5.35).—The foxglove leaves are extracted at  $<30^{\circ}$  with a  $4\cdot 2^{\circ}_{0}$ aq. solution of Pb(OAc)<sub>2</sub>, the extract is treated with a precipitant (Na<sub>2</sub>SO<sub>4</sub>) for the Pb, and the filtrate is stripped with CHCl<sub>3</sub>, the latter solution being conc. at  $<30^{\circ}$  in vac. and run into light petroleum to ppt. the pure glucoside. B. M. V.

Preparation of a condensation product of iodoform and guaiacol. CHINOIN GYÓGYSZER ÉS VEGYÉSZETI TERMÉKEK GYÁRA R.T. (DR. KERESZTY AND DR. WOLF) (B.P. 478,902, 27.10.36. Hung., 6. and 7.11.35 and 28.4.36).-CHI<sub>3</sub> is heated with about 1.2 pts. of guaiacol at 105° until evolution of MeI has practically ceased (40-60 hr.). Most of the unchanged materials and by-products are removed by distillation or extraction with solvents immiscible with  $H_2O$  ( $C_6H_6$ , PhMe), or the medicinally-active reaction products are extracted with aq. solutions of weak alkalis, if desired progressively with alkalis of increasing alkalinity, or with aq. solutions of alkaline bisulphites, followed by acidification. These purification processes may be combined. The product is useful in the treatment of tuberculosis. R. G.

**Production of hexyl[pyro]catechol.** L. P. KYRIDES, ASST. to MONSANTO CHEM. CO. (U.S.P. 2,067,452, 12.1.37. Appl., 19.10.31).— $o-C_6H_4(OH)_2$  is treated with an aliphatic carboxylic chloride to form an ester which by heating with ZnCl<sub>2</sub> is rearranged to the ketone; this is reduced with Zn-Hg and HCl to form the alkylpyrocatechol with an alkyl group directly attached to the nucleus. *Hexylpyrocatechol*, b.p. 180—181°/12 mm., thus prepared, is a germicide and general disinfectant. R. G.

Manufacture of (A) anæsthetic salts, (B) organic anæsthetic compounds, (C) alkaloid salts. J. L. RÉGNIER (B.P. 477,822—3 and 477,882, 1.4.36. Fr., [A] 2. and 29.4.35, [C] 29.4.35).—(A) The manufacture is claimed by standard methods of *n*- and *iso*-butyrates, crotonates, phenyl-acetates, -propionates, -butyrates, and -butylacetates, cinnamates, and hydratropates of anæsthetic bases of the aminoalkyl benzoate or alkyl *p*-aminobenzoate class; these have much greater anæsthetic activity than

have the common inorg. salts. In examples, a solution of the hydrochloride is mixed with the equiv. amount of acid or its Mg salt and sterilised. (B) Anæsthetic bases of the alkyl or aminoalkyl *p*-aminobenzoate class are treated with the chloride or anhydride of phenyl-acetic, -propionic, or -butylacetic acid; both the resulting free bases (in oils) and their salts are said to possess better anæsthetic properties than the corresponding Bz derivatives. The *phenylacetyl* derivative, m.p. 73° (*hydrochloride*, m.p. 145°), of  $\beta$ -diethylaminoethyl *p*-aminobenzoate is described. (c) The  $\alpha$ - and  $\beta$ -phenylpropionates, phenylbutyrate, and phenylbutylacetate of morphine, pilocarpine, atropine, eserine, and sparteine, prepared by heating together or mixing in H<sub>2</sub>O the appropriate acid and base or by metathesis, are claimed to have lower toxicities than the known salts. H. A. P.

Manufacture of alcohols [of the ætiocholane series] and derivatives thereof. SCHERING-KAHL-BAUM A.-G. (B.P. 479,252, 25.3.37. Ger., 26.3.36. Addn. to B.P. 446,501; B., 1937, 289).—The process of the chief patent (condensation with Mg alkyl halides) is applied to ketones of the ætiocholane series. E.g., 3-hydroxyætiocholan-17-one, m.p. 151—  $152^{\circ}$ , is converted by MgMeI in Et<sub>2</sub>O into 17-methylætiocholane-3 : 17-diol; epi-17-ethyl- and (by starting with the Ac derivatives and subsequently hydrolysing) 17-isopropyl- and cpi-17-isopropyl-ætiocholane-3 : 17diol are similarly obtained. H. A. P.

Hydrogenation of æstrin and its æstrogenous derivatives. H. LUND (B.P. 479,198, 1.8.36).— Æstrin etc. (I) is treated with an Al derivative of a sec. alcohol (II) in a solvent and the unstable additive product thus formed is decomposed to give the  $H_2$ -derivative of (I) and the ketone corresponding with (II), e.g., by heating. Thus æstrin benzoate is boiled with Al(OPr<sup>6</sup>)<sub>3</sub> in dry Pr<sup>6</sup>OH under a reflux condenser at 65°; COMe<sub>2</sub> is evolved and dihydroæstrin is formed. H. A. P.

**Production of activators for sexual hormones.** A. G. BLOXAM. From Soc. CHEM. IND. IN BASLE (B.P. 469,728, 23.1.36).—A solution in  $CS_2$  or a hydrocarbon of the substance which increases the activity of male sexual hormones [e.g., an extract of lipoid or acid character, prepared from animal organs, human or body fluids, etc. (cf. A., 1935, 1033)] is treated with an adsorbent and the active material is extracted therefrom with a suitable org. solvent. Purification may be effected by complete or partial repetition of the process. E. H. S.

High-vacuum distillation [of organic substances]. EASTMAN KODAK CO., Assees. of K. C. D. HICKMAN (B.P. 476,134, 10.10.36. U.S., 11.10.35).— The removal by mol. distillation under high vac. (<0.1 mm.) of vitamins, sterols, or hormones contained in org. substances, e.g., oils, fats, waxes, which are liquid at the temp. of distillation is facilitated by adding a compound or mixture of compounds having about the same b.p. under the conditions employed as that of the vitamin, sterol, or hormone. Suitable substances for addition are fatty acids, esters, mineral oil fractions, terpenes, and essential oils. E.g., the separation of vitamin-A and -D from fish oils is improved by the addition of trinonoin (4 pts.) and distillation at 160°/mol. vac. N. H. H.

Stabilised organic composition [vitamin preparation]. H. N. HOLMES, ASST. to PARKE, DAVIS & Co. (U.S.P. 2,051,257, 18.8.36. Appl., 9.3.34).— Sterilisation of fish-liver oils and concentrates of vitamin-A and -D against oxidation and vitamin deterioration is obtained by addition of 0.1-1% of lecithin, with or without quinol. Stabilised halibutliver oil is claimed. E. B. H.

Manufacture of therapeutically valuable gold compounds. SCHERING-KAHLBAUM A.-G. (B.P. 479,358, 1.8.36. Ger., 2.8.35).—Keratins are hydrolysed (with acids or acid followed by a proteolytic enzyme) until H<sub>2</sub>O-sol. and converted into Au compounds without reduction. *E.g.*, hair is heated with 18% HCl at 100° until dissolved, neutralised with NH<sub>3</sub>, filtered, treated with AuCl<sub>3</sub> until a permanent ppt. is formed, neutralised with NaOH, and poured into EtOH. The pptd. Au derivative is purified by redissolution in NaOH and repptn. with EtOH and contains 6% Au. H. A. P.

Manufacture of lecithin preparations. C. H. BUER (B.P. 472,138, 14.11.36).—Lecithin, after drying in thin layers (to 1% of  $H_2O$ ), is mixed with EtOH (5%) and formed into balls, rods, etc., which are then coated with a  $H_2O$ -repellent, e.g., beeswax. E. H. S.

Drying of tobacco. H. S. BOGATY, Assr. to PROCTOR & SCHWARTZ, INC. (U.S.P. 2,067,115, 5.1.37. Appl., 1.2.36).—The leaves are loosely confined between fixed vertical walls and horizontal perforated conveyor belts running at different speeds, the drying air being passed upwards to cause substantial suspension and the relative speed of the belts causing relative motion between the leaves. B. M. V.

Improvement of smoking tobacco. A. AZAR-IAN (B.P. 471,888, 9.12.35. Ger., 10.12.34).—Tobacco is fermented, preferably at  $< 25^{\circ}$  and in absence of air, with addition of an essential oil or oils, *e.g.*, anisced oil and lemon oil vapour. The process may be repeated after admission of air and cooling.

E. H. S.

Denicotining of tobacco. L. LIPPMANN (B.P. 471,854, 13.5.36).—Tobacco is fermented in presence of air, and preferably with addition of acid, in an alkaline liquor which has already been once or twice fermented and contains virulent bacteria. E. H. S.

Destruction of tobacco pests by means of chloropicrin. M. SCHOENE (NÉE MOKRZECKA) (B.P. 471,848, 22.3.37. Poland, 21.3.36).—Chloropicrin is evaporated or atomised, preferably by direction through a jet, on to the walls and ceiling of a compartment containing the tobacco at  $< 16^{\circ}$  in an atm. of R.H. > 90%. E. H. S.

Production of vaccines for use in treatment of canine distemper. H. M. SHOETENSACK (B.P. 471,189, 28.2.36).—The sp. organism, Asterococcus canis, types I and II, is isolated and cultivated in vitro and when the culture is sufficiently antigenic the organisms are killed. E. H. S. Suppository medication. J. C. BIRD, Assr. to HOFFMANN-LA ROCHE, INC. (U.S.P. 2,055,063, 22.9.36. Appl., 25.11.35).—Mixtures of medicaments with higher fatty acid esters of glycerol or a glycol, *e.g.*, propylene glycol stearate, and amines, particularly triethanolamine stearate, are specified. E. H. S.

Soap.—See XII. Vehicle for use in medicines etc.—See XXIII.

# XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Reducing properties of photographic gelatin. S. M. SOLOVIEV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 3, 10—17).—Colorimetric measurements of the reducing power of gelatin for  $AgNO_3$  are described. NH<sub>3</sub> greatly favours the growth of Ag particles, but has little influence on the rate of formation of nuclei. CH. ABS. (e)

Relation between the reducing and fogging powers of gelatin. V. A. BEKUNOV (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 23—29).—The reducing power of gelatins is parallel to the tendency to fog. CH. ABS. (e)

Effect of composition of developer on production of yellow fog. D. P. SCHTSCHERBOV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 3, 59-61).— The intensity of yellow fog depends less on the composition of the developer than on the time of development. When yellow fog occurs in a positive film it is recommended to develop the negatives to a higher  $\gamma$  and the positive film to a correspondingly lower  $\gamma$ . CH. ABS. (e)

Spontaneous panchromatism of photographic emulsions in relation to their preparation. K. V. CHIBISOV, M. V. KRASCHENINNIKOVA, and I. T. LAUBERT (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 63-76).-The tendency to coloured fog is always increased by the introduction of AgCl in the second ripening process. The material in the gelatin which produces these effects can be extracted by washing and the extract will render a normal gelatin effective. Washing will prevent a gelatin causing panchromatism, but does not necessarily obviate coloured fog. Both effects are prevented by acidifying gelatin and washing thoroughly. Spontaneous panchromatism is decreased by an increase in the proportion of AgI, but is not affected by addition of stabilisers. CH. ABS. (e)

Nature of the coloured fog of photographic emulsions. V. A. BEKUNOV and M. I. SHOSTKO (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 77-92).—Coloured fog is due to the presence in gelatin of reducing substances or labile S-containing compounds. The Ag or Ag<sub>2</sub>S particles produced serve as condensation nuclei for Ag reduced in the process of anomalous physical development. CH. Abs. (e)

Theory of washing of photographic emulsions. I. M. FEDOROV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 3, 28–39). CH. ABS. (e)

Physico-chemical mechanism of the ripening of photographic emulsions. K. V. CHIBISOV and A. A. MICHAILOVA (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 143—161).—Grain counts show that the first ripening is a crystallisation of AgBr. In the second ripening the dispersion of the AgBr is unchanged. It is independent of the stage at which the first ripening was stopped. CH. ABS. (e)

Ageing of photographic emulsions. K. V. CHIBISOV, A. V. POBETZINSKAJA, and S. A. PULINA (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 108— 122).—The ageing process is a definite chemical ripening and occurs more rapidly at the higher humidities. Little occurs at humidities <30%. The afterripening is diminished for a given sensitivity and min. fog by increasing the first digestion and correspondingly shortening the second. Introduction of KBr in the second digestion stabilises the emulsion. CH. ABS. (e)

Resolving power of photographic emulsions in relation to their preparation. K. V. CHIBISOV and N. V. MAKAROV (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 30-62).—The rate of addition and the amount of AgI have a marked effect on the resolving power. This increases from 32 to 60 for a series of emulsions of approx. the same speed as the [AgI] increases from 0 to 5%. The duration of ripening, amount of gelatin, total concn., and addition of sensitisers have no marked effect. An amount of yellow dye sufficient to produce strong absorption of blue light increases the resolving power. For mixtures of emulsions it is  $\propto$  that of the components.

CH. ABS. (e)

Theory and measurement of the resolving power of photographic layers. H. FRIESER and H. LINKE (Z. wiss. Phot., 1938, 37, 19-26).—The theoretical derivations are given for the visual method (microscopical examination of a photographed screen), the method of diffusion of the image of a slit with varying exposure, and the amplitudereduction method (based on sound-film work) for determining resolving power. Experimental results confirm the theoretical relationships of the methods. J. L.

Drying of light-sensitive coatings. V. S. KOLTZOV (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 93—107).—Data on drying under controlled conditions are given. CH. ABS. (e)

Stabilisation of photographic light-sensitive materials. V. J. MICHAILOV (Photo-Kino Chem. Ind. U.S.S.R., 1935, No. 3, 18—27).—For an emulsion which ages too rapidly, a gelatin of low reducing power is recommended. The first and second ripening should be adjusted so that the emulsion is not pushed too far. The time of washing and of other operations tending to ripen the emulsion should be shortened. KBr should be introduced before the second ripening. The use of org. sensitisers, especially NHPhAc, is recommended. When ageing is due to the influence of the base, the acidity of the substratum should be a min., and a neutralising agent such as NaHCO<sub>3</sub> should be used in the emulsion. CH. ABS. (e)

Stability of film base. P. Kozlov (Soviet Kino-Photo Ind., 1935, No. 2, 35-42).—The action of heat and ultra-violet light on the base and the effect of the softener on ageing are discussed.

Сн. Авз. (е)

Formation of complexes by colour-sensitisers. J. I. BOKINIK (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 14—22).—1 mol. of Pinacyanol is adsorbed by AgBr for approx. every 10 Br. It is adsorbed even in presence of excess of Ag<sup>\*</sup>. CH. ABS. (e)

Relation between adsorption of dyes on silver bromide and their sensitising power. A. I. RABINOVITSCH and C. S. BAGDASSARIAN (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 5–13).—The sensitisers Pyronine G, Rhodamine B, Eosin, Phloxin, and Erythrosin were adsorbed more or less strongly on AgBr. The non-sensitisers Acid Rhodamine and Bordeaux B were not adsorbed. The adsorption coeff. for the strong sensitisers increases rapidly after a certain concn. is reached. CH. ABS. (e)

New German proposals for determination of the sensitivity of negative materials. D. A. SOLSKI, B. N. MODESTOV, and S. A. BATSCHURECHINA (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 162–183).—A discussion. CH. ABS. (e)

[Photographic] sensitometric investigations. W. SEIFERT (Z. wiss. Phot., 1938, 37, 5-9).-The curve calc. from the characteristic curves of negative and positive emulsions to represent the reproduction of the brightnesses of an image in a print from a negative has been found to agree exactly with experimental results, using a wedge as image. Trials with a picture showed that the subjective limit for differences of brightness is but little < that by photometric measurements. The form of the characteristic curve is definable by three terms: the "softness" ( $\infty$  to the density over the inertia point  $\div$  the  $\gamma$ ), the projected length of the straight-line portion, and the  $\gamma$ . The ratio of the tan of the curve over the inertia point to  $\gamma$  is a const. (0.46) for the curves of all emulsions (with any developer). Characteristic curves are therefore more directly applicable to practical exposure problems. J. L.

Sensitometric study of the Sabatier effect. V. I. SHEBERSTOV (Trans. Kino-Photo Res. Inst., Moscow, 1935, 3, 139-142). CH. ABS. (e)

How long is a plate destined for "physical development after fixing" stable between fixing and developing? E. VON ANGERER (Z. wiss. Phot., 1938, 37, 73).—Plates which were exposed, fixed, washed, and dried could be physically developed to perfect images after 45 and 66 months. The latter plate had local patches of surface fogging, due to separation of Ag, but these could easily be removed by a light abrasive. J. L.

How can the troublesome "burning" of images with hot-drying be prevented? H. KIESER (Phot. Ind., 1938, 36, 169, 172).—Deterioration of images in printing papers by hot drying, e.g., in glazing, can be avoided by the use of stale fixing baths in preference to fresh solutions, or at least by using a fresh bath for >10 min. Preferably two fixing baths are used, either first fresh and then a much used bath, or vice versa. The effect is due to the stabilisation of the image by the pptn. of some Ag<sub>2</sub>S from the used bath, which binds together the spongy Ag image and prevents its coagulation or distortion by heat. J. L. Advantages and disadvantages of methods of colour photography. von HOLLEBEN (Phot. Ind., 1938, 36, 203-205).—A review. The dye-development processes (Kodachrome, Agfacolor) are considered to be the best, especially for their accuracy of colour, freedom from parallax, high sensitivity, simplicity, and permanent registration of the images. J. L.

Organic photochemistry. VIII. Photography with organic compounds. M. TANUMA and S. SAKURAI (Bull. Inst. Phys. Chem. Res. Japan, 1937, 16, 1447—1453; cf. A., 1938, I, 10).—The ZnCl<sub>2</sub> double salts of pp'-tetrazocarbazole, p-diazodialkylanilines and -oxybenzanilides are suitable for diazotype photography. A. LI.

Dimensional changes in aërial photographic films and papers. R. DAVIS and E. J. STOVALL, jun. (J. Res. Nat. Bur. Stand., 1937, 19, 613-637).— Both photographic films and papers are subject to shrinkage after processing, the degree of shrinkage being dependent on the  $H_2O$  content of the atm. Dimensional changes are least in the machine direction (along the roll) and so differential shrinkage in the final print can be reduced by crossing the machine directions of the negative and paper. Films continue to shrink for some time, owing to loss of solvents and plasticiser. Instruments for measuring these shrinkages are described. J. W. S.

Contrast of photographic positive papers. J. BONTENBAL (Phot. J., 1938, 78, 76-88).—A detailed discussion is given of the numerous methods hitherto proposed for defining contrast. The requirements in a printing paper for correct reproduction of original brightnesses of an object, when using different types of negative material, are considered theoretically in relation to the characteristic curve, and measured statistically from collected opinions of a series of prints of a given picture. Contrast is considered to be best defined by the exposure difference (log  $E_2$  log  $E_1$ ) between the points of the curve where  $D_1 =$ 0.25 and  $D_2 = 0.90$ . The grading of glossy papers by the contrast is discussed. J. L.

Monochromatic filters for spectral lamps. H. NAUMANN and J. KALTENBACH (Z. wiss. Phot., 1938, 37, 27—32).—A no. of new filters have been prepared; their composition, transparencies, etc. are tabulated. Coal-tar dyes are chiefly used. The theory of transparency measurement is discussed; the use of a supplementary filter to remove far-red and infra-red rays which affect photometric measurements, but not the visual effect, is necessary. J. L.

See also A., I, 116, Absorption spectra of unsymmetrical cyanine dyes. 151, Optical sensitising of Ag halides by dyes. Herschel effect. Dyesensitised emulsions. 159, Photography in the infra-red. II, 95, Quinol and its oxidation products in alkaline solutions.

## PATENTS.

Modification of sensitivity of photographic emulsions. J. D. KENDALL (B.P. 457,527, 30.5.35). —The use is claimed as photosensitisers of  $\mu$ -thiones or  $\mu$ -selenones of the oxazole, thiazole, or selenazole series (cf. B.P. 475,647; B., 1938, 256) or of corresponding compounds of the C<sub>5</sub>H<sub>5</sub>N or condensed C<sub>5</sub>H<sub>5</sub>N series in which the S or Se is  $\alpha$  or  $\gamma$  to N, e.g., 1-methyl- or 1-ethyl-1: 2-dihydropyridine-2-thione or 1-methyldihydropyridine-4-thione. H. A. P.

Production of [photographic image-bearing] coloured gelatin layers. B. GASPAR (B.P. 478,735, 22.6.36. Ger., 21.6.35).-A photographically sensitised gelatin layer contains a precipitant for a dyestuff, colour being developed (after exposure) by immersion in the dye solution; alternatively a dye intermediate is incorporated in the layer and dyeformation brought about after exposure. Superimposed layers of different colours are obtainable by suitable choice of precipitants etc. and dyes. E.g., a AgBr-gelatin emulsion layer coloured yellow by Metanil Yellow and 4-amino-2-phenylquinoline hydrochloride is superimposed by a layer containing diphenylguanidine acetate; after exposure and fixing, the latter is coloured by immersion in Diamine Pure Blue FF. H. A. P.

Colour-forming developers and processes of colour development. KODAK, LTD. From EAST-MAN KODAK CO. (B.P. 478,942, 478,933-4, 478,983-6, and 478,989-91. [A-I] 23.4.36, [J] 23.4.36 and 24.5.37).-There are added to photographic Ag halide emulsions substances capable of combining to form coloured compounds with oxidation products of the developer used [an alkylated C6H4(NH2)2]. The compounds claimed in the individual specifications are: (A) R·CO·CH<sub>2</sub>·CN, in which R contains at least two cyclic nuclei, e.g., a-naphthoylacetonitrile, m.p. 100-101°, and its 4-OMe-, m.p. 180-182°, and 2-, m.p. 93-95°, and 4-Me derivatives, m.p. 85-88°, 3-w-cyanoacetyldibenzfuran, m.p. 133-135°, p-phenyl-, m.p. 99-101°, p-4-chlorophenyl-, m.p. 171-173°, and p-phenoxy-benzoylacetonitrile, m.p. 85-86°, 3-wcyanoacetylacenaphthene, m.p. 160-162°, 1-w-cyanoacetylcoumarone, m.p. 151-152°, 6-methyl-, m.p. 159-160°, and ar-tetrahydro-2-naphthoylacetonitrile, m.p. 98-100°, and 4-chloro-1-w-cyanoacetylcoumarone, m.p. 127—129° (the use of  $\beta - \tilde{C}_{10}H_7 \cdot CO \cdot CH_2 \cdot CN$  in presence of formaldehydesulphoxylate or NH<sub>2</sub>OH is excluded); these are all made from the phenacyl halide and alkali cyanide in aq. EtOH; p-phenyl-, m.p. 127-128°, p-phenoxy-, and p-4-chlorophenylphenacyl chloride, 4-methoxy-, m.p. 69-70°, 2-methyl-, b.p. 190-195°/8 mm., and 4-methyl-1-chloroacetyl-naphthalene, b.p. 197-202°/11 mm., and 4-chloro-1-ω-bromoacetylcoumarone, m.p. 111—113°, and tentofol scribed (of. B.P. 474,353; B., 1938, 322); (B)  $X \cdot CH_2 \cdot CO \cdot CH_2 \cdot CO \cdot Y$  in which X is halogen, alkyl,  $CO_2R$ , or H, and Y is alkyl, furoyl,  $C_{10}H_7$ , or OR (except where X is H), R being alkyl, aryl, or aralkyl,  $e.g., \ \hat{\mathbf{CH}}_2\mathbf{Cl}\cdot\mathbf{CO}\cdot\mathbf{CH}_2\cdot\mathbf{CO}_2\mathbf{Et}, \ \mathbf{CO}(\mathbf{CH}_2\cdot\mathbf{CO}_2\mathbf{Et})_2, \ \mathbf{CH}_2\mathbf{Ac}_2,$  $\beta$ -naphthoylacetone, m.p. 81-82° (from EtOAc,  $\beta$ -C<sub>10</sub>H<sub>7</sub>·COMe, and NaOEt), and Et furoylacetate, b.p. 143-145°/20 mm. (from EtOAc, Et furoate, and Na); (C) Et<sub>2</sub> malonate, Et p-nitrophenvlacetate, 1:4-

dihydroxyisoquinoline, rhodanine, 2-hydroxy-3:4-dihydroquinoxaline, m.p. 133-135° [prepared by interaction of o-C6H4(NH2)2 with CH2Cl·CO2H and Zn in H<sub>o</sub>O], and Et β-ketobutyrate-1-benzthiazolylhydrazone, m.p. 108-109° (CH2Ac•CO2Et and the hydrazine in AcOH); (D) N-substituted indoxyls or oxindoles, e.g., N-methyl- and N-ethyl-oxindole, N-acetyl-indoxyl and -2: 3-naphthindoxyl, m.p. 186-188° (from Na<sub>2</sub> 3-carboxy-2-naphthylaminoacetate and Ac<sub>2</sub>O; Ac<sub>2</sub> derivative of enolic form, m.p. 165-166°); (E) halogeno-phenols or -dihydroxynaphthalenes (one OH and at least one halogen in each ring) containing no extra substituent other than hydrocarbon groups, e.g., the mono-, di-, tri-, and pentachloro- and -bromo-phenols, 2:4-dichloro-6-cyclohexylphenol, 2:6-dibromo- and 2:4:6:8-tetrachloro-1: 5-dihydroxynaphthalene; (F) o- and m- $NH_2 \cdot C_6 H_4 \cdot OH$  and their derivatives, e.g., m-NEt<sub>2</sub> \cdot C\_6 H\_4 \cdot OH, o-NHAc  $\cdot C_6 H_4 \cdot OH$ , 1:3:5-OH  $\cdot C_6 H_3 (NHPh)_2$ , and o-nitrobenzylidene-o-amino-phenol, m.p. 104–105°; (G) 8-hydroxyquinoline and its derivatives, e.g., methiodide and 5:7-Br<sub>2</sub>-compound, m.p. 137-138°: (H) o- or p-OH·C<sub>6</sub>H<sub>4</sub>·CH:CYR in which Y is H and R is a homo- or hetero-cyclic ring or Y and R are together a homo- or hetero-cyclic ring, e.g., disalicylidenecyclohexanone, m.p. 159-161°, 2-0-hydroxystyryl-pyridine, m.p.  $158-161^{\circ}$  (from  $\alpha$ -picoline, o-OH·C<sub>6</sub>H<sub>4</sub>·CHO, and ZnCl<sub>2</sub> at  $150-155^{\circ}$ ), and -thiazoline, m.p. 139—141°, 1-o-hydroxystyryl-benzthiazole, m.p. 235—236°, and 3-phenyl-5-sali-cylidene-2: 4-thiazoledione, m.p. 175—177°; (I) a pyrazolone containing a heterocyclic substituent (furfuryl, quinolyl, or benzthiazolyl), or a 5-imino- or 5-thio-, 3-hydroxy-, or 3-carboxy-pyrazolone, e.g., 1-phenyl-3-furfuryl-5-pyrazolone, m.p. 180-181° (from Et furoylacetate and NHPh·NH<sub>2</sub>), 1-1'-benzthiazolyl-3-methyl-5-pyrazolone, m.p. 226-227°, 3-hydroxy-1-phenyl-5-pyrazolone and -5-iminopyrazolone, and 1-8'-quinolyl-3-methyl-5-pyrazolone, m.p. 256-258° (8-quinolylhydrazine, m.p. 137-139°, is made from 8-aminoquinoline by diazotisation and reduction with SnCl<sub>2</sub>-HCl); (J) phenols or naphthols having in o- or p-OMe, -O·CH<sub>2</sub>R, or -O·CH<sub>2</sub>·COR, where R is a hydrocarbon radical (hydrocœrulignone is excluded), e.g., quinol Me,  $CH_2Ph$ , and monophenacyl ether, guaiacol, eugenol, isoeugenol, and pyrogallol 1:3-Me<sub>2</sub> ether. H. A. P.

Photographic developing agents. I. G. FARB-ENIND. A.-G. (B.P. 479,446, 5.8.36. Ger., 31.8.35).— Fine-grain development is claimed to result from the use of pyrimidines having in 2:5 NH<sub>2</sub> and/or OH, e.g., 4:5-diamino-2:6-dihydroxy-, 2:4:5-triamino-6-hydroxy-, and 2:4:5:6-tetra-amino-pyrimidine sulphate, alone, or with other developers, e.g., metol, quinol. H. A. P.

Ultra-violet printing-out compounds. S. E. SHEFFARD and W. VANSELOW, Assrs. to EASTMAN KODAK CO. (U.S.P. 2,066,582, 5.1.37. Appl., 7.9.35). —The use is claimed as photosensitive compounds for papers sensitive to ultra-violet but relatively insensitive to ordinary light of the Ag salts of 1-psulphophenyl-3-methyl- and -3-carboxy- and 1phenyl- and 1-m-nitrophenyl-3-carboxy-5-pyrazolone. H. A. P. Cellulose derivative compositions [for use in making photographic films]. A. L. HENNE, Assr. to GEN. MOTORS CORP. (U.S.P. 2,056,787, 6.10.36. Appl., 30.1.31).—Solutions of cellulose derivatives in  $C_2Cl_3F_3$ ,  $CCl_3F$ , etc. are used for preparing, e.g., photographic films. S. M.

Manufacturing finely-divided substances.— See I. Polymethine dyes.—See IV.

## XXII.-EXPLOSIVES ; MATCHES.

Evolution of nitric oxide by various nitrated products at low temperature. M. LAMBREY (Compt. rend., 1937, 205, 978—979).—When nitrocellulose is stabilised by NHPh<sub>2</sub>, evolution of NO does not occur at 50°, although in absence of NHPh<sub>2</sub> decomp. appears to occur at lower temp. Pentacrythritol tetranitrate does not yield NO at a measurable rate below 43°; at higher temp. the rate of decomp. increases rapidly. E. S. H.

Combustion and detonation of solid explosives. M. PATRY (Z. ges. Schiess- u. Sprengstoffw., 1938, 33, 6-10, 33-37).-Photographs of the explosion wave in a glass tube show that the light band is cut off by a disturbance at the end of the tube, caused by the forward projection of the last portions of the tube at different velocities. A hypothesis is advanced for this and confirmed by experiments with detonators in glass tubes and on glass plates, respectively. In tubes of acetylcellulose the wave has a much smaller velocity (= 2000 m./sec.). A No. 7 detonator was insufficient to give a clear record of the propagation in the tube walls, and it was necessary to use a powerful explosive, such as gelatine dynamite. In the rear of the last part of the explosive a non-luminous shock wave is developed at the same time that the luminous gases are projected forward. At first the velocities of propagation of these two phenomena are identical, but that of the gases decreases more rapidly and then the shock wave overtakes them. After this the velocity of the latter becomes less and less and the gases rapidly cease to be sufficiently luminous to give a record. Photographs are shown of the explosion of one and more detonators, tetryl,  $C_6H_2(NO_2)_3$  OH, and dynamite, and vals. are given for D, the distance beyond which the shock wave and the luminous gases separate in glass tubes of different dimensions. (Cf. B., 1938, 228.) W. J. W.

Determination of sensitiveness to shock of explosives. T. URBAŃSKI (Z. ges. Schiess- u. Sprengstoffw., 1938, 33, 41—44).—Investigations were carried out with pentaerythritol tetranitrate. The fall-hammer test should be made on 0.01-0.02 g. of explosive of grain diameter  $\simeq 0.1$  mm. Several blank trials should be made with the piston until there is no further visible deformation, and its rebound must also be determined before the energy expended in causing explosion can be cale. At least two heights of fall with an accuracy of 1 cm. should be determined, *i.e.*, the lowest at which 10%, and the highest at which 50%, of explosions occur. It is advisable to have at least two comparative standards [hexogen and C<sub>6</sub>H<sub>2</sub>(NO<sub>2)3</sub>·OH]. W. J. W. Nitrocellulose.—See V. Determining nitroglycerin.—See XX.

#### PATENTS.

Stratified primer charge. F. R. SEAVEY, Assr. to WESTERN CARTRIDGE Co. (U.S.P. 2,068,516, 19.1.37. Appl., 14.7.33).—A small quantity of sensitive initiating mixture is placed next the anvil and a majority of less-sensitive fuel and oxidising mixture away from it. The compositions are not claimed.

B. M. V. **Explosive.** W. O. SNELLING, Assr. to TROJAN POWDER CO. (U.S.P. 2,067,213, 12.1.37. Appl., 17.6.35).—Initiating explosives (60—90 pts.) are incorporated in a suspension of rubber (40—10 pts.) in H<sub>2</sub>O or non-aq. solvent ( $C_6H_6$ ). After evaporation of the solvent, an elastic composition is obtained which can be deformed without separation of the explosive and retains its sensitiveness even after long storage. W. J. W.

Stabilisation of nitrates of carbohydrates. E. BERL (B.P. 469,663, 29.1.36).—Removal of the impurities is effected by treating the nitrocellulose (I) (e.g.) at elevated temp. and pressure with a non-solvent swelling agent, e.g., MeOH, EtOH, or a mixture of solvents and non-solvents, e.g., COMe<sub>2</sub> and  $H_2O$ . The treatment is best performed by evaporating the extracting agent, allowing the vapour to come in contact with the (I), and siphoning off, an alkali being added before re-evaporation to render the extracted material non-volatile. W. J. W.

Match. H. W. GREIDER and M. F. SMITH, Assrs. to PHILIP CAREY MANUFG. Co. (U.S.P. 2,066,399, 5.1.37. Appl., 21.9.33).—The splint is incombustible, being composed of 50-90% of asbestos or the like and 50-10% of fibre pulp manufactured by an alkaline process, *e.g.*, kraft, with sol. silicate and starch as impregnant and binder. An oily or waxy composition is spread over part only of the splint and a tip of known composition is applied.

B. M. V.

## XXIII.—SANITATION; WATER PURIFICATION.

Air conditioning in manufacturing dairies. Z. PÉRKONS (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 305–308).—The covering of processing and sterilising plant, hot  $H_2O$  from vessels to run down drains, and sound joints in steam piping reduce the high R.H. during working a dairy and thus decrease the growth of mould and bacteria. Air for storage rooms and workshops should be conditioned as to temp. and R.H., but for butter storage should be cooled. The maintenance of a consistent temp. in working rooms is important and should be ensured with hot- $H_2O$  piping and radiators. W. L. D.

Choice of suitable types of respirator for rescue work in the potash mining industry. P. I. SCHILOV (Kalii, 1937, 6, No. 4, 40–43).—The results of physiological tests carried out on subjects wearing three types of respirators, viz., the RKR-1, the Draeger 1924, and the KIP-3 are described. The tests were done under standard conditions at external temp. of 10–50°, at 10° intervals. For all types of apparatus, analyses of exhaled air showed that the  $CO_2$  content increases sharply when the external temp. is raised from 20° to 30°, whilst at 40° and 50° it falls below that for 30°. D. G.

Military and civilian gas masks W. MIELENZ (Z. Ver. deut. Ing., 1937, 81, 1273–1279).—The types employed by Great Britain, France, Germany, Poland, etc. are diagrammatically described. Particulars are given of the constructional and absorbent materials used. R. B. C.

Lead and silicosis: factory precautions. D. F. W. BISHOP (Trans. Ceram. Soc., 1938, 37, 17— 23).—General cleanliness, dust extraction, suitable clothing, and good supervision are necessary precautions. J. A. S.

Antiseptic power of solutions of sodium chloride and of other salts. P. CHAMBARD and R. GARNOT (J. Soc. Leather Trades Chem., 1937, 21, 643—653).—The antiseptic power is expressed as log N/n, where N is the no. of organisms present in a culture medium containing no salt and n the no. in the same medium to which a definite salt concn. has been added. The order of diminishing antiseptic power at mol. concn. was  $K_2CO_3$ ,  $Na_2S_2O_3$ ,  $MgSO_4$ ,  $Na_3SO_4$ , NaCl. A saturated solution of NaCl was more antiseptic than one of  $Na_2SO_4$  or  $MgSO_4$ . The orders of antiseptic and dehydrating power were the same.  $SO_4''$  is more antiseptic than Cl'.  $K_2CO_3$ owes its power to OH'. D. W.

Problems and their answers at the Ontario activated sludge plant. H. M. ELY (Sewage Works J., 1937, 9, 1033—1034).—Two types of bulking are experienced: (1) due to insufficient air, which can be easily remedied, and (2) that due to addition of foreign substances (*i.e.*, orange syrup) causing a change in d of the sludge, which can be remedied by addition of soil to wt. Oil and smoke in the air affected the filter plates, increasing the air pressure; this was remedied by injecting petrol into the air main. O. M.

Utilisation of sewage sludge. W. GUMZ (Fueurungstech., 1937, 25, 326-327).—The sludge is dried by hot waste gases from a combustion chamber in which the dried material is burned in pulverised-fuel burners. A plant at Chicago is diagrammatically described. R. B C.

Utilisation of sewage sludge as fertiliser. REPT. OF COMMEE. ON SEWAGE DISPOSAL, AMER. PUBLIC HEALTH ASSOC., PUBLIC HEALTH ENG. SECT. (Sewage Works J., 1937, 9, 861—912).—From a study of American and Canadian data the following conclusions were reached. The use of fresh sludge as fertiliser may be troublesome, due to grease content, odour, and bacteria, but digested sludge (wet, air- or oven-dried) can be used as substitute for manure, having roughly the same fertilising val. The N content is rather low (0.5-3.0%, dry basis). Heatdried activated sludge is of real val. as an org. N fertiliser (3—6%, dry basis) and is free from weed seeds. Heat-dried activated sludge and digested sludge are hygienically safe for all agricultural and horticultural purposes; digested sludge when ploughed-in can be used for vegetables to be cooked, but fresh sludge should be treated as nightsoil and used only for forage crops. No cases of sickness have been traced to the use of digested or activated sludge. O. M.

Effect of industrial wastes on sewage treatment. A. L. FALES (Sewage Works J., 1937, 9, 970-997).—Trade wastes and their effect on sewage treatment, indicating those to be excluded from the sewers, those to be admitted only after storage to equalise flow and quality, and those requiring pretreatment, are reviewed. O. M.

Packing-house waste and sewage treatment at Sioux Falls, South Dakota. R. E. BRAGSTAD and L. BRADNEY (Sewage Works J., 1937, 9, 959-969).—Results indicate that such waste can be satisfactorily purified when admixed in sewage.

0. M.

Seasonal changes in temperature, salinity, phosphates, nitrate-nitrogen, and oxygen of the ocean waters on the continental shelf off New South Wales, and the relationship to plankton production. W. J. DAKIN and A. N. COLEFAX (Proc. Linnean Soc. N. S. Wales, 1935, 60, 303—314). —Data are given for the temp., Cl', NO<sub>3</sub>'-N, PO<sub>4</sub>''', and O<sub>2</sub> contents of sea-H<sub>2</sub>O at various depths. Fluctuations in NO<sub>3</sub>'-N and PO<sub>4</sub>''' are traceable to the effect of the plankton. CH. ABS. (e)

Interaction between copper tubes and the iodised Utrecht tap water. J. F. REITH and C. P. VAN DIJK (Chem. Weekblad, 1938, 35, 102—104).— The I content of Utrecht tap water  $(5 \times 10^{-5} \text{ g./litre})$ is unchanged in tinned-Cu pipes, but is reduced on keeping in clean Cu pipes. The absorption is irregular and the absorbed I is removed by flowing H<sub>2</sub>O so that the loss to the consumer is negligible. The Cu content is within tolerable limits. S. C.

Suppression of iron bacteria in waterworks. H. BEGER (Ges- u. Wasserfach, 1938, 81, 82–83; cf. B., 1938, 232).—Dissolved Fe and Mn salts are sources of energy for the life processes of the bacteria, certain types of which are classified according to their preference for one or other metal. The bacteria can be deprived of  $Fe(HCO_3)_2$  derived from pipes etc. by aëration or by using non-metallic materials. Systematic observation of the Fe and Mn content of the H<sub>2</sub>O, and biological examination of any increase thereof, are recommended. A. R. PE.

Corrosion and the Langelier calcium carbonate saturation index. F. E. DEMARTINI (J. Amer. Water Works Assoc., 1938, 30, 85-111).-Langelier's theory and equations for the calculation of  $p_{\rm H}$  at which a given H<sub>2</sub>O is in equilibrium with solid CaCO<sub>3</sub> (cf. B., 1937, 193) are reviewed and compared with Strohecker's work (cf. B., 1937, 298). Langelier's index shows whether a given H<sub>2</sub>O tends to dissolve or deposit the CaCO<sub>3</sub> coating, and was determined together with actual corrosion conditions for the H<sub>2</sub>O of 5 Californian cities. These results show that cold H<sub>2</sub>O having a saturation index more positive than -0.5 and hot H<sub>2</sub>O having one more positive than 0 cause only slight corrosion. The inaccuracy of determining minute quantities of free CO2 by titration with N/44-NaOH (to phenolphthalein) is discussed,

and equations for computing  $HCO_3'$ ,  $CO_3''$ , free  $CO_2$ , and OH' from the total alkalinity and  $p_{\rm H}$  are given. O. M.

Cathodic protection of the Mokelumne Aqueduct. H. A. KNUDSEN (J. Amer. Water Works Assoc., 1938, 30, 38—55).—Underground corrosion of metal pipes is controlled by making the pipe a cathode, using the soil moisture as electrolyte, and inserting an anode. A method of testing the condition of the pipe covering without unearthing is described. Estimated costs of the process are given. O. M.

**Operating kinks [in water purification].** A. R. TODD (J. Amer. Water Works Assoc., 1938, 30, 112—120).—Ohio river-H<sub>2</sub>O if acid ( $\Rightarrow p_{\rm H} 5.5$ ) after treatment with FeSO<sub>4</sub> and Cl<sub>2</sub> gave no phenolic taste or odour, but if treated with CaO formed a resinous product and caused trouble. To overcome the difficulty of Cl<sub>2</sub> determination in presence of high NO<sub>2</sub>' etc. it is distilled off and determined. To remove slime and org. matter from sand filters NaCl is more effective than NaOH. O. M.

Mechanisation of the water-chlorination process. L. A. KULSKI (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 119–125).—Design of plant for automatically feeding  $Cl_2$  to  $H_2O$  is discussed. O. M.

LK chlorinator mixers as gas-absorbing apparatus. L. A. KULSKI and O. K. LEBEDINTZEVA (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 91–117).—The factors governing the most effective conditions in the mixer for  $Cl_2$  absorption by  $H_2O$ , and its other possible uses (e.g.,  $Cl_2$  adsorption by alkali, and for white-Pb solution containing < 20 g. of active Cl per litre), are investigated. O. M.

New designs of Soviet [water] chlorinator. L. A. KULSKI (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 55–73).—Improvements in design, including dry-gauge-type gasometers, accurate gauges tabulated in g., and Cl<sub>2</sub>-resistant coatings for the inner parts etc., are outlined. O. M.

Control of chlorine passing through the chlorinator capillaries. L. A. KULSKI, L. P. MALJUSCHITZKI, and G. M. MITILINO (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 75–89). —Tests show that the rate of flow of  $Cl_2$  from capillary tubes does not depend on their diameters, but is a const. The amount of  $Cl_2$  issuing is  $\infty$  the area of the capillary. O. M.

Purification of water and foodstuffs with silver ions. L. A. KULSKI (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 7-24).—Oligodynamic action depends on the presence of optimum amounts of cathodic Ag, and as the amounts of Ag producing useful effects surpass the limits of oligodynamic effect, doses of 0.4-0.9 mg. of Ag are necessary. The electro-cathodic method of raising the Ag content is the most promising, and three designs of suitable instruments (ionators) for industrial sterilisation of H<sub>2</sub>O and food are discussed. O. M.

Silver ion and ammoniated silver ion as sterilising agents in a swimming pool. W. E. CALD-WELL, W. B. BOLLEN, F. W. BIRD, and G. F. OSLER (J. Amer. Water Works Assoc., 1938, **30**, 131–136).– 0·15 p.p.m. of  $AgNO_3$  added to an artificially inoculated swimming pool proved bactericidally beneficial. AgCl turbidity and blackening due to Cl' was prevented by adding  $AgNO_3$  in aq. NH<sub>3</sub>; this had approx. the same bacteriological effect. O. M.

Control of the electro-cathodic process in [water-purification] practice. L. A. KULSKI and G. M. MITILINO (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 25—36).—Tests showed that the amount of Ag in  $H_2O$  by this process corresponded with the electrical energy consumed (within the limits of 0.058—0.0059 amp./cm.<sup>2</sup>) in presence of KNO<sub>3</sub>, NH<sub>3</sub>, HCl, and traces of Cl'. Chlorides and sulphides coated the electrodes and prevented dissolution.

O. M.

Nephelometric determination of cathodic silver in water. L. A. KULSKI and G. M. MITILINO (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 43–49).—A method for determining small amounts of ionised Ag (0.00008–0.01 g. per litre) with an error of > 3-4% is given. The H<sub>2</sub>O must be free from colouring and suspended matter. O. M.

o-Tolidine as a reagent for the colorimetric determination of silver [in water]. L. M. KUL-BERG and S. B. SEREBRIANI (Mem. Inst. Chem. Tech. Ukrain. Acad. Sci., 1937, No. 4, 37–42).—As the limit for determining Ag colorimetrically by this method is 0-0075 g. per litre,  $H_2O$  sterilised by Ag must first be conc. (cf. A., 1937, I, 97). O. M.

Utilisation and disposal of sulphite waste. K. A. KOBE (Sewage Works J., 1937, 9, 1019–1023). —Sulphite waste liquor has the greatest pollution effect of any paper-mill wastes as  $>\frac{1}{2}$  the wood wt. is discharged as waste liquors. Pollution may be prevented by utilisation of the products; the possible field of utilisation (for yeast production, EtOH by fermentation, adhesives for linoleum cement, road binder, tanning extract, synthetic plastics, etc.) is reviewed. By evaporation or pptn. a fuel can be obtained. 0. M.

Removal of waste waters from dairies. PLOCK, BOCK, SCHWARZ, SCHLOEMER, SEELEMANN, and CLAUSSEN (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 308—312).—Two methods, the biological and chemical, are used to purify dairy effluents. The former requires a percolator and a digestion tank after an initial settling tank, two sets being run in parallel. The chemical method involves flocculation of colloidal material by addition of solutions of heavymetal salts in settling tanks, and digestion of sugar and sol. N compounds carried out in percolators and septic tanks.  $CuSO_4$  and Cr alum are used as precipitants. W. L. D.

Composition and disposal of waste waters from industrial dairy plants. F. KIEFERLE and H. GNUSCHKE (Proc. XIth World's Dairy Cong., Berlin, 1937, 3, 293—297).—Waste waters contain 0.1—7.0% of total solids, the most conc. effluent being from cheese factories. The  $p_{\rm H}$  varies from 4.3 to 10.1. Washings from milk-collecting depôts contain least milk solids. The methylene-blue test for testing for the putrefactive properties of different sewages is limited as it fails to give results in strongly acid or alkaline waters. Fermentation of lactose is slow and the breakdown of protein is also retarded. The gas from the sludge in the settling tanks has a high calorific val. W. L. D.

Survey of recent developments in treatment of industrial wastes. W. RUDOLFS (Sewage Works J., 1937, 9, 998—1018).—New work in trade-waste disposal (*i.e.*, wastes from gas and phenol, dairy, brewing, distillery and fermentation, tannery, meat packing, cannery, sugar, oil, grease, laundry, textile, dye, paper, alcohol, mince and pickling liquors) and the effect of such wastes on stream pollution are reviewed. O. M.

 $H_2O$ -conditioning.—See I. Antiseptic power of salts.—See VII. Effect of F in fertilisers on health.—See XVI. Air in Swiss cowsheds.—See XIX.

See also A., I, 153, Prep. of soft  $H_2O$ . III, 232, Bacterial contamination of air of textile mills. Air conditioning.

#### PATENTS.

Air conditioning. C. F. BERAN, Assr. to CELAN-ESE CORP. OF AMERICA (U.S.P. 2,064,808, 22.12.36. Appl., 8.2.34).—Air from a textile-processing (solventrecovery) plant is caused to transmit its cold to another mass of air (to condition it) by means of a circulation of  $H_2O$  or other suitable liquid in intimate contact with both airs. B. M. V.

Dentrifice product. J. RIPERT, ASST. to THIBAUD, GIBBS & Co. (U.S.P. 2,059,396, 3.11.36. Appl., 12.7.34. Fr., 9.1.34).—The abrasive consists of finely-powdered natural mica (hardness 2—3° Moh). E. H. S.

Production of a composition for use as a vehicle for other substances [medicines, cosmetics, etc.]. A. SAUER, ASST. to FISSAN EXPORT CO. J. BLOCH & SOHN (U.S.P. 2,059,811, 3.11.36. Appl., 21.9.33. Ger., 11.11.27).—A SiO<sub>2</sub> xerogel (prep. described; grain size 1—100  $\mu$ .) containing an acid F compound, e.g., H<sub>2</sub>SiF<sub>6</sub>, which reacts only slowly with H<sub>2</sub>O to release F in bound form is used as a vehicle for active substances in cosmetics. E. H. S.

Septic tank. W. E. JAQUITH (U.S.P. 2,068,140, 19.1.37. Appl., 2.3.34).—The tank is rather tall, with both openings near the top, but the incoming sewage is directed to the bottom. B. M. V.

Settling tank. G. L. MOREHEAD, ASST. to LINK-BELT CO. (U.S.P. 2,068,428, 19.1.37. Appl., 17.4.33). —The tank is operated at const. liquid level, the influent comes up through a central pier to a point well below the surface and is there directed downwards, and the sludge is collected in an annular gutter surrounding the pier below the general tank floor and always covered by an inclined roof except at points where rotating, radial scrapers enter. B. M. V.

Scum-paddling device for sludge-digestion tanks. M. B. TARK, Assr. to LINK-BELT CO. (U.S.P. 2,068,521, 19.1.37. Appl., 13.6.35).—On a circular tank a limited zone embracing a diameter is swept by chains and flights to remove air and cause scum to sink. B. M. V.

Treatment of sewage. AMER. CENTRIFUGAL CORP. (B.P. 478,977, 22.1.37. U.S., 3.2.36).— Sedimentation, chemically-pptd., or activated sludge from sewage treatment, after thickening, is centrifugally dewatered to such an extent that the product is combustible. Apparatus is figured. O. M.

Plant for distilling, sterilising, and supplying water. H. JESSOF and C. H. COOK (B.P. 478,075, 5.8.36).—A central distilling plant is situated on an upper floor of a building and comprises a primary circuit embodying a steam-heated evaporator, condensers, and storage tank for hot distilled  $H_2O$ , having a sterilising filter in the vent. The hot- $H_2O$ draw-off pipes are led downwards in close proximity to the steam supply pipe rising from a boiler in the basement. Heating coils in the storage tank and cooling means for the distilled  $H_2O$  may also be provided. B. M. V.

Purification of musty water [from alcohol stills]. E. D. ORTEGA (U.S.P. 2,068,465, 19.1.37. Appl., 31.8.34).—A mixture of musty  $H_2O$  and clean  $H_2O$  (1:1 vol.) is heated to near the b.p., CaO (48 g. per gal. of musty  $H_2O$ ) is added, and the liquid boiled and transferred to a cooling container having large exposed surface; while therein it is sprayed with a quantity of cold  $H_2O$  = that of the musty and clean  $H_2O$  together. After keeping for 3—4 min. to ppt. solids,  $K_2O$  can be recovered by addition of petroleum ( $\frac{1}{15}$  of the vol. of musty  $H_2O$ ) and evaporating in vac. B. M. V.

Destruction of living organisms [by irradiation]. A. G. WORTHING and R. S. EULER (U.S.P. 2,059,835, 3.11.36. Appl., 29.1.36).—Infra-red radiation of  $\lambda \ll 26,000$  A. is directed on to the organisms. E. H. S.

**Preparation of germicidal compositions.** H. B. KIMERLIN (U.S.P. 2,067,674, 12.1.37. Appl., 25.11.35).—A double compound of  $HgI_2$  (with HI) is heated at >1 atm. with a glycol or a glycol ether; the resulting compound is added to soap or a detergent. *E.g.*, a solution of KI (22 pts.) and  $HgI_2$ (30 pts.) in H<sub>2</sub>O is acidified to  $p_{\rm H}$  4—4.5 and heated at 130—140° in an autoclave with diethylene glycol Bu ether (I) (240 pts. by vol.); the product and fresh KI are added to a K coconut oil soap (500 pts.) in (I) (1350 pts. by vol.), and the resulting solution is adjusted to  $p_{\rm H}$  7—8 (7.0) by 2N-NaOH. H. A. P.

Preparations for combating vermin and their application. A. CARPMAEL. From I. G. FARBEN-IND. A.-G. (B.P. 478,350, 12.6.36).—Aliphatic sulphonyl fluorides, alone or mixed with a solid (talc, chalk), liquid insol. in  $H_2O$  (not  $Et_2O$  or  $NH_2Ph$ ) or  $COMe_2$ , or toxic or inert gas  $[CO_2, CO, (CH_2)_2O]$  as diluent, are used as vermin poisons which are harmless to plant life. The disinfection of wheat seeds is described. A. H. C.

Detecting foreign gases in air or other gas.— See I. Hexylpyrocatechol.—See III. Artificial stone from refuse clinker.—See IX. Conditioning air for flour mills.—See XIX.

wata, W. B. Botany, F. W. Burn, a-