

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

APRIL 22 and 29, 1932.*

I.—GENERAL; PLANT; MACHINERY.

Automatic recorder for sulphur acids in flue gases. J. J. FOX and L. G. GROVES (J.S.C.I., 1932, 51, 7—10 r).—An apparatus has been designed to record the residual S in flue gases after scrubbing in purifying chambers. The principle involved is the conversion of the S oxides into H_2SO_4 by means of dil. aq. H_2O_2 which has been adjusted to a definite p_{H} . The acid produced changes the p_{H} according to the S content of the gases. The p_{H} is measured by means of a glass electrode by the change of voltage, which is converted by an electrometer triode valve into a current suitable for amplifying and passing through a Cambridge recording galvanometer. Zero "creep" was avoided by Morton's method of using a large condenser in the galvanometer circuit. A continuous graph of the S acids is obtained.

Relative and absolute humidities. A. F. DUFTON (J.S.C.I., 1932, 51, 94 r).—A nomogram for converting relative humidity into abs. humidity is described.

Heat transfer in stream-line flow. II. Experiments with glycerol. T. B. DREW (Ind. Eng. Chem., 1932, 24, 152—157; cf. B., 1931, 949).—A $\frac{1}{8}$ -in. Cu tube surrounded by a double steam-jacket was used. The inner jacket was supplied with dry steam and the condensate measured. The outer jacket minimised outward heat losses. The temp. differences used were 35°, 45°, and 65°. The temp. rise/initial temp. difference was plotted against Wc/kL , where W is the rate of discharge and c the heat capacity. These curves vary from the Graetz theoretical curve for zero temp. difference, the variation increasing with the temp. difference and being outside the limits of experimental error. This method of correlating results for different liquids, or for the same liquid under different conditions, is probably unsatisfactory. C. IRWIN.

Heat penetration by convection. D. E. A. JONES (Food Tech., 1931, 1, 63—65).—When the contents of a can are largely liquid, convection plays an important part in processing. On the assumption that a thin film of liquid in contact with the walls is at rest, a formula has been derived for the internal temp. of the can in terms of its initial temp., that of the bath, the area and thickness of the film, the vol. of the contents, and their thermal diffusivity. The consts. were evaluated from experimental results obtained with H_2O . Using the val. of the film thickness, d , thus found (0.09 cm.), time-temp. curves have been plotted which agree closely with those obtained in practice. The val. of d must be varied to suit the consistency of the product.

H. J. DOWDEN.

Multi-stage refrigerator compressors in the chemical industry. H. FREUND (Chem. Fabr., 1931, 477—478, 486—488, 494—495).—The theory of the operation of NH_3 refrigerator plants is given and the advantages of coupled multi-stage compressors are demonstrated. The application of such compressors to crystallisation plants is outlined. Constructional details are given of typical 2- and 3-stage compressors and the use of refrigerating plants employing 2 working substances, for the attainment of temp. below about -78° , is noted. H. F. GILLBE.

Automatic control and regulation of acid baths. HÜTTER (Chem. Fabr., 1931, 478—479).—The electrical circuit and some constructional details are given of a device whereby bath acidity is continuously recorded and controlled by conductivity measurements. The apparatus costs but little more than automatic temp. recorders. H. F. GILLBE.

X-Rays as a research tool in chemistry and industry. G. L. CLARK (Ind. Eng. Chem., 1932, 24, 182—190).—In radiography the thickness of Fe penetrated increases linearly with the voltage, and X-ray examination is now used industrially in the testing of castings, locomotive boilers, etc. Greater penetration is given by the use of γ -rays. The advantages and disadvantages of X-ray chemical analysis are discussed. Amongst the latter are that it cannot conveniently be applied to elements lighter than Ca, and the approx. nature of the quant. results derived from line intensities. The fluorescent-ray method using the Hevesy tube has effected great improvement in the latter respect. The X-ray examination of crystal structure has enabled Fe alloy structures to be systematised. Particle grain-size can be determined by measuring the width of X-ray diffraction rings, and this method can be used as a check on measurements from the microscope. Another important application is in the detection of internal strains in opaque crystals, and work is in progress on the X-ray study of cold-working and heat-treatment of metals. Other applications are in the study of X-ray diffraction rings from thin films of org. liquids in which mol. orientation occurs, of mol. shapes, and of the structure of polymerised natural materials such as rubber etc. C. IRWIN.

Parallel-scale charts. R. C. STRATTON, J. B. FICKLEN, and W. A. HOUGH (Ind. Eng. Chem., 1932, 24, 180—181).—If Na_2CO_3 alone is to be used in purifying boiler feed-water the relation between Na_2CO_3 required and Ca present in the H_2O is given by 2 parallel scales. If CaO is also to be used, Mg being present in appreciable quantities, the requirements of Na_2CO_3 depend on Ca, Mg, and HCO_3^- present and of CaO on the last two.

* The remainder of this set of Abstracts will appear in next week's issue.

The requirements of each are then determined by using 4 and 3 parallel scales, respectively. They are used by converting Ca into its Mg equiv., adding the Mg present, converting into HCO_3' equiv., and deducting the HCO_3' present. The scales are constructed from modifications of Stabler's empirical formulae. The method is applicable to many other chemical calculations. C. IRWIN.

Handling of corrosive gases. T. H. CHILTON and W. R. HUEY (Ind. Eng. Chem., 1932, 24, 125—131).—Gases which are corrosive at atm. temp. are corrosive only in the presence of H_2O and the action depends on the presence of a surface conducting film; the problem is similar to that of handling aq. solutions. Direct corrosion by a gas produces a mol. surface layer of a compound which must be penetrated for corrosion to proceed further. Such action is necessarily slight at low temp., and this type is often termed high-temp. corrosion. A third type is exemplified by the embrittlement of steel by H_2 , in which no surface change is seen, the attack being on minor constituents of the metal. Materials suitable in each case are discussed. The Cr-Ni alloys used for HNO_3 absorption are corroded by HCl, and it is unsafe to use them for HNO_3 of natural origin. Certain alloys containing 60% Ni with Mo, Cr, and Fe are now stated to be resistant to HCl. Cu may be used for HF vapours if O_2 is absent. Synthetic resins are likely to be useful in many of these cases. "Heat-resistant alloys," i.e., those resistant to O_2 at high temp., employ Cr, the necessary proportion increasing with the temp. of operation. Al is said to increase resistance to hot gases containing SO_2 . Cu is suitable for CO under pressure. The disintegration of metals by H_2 at high pressure and temp. has so far been dealt with by the avoidance of high temp. in high-pressure work.

C. IRWIN.

Cause of fluctuations in rising mixtures of gas and liquid. J. VERSLUYS (J. Rheology, 1932, 3, 3—15).—From a simplified examination of conditions in a vertical channel of uniform cross-section it is shown that the foam condition stable at lower levels is separated from the mist condition into which it tends to change by an intermediate zone in which neither is stable. If the mouth lies in the unstable region fluctuations in outflow will occur.

C. W. DAVIES.

Thixotropy and plasticity. I. Measurement of thixotropy. E. L. McMILLEN (J. Rheology, 1932, 3, 75—94).—Thixotropy is measured by the rate of the fluidity decrease, using a modified Kämpf viscosimeter (B., 1931, 728). Data are recorded for some paints.

C. W. DAVIES.

Heat exchanger.—See II. Phosphate blast furnace.—See VII. Laboratory kilns.—See VIII. Embrittlement of [boiler] steel. Materials for high-temp. steam plant. Lubrication tests on bearing metals.—See X. Pressures in cans during processing.—See XIX. Control of p_{H} of H_2O .—See XXIII.

See also A., Mar., 240, Magneto-optical method of analysis. 245, Thermo-regulators (20—1000°).

PATENTS.

Furnaces burning waste material, rubbish, and the like. VESUVIO FEUERUNGSBAU G.M.B.H. (B.P.

366,307, 25.2.31. Ger., 26.2.30).—In a furnace having reciprocating firebars, the auxiliary fuel is supplied to the extreme front of the grate and the rubbish down a stepped passage, where it is dried by the gases of combustion, on to the grate some distance back.

B. M. VENABLES.

Treatment of water for steam boilers. J. M. HOPWOOD, Assee. of R. E. HALL and H. A. JACKSON (B.P. 364,746, 8.11.30. U.S., 23.11.29).—The addition of meta- or pyro-phosphates to pretreated or untreated feed-water is claimed as an effective means of controlling the alkalinity of the water and preventing scale deposition. In high-pressure boilers these phosphates are converted into the acid orthophosphates with consequent increase in alkali-neutralising capacity, so that any NaOH produced from excess Na_2CO_3 from the lime-soda-ash treatment or NaHCO_3 from zeolite pretreatment is adequately neutralised, and Ca present is pptd. as a non-adherent sludge. Corrosion or deposition in heated pipelines is unlikely to occur under these conditions.

C. JEPSON.

Controlling the sludging of steam boilers. K. HÖHL (B.P. 366,113, 24.10.30).—An elaborate electrical system of remote control of the blow-down valve is described. The period of blowing is recorded by a thermo-sensitive element attached to the outside of the sludge pipe.

B. M. VENABLES.

Condensers. WESTINGHOUSE ELECTRIC & MANUFACTURING CO., Assees. of J. P. LIDIAK, J. H. SMITH, C. B. TULEY, H. F. SCHMIDT, and F. A. MEYER (U.S.P. 1,845,538—1,845,549, 16.2.32).—Various forms of nest-of-tube type condensers are described, the claims covering devices for securing the flow of vapours to be condensed and of cooling water through the tubes.

Heat transfer at high temperatures. C. FIELD, Asst. to CHEM. MACHINERY CORP. (U.S.P. 1,810,912, 23.6.31. Appl., 5.2.27).—Hg is boiled, and then condensed by the material to be heated. The pressure of the condensing Hg is regulated by the temp. of the material.

B. M. VENABLES.

Mixing and heat-interchange apparatus. H. S. BEERS, Asst. to TURBO-MIXER CORP. (U.S.P. 1,810,637, 16.6.31. Appl., 12.4.29).—A jacketed tank is provided with an impellor on the bottom, guides to direct the circulated liquid along the jacketed surfaces of the bottom and wall, and with a cylindrical baffle so that efficient circulation may take place when the tank is filled to different levels.

B. M. VENABLES.

Rotary dryer. W. A. HARTY and F. W. MOORE, Assts. to HARMOR & CO., INC. (U.S.P. 1,810,476, 16.6.31. Appl., 15.12.28).—In a rotary dryer the heating gases after passing through a hollow mandrel concurrent to and out of contact with the material are returned partly in contact with and countercurrent to the material in the annular space and partly through hollow ribs attached to the surface of the mandrel.

B. M. VENABLES.

Stabilisation of (A) refrigerants, (B) the atmosphere of refrigerating systems. R. W. DAVENPORT, Asst. to CHICAGO PNEUMATIC TOOL CO. (U.S.P. 1,809,833—4, 16.6.31. Appl., [A] 17.6.26, [B] 25.3.27).—In (A) a refrigerant of the chlorinated hydrocarbon type is made

as dry as possible before use and, when in use, is passed in the liquid state in contact with basic oxides or hydroxides, *e.g.*, CaO, with the object of supplying OH ions and neutralising any acids which may form. The same precaution may be taken with the lubricant used. In (B) the atm. in that part of a similar system having the highest pressure and lowest temp. is acted on by a reducing agent. B. M. VENABLES.

Dewatering towers. GES. F. FÖRDERANLANGEN E. HECKEL M.B.H. (B.P. 366,296, 17.2.31. Ger., 17.2.30).—A tower for draining, *e.g.*, coal is provided with an axial telescopic passage through which the upper layers may be removed through the bottom before the lower layers. B. M. VENABLES.

Construction of filter-presses. M. WILDERMAN (B.P. 366,430, 1.9.31. Addn. to B.P. 358,526; B., 1932, 4).—Reinforcing means are described for the filter-plates of porous and non-porous rubber described in the prior patent above and in B.P. 307,525 (B., 1929, 459). B. M. VENABLES.

Re-activation of adsorbent [clay]. W. S. BAYLIS, Assr. to FILTROL CO. OF CALIFORNIA (U.S.P. 1,810,155, 16.6.31. Appl., 10.4.28).—Spent bentonite etc. which has been used for decolorising oils etc. is decarbonised by heating below sintering point in a current of air and the clay is then worked up to a stiff mud by the addition of H₂O and 1.4% of H₂SO₄ (calc. on the wt. of dry clay) with simultaneous heating to just below 100°. L. A. COLES.

Continuous crystalliser. W. H. LOHMANN, Assr. to GEN. CHEM. CO. (U.S.P. 1,810,217, 16.6.31. Appl., 5.2.27).—In an apparatus comprising a trough with a helical conveyor blade, the further end of the latter is formed as a scoop to deliver the crystals through an elevated aperture in the end of the trough. B. M. VENABLES.

Production of foam. J. DYHR, Assr. to SCHAUMBAD GES.M.B.H. (U.S.P. 1,810,394, 16.6.31. Appl., 5.11.29. Ger., 21.2.29).—A device comprising a fluted tube having perforations at the bottom of the flutes and a surrounding porous medium is used for the introduction of gas into the foam-producing liquid. B. M. VENABLES.

Device for mixing gases and liquids. J. M. DAILY, Assr. to AMER. OZONE CO. (U.S.P. 1,810,131, 16.6.31. Appl., 25.5.29).—An ejector device, in which the gas is supplied to both sides of an annular jet of the liquid and the mixing completed by a baffle, is described. B. M. VENABLES.

Method of reciprocal action between gases and finely-divided materials. G. MÜLLER and J. JAENICKE (U.S.P. 1,810,055, 16.6.31. Appl., 20.3.28. Ger., 9.2.27).—During the reaction period the gas is passed upwards through the solid matter at such a rate as to maintain the latter in suspension but substantially stationary in the vessel. On completion of the reaction the gas current is increased and the solids are blown out by it, with subsequent separation elsewhere. Preferably the displacement is made slowly and fresh solid matter simultaneously added to the lower zone. B. M. VENABLES.

Means for removing grit, dust, sulphur, and other solids from air or gases, such as the gases

leaving a furnace. A. B. SEABORNE (B.P. 366,241, 3.1.31).—The gases enter downwardly through the apex of a conical deflector, pass over the surface of a pool of washing liquid, and then travel upwards round the edge of the cone. Liquid is caused to overflow from an annular launder surrounding the gas-inlet pipe, and the surface of the pool is kept violently agitated by, *e.g.*, upward jets of gas. B. M. VENABLES.

Filtering apparatus [for air etc.]. W. SELL, Assr. to K. & T. MÖLLER GES.M.B.H. (U.S.P. 1,810,090, 16.6.31. Appl., 23.5.29. Ger., 5.6.28).—Forms of corrugations suitable for plates that are wetted with a film of oil or other viscous liquid are described. B. M. VENABLES.

Separation of gases. R. L. HASCHE, Assr. to AMER. SMELTING & REFINING CO. (U.S.P. 1,810,312, 16.6.31. Appl., 5.5.28).—SO₂ is recovered from furnace gases by compression, cooling to room temp. by an external cooling agent (all subsequent coolings being effected by heat exchange within the system), approx. drying by cooling to 0°, complete drying by means of CaCl₂ or other absorbent, and further cooling with liquefaction. After separation of the liquid and gases the former is vaporised by heat exchange and delivered without much loss of pressure; the latter are completely freed from SO₂ by an adsorbent (in duplicate for continuous work), passed through an expansion engine, and the cold thus produced is utilised by heat exchange with the incoming gases in several stages. B. M. VENABLES.

Manufacture of a friction element. J. DRISCOLL, Assr. to JOHNS-MANVILLE CORP. (U.S.P. 1,812,326, 30.6.31. Appl., 21.2.30).—Zn dust is incorporated in a brake lining constructed of asbestos yarn reinforced with brass wire. L. A. COLES.

Ice-making [apparatus]. F. H. BINGHAM (B.P. 367,179, 20.2.31).

Apparatus for high-temp. gas reactions.—See II. H₂SO₄ from flue gases. Material for desulphurising gases.—See VII. Heat-insulating material. Heat-conducting refractory.—See VIII. Metal-melting furnaces.—See X. Removing particles from gases. Smoke-detecting apparatus. Pyrometer.—See XI.

II.—FUEL; GAS; TAR; MINERAL OILS.

Combustion of coal dust. A. L. GODBERT and R. V. WHEELER (Safety in Mines Res. Brd., 1932, Paper No. 73, 21 pp.).—Particles of coal dust were allowed to fall through a heated furnace and, while burning, were photographed on sensitised paper wrapped around a revolving drum. The relative speeds of combustion of different coal dusts are, like their ignition speeds, determined by the reactivity of the ulmin materials and by their content of highly inflammable ulmin material. The approx. relationship between the inflammability of a coal dust and such other chemical property as its C, O, or volatile-matter content is a secondary relationship. Two stages in the combustion of the volatile matter are distinguished. In the first the non-ulmin material of the coal dust distils and the resulting oils burn on the surface of the particle; in the second a more

tardy decomp. of the ulmin material results in a similar liquation and burning of the oils. C. B. MARSON.

Effect of rate of mixing of air and fuel gas on combustion in flues and furnaces. J. W. CUTHBERTSON (J.S.C.I., 1931, 50, 451–457 r).—The rate of mixing of the gas and air is most important in determining the type of flame produced. High velocities favour rapid mixing and the flame is often short; the effect may, however, be influenced greatly by altering the relative velocities of the gas and air. Slow mixing tends to make the flame long. In this case the excess air required for combustion may be high, but it is possible to reduce this by preheating the air. With a good design of closed flue, using preheated air, it is usually possible to work with 10% excess. As the excess increases, the max. temp. attainable is reduced, more heat being carried out of the flue by the increased vol. of N_2 entering with the air. The relationship between port velocity and flame length is of a logarithmic form, but the flame length is also influenced by the manner in which the air required for combustion is admitted. The diameter of the gas and air ports has an effect on the flames. The best form of port for most purposes is a convergent cone.

Development of Dakota lignite. VI. Effects of blending and mechanical pressure on coking of lignite. A. W. GAUGER, J. R. TAYLOR, and C. W. ULMEN (Ind. Eng. Chem., 1932, 24, 36–40).—Ordinarily the distillation of lignite yields a gas rich in CO_2 , but by precarbonisation at 450° most of the CO_2 is eliminated. Mixtures of the precarbonised char, petroleum pitch, and certain bituminous coals when carbonised gave hard cokes. Mechanical pressure during carbonisation improved the hardness of the solid residue; the best coke was obtained from a carbonisation made at 600° , under a pressure of 1920 lb./sq. in. Addition of $AlCl_3 \cdot 6H_2O$ greatly aided the formation of a coke residue. C. B. MARSON.

Coke and charcoal. IV. Effect of ash on reactivity and combustibility of carbon materials. Y. OSHIMA and Y. FUKUDA (J. Fac. Eng., Tokyo, 1932, 20, 65–99).—A detailed account of work already noted (B., 1931, 870).

Determination of nitrogen in coals by Kjeldahl's method. E. BÖRNSTEIN and A. J. PETRICK (Brennstoff-Chem., 1932, 13, 41–45).—The effect of the addition of various metals and metal salts on the determination of N in three Lower Silesian coals by Kjeldahl's method has been studied. The vals. obtained were reproducible, but were all lower than those obtained by Lambris' method (B., 1927, 289, 321); the results obtained with the addition of K_2SO_4 and Hg represented only 58–67% of the total N in the coal. The best results, representing 70–80% of the total N, were obtained with the addition of Pt-asbestos, MnO_2 , and Zn dust. The ash constituents of the coal had no apparent influence on the results. The higher the temp. at which decomp. was effected, however, the greater was the loss of N. By recovering the free N_2 evolved during decomp. and adding this to the Kjeldahl result an accurate val. for the total N was obtained. A. B. MANNING.

Determination of sulphur in graphite. K. SVOBODA (Angew. Chem., 1932, 45, 49; cf. B., 1932, 51).—The author agrees that there is no advantage in using for the titration alkali more dil. than 0.005N.

H. F. GILLBE.

Conversion of methane into carbon monoxide and hydrogen. C. O. HAWK, P. L. GOLDEN, H. H. STORCH, and A. C. FIELDNER (Ind. Eng. Chem., 1932, 24, 23–27).—A cyclic process for converting CH_4 , or gases containing CH_4 , into CO and H_2 by their reaction, in the presence of catalysts, with H_2O or CO_2 is described. Using steam, an increase in the steam concn. produced increasing quantities of CO_2 without increasing the fraction of CH_4 converted. Catalysts prepared from Ni nitrate and a refractory support gave the most consistently high conversions, $Ni-Al_2O_3$ and Co catalysts being unsatisfactory. The reaction of CH_4 with CO_2 proceeds to approx. the same extent as the steam reaction at temp. between 800° and 1000° . C. B. MARSON.

Power and fuel gas from distillery wastes. C. S. BORUFF and A. M. BUSWELL (Ind. Eng. Chem., 1932, 24, 33–36).—Hot distillation wastes containing 3–4% of solids and 0.2% of org. acids may be fermented thermophilically to produce a fuel gas (CH_4 and CO_2) of calorific val. 550–580 B.Th.U./cu. ft., at a very low cost. From an average daily vol. of 1,500,000 gals. of this waste, 3600 cu. ft. of gas could be produced. A gasification of 58–72% of the org. matter is accomplished in 2–6 days. A stable, inoffensive sludge residue is formed as well as an effluent liquor which can safely be discharged into sewers. C. B. MARSON.

Apparatus for determination of undecomposed H_2O in hot producer gas, water-gas, and other gases. O. KÖNIG (Z. Oesterr. Ver. Gas- u. Wasserfach, 1931, 71, 148–149; Chem. Zentr., 1931, ii, 2247).—Most of the H_2O is condensed by cooling to below 35° , and the quantity of steam is calc. from the vol. of the H_2O . A. A. ELDRIDGE.

Peat bitumens. I. Fatty acids. E. V. RAKOVSKI and N. G. EDELSTEIN (Brennstoff-Chem., 1932, 13, 46–49).—The $EtOH-C_6H_6$ (1:1) extract of a peat bitumen contained 33% of resins, of which 54.5% consisted of crude resin acids (m.p. $145-150^\circ$). The wax fraction of the bitumen (13%) contained 57% of crude fatty acids, the residue consisting of esters and non-saponifiable substances. The crude acids were purified by fractionation under low pressure and by fractional pptn. with alcoholic $Cd(OAc)_2$ from C_6H_6-EtOH (4:1) solution. The acids $C_{26}H_{52}O_2$, $C_{27}H_{54}O_2$, and $C_{28}H_{56}O_2$ were isolated and identified. A. B. MANNING.

Catalytic reduction of tar phenols to aromatic hydrocarbons. F. FISCHER, T. BAHR, and A. J. PETRICK (Brennstoff-Chem., 1932, 13, 45–46).— $PhOH$ and its homologues have been reduced to the corresponding hydrocarbons, C_6H_6 , $PhMe$, etc., by passing the vapour mixed with H_2 over an active Mo catalyst at $350-400^\circ$. The most active catalyst was prepared by dissolving the metal in HNO_3 and igniting the oxide so obtained; mixed catalysts containing MoO_3 together with oxides of Cr, U, Zn, etc. were also effective. MoS_3 did not appear to be more active than MoO_3 . The

activity of the catalyst gradually fell, due to the deposition thereon of high-boiling by-products of the reaction, but was restored by heating in air to not too high a temp. Technical gases containing H_2 , e.g., coke-oven gas, could be used instead of pure H_2 for the reduction. Dihydroxybenzenes were reduced in stages, first to $PhOH$, then to C_6H_6 ; α - and β -naphthol gave $C_{10}H_8$. Low-temp. tar fractions containing phenols could be reduced directly to oils free from tar acids. The rate of reduction was increased by raising the pressure to 10–20 atm. A. B. MANNING.

Separation in mixtures of petroleum asphalts and coal-tar pitch. E. I. BARG (Plast. Massi, 1931, 1, 30–35).—Natural asphalt previously boiled down mixes well with coal-tar pitch in all proportions; the lower-melting varieties are less satisfactory, but the mixtures do not separate into two layers. Up to 50% of petroleum asphalt can be introduced provided the pitch and natural asphalt are previously mixed. Pitch freed from suspended C mixes with both natural and petroleum asphalt, particularly good products being obtained from high-melting asphalts. When these were used in conjunction with fillers for making pressed articles at 100–150°/250 atm. there was evidence of partial separation of the components at the surface. The mechanism of the phenomenon is discussed.

G. A. R. KON.

Separation in mixtures of petroleum asphalts and coal-tar pitch. G. D. KREUZER (Plast. Massi, 1931, 1, 36).—The results of Barg (preceding abstract) are criticised on the ground that the separation observed in the mixtures of petroleum asphalt and pitch is principally due to the poor-quality Caucasian asphalt employed; good-quality petroleum asphalt is very similar to the natural product and should not require boiling down.

G. A. R. KON.

German petroleum. G. BAUM (Brennstoff-Chem., 1932, 13, 49–53).—The oil-fields of Germany are briefly described.

A. B. MANNING.

Vertical heat exchanger for benzol distillation. O. KREBS (Chem. Fabr., 1932, 25–26, 34–35).—The stripped wash oil leaves the benzol still of a benzol-recovery plant at 140°. In an upright heat exchanger with a heat-exchange surface of 50 sq. m. per cu. m. of oil with 7 m. of pipe length it is possible to preheat the feed to 115°. The pipes should occupy half the cross-section of the vessel so that the two flows are equal. Where vac. distillation is not in use efficiency can be increased by multiple circulation, but this must be avoided where vaporisation of H_2O and C_6H_6 might already occur in the heat exchanger. Trouble with vapour formation may also arise in the simple heat exchanger. It may be remedied by giving sufficient fall to the oil-return pipe or fitting a special vapour release. The gradual thickening of wash oil with use affects the working of the heat exchanger. Instances of fracture of heat exchangers in cast Fe, due to vibration, are mentioned and calculations of dimensions and capacity given.

C. IRWIN.

Chemical utilisation of natural and refinery gases. P. K. FROLICH and P. J. WIEZEVICH (Ind. Eng. Chem., 1932, 24, 13–17).—The reactions of saturated

and unsaturated hydrocarbons, with respect to cracking, oxidation, halogenation, addition, and polymerisation, are dealt with in the light of recent data.

C. B. MARSON.

Thermatomic process for cracking of gaseous hydrocarbons. R. L. MOORE (Ind. Eng. Chem., 1932, 24, 21–23).—A description is given of the manufacture of "Thermax" C black at the Sterlington, Louisiana (U.S.A.), works of the Thermatomic Carbon Co. The properties and use of this prep. in the manufacture of rubber goods are described.

C. B. MARSON.

Reaction-velocity coefficients of oil cracking. J. C. GENESSE and R. REUTER (Ind. Eng. Chem., 1932, 24, 219–222).—When the velocity coeffs. (k sec.) for the unimol. cracking reactions of gas oil, naphtha, CH_4 , C_2H_6 , C_3H_8 , C_4H_{10} , C_2H_4 , C_3H_6 , and isobutane are plotted against the reciprocal of abs. temp., parallel straight lines are obtained and the energy of activation in each case is of the order of 53,400 g.-cal. per g.-mol.

D. K. MOORE.

Heat content of petroleum oil fractions at elevated temperatures. H. M. WEIR and G. L. EATON (Ind. Eng. Chem., 1932, 24, 211–218).—The heat contents of four petroleum oil fractions, $d^{15.5}$ 0.7459–0.9334, have been determined for temp. up to 540° and are represented in the liquid phase by $H = (15d - 26) - (0.465d - 0.811)t + 0.000290t^2$ and in the vapour phase by $H = (215 - 87d) + (0.415 - 0.104d)t + (0.000310 - 0.000078d)t^2$, in which H = total heat content in B.Th.U. above 0°, t = °F., and d = sp. gr. of the liquid at 15.5°. The equations are recommended for Midcontinent (U.S.A.) oils. The heat content of a gas oil (d 0.9639) has also been determined. The fall in temp. due to adiabatic expansion of the vapour of a naphtha ($d^{15.5}$ 0.7459) has been determined; the crit. pressure and temp. are calc. to be 515 lb./sq. in. abs. and 302°, respectively.

D. K. MOORE.

Leuna benzine and catalytic hydrogenation under pressure. M. PIER (Chem.-Ztg., 1932, 56, 2–3).—Results obtained by the I. G. Farbenindustrie A.-G. in the pressure hydrogenation of oils obtained by the carbonisation of coal, lignite, and shale are outlined.

A. R. POWELL.

[Determination of] sulphur in oils. G. C. GRISWOLD (Chemist-Analyst, 1931, 20, No. 6, 14–15).—The oil (0.686 g.), in a steel or Fe receptacle (8 c.c.) placed in a Ni crucible (90 c.c.), is mixed with 5 g. of Eschka's mixture, then with a mixture of $KClO_3$ (1 g.) and Eschka's mixture (1.5 g.), and covered with $KClO_3$ (6 g.). The crucible is placed on a hot plate and covered with a watch-glass. When condensed H_2O has evaporated a direct flame is applied to, and confined to, the bottom of the crucible. After 2 hr. the mass is cooled, extracted with H_2O (200 c.c.) and HCl (40 c.c.), the extract is filtered, and the S determined as $BaSO_4$.

CHEMICAL ABSTRACTS.

Ignition quality of fuels in compression-ignition engines. G. D. BOERLAGE and J. J. BROEZE (Engineering, 1931, 132, 603–606, 687–689, 755–756).—Ignition and ignition delay and their relation to knocking in oil engines are discussed. Tests carried out on a 20-h.p. Thomassen direct-injection engine showed that

a "knock figure" for a fuel could be obtained by measuring the compression pressure (as shown by out-of-phase indicator diagrams) when the limit of smooth running was reached by either throttling or supercharging, and dividing this by the normal compression pressure. Commercial fuels gave vals. of 0.6—1.2 and higher for this knock figure. The ignition delay (time from opening of fuel valve to rapid increase of indicated pressure) was measured by a modified out-of-phase indicator (an optical form is described). The effect of ignition delay and engine conditions on combustion is discussed on the basis of these results. It is shown that a way of arriving at the ignition rating is to compare the difference of ignition delay at two given pressures with the corresponding difference obtained with a standard fuel. Comparison of ignition quality obtained in the Thomassen engine on this basis with results of tests in other oil engines is shown to warrant the use of this ignition-delay method of rating. Admixture of coal-tar oil to a gas-oil fuel showed increased rating figures.

H. E. BLAYDEN.

Stabilising action of petrol obtained by hydrogenation [of primary coal tar]. L. JACQUÉ (Compt. rend., 1931, 193, 1185—1187).—The temp. at which separation occurs in mixtures containing (75—0.75*n*) vols. of petrol, 25 vols. of EtOH, and 0.75*n* vols. of (a) the product distilling below 200° of the hydrogenation of primary tar, and (b) benzol (85% <100%) vary linearly for heavy Grozny petrol, d^{15}_4 0.742, and EtOH (99%) from -1.5° for $n = 0$ to -15° for $n = 21$; also with EtOH (97.5%) from 15° for $n = 0$ to 0° for $n = 24$. For touring spirit (d^{15}_4 0.728) and 99% EtOH the figure is -15° for $n = 0$, but with 97.5% EtOH it is $+2.5^\circ$, falling linearly to -10° for $n = 24$ of (a), or 10 of (b). (Cf. B., 1931, 829.)

C. A. SILBERRAD.

S acids in flue gases.—See I. Oxidation of hydrocarbons catalysed by N oxides. Ketones as solvents.—See III. Corrosion in CO₂ factory.—See VII. Annealing of metals. Oil in blast-furnace gas flues.—See X. Bakelite from shale oil.—See XIII.

See also A., Mar., 232, Oxidation etc. of combustible gaseous mixtures. 235, Catalysts for production of H₂ by the water-gas reaction. 241, Analysis of mixtures of H₂, CH₄, C₂H₆, and C₃H₈. Determination of I in coal. 249, Occurrence of I in H₂O and coal. 253, Nature of humic acid in brown coal.

PATENTS.

Production of fuel etc. S. P. MILLER, Assr. to BARRETT Co. (U.S.P. 1,812,829, 30.6.31. Appl., 17.4.28).—The economic utilisation of coke-oven tar as fuel in steel plants is improved by distilling part of the tar to give a distillate suitable for creosote oil, and a pitch residue, and blending the latter while hot with the remainder of the tar. The distillation is preferably carried out continuously in a pipe still.

A. B. MANNING.

Manufacture of carbon black. G. C. LEWIS, Assr. to COLUMBIAN CARBON Co. (U.S.P. 1,810,918 and 1,811,889, [A] 23.6.31, [B] 30.6.31. Appl., [A] 14.1.28,

[B] 31.12.27).—(A) A hydrocarbon gas, e.g., natural gas, is heated to a temp. below that at which C is deposited, but sufficiently high to bring about chemical changes such as the formation of aromatic hydrocarbons, and the gas, after being cooled (but not sufficiently to condense any of its constituents) by reducing its pressure and/or by heat interchange with incoming gas, is used for the production of C black by impingement of its flame on a cool plate. (B) Increased yields of C are obtained by subjecting the flame and the cool plate to the action of ultra-violet light. A. B. MANNING.

Preparation of active, elementary carbon from substances such as carbon monoxide and carbon monoxide-containing gases. H. C. J. AARTS, Assr. to GEN. CARBONALPHA Co. (U.S.P. 1,812,230, 30.6.31. Appl., 4.5.29. Holl., 4.5.28).—The gases are passed through a reaction chamber at 300—500° wherein the CO is decomposed according to the equation $2\text{CO} \rightarrow \text{C} + \text{CO}_2$, the C produced in the reaction acting as the necessary catalyst. The reaction may be started by means of an extraneous catalyst, e.g., Fe₂O₃, which is then gradually removed with the C formed. The CO₂ may be reconverted into CO in a producer charged with suitable carbonaceous material, and recirculated.

A. B. MANNING.

Carbonaceous product. R. T. GOODWIN, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,812,589, 30.6.31. Appl., 18.2.26).—The heavy residues of hydrocarbon oil cracking are mixed while hot, e.g., at 140°, with 0.5 vol.-% of dil. H₂SO₄ or other acid. The pptd. material, which is separated by filtration, has a fusing point between 160° and 230° and is sol. to the extent of 15—30% in CS₂; it forms a suitable binder for briquetting purposes. After extraction with CS₂ it may be used in the manufacture of electrodes, or as a rubber filler, etc.

A. B. MANNING.

Production of hydrogen from hydrocarbon gases. STANDARD-I.G. Co., Assees. of (A, B) W. V. HANKS, (A) G. H. FREYERMUTH, and (B) J. K. SMALL (B.P. 366,360 and 366,369, [A] 18.4.31, [B] 24.4.31. U.S., [A] 31.5.30, [B] 15.5.30).—(A) Hydrocarbon gases of low mol. wt. are mixed with an excess of steam and passed over a Ni or other catalyst at 400—650° or above, and the mixture of H₂ and oxides of C formed is passed over a second catalyst, e.g., Fe₂O₃, at about 430°, with more steam in order to convert the CO into CO₂ (which is subsequently removed) and additional H₂. The direction of flow of the gases is reversed periodically in order to reduce deposition of C on the catalysts. (B) The mixture of hydrocarbon gases and steam is passed over the catalyst at 650—1100°, and the catalyst is reactivated periodically by passing over it a mixture of O₂ or CO₂ with steam and/or inert gases.

A. B. MANNING.

Manufacture of water-gas, and apparatus for carrying out other endothermic gas reactions at high temperatures. B. R. GOODFELLOW, F. B. GRANT, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 366,066, 20.10.30 and 8.6.31).—Water-gas is produced from finely-divided fuel and steam in a generator comprising four chambers, two of which are used only as regenerators and two only as reaction chambers; a high mean temp.

may thereby be obtained in the reaction zone without anywhere exceeding the safe temp. limit of the material used in the construction. During the "blow," the apparatus is raised to the requisite temp. by burning in it a fuel-air mixture; during the "run," steam, preheated in one regenerator, is mixed with the pulverised fuel and passed through the reaction chambers and the second regenerator in succession. The four chambers are preferably so designed as to form the quadrants of a cylindrical shell.

A. B. MANNING.

Production of a mixture of coal gas and water-gas. DESSAUER VERTIKAL-OFFEN-GES. M.B.H. (B.P. 366,414, 15.7.31. Ger., 30.7.30).—Coal gas and water-gas, the latter obtained by treatment of low-grade fuel, are produced simultaneously in separate, externally-heated, adjacent retorts, and are mixed in an externally-heated chamber at the top of the water-gas retort. The temp. of the mixing chamber is maintained between the condensing point and the cracking point of the heavy hydrocarbons in the coal gas.

A. B. MANNING.

Transformation of coke-oven gas or town gas into ammonia and methyl alcohol. SOC. DES MINES DE DOURGES (B.P. 366,268, 21.1.31. Fr., 28.2.30).— H_2 is prepared by the alternate oxidation of Fe with H_2O and reduction of the Fe_3O_4 with coke-oven gas. The H_2 from the first reaction is purified and passed to storage. The residual gas from the second reaction is transformed into a mixture of CO, N_2 , and H_2 by contact with coke at 1200° (cf. B.P. 360,750; B., 1932, 103). The mixture, after purification and adjustment to a suitable composition by the addition of H_2 or CO, is then utilised for the synthesis of MeOH. The residual gas from this operation is washed with a cuprammoniacal solution to remove CO, and with aq. NaOH to remove CO_2 , and after adjustment of its composition by the addition of H_2 or N_2 , is used for the synthesis of NH_3 . The CO absorbed in the cuprammoniacal solution is subsequently recovered.

A. B. MANNING.

Obtaining ammonia as ammonium sulphate from gases. C. STILL (B.P. 365,737, 9.12.30. Ger., 9.12.29).—Gases containing NH_3 are freed from H_2S by washing with an aq. suspension of Fe oxide compounds and then treated in an NH_3 scrubber (B) with an $(NH_4)_2SO_4$ lye which traverses a cyclic path through an acid scrubber (A), for interacting with sulphurous acid gases, and then through scrubber B for taking up the NH_3 , the lye being oxidised in a separate step between the scrubbers by air, or gases containing O_2 , under pressure, introduced below into a high, narrow column of the lye. The gases discharged from B are kept ammoniacal and washed with fresh H_2O , the liquor formed being added to the washing lye. The spent Fe oxide suspension is re-oxidised by passing air (still under pressure) from the oxidising step of the washing lye. The raw S (containing Prussian-blue) thus separated is roasted to sulphurous acid gases, which enter scrubber A. Roasting is carried out in the presence of steam in a continuously-operating furnace in such a way that the NH_3 formed from the Prussian-blue in the zones of moderate temp. does not come again in contact with zones of higher temp. Dil. H_2SO_4 is formed from the SO_2 in the roaster gases by washing with H_2O or an

aq. liquor and is used for neutralising the $(NH_4)_2SO_4$ lye to be evaporated.

F. YEATES.

Gas purification. KOPPERS Co., Assees. of (A) G. A. BRAGG, (B) A. A. KOHR (U.S.P. 1,809,818 and 1,812,099, [A] 16.6.31, [B] 30.6.31. Appl., [A] 31.12.27, [B] 13.7.25).—(A) The gas is treated with a solution, preferably of Na arsenite or thioarsenate, which absorbs the S compounds and can be reactivated by oxidation with the liberation of free S. The greater portion of the gas-purification liquid is recirculated without reactivation, whilst the remainder is withdrawn, reactivated to an extent to maintain the process in equilibrium, freed from S, and returned into circulation. (B) The gas is washed with an alkaline solution containing an Fe compound, e.g., $Fe(OH)_3$, in suspension. The spent wash liquor is passed through a reaction tank of sufficient size to permit the reaction between the Fe compound and the NaHS formed by the absorption of H_2S to proceed to completion, and thence is passed through a "thioniser" wherein the solution is regenerated by aeration. After separation of the free S the solution is heated and recirculated.

A. B. MANNING.

Methods of testing firedamp. BRIT. THOMSON-HOUSTON Co., LTD., and H. DE B. KNIGHT (B.P. 366,020, 25.10.30).—A device for indicating the presence of firedamp, of the type in which a luminous flame cap is formed when a certain proportion of firedamp is present, is provided with two electrical contacts in the space where the cap is formed; to these a potential is applied so that the lowered conductivity of the gases of the cap brings about a discharge which completes an indicating circuit.

A. B. MANNING.

Oil-fractionating apparatus. C. L. SMITH and C. B. WATSON (U.S.P. 1,811,189, 23.6.31. Appl., 28.2.28).—A fractionating tower, comprising a hollow shell with a lower inlet and an upper outlet for vapours, has a heating coil at the bottom and an upper cooling coil with a fractionating section between consisting of a series of superposed groups of nested trays arranged in relatively spaced offset order with distributing pans immediately above, each tray being formed to include a trough to receive condensate.

H. S. GARLICK.

Conversion of [petroleum] oils in vapour phase. C. R. WAGNER, Assr. to GYRO PROCESS Co. (U.S.P. 1,811,194, 23.6.31. Appl., 21.8.28).—Hydrocarbon vapours are cracked by passage at 540 – 590° through a bank of converting tubes or elements the return bends of which are elongated and situated outside the heating zone, and act as "soaking" or reaction chambers. Preferably a core of catalytic material is inserted in one or more tubes of the converter, whilst the internal diam. of the return bends may be regulated to control the velocity of flow of oil vapour therethrough.

H. S. GARLICK.

Treatment of petroleum oil. C. B. WATSON, Assr. to PURE OIL Co. (U.S.P. 1,811,195, 23.6.31. Appl., 9.2.27).—Hydrocarbon oil vapours, heated at 400 – 480° at a relatively low pressure and for insufficient time to cause cracking, are injected at high velocity into a reaction zone against a stream of superheated steam at 540 – 815° . The non-vaporised products are withdrawn from the reaction zone; the vapours are suddenly cooled

to non-converting temp. directly they leave the reaction zone, and are fractionated. H. S. GARLICK.

Apparatus for catalytically treating hydrocarbon oil. G. EGLOFF, Assr. to UNIVERSAL OIL PRODUCTS CO. (U.S.P. 1,810,648, 16.6.31. Appl., 16.8.22. Renewed 1.9.28).—A water-cooled rotating cylinder is positioned above the surface of oil undergoing distillation in the presence of AlCl_3 in a pressure still, and serves to condense the heavy oil and metallic chloride vapours, these being returned to the main body of the oil by the action of a scraper. H. S. GARLICK.

Apparatus for continuous distillation of heavy hydrocarbons. E. A. BARBET (B.P. 366,006, 13.10.30).—Hydrocarbon oil from which the lighter products have been removed is vaporised by projection through a heat-insulated injection pipe into molten metal, through which it travels at a short distance below the surface and at such speed that cracking is avoided. The unvaporised asphaltic residues are continuously removed, the whole process being conducted under reduced pressure if desired. H. S. GARLICK.

Manufacture of hydrocarbons not saturated with hydrogen and hydrogen from gas mixtures containing hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 366,102, 20.8.30. Cf. B.P. 364,106; B., 1932, 248).—The initial mixture of gaseous hydrocarbons is divided into fractions, *e.g.*, by fractionally releasing the pressure on solutions in a solvent, and the fractions are treated singly under the most appropriate conditions of temp. and pressure. H. S. GARLICK.

Manufacture of [liquid] hydrocarbons from gaseous hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 366,112, 24.10.30).—Liquid hydrocarbons are produced by charging gaseous paraffinic and/or olefinic hydrocarbons (free from C_2H_2) with catalytically acting vapours of metals having m.p. $< 500^\circ$ (except the alkali metals), at a temp. which may be above the m.p. or b.p. of the metals, but is below the conversion temp. of the hydrocarbons, and heating to $400\text{--}1100^\circ$. H. S. GARLICK.

Manufacture of high-compression automotive distillate. C. J. PRATT, Assr. to AUTOMOTIVE DISTILLATE CORP. (U.S.P. 1,810,574, 16.6.31. Appl., 14.6.28).—Cracked hydrocarbon vapours are passed through hydrocarbon oil to bring about a preliminary cracking thereof at about atm. pressure. The liquid residuum is removed, and the mixed vapours are partly condensed to form recycling hydrocarbons which are separately removed, cooled by indirect heat exchange, and collected; quantities are withdrawn from this bulk supply, preheated, and substantially completely cracked in the vapour phase at $> 676^\circ$ with no superimposed pressure. The hot, cracked vapours are brought into contact with the original preheated hydrocarbon oil. The light hydrocarbon vapours are condensed. H. S. GARLICK.

Refining of oils. A. R. MOORMAN and I. C. CARPENTER, Assrs. to CONTACT FILTRATION CO. (U.S.P. 1,809,862, 16.6.31. Appl., 4.1.29).—An acid-treated oil is heated with a comminuted solid absorbent previously used for decolorising neutralised oil, separated there-

from, and heated to $> 100^\circ$ with fresh absorbent to effect decolorisation. H. S. GARLICK.

Gas offtakes used in carbonising plants. WOODALL-DUCKHAM (1920) LTD., and A. MCD. DUCKHAM (B.P. 367,508, 1.1.31).

Dewatering towers. Removing S etc. from gases. Re-activation of adsorbent clay.—See I. Separation of oxygenated products from hydrocarbons. Esters from olefines.—See III. Revivifying $\text{K}_4\text{Fe}(\text{CN})_6$. H_2 [from steam and CO]. Material for desulphurising gases.—See VII. Acid-proof masonry. Road-making materials. Asphaltic material.—See IX. Protected metal article.—See X.

III.—ORGANIC INTERMEDIATES.

Partial oxidation of hydrocarbons catalysed by oxides of nitrogen. C. H. BIBB (Ind. Eng. Chem., 1932, 24, 10—12).—The proportions of hydrocarbons, air, and nitric oxides, the temp., the gas velocity through the reaction zone or the time of heating, the form of reaction chamber, and the nature of the hydrocarbon all have pronounced effects on the result obtained. Using natural gas and the first unit only of a battery of 4 furnaces, condensers, and scrubbers, 1 lb. of NO_2 gave 5.9 lb. of 40% CH_2O ; using all four units, 7.42 lb. were obtained. C_3H_8 , using 1 unit only, yielded 12.07 lb. By recycling through 1 unit the high yield of 50 lb. of 40% CH_2O per 1000 cu. ft. of natural gas was obtained. C. B. MARSON.

Dehydration of ethyl alcohol. K. R. DIETRICH (Angew. Chem., 1932, 45, 233—238).—A review of some recently proposed methods.

Determination of *o*-cresol in cresylic acid. F. M. POTTER and H. B. WILLIAMS (J.S.C.I., 1932, 51, 59—60 r).—The method is based on the property of pure *o*-cresol of forming a cryst. compound of definite m.p. with cineole. Cresylic acid and cineole are mixed in mol. proportions, and the crystallising point of the mixture is determined. The *o*-cresol content is read from a curve prepared from data obtained by using pure *o*-cresol (crystallising point 30.95°) and cineole (b.p. $175.5\text{--}177.4^\circ$, crystallising point 1.0°). Exact details of the method and apparatus for determining the crystallising point are given; precautions are necessary to ensure absence of H_2O . Results are accurate to within 0.5%, and the method is most satisfactory for samples containing over 30% of *o*-cresol.

Mustard gas manufacture. K. B. QUINAN (Ind. Chem., 1931, 7, 474—476, 491—494; 1932, 8, 30—32, 70—73).—A first publication of the author's notes for the layout of the Avonmouth factory in 1918. "Mustard gas" ($\text{C}_2\text{H}_4\text{Cl}_2\text{S}$) is produced by the interaction of C_2H_4 and S_2Cl_2 . It was proposed to construct an experimental plant of capacity 1 ton per day as pilot for a 400-tons-per-week factory. The crux of the problem was the manufacture of C_2H_4 free from H_2O and EtOH . It may be prepared by the reaction $\text{EtOH} = \text{C}_2\text{H}_4 + \text{H}_2\text{O} - 19,700 \text{ C.H.U.}$ in presence of either kaolin or H_3PO_4 as catalyst. The successful operation of this reaction is a problem of heat transfer, and for this reason a furnace in which a current of EtOH vapour was passed

through a layer of H_3PO_4 7—8 in. deep in a vessel of cast Fe heated by gas or coke was designed. The author then tabulates the plant components for the large-scale factory and calculates the raw material requirements and necessary storages. The C_2H_4 section was to be arranged in five units. The steam required for the vaporisers is calc., as also is the amount of surface necessary in a tubular heater. The superheaters are for use in raising the temp. of the EtOH vapour to 300° by means of the waste furnace gases from the generators, the dimensions of which are worked out. For the generators a set of cast-Fe pots containing H_3PO_4 was chosen; the dimensions are worked out by the use of small-scale experience. Dimensions of outlet connexions and condensers are calc. The latter were to be multitubular for perfect condensation, and space was left in front of the generators for addition of kaolin converters, if necessary. The condensate was to be collected and rectified. The gases then passed through H_2SO_4 scrubbers and spray catchers to a gas-holder. Beyond this the C_2H_4 blower was located. The $(\text{C}_2\text{H}_4\text{Cl})_2\text{S}$ reaction vessels were made by Pb-lining six sulphonators and fitting coils and stirrers, calculations for which are given. It was calc. that one week was necessary to allow complete deposition of S from the hot, crude reaction product. For this boilers were provided, and as the S accumulated it was to be freed from $(\text{C}_2\text{H}_4\text{Cl})_2\text{S}$ by adding NaOH, heating with steam, and washing out to a pit. The settled product was to be filtered from any remaining S and diluted with a 1:3 mixture of CCl_4 and PhCl, to bring it to $d^{15}_{20} 1.34$. A complete fume system and other safety precautions are considered.

C. IRWIN.

Examination of amyl nitrite. J. C. KRANTZ, JUN., and C. J. CARR (Pharm. Weekblad, 1932, 69, 101—105).—The measurement of the vol. of N_2 liberated by reduction with HI affords a fairly accurate method of analysis if allowance is made for the v.p. of the mixture after reaction (± 50 mm./ 25°). The argentometric method is quicker but less accurate, since chlorides may be formed by interaction of the conc. HNO_3 and KClO_3 used.

S. I. LEVY.

Preparation of retene from rosin oil by dehydrogenation with sulphur and related substances. W. NAGEL and M. KÖRNCHEN (Chem. Umschau, 1932, 39, 1—6).—The reaction has been studied under standardised experimental conditions, the retene being separated from the products by pptn. as picrate and recryst. Optimal conditions must be selected so that cracking and decomp. of the nascent retene are minimised. S is the most active dehydrogenator (optimum temp. 180 — 205° ; 6—8 hr.), but a higher yield and purer product are obtained by the use of Se, as the contemporaneous secondary decomp. is much slower and the optimal limits of temp. (280 — 305°) and time of reaction (12 hr.) are consequently less sharply defined. Te dehydrogenates too slowly to be of practical value. Fresh rosin oil gives a better yield than old; the unpurified fraction, b.p. 320 — $345^\circ/760$ mm., is the richest in retene-forming components, which appear to be chiefly of an acidic nature, although retene can be prepared from deacidified rosin oil. E. LEWKOWITSCH.

Aliphatic ketones as solvents. J. G. PARK and H. E. HOFMANN (Ind. Eng. Chem., 1932, 24, 132—134).—The solubility of nitrocellulose, of oils, and of resins in the lower aliphatic ketones has been determined together with the viscosities of the solutions and their evaporation rates. COMeEt is recommended as a substitute for EtOAc in nitrocellulose lacquers and as a solvent in cellulose acetate compositions. COMeBu is recommended as a substitute for BuOAc in nitrocellulose lacquers together with COMePr and Me amyl ketone when other evaporation rates are needed. They have good blush-resistance, are compatible with all resins, and are stable to light, heat, and moisture.

C. IRWIN.

Evaporation rates of organic liquids. H. E. HOFMANN (Ind. Eng. Chem., 1932, 24, 135—140).—Methods of determining evaporation rates are discussed and published results compared. The author uses dry air passed vertically into a short-necked, round-bottomed flask containing the liquid, the whole being maintained at 25° . The time for complete evaporation was noted. Results are comparative if the same vol. of liquid is used in each case. The rate may be approx. predicted by the formula $(\text{v.p.} \times \text{mol. wt.})/11$, from which the rate for BuⁿOAc is 100 (at 20°). Compounds which form const.-boiling mixtures form const.-evaporating mixtures, but the composition of the mixtures is not the same. Many new mixtures discovered by the author are tabulated. Two "apparent const.-evaporating" ternary mixtures are also given.

C. IRWIN.

Heat-transfer of glycerol. X-Rays in research.—See I. Reducing tar phenols to hydrocarbons. Utilising natural gas etc.—See II. Lower fatty acids in wines. Rubber hose for AcOH manufacture.—See XVIII. Trigonelline from coffee.—See XIX.

See also A., Mar., 232, MeOH and CH_2O from CH_4 . 235, Catalytic oxidation of PhMe. Formation of COMe₂ from AcOH. 236, Alkylation of amines. 240, Magneto-optical method of analysis. 261, Prep. of trimethylnaphthalenes. Electrochemical nitration of C_{10}H_8 . 263, Salts of phenylenediamines with org. acids. Aliphatic diazo compounds. 264, Azo dyes and intermediates. 266, Fluoran derivatives. 270, Synthesis of 3:4-dihydroxynaphthalic acid. 273, Synthesis of trichloroantraquinones. 280, Synthesis of thionaphthindoles. 281, Prep. of quinolinic acid. 284, Prep. of phthalazine etc. Dehydrogenation of pyridine by anhyd. FeCl_3 . Tetrapyrrolethanes etc. 305—6, Acetoacetic acid transformation and β -hydroxybutyric acid formation by yeast.

PATENTS.

Production of acetylene and vinyl chloride from ethylene dichloride. J. P. BAXTER, W. A. M. EDWARDS, R. M. WINTER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 363,009, 19.9.30).— $\text{C}_2\text{H}_4\text{Cl}_2$ above 800° , preferably at 800 — 1000° in presence of diluent gas (HCl , steam, N_2 , CO_2), gives according to conditions C_2H_2 and/or vinyl chloride. Short heating (0.8—2 sec.) favours production of vinyl chloride, longer heating (2—6 sec.) and higher temp. C_2H_2 . C. HOLLINS.

Separation of products containing oxygen from hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 366,025, 27.10.30).—The products of the destructive oxidation of non-aromatic hydrocarbons, or those of the hydrogenation of vegetable or animal oils, waxes, or polyhydric alcohols, are dissolved out from mixtures thereof with non-aromatic hydrocarbons (C_8 or above) by treatment with liquid SO_2 at 25–60°, preferably in the absence of substantial quantities of H_2O . C. HOLLINS.

Production of esters from olefines. STANDARD OIL DEVELOPMENT CO., ASSEES. of P. K. FROLICH and P. L. YOUNG (B.P. 362,215, 20.1.31. U.S., 21.1.30).—Olefine and anhyd. acid are maintained in prolonged contact at raised temp., preferably by passing them in countercurrent through a packed tower fed with H_2SO_4 , H_2SO_4 and ester being continuously withdrawn and ester separated by extraction with low-boiling solvent. Butylene and AcOH at 75°/10 atm. give BuOAc. C. HOLLINS.

Manufacture of ethers [from alkyl hydrogen sulphates] and apparatus therefor. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 362,593, 13.10.30).—The residual mixture of alkyl H sulphate, H_2SO_4 , alcohol, and H_2O obtained in the conversion of the first-named into ethers is fractionated, and the vapours, freed from H_2O in a separate column, are made to react with fresh alkyl H sulphate above 100° to produce a further yield of ether. Apparatus is claimed. C. HOLLINS.

Manufacture of condensation products of aldehydes and catalysts therefor. BRIT. INDUSTRIAL SOLVENTS, LTD. From DEUTS. GOLD- U. SILBERSCHNEIDANSTALT, VORM. ROESSLER (B.P. 362,458, 4.9.30).—Al alkoxides are used to initiate and catalyse their production from Al and alcohols; e.g., 1 kg. of sheet Al is dissolved in 11 litres of hot BuOH in 2 hr. in presence of 0.5–0.7 kg. of $Al(OBu)_3$. The product is used to convert MeCHO into EtOAc and BuOAc. C. HOLLINS.

Manufacture of oxidation products of trichloroethylene. CONSORT. F. ELEKTROCHEM. IND. G.M.B.H. (B.P. 363,099, 20.11.30. Ger., 7.12.29).— C_2HCl_3 is oxidised by O_2 at raised temp. to an oxide, which is converted into dichloroacetyl chloride by heat alone (at 200°) or by treatment with *sec.* or *tert.* bases, and into a mixture of dichloroacetyl chloride and chloral by treatment with anhyd. metal chlorides, e.g., $AlCl_3$, $SbCl_3$, $SbCl_5$, $FeCl_3$, or $TiCl_4$. C. HOLLINS.

Manufacture of acetic anhydride. C. F. BOEHRINGER & SÖHNE G.M.B.H. (B.P. 362,462, 6.6.30. Ger., 6.6.29).—In the conversion of AcOH into Ac_2O a SiO_2 or Al_2O_3 gel of incomplete surface development, especially a gel treated with aq. NH_3 or HCl or C, is used as carrier, preferably with a Pt catalyst. C. HOLLINS.

Manufacture of a substitute for amyl alcohol. USINES DE MELLE, formerly SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES (B.P. 362,204, 7.1.31. Fr., 7.1.30).—Mesityl oxide is hydrogenated, e.g., in presence of Ni on asbestos at 120° at ordinary pressure, to COMeBu^s, b.p. 114–116°, and methylisobutylcarbinol, b.p. 130–132°. C. HOLLINS.

Hydrogenation of mesityl oxide. BRIT. INDUSTRIAL SOLVENTS, LTD. From DEUTS. GOLD- U. SILBERSCHNEIDANSTALT, VORM. ROESSLER (B.P. 362,457, 4.9.30).—Mesityl oxide is reduced by H_2 and Ni almost quantitatively to COMeBu^s at 140°/8–10 atm. or to the carbinol at 180–190°/29–30 atm. C. HOLLINS.

Manufacture of agents for wetting, dispersing, or emulsifying. O. L. BEER (B.P. 362,016, 10.9.30. Ger., 24.6.30).—A chlorinated polynuclear hydrocarbon, especially $C_{10}H_8$ or its alkyl derivatives, is condensed with < 10% of CH_2O in H_2SO_4 below sulphonation temp.; active C may be present. Sol. resinous wetting agents, unaffected by acids, alkalis, or hard H_2O , are thus obtained from chlorinated anthracene, 1-chloronaphthalene, and 1-chloromethylnaphthalenes. C. HOLLINS.

Production of esters [wetting, cleansing, and dispersing agents]. H. T. BÖHME A.-G. (B.P. 362,195, 1.1.31. Ger., 10.2.30).—Di- and poly-basic higher fatty esters are sulphonated, or the acids are esterified and sulphonated. The Bu^c ester of the dibasic hydroxy-acid $C_{19}H_{36}O_5$ (from the cyanohydrin of ricinoleic acid) gives on sulphonation below 15° a wetting agent. C. HOLLINS.

Manufacture of chlorobenzene. DR. F. RASCHIG GES.M.B.H. (B.P. 362,817, 13.4.31. Ger., 12.4.30).—A mixture of C_6H_6 vapour, HCl, and O_2 , with or without steam or other diluent, is led over a Cu catalyst containing one or more metals of groups III–VIII, below 300°, e.g., at 180–200°. Suitable catalysts are: SiO_2 gel, $CuCl_2$, and $CoCl_2$; kieselguhr, $CuCl_2$, and $NiCl_2$; active C, $CuCl_2$, and $MnCl_2$; $Al(OH)_3$, $CuCl_2$, and CCl_4 . C. HOLLINS.

Manufacture of readily soluble non-dyeing thio-derivatives of phenols. I. G. FARBENIND. A.-G. (B.P. 362,501, 5.9.30. Ger., 6.9.29).—A N-free phenol, e.g., PhOH, *p*-cresol, *o*-chlorophenol, is heated with S and enough aq. Na_2CO_3 to produce a H_2O -sol. product. C. HOLLINS.

Manufacture of derivatives of 1 : 4 : 5 : 8-naphthalenetetracarboxylic acid. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 362,906, 8.9.30).—A 1 : 4- or 1 : 5-dihalogenonaphthalene-5 : 8- or -4 : 8-dicarboxylic acid or its dinitrile is heated with KCN and $Cu_2(CN)_2$ or other metal cyanide in a diluent (H_2O , pyridine, quinoline) to give 1 : 4 : 5 : 8-naphthalenetetracarboxyldi-imide. The 1 : 4-dichloro-5 : 8-dicarboxylic acid, m.p. > 360°, is obtained from the dinitrile, m.p. 267°; 1 : 5 : 4 : 8-isomeride, m.p. > 330°, by oxidation of 1 : 5-dichloro-4 : 8-di(chloroacetyl)naphthalene, m.p. 245°. C. HOLLINS.

Manufacture of 1 : 4 : 5 : 8-naphthalenetetracarboxylic acid and derivatives thereof. I. G. FARBENIND. A.-G. (B.P. 363,044, 17.10.30. Ger., 17.10.29).—The products of B.P. 359,201 (B., 1932, 174) are oxidised, e.g., with CrO_3 , HNO_3 , acid $KMnO_4$, or MnO_2 . C. HOLLINS.

Manufacture of intermediates for [ice colour] dyes. IMPERIAL CHEM. INDUSTRIES, LTD. From E. I. DU PONT DE NEMOURS & Co. (B.P. 362,027, 12.9.30).—An *o*-, *m*-, or *p*-nitrobenzoic anilide, alkoxy- or halogenated anilide, or toluidide, xylylide, etc. is reduced, and condensed with 2 : 3-hydroxynaphthoic acid, e.g., in

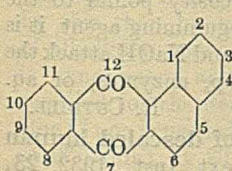
presence of PCl_3 and PhMe , to give coupling compounds having pronounced affinity for cotton. The example is *p*-2:3-hydroxynaphthamidobenzanilide, m.p. 291–292°.

C. HOLLINS.

Manufacture of condensation products of the benzanthrone series and [vat] dyes therefrom. I. G. FARBENIND. A.-G. (B.P. 362,696, 22.12.30. Addn. to B.P. 308,651; B., 1930, 502).—A benzanthrone-3:4-dicarboxylic anhydride is condensed with an *o*-diamine in a diluent (H_2O , EtOH , PhNO_2) below 80° to give an alkali-insol. *o*-aminoarylimide, convertible into the dyes of the prior patent by heating alone or in a solvent. Products from benzanthrone-3:4-dicarboxylic anhydride and *o*-phenylene-, 2:3-tolylene-, 4-chloro-*o*-phenylene-, 2-chloro-4:5-tolylene-, 4-ethoxyphenylene-, and 1:2-naphthylene-diamines, from 10:11-benzbenzanthrone-3:4-dicarboxylic anhydride and *o*-phenylenediamine, and from chlorobenzanthrone-3:4-dicarboxylic anhydride and *o*-phenylenediamine, are described.

C. HOLLINS.

Manufacture of intermediate products and [vat] dyes of the 1:2-benzanthraquinone series. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 362,482, 28.8.30).—A 1:2-benzanthraquinone is chlorinated in an org. solvent in absence of inorg. acid agents, and HCl is removed from the resulting additive compounds,



e.g., by heating alone, or with pyridine or AlCl_3 or in PhNO_2 , or by powdered KOH at 15°. Products from 1:2-benzanthraquinone (annexed formula) and its 5-Cl-, 5-OMe-, and 3-Cl- or 3-Br-derivatives are described. The

two last-mentioned give trichlorobenzanthraquinone (yellow vat dye).

C. HOLLINS.

Manufacture of derivatives of the 1:2-benzanthraquinone series. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 362,965, 8.9.30).—A 2-halogeno-1:2-benzanthraquinone is chlorinated or brominated in presence of inorg. acid agents (H_2SO_4 , ClSO_3H , AlCl_3) and, if desired, catalysts (Fe salts, I, S, *tert*-bases). Further halogen may be introduced, and the products may be converted by heating with Cu or Hg into halogenated dibenzanthraquinonyls, which yield violet-blue vat dyes by treatment with AlCl_3 etc. 20 examples are given.

C. HOLLINS.

Manufacture of [aminoarylamino]anthraquinone derivatives. IMPERIAL CHEM. INDUSTRIES, LTD., R. F. THOMSON, and W. W. TATUM (B.P. 362,441, 28.7.30).—A halogenated acylamino- or acylalkylaminoanthraquinone is condensed with an arylenediamine. Excess of diamine may be used, or the reaction may be conducted in an org. liquid, *e.g.*, pyridine. The acyl group may subsequently be removed.

C. HOLLINS.

MeOH from gas.—See II. **Wetting etc. agents.**—See VI.

IV.—DYESTUFFS.

See A., Mar., 263, **Prep. of optically active dyes.** 264, ***o*-Bisazo- and *pert*-bisazo dyes.** Action of salts of H_2SO_3 on aromatic NH_2 - and OH -compounds. 280, **Application of calorimetry to pyrrole dyes.** 282, **Cyanine dyes and related compounds.** 284,

Prep. of dyes from phthalazine etc. Dyes from dehydrogenation of pyridine by anhyd. FeCl_3 . 285, **Tetrapyrrolethanes etc. and dyes therefrom.** 286, **Acenaphthenequinone series.**

PATENTS.

Preparation of blue and blue-violet sulphurised dyes. CHEM. FABR. VORM. SANDOZ (B.P. 362,267, 6.3.31. Ger., 8.3.30).—Indophenols or leuco-indophenols are thionated in presence of aromatic nitrosulphonic acids free from OH and NH_2 groups, *e.g.*, *m*-nitrobenzenesulphonic or 1-chloro-4-nitrobenzene-2-sulphonic acid. Purer shades and absence of resin formation result.

C. HOLLINS.

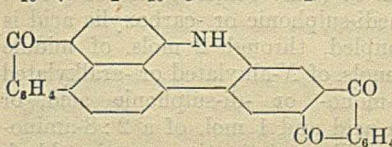
Manufacture of colouring preparations and their application. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 362,061, 24.9.30).—Morpholine or an *N*-alkyl-, -aryl, or -alicycyl derivative is added to dyes or dye preps. to improve the levelling power and depth of shade, *e.g.*, of Wool-fast-yellow, Anthraquinone-blue SR extra, Supramine-red B, Naphthylamine-black 10B, Indanthrene-violet R extra, or indanthrone. Suitable addenda are morpholine and *N*- β -hydroxyethyl-, *N*-phenyl-, and *N*-cyclohexyl-morpholines. Silk-dyeing is excluded.

C. HOLLINS.

Manufacture of anthraquinone derivatives [acid wool dyes]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 363,027, 8.10.30).—The Cl atoms in 2:3-dichloro-1:4-diaminoanthraquinones are replaced successively or in one operation by an aryloxy- and a sulphyloxy-group. The phenoxy- and *m*-toloxy-compounds are blue-violet wool dyes.

C. HOLLINS.

Manufacture of vat dyes of the benzanthrone series. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 362,449, 2.9.30).—1-(3'-Nitro-4'-benzanthrone-1'-amino)anthraquinone, which may be produced *in situ*, is converted by heat, preferably in a solvent (PhNO_2 , $\text{C}_{10}\text{H}_7\text{NO}_2$, C_{10}H_8 , or COPh_2), into a vat dye of annexed



formula. Vat dyes are similarly obtained from the 6- NH_2 - (grey-blue), 10'-Cl- (dark green), 6-benz-

amido- (olive-green), and 9'-chloro-6-amino- (grey-blue) derivatives.

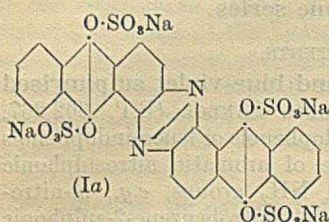
C. HOLLINS.

Manufacture of nitrogenous vat dyes [from benzanthrone-1-aminoanthraquinones]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 362,432, 2.9.30. Addn. to B.P. 358,074; B., 1932, 175).—The dyes of the parent patent are made by introducing the aryl group after the alkaline condensation. Thus the product made by heating 5-amino-1-(3'-benzanthrone-1'-amino)anthraquinone with EtOH-KOH is condensed with *vic*-tetrabromobenzene (grey-blue), 1-chloro-2:4-dinitrobenzene (olive-grey), 1- or 2-chloroanthraquinone, bromo-1:2-benzanthraquinone (grey), trichloroanthraquinoneacridone (grey to black), or 1:5-dichloroanthraquinone (grey to black).

C. HOLLINS.

Dyes and dyeing [enolic sulphuric esters from indanthrones]. D. A. W. FAIRWEATHER, J. THOMAS, and SCOTTISH DYES, LTD. (B.P. 359,889, 17.4.30, 13.6.30,

and 10.2.31).—Various azine ("a") and hydroazine ("h") sulphuric esters of the leucoindanthrone series are described. The azine tetra-ester (Ia) is converted by



mild reduction (alkaline hyposulphite at 40°) into its *NN'*-dihydro-compound (Ih) which reverts to (Ia) in air. Further reduction replaces one sulphato-group successively by OH (IIh) and H (IIIh) and finally a second sulphato-group by H, yielding a dianthranol-hydroazine di-ester (IVh). Corresponding azine esters are obtained: (IIa) by treatment of (Ia) with AcOH, or by air-oxidation of (IIh), or by autoreduction of (Ia) by keeping; (IIIa) by air-oxidation of (IIIh). Any of these azine esters may be oxidised to an anthraquinone-anthrahydroquinoneazine di-ester (Va). The dianthranolazine di-ester (IVa) is obtainable from (Ia) by the action of conc. aq. alkali, but OH is apparently introduced at the same time. The di-esters (IVa) and (Va) are remarkable in that they are developed on the fibre by cold dil. acid alone; the others require the presence of an oxidant. Substituted derivatives are mentioned.

C. HOLLINS.

Manufacture of azo dyes [ice colours and pigments]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 362,987, 12.9.30).—A 2:3-hydroxynaphthoic arylamide is coupled in substance or on the fibre with a diazotised aminoalkoxycarbazole, obtainable by nitration (in Ac₂O) and reduction of a 2-alkoxycarbazole. These amines diazotise without formation of a NO-compound. Examples are amino-2-methoxycarbazole → anilide (blue); amino-2-ethoxy-*N*-methylcarbazole → β-naphthylamide (black-blue).

C. HOLLINS.

Manufacture of azo dyes [for printing on silk]. I. G. FARBENIND. A.-G. (B.P. 362,513, 6.9.30. Ger., 7.9.29).—A benzidine-sulphonic or -carboxylic acid is tetrazotised and coupled, through 2 mols. of middle components, with 2 mols. of *N*-alkylated or -aralkylated 2:8-aminonaphthol-mono- or -di-sulphonic acid, or with 1 mol. of such acid and 1 mol. of a 2:8-aminonaphtholdisulphonic acid or derivative, to give black printing colours for silk. Examples are: benzidine-2:2'-disulphonic acid → 2 mols. of cresidine → K-acid and *N*-butyl-γ-acid, or K-acid and *N*-β-hydroxyethyl-γ-acid, or 2 mols. of *N*-β-aminoethyl-K-acid.

C. HOLLINS.

Benzanthrone dyes. Benzanthraquinone derivatives and dyes. Aminoarylaminoanthraquinone derivatives. Intermediates for ice colours.—See III. Diazo-types.—See XXI.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Linen cooking liquors. M. M. TSCHILIKIN (Cellulosechem., 1932, 13, 36—38).—Pectin material from flax causes no trouble in the purification and bleaching of this fibre since it is decomposed in the NaOH cooking liquor, and on acidifying the latter only small amounts of pentosan and methylpentosan are found. Na₂CO₃ liquor is more highly coloured than the NaOH liquor

and contains unchanged carbohydrate capable of reducing Fehling's solution. These liquors have important emulsifying powers, so that waxy materials are removed by them. The greater part of the ppt. obtained on acidifying the liquor consists not of pectin material, but of unknown and insol. substances containing N which yield NH₂-acids similar to those obtainable from cotton scouring liquors. The ppts. from the NaOH and Na₂CO₃ liquors contain, respectively, 7.45% and 12.6% of material extractable with C₆H₆ and Et₂O, and about 19.5% extractable with EtOH, whilst the readily sol. portion from the liquors contains salts of the lower fatty acids.

B. P. RIDGE.

Wild silks. I. Isoelectric point of wild-silk fibroin. S. BITO (Bull. Sericulture, Japan, 1931, 4, No. 2, 2—3).—The isoelectric points of dialysed dispersions of degummed tussah and kuriwata silk in aq. Ca(CNS)₂ were found nephelometrically to be at *pH* 2.79 and 2.85, respectively.

R. CUTHILL.

Relation between viscosity of a fibroin sol and changes in the colloidal state of the fibroin in boiling off. R. INOUE and K. KITAZAWA (Bull. Sericulture, Japan, 1931, 4, No. 2, 7—9).—The viscosity of dispersions in Loewe's reagent of fibroin prepared by degumming cocoon silk by various methods has been determined. Assuming that a low viscosity points to the fibre having been injured by the degumming agent, it is concluded that aq. Na₂CO₃, H₂SO₄, and NaOH attack the fibre, whilst degumming with soap, enzymes, or aq. NH₃ has no ill effects.

R. CUTHILL.

Sulphur content and regain of descaled human hair. N. H. CHAMBERLAIN (J. Text. Inst., 1932, 23, 13—16 T).—The regain (at 22.2° and 63% R.H.) and the S content of human hair are not affected by descaling the material.

B. P. RIDGE.

Breaking strength and extensibility of artificial silk. Y. KAMI (Bull. Sericulture, Japan, 1931, 4, No. 2, 9—10).—The breaking strength of an artificial silk yarn is less than the sum of the strengths of the constituent filaments, and, like the extensibility, which is greater than that of a single filament, decreases as the amount of twist increases. With increasing humidity the strength rises to a max. and then falls again, whereas the extensibility increases continuously.

R. CUTHILL.

Saccharification of wood. H. A. AUDEN and W. P. JOSHUA (J.S.C.I., 1932, 51, 11—16 T).—A brief summary is given of the attempts to produce EtOH from wood and the fundamental investigations relating to the conditions of hydrolysis of such cellulosic material. The disadvantages of the previous methods, due either to the comparatively large quantities of acid used, or the prohibitive cost of recovering in a form suitable for re-use in the process, are pointed out as well as the mechanical difficulties in plant design. An important feature of the process described is that the temp. necessary for the saccharification is achieved solely by preheating the hydrolysing liquid, and the saccharification is thus independent of external heating. The hydrolysing agent used is H₂O containing 0.1—0.2% of H₂SO₄, and the saccharification takes place at about 175° at a pressure exceeding the v.p. of the percolating liquid. A description of a plant is given, whereby

yields of the order of 35–40 gals. of EtOH per 1000 kg. of dry wood are obtained, the actual conversion into sugars being 45–50%, or, expressed as fermentable sugars, 30–35%.

Soda- and sulphate-digestion of wood. E. HÄGGLUND and R. HEDLUND (Papier-Fabr., 1932, 30, 49–53, 61–65).—Experimental small-scale digestions of wood with NaOH and Na₂S, which have been carried out in specially designed, oil-heated, rotating autoclaves, are described. Yield of pulp is not influenced by Na₂S content of liquor or by temp. between 150° and 170°, nor is lignin content appreciably different over this range of temp. Better removal of lignin is found to result from increasing Na₂S content of liquor, up to 16% of total alkali content, above which concn. no advantage accrues. Several curves illustrating the effect of varying digestion conditions are given.

T. T. POTTS.

Determining the degree of decomposition of unbleached sulphite pulp by means of chlorine water. H. OKADA (Cellulosechem., 1932, 13, 33–35).—A sample of the pulp suspended in H₂O is treated with a known wt. of aq. Cl₂ for 1 hr. at 0° and the Cl₂ consumption (g. of Cl₂ per 100 g. of pulp) is determined by titration of the liquid with 0.1N-Na₂S₂O₃. The apparatus required is simple and greater accuracy is obtainable by this than by many other methods. Rigid control of alkalinity, concn. of pulp, amount of Cl₂, temp., etc. is unnecessary and no special apparatus, such as is required for the determination of the Sieber no. or the Roe Cl no., is needed. The reaction is complete in 30 min. at 0°, whilst at 20° the consumption of Cl₂ is greater, but under these conditions attack of the cellulose probably occurs, as indicated by viscosity vals.

B. P. RIDGE.

Theories of [paper] sizing in the light of the "Bewoid" process. B. WIEGER (Zellstoff u. Papier, 1932, 12, 15–18).—The membrane, electric-charge, and drying process theories of sizing are criticised. Examination of the "Bewoid" (B. Wieger-dispersoid) process, however, sheds further light on the sizing problem. Here the particles are uniform spheres 0.5–2 μ in size and form a dispersoid intermediate between a colloid and a suspension. They are unchanged by coagulation and show no gel formation and therefore cannot form a membrane round the fibres. A theory of mordanting by the Al has also been suggested, but the author considers that Na takes part in a mordanting action, that part of the resin is present as Al resinate, and that the dispersion consists of a solid solution of Na resinate in resin. The surface of the size particle therefore contains Na, and this is exchanged for Al from the adjacent Al(OH)₃ gel, thereby producing a strong mordant action and fixing the size on to the fibres which are already coated with the Al(OH)₃ gel. If this Na is absent, even excess of alum causes no sizing.

B. P. RIDGE.

Staining method for microscopical determination of mechanical-wood content of paper. B. SCHULZE (Papier-Fabr., 1932, 30, 65–66).—The staining solution comprises a 1 : 1 : 1 mixture (by vol.) of 6% aq. Na₂SO₄ and 1 : 70 aq. solutions of Brilliant Congo Blue

2 R.W. and Cotton Brown N. A small portion of paper is boiled in this solution for 30 sec. and washed. The fibres are teased and mounted in tap-H₂O, the H₂O is removed, the slide dried at 60°, and a permanent mount in Canada balsam is made. Chemical wood fibres are stained blue to violet, mechanical wood chestnut-brown. The permanence of the prep. facilitates comparison with standards.

T. T. POTTS.

Grey mould. A micro-study. J. SCOTT (Food Tech., 1932, 1, 225–226).—A description is given of *Ascopthora Mucedo*, closely related to the *Mucors*, which produces spoilage in permeable paper wrappings used for foodstuffs.

E. B. HUGHES.

Stapling of cottons. Laboratory methods in use at the Shirley Institute, 1931. G. G. CLEGG (J. Text. Inst., 1932, 23, 35–54 T).

See also A., Mar., 272, Ultra-violet absorption of lignin.

PATENTS.

Manufacture of gas-cell fabric. GOODYEAR TIRE & RUBBER Co., Assees. of W. C. CALVERT (B.P. 365,350, 6.2.31. U.S., 8.4.30).—A light fabric base is coated on both sides with a self-curing rubber cement, followed by a number of coats of a mixture of rubber latex with aq. gelatin and polyglycerol, the proportion of gelatin and polyglycerol being increased in each successive coat; a layer of pure rubber latex is then applied to the fabric, and when dry the whole is varnished or coated with paraffin.

F. R. ENNOS.

Manufacture of cellulose acetate. H. BLEASDALE, and APEX (BRITISH) ARTIFICIAL SILK, LTD. (B.P. 365,710, 25.11.30).—Ripened acetylation liquors, after treatment with excess of solid NaOAc to neutralise the acid catalyst (H₂SO₄), are distilled under high vac. at 70° while maintained in agitation, in order to remove and recover AcOH. The hot distillation residue is treated with sufficient aq. pptg. agent (H₂O) nearly to initiate pptn. of the ester, and this prediluted residue is shaped and pptd. by immersion in excess of H₂O or dil. AcOH.

F. R. ENNOS.

Preparation of nitrocellulose and nitrocellulose products. B. LANGE (B.P. 365,611, 14.8.30. Ger., 24.1.30).—In the nitration of cellulose, dehydration of nitrocellulose by treatment with H₂O-displacing liquids, and surface-treatment of nitrocellulose ammunition powders with solutions of camphor, Centralite, etc. in volatile media, the material, e.g., cellulose, is treated with the appropriate liquid, e.g., nitrating acid, in a centrifuge the drum of which rotates at relatively high speed and from which the treating liquid, after reacting with the material, is continuously removed and re-introduced into the centrifuge for use again.

F. R. ENNOS.

Production of artificial silk from viscose. ALGEM. KUNSTZIJDE UNIE N.V. (B.P. 364,995, 18.5.31. Holl., 23.5.30. Addn. to B.P. 363,908; B., 1932, 256).—The highly sulphonated fatty products and the alkylated sulphonic acids used in the prior patent are incorporated at any suitable stage with viscose having an NH₄Cl number < 12° Hottenroth, and spun into an acid pptg. bath with simultaneous stretching of the filament.

F. R. ENNOS.

Spinning of artificial silk by the stretch-spinning process with flowing precipitating liquid. BRIT. BEMBERG, LTD. (B.P. 365,502, 19.8.31. Ger., 10.9.30).—The thread is deviated by a rod from the freely running jet of pptg. liquid, which is braked just below the rod by an adjustable impact plate. F. R. ENNOS.

Manufacture of artificial silk. VEREIN. GLANZSTOFF-FABR. A.-G. (B.P. 365,436, 17.4.31. Ger., 19.4.30).—The freshly wet-spun threads are collected in the form of cop winding on light, perforated tubes of paper, metal, etc., on which they are washed and subsequently treated by forcing liquids therethrough, dried, and despatched for further working. The tubes may have inner supporting members which serve for mounting on the spinning machinery and wet-treatment appliances. F. R. ENNOS.

Manufacture of artificial threads. I. G. FARBEN-IND. A.-G. (B.P. 365,982, 28.7.31. Ger., 28.7.30).—The spinning solution contains cellulose xanthate and a xanthate of a H_2O -insol. higher alcohol or ester thereof, e.g., fatty alcohols (lauryl, stearyl, cleyl), or monohydric saturated or unsaturated alcohols obtained by reduction of the corresponding fatty acids, or of a partly substituted H_2O -insol. derivative of polyvinyl alcohol. F. R. ENNOS.

Manufacture of artificial threads and filaments [of reduced lustre] and products therefrom. COURTAULDS, LTD., and C. DIAMOND (B.P. 365,178, 18.10.30. Addn. to B.P. 338,269; B., 1931, 110).—In place of the oils, a small quantity of wax (paraffin or spermaceti) is added to the spinning solution. F. R. ENNOS.

Manufacture of artificial threads, filaments, etc. COURTAULDS, LTD., C. F. TOPHAM, E. HAZELEY, and E. A. MORTON (B.P. 365,365, 16.2.31. Addn. to B.P. 290,833; B., 1928, 565).—The deforming process is applied to filaments obtained by means other than the box-spinning method. F. R. ENNOS.

Manufacture of artificial filaments, yarns, etc. BRIT. CELANESE, LTD. (B.P. 366,110, 22.10.30. U.S., 22.10.29).—Spinning solutions of diminished viscosity are prepared by dissolving org. derivatives of cellulose in org. liquids, e.g., aq. $COMe_2$, containing up to 4% (on the wt. of the cellulose) of a substance which is a non-solvent for the cellulose derivative and dissolves in the org. liquid, increasing its electrical conductivity, e.g., chloride, sulphate, or resinate of Al, oleates of Cu, Mg, or Zn, triethanolamine or other org. bases, etc. F. R. ENNOS.

Manufacture of artificial films and filaments. G. Tocco (B.P. 365,484, 29.6.31. Belg., 3.7.30).—Films or filaments of org. derivatives of cellulose are fed on to an endless band in a sealed chamber where they are subjected to a vac. until the solvent is evaporated, a current of air or gas being led along their path, if desired, to assist in evaporation and removal of the solvent to a recovery chamber. The product is finally led out of the evacuated chamber through a liquid seal formed by a barometric column to a collecting spool. F. R. ENNOS.

Production of artificial filaments or threads [of large cross-section]. BRIT. CELANESE, LTD., R. H. J.

RILEY, W. G. LOWE, and W. I. TAYLOR (B.P. 366,070, 22.10.30).—A number of filaments composed of a cellulose derivative are rendered tacky by treatment with a solvent or softening liquid containing one or more high-boiling solvents or plasticisers (triacetin, tolyl phosphate, etc.), and are then heated so as to cause them to adhere together. F. R. ENNOS.

Manufacture of stencil sheets. S. HORII (B.P. 365,542, 17.10.30).—A fibrous base, e.g., Yoshino paper, is coated with a solution of esters of polysaccharides (cellulose, starch), tempering agents (resins, oils, fatty acids and their esters, Ph_3PO_4 , etc.), and stabilising colouring substances (opaque red, orange, yellow, or brown dyes or pigments) which absorb the ultra-violet rays of sunlight. F. R. ENNOS.

Drawing and tracing material. KALLE & Co. A.-G. (B.P. 366,217, 15.12.30. Ger., 16.12.29).—A cellulose hydrate film, having on each side a thin homogeneous layer of lacquer of a cellulose derivative, is coated with a granular layer consisting principally of cellulose derivatives (nitrocellulose) or resins or mixtures thereof, together with small quantities of fillers (e.g., starch, talc, prepared chalk, colloidal $CaCO_3$), if desired. F. R. ENNOS.

Protective coatings for paper and articles of paper or like material. H. J. PRINS (B.P. 365,466, 27.5.31).—After pretreatment with casein, gum, glue, etc. in order to fill the pores, paper is coated with a latex or emulsion of rubber, gutta-percha, balata, etc., partly dried, further treated with mineral or vegetable waxes, and heated at or above the m.p. of the wax. F. R. ENNOS.

Machines for spinning artificial silk or like artificial fibres. SOC. ANON. "SNIA VISCOSA" Soc. NAZIONALE INDUST. APPLIC. VISCOSA (B.P. 367,370, 15.11.30. It., 18.10.30).

Glass-paper and the like [for surface dressing of pile fabrics]. A. SINDERMAN (B.P. 367,530, 26.1.31).

Friction element.—See I. Dielectric materials.—See XI. Transparent sheets. Composite articles.—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Application of Lunge's gasometric method to determination of hydrogen peroxide content of partly exhausted bleaching baths. W. FEHRE (Z. anal. Chem., 1932, 87, 185—190).—When the presence of oxidisable org. substances makes the determination of H_2O_2 by titration with $KMnO_4$ impossible, the determination may be made gasometrically by means of the reaction $CaOCl_2 + H_2O_2 = CaCl_2 + H_2O + O_2$. The reagent is a filtered suspension in 1000 c.c. of H_2O of 25—35 g. of bleaching powder containing 30—20% of active Cl, and the gas burette is charged with a 6—8% aq. solution of NaOH. R. CUTHILL.

Dyes on vegetable fibres: fastness tests. ANON. (Boll. Assoc. Ital. Chim. Tessile Color., 1931, 7, 325—330).—A translated summary of the recommendations published by the French Syndical Chamber of Textile Dyers is given. T. H. POPE.

Unshrinkable finish for knitted woollen goods. S. R. TROTMAN (J.S.C.I., 1931, 50, 463—467 T; 1932, 51, 66 T; cf. *ibid.*, 1921, 40, 219 T; 1926, 45, 20 T; 1928, 47, 4 T).—The standards which a well-chlorinated fabric should fulfil are given and methods of testing described. The control of the p_H of the chlorinating solution when a hypochlorite and a mineral acid are used is too difficult for manufacturing practice. When very weak acids, acid salts, or salts which are hydrolysed by H_2O are substituted for a strong acid the process becomes more controllable, but considerable structural damage is still produced. The gradual liberation of the Cl_2 in contact with the fabric either from a solution of a hypochlorite or indirectly from Aktivin, or by treating $NaCl$ with a persulphate, was not more successful, and it is concluded that it is impossible to chlorinate wool with free Cl_2 on the large scale without producing at least 20% of structural damage. $HOCl$ produces very little damage when only low concns. are used, but with 5% of available Cl on the wt. of the goods and the comparatively high concn. of the liquor demanded by commercial practice, free Cl_2 is liberated and the process loses its value. This occurs even when the solution has the initial $[H^+]$ of $HOCl$ (p_H 6). Experiments were made with the object of either preventing the liberation of this Cl_2 or rendering it innocuous. Protective colloids such as starch, vegetable gum, and dextrin had no beneficial action, but a neutralised solution of gelatin reduced the damage greatly, owing to the formation of chloroamines by interaction of the Cl_2 and gelatin. Tanning agents, synthetic tans, aldehydes, and quinone had no direct protective action, but pretreatment of the fabric with any of these was found to be beneficial. Phenols, particularly $PhOH$, have a great protective action. Fabrics treated with solutions of bleaching powder, H_3BO_3 , and 0.5% of $PhOH$ (on wt. of goods) never showed more than 15% of damage as compared with 60—70% when treated by the ordinary method. The tensile strength and elasticity were both higher also, but the colour of the treated fabric was not good and it was difficult to bleach. Various methods not involving the use of Cl_2 or $HOCl$ were tried, such as pptn. in the fabric of metallic oxides or gelatin tannate. A small reduction in shrinkage was observed, but in no case sufficient for commercial purposes. The same was the case with solutions of metallic salts, silicotungstic and silicophosphoric acids, but after-treatment of a lightly chlorinated fabric with $ZnCl_2$ or $Na_2B_4O_7$ reduced the shrinkage considerably without producing damage.

Fumigation.—See XXIII.

See also A., Mar., 224, Adsorption of anthraquinone by cotton cellulose.

PATENTS.

Washing of linen. B. STEVERLYNCK (B.P. 366,412, 3.7.31. Belg., 3.7.30).—The goods are steeped overnight in a well-lathered soap bath at 50—60°, and then, without previous washing, in a bath at 60° containing H_2O_2 as liberated by the addition of a powder consisting of Na_2O_2 10—20, $NaHCO_3$ 20—40, and Na_2CO_3 70—40%; the goods are then rinsed and dried. A. J. HALL.

Pulverulent preparation for production of a rinsing liquid for after-treatment of washed

animal fibres, woollen or silken fabrics, and especially the hair of the head. K. SCHWARZKOPF (U.S.P. 1,811,809, 23.6.31. Appl., 17.7.30. Ger., 24.5.28).—A non-hygroscopic acid powder is used which contains hygroscopic citric or tartaric acid (50%) and non-hygroscopic boric or salicylic acid (50%).

A. J. HALL.

[Wetting-out agents for] treatment of natural and artificial cellulosic fibres with alkali. CHEM. FABR. VORM. SANDOZ (B.P. 365,323, 16.1.31. Ger., 16.1.30).—Mixtures containing 60—98% of phenols (cf. B.P. 279,784; B., 1928, 228) and 40—2% of ketones free from OH groups (*e.g.*, $COMe_2$ and its homologues, cyclopentanone, cyclohexanone or its Me derivative, camphor, and commercial acetone oil) are efficient wetting-out agents for use with mercerising liquors.

A. J. HALL.

Soluble tube for dyeing and bleaching [yarn packages]. W. N. PHARR, Assr to HARTSELL MILLS Co. (U.S.P. 1,810,057, 16.6.31. Appl., 14.11.29. Renewed 24.4.31).—The tubes are composed of a mixture of glue and dextrin, with or without glycerin, which dissolve in the dye liquor and also retard absorption of dye by the yarn.

A. J. HALL.

Dyeing esters and ethers of cellulose. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 362,846, 6.8.30).—Acetate silk etc. is dyed with 1:4-di(hydroxy-arylamino)anthraquinones, *e.g.*, 1:4-di-*m*-hydroxyanilinoanthraquinone (blue-green), 1:4-di-*p*-aminoanilino-5-hydroxy- or -7:8-dihydroxy-anthraquinone (green). [Stat. ref.]

C. HOLLINS.

Production of dyeings on cellulose esters and ethers. I. G. FARBENIND. A.-G. (B.P. 362,921, 6.8.30. Addn. to B.P. 272,482; B., 1928, 744).—Acetate silk etc. is dyed with 1:4-diamino-2:3-dialkoxyanthraquinones. The $(OMe)_2$ -compound gives pink shades. [Stat. ref.]

C. HOLLINS.

Solutions used in dyeing [with ice colours]. IMPERIAL CHEM. INDUSTRIES, LTD., R. F. GOLDSTEIN, and A. Y. LIVINGSTONE (B.P. 362,548, 19.9.30).—Gum arabic is added to 2:3-hydroxynaphthoic arylamides or their alkaline solutions as stabiliser. C. HOLLINS.

Manufacture of azo dyes on the fibre [ice colours]. SOC. CHEM. IND. IN BASLE (B.P. 361,909, 18.7.30. Switz., 18.7.29).—A 2:3-hydroxynaphthoic arylamide is coupled on the fibre with a diazotised benzoic (or substituted benzoic) 2'-halogeno-4'-aminoanilide carrying in 5'-position halogen, alkyl, or alkoxy. Examples are: α -naphthylamide with diazotised benzoic 2'-chloro-4'-amino-5'-methylanilide (bordeaux); *p*-chloroanilide with the diazotised 5'-OMe-compound (red-violet).

C. HOLLINS.

Fast-dyeing of bone. E. C. BERTOLET, Assr. to G. K. HALE MANUFG. Co. (U.S.P. 1,812,734, 30.6.31. Appl., 17.7.26).—Well-penetrated dyeings are obtained by use of a cold liquor containing an oil-sol. dye, a fatty substance (for dissolving the dye), a crude petroleum or coal-tar distillate, and EtOH (for securing penetration).

A. J. HALL.

Treating [colouring] fabrics having a cellulose acetate pile. J. & J. M. WORRALL, LTD., H. LIVSEY,

and G. E. HOLDEN (B.P. 365,132, 12.8.30).—Artificial silk velvet fabric consisting of a cotton backing and a cellulose acetate silk pile is padded or printed with a solution of regenerated cellulose (*e.g.*, viscose silk) in 8–12% NaOH (*cf.* B.P. 297,607; B., 1928, 856), then dried, neutralised with AcOH, and dyed with direct dyes; the lustre of the pile is not dulled. A. J. HALL.

Treatment of textiles and agents therefor. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 362,060, 24.9.30).—Morpholines free from chromophore groups, with or without dispersing agents and/or org. solvents, are added to non-dyeing aq. baths (*e.g.*, bucking, scouring, or stripping baths) for treatment of textiles free from silk. Examples are *N*- β -hydroxyethyl-, 2:6-dimethyl-, and *N*-cyclohexyl-morpholines. C. HOLLINS.

Decolorising substance [for textiles]. W. KRITCHEVSKY, Assr. to RIT PRODUCTS CORP. (U.S.P. 1,810,658, 16.6.31. Appl., 7.12.28).—The stripping efficiency of the dry mixture of a sulphonylate-formaldehyde salt and a substance having an acid reaction, described previously (U.S.P. 1,524,737; B., 1925, 281), is increased by the addition of a salt of a sulphonic acid of an alkylated polynuclear hydrocarbon, such as *N*isopropyl-, butyl-, or isoamyl-naphthalene-sulphonate. A. J. HALL.

Treatment [lubrication] of [cellulose ester and ether] textile materials. BRIT. CELANESE, LTD., R. P. ROBERTS, and S. A. WELCH (B.P. 365,621, 15.10.30).—Cellulose acetate (*etc.*) threads and yarns are lubricated by impregnation with compositions similar to those described previously (B.P. 351,084; B., 1931, 802), but also containing a hygroscopic solid, *e.g.*, NaOAc or KOAc, and a plasticiser. A. J. HALL.

Impregnation of fabric with cellulose regenerated from viscose. A. H. KILNER (B.P. 366,351, 10.4.31).—After impregnation with a viscose solution fabric is led through a neutral or acid pptg. bath while stretched laterally; it is then washed, desulphurised, bleached, and dried (after impregnation with glycerin to give softness and pliability), also while stretched. A. J. HALL.

Production of [crêped] textile materials. BRIT. CELANESE, LTD., W. A. DICKIE, and R. W. MONCRIEFF (B.P. 365,040—1, [A, B] 2.10.30).—Fabric made from yarns of (A) cellulose artificial silk or natural fibres, or (B) cellulose acetate or other org. cellulose derivative fibres, is coated at spaced intervals with a casein, rubber, albumin, or algin size, and then scoured, whereby the size is removed and the fabric acquires a cockled appearance. A. J. HALL.

Treatment of natural and artificial cellulosic fibres with alkali [wetting agents for mercerising liquors *etc.*]. CHEM. FABR. VORM. SANDOZ (B.P. 361,865, 25.8.30. Ger., 16.6.30. Addn. to B.P. 359,399; B., 1931, 99).—To the mercerising liquor are added phenols together with 2–40% of mixtures of mono- or poly-hydric alcohols [having at least ($n+1$) C atoms for n OH groups] or ketone-alcohols or ethers of poly-hydric alcohols (having at least 1 free OH). Examples are: commercial xylenol, commercial methylcyclohexanol, and diethylene glycol mono-*n*-butyl ether or

glycerol α -xylyl ether; commercial cresol, glycerol α -xylyl ether, and pinacone. C. HOLLINS.

Loading of natural silk. W. ZÄNKER (B.P. 365,085, 11.9.30. Ger., 13.9.29).—Silk is treated in a slightly acid solution of a metal capable of forming a loading compound on the silk (*e.g.*, Sn, Al, Zr, Zn), a protective colloid (glue), an inorg. salt (*e.g.*, Na₂SO₄, MgCl₂, and NH₄Cl) which causes salting-out of the loading compound on to the silk, and a substance such as H₃PO₄ which reacts in the bath to form the loading compound; subsequently the silk is treated with a weakly alkaline bath without intermediate washing. The loading bath may also be prepared with the aid of stable inorg. or org. double compounds of loading metals and neutral salts [*e.g.*, Na₂Sn(CO₂H)₆ and Sn(NH₄)₂Cl₆]. The process allows loading up to 10%. A. J. HALL.

Treatment of wool, feathers, hair, *etc.* for cleaning and [moth-]protecting purposes [and soap therefor]. A. CARMAEL. From I. G. FARBENIND. A.-G. (B.P. 366,090, 29.10.30).—A moth-proofing soap suitable for domestic use in the washing of wool materials consists of an ordinary soap containing about 10% of a moth-proofing agent such as a quaternary phosphonium salt (*cf.* B.P. 312,163; B., 1930, 1025), or sol. salts of H₂SeO₃, H₂SeO₄, HF, or H₂SIF₆. A. J. HALL.

Moth-proofing [compounds]. I. G. FARBENIND. A.-G. (B.P. 365,233, 7.11.30. Ger., 31.12.29).—Animal fibres are moth-proofed by impregnation with up to 1% of a Sr salt [Sr(NO₃)₂ and SrCl₂ from aq. solutions, Sr(OAc)₂ and Sr salicylate from EtOH solutions, and Sr oleate from C₆H₆ solution], these salts being preferred to Ba salts since they are non-poisonous. A. J. HALL.

Treatment of animal fibres [for manufacture of artificial leather]. SOC. INVENZIONI BREVETTI ANON. TORINO, Assees. of A. FERRETTI (B.P. 365,564, 21.10.30. U.S., 30.12.29).—Products are prepared continuously by means of papermaking machinery, using an aq. slurry which contains disintegrated scraps of hide, rubber latex (10–20% on the wt. of hide), a vulcanising agent (2–10% of the dry rubber content of the latex), an antioxidant, and a vulcanisation accelerator, all being sol. or dispersible in H₂O; the latex is added just before dewatering the slurry. A. J. HALL.

Apparatus [jigs] for dyeing fabrics. W. A. S. CAYLEY and E. W. HUNT (B.P. 367,157, 4.2.31).

Apparatus for sizing single threads of textile fibres, especially artificial silk. PARCOFIL A.-G., and E. SCHWEIZER (B.P. 367,128, 19.1.31).

Wetting *etc.* agents.—See III. Dyeing [with indanthrone derivatives]. Printing on silk.—See IV.

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

Development of the contact sulphuric acid process. G. BACHALARD (Chim. et Ind., 1932, 27, 3–14).—Present tendencies in SO₂ production are discussed. Knietzsch's data for equilibrium relations cannot be directly applied owing to the imperfections of catalysts. They can be used, however, to demonstrate the great advantage in the use of S over pyrites in

reaction velocity under given conditions and at optimum temp. This temp. varies through the converter with the progress of the reaction. Numerous patents which attempt to effect such progressive temp. control are discussed. Methods include two-stage conversion and tubular converters with heat exchangers and cooling devices. Attempts have been made to economise Pt by using greater dilutions, but such masses deteriorate rapidly. The use of SiO_2 gel as a Pt support has made little progress. The use of V catalysts depends on the capacity of V_2O_4 and V_2O_5 to form additive compounds with SO_3 . The support is important, the SiO_2 present playing an essential part. V catalysts have been produced even more active than Pt catalysts, at least at below 400° , and they are unaffected by the usual poisons, though it is desirable to dry the gas. One has worked since 1921 without loss of efficiency.

C. IRWIN.

Removal of iron impurities in the manufacture of Glauber's salt. R. BIGAZZI (Industria chim., 1931, 6, 638—640; Chem. Zentr., 1932, ii, 1177).—In order to avoid the loss of SO_3 , as CaSO_4 , resulting from the removal of Fe^{+++} from Na_2SO_4 with milk of lime, it is proposed to effect the purification by the addition of the calc. quantity of Solvay soda to the hot solution.

L. S. THEOBALD.

Volatilisation of potash from potassium aluminium silicates. S. L. MADORSKY (Ind. Eng. Chem., 1932, 24, 233—237).—Leucite, greensand, feldspar, and the like ground and dried were heated for 40 min. at 1510° with various promoters. CaSO_4 retarded K_2O volatilisation. CaCl_2 and CaCO_3 both promote it, but a mixture is better than either alone. A 1:2 mixture of leucite and CaCO_3 gave 43% volatilisation, which is a similar figure to that obtained in a cement kiln. If to this mixture 0.6—1.0 K_2O equiv. of CaCl_2 be added the volatilisation is 90—100%. Fusion takes place at above 1200° . It is suggested that where possible these K-bearing minerals should be substituted for clay in cement manufacture; the KCl fumes can then be recovered, treated with H_3PO_4 , and the HCl evolved used to regenerate the CaCl_2 promoter. In the case of greensand a high-Fe cement would be produced; the other minerals would give cements of normal composition.

C. IRWIN.

Thermal efficiency of the phosphate [rock] blast furnace. P. H. ROYSTER and J. W. TURRENTINE (Ind. Eng. Chem., 1932, 24, 223—226).—Tests made with a model blast furnace 80 in. high and having a capacity of 12 cu. ft. gave a coke consumption of about 6.7 pts. of coke per 1 pt. of H_3PO_4 with a blast temp. of 470° and about 4.8 pts. with blast temp. of 650° . This corresponds to thermal efficiencies of about 5.5% and 8.0%. Crushed firebrick was added to remove the excess of CaO as slag. Increase in slag due to the use of low-grade phosphate rock is believed not to affect adversely the heat balance, and the only limit is that if the quantity is too great the furnace may become mechanically unmanageable. The important point is the adequate heating of the blast. C. IRWIN.

Serious [corrosion] troubles in a carbon dioxide factory. H. DUBOVITZ (Chem.-Ztg., 1932, 56, 18—19).

—The CO_2 is prepared by burning coke and the gases after washing are passed through K_2CO_3 solution to absorb the CO_2 , which is subsequently expelled by boiling. Serious corrosion of the phosphor-bronze cylinders of the plunger pump circulating the K_2CO_3 solution occurred during the course of a year. This was traced to the presence of NO_2 in the gases absorbed by the alkali; on boiling to expel the CO_2 the KNO_3 is decomposed and the HNO_3 attacks the Cu. After use for 18 months the K_2CO_3 contained 0.81% NO_2 . The trouble due to NO_2 is avoided by using an even coke layer not thicker than 10—15 cm. on the grate and a large excess of air.

A. R. POWELL.

Reduction of sulphur dioxide with hydrogen and carbon monoxide in the temperature range 380 — 850° . E. TERRES, K. SCHULTZE, and H. FORTKORD (Angew. Chem., 1932, 45, 164—171).—The reduction of SO_2 to S by CO or by H_2 has been examined from the point of view of technical application. At about 600° the reaction is almost quant. and 80% conversion occurs at about 800° . The reaction velocity at the lower temp. is sufficient when a catalyst is used. Pt on clay and Fe_2O_3 on asbestos or clay are recommended for either reaction, but the Fe_2O_3 catalyst is better for use with CO, since Pt favours side reactions which produce COS and CS_2 . These side reactions preponderate at higher temp. and, when H_2 is used, H_2S is formed at temp. above 800° .

E. S. HEDGES.

Analysis of asbestos and asbestos goods. ANON. (India-Rubber J., 1932, 83, 326—327).

S acids in flue gases. Control of acid baths. Handling corrosive gases.—See I. Converting CH_4 into CO and H_2 .—See II. Determining H_2O_2 in bleaching baths.—See VI. Pb chromate pigments.—See XIII. Solubility of Fe phosphates in org. acids.—See XVIII.

See also A., Mar., 229, Systems H_2O — CO_2 — NH_3 , K_2CO_3 — KHCO_3 — H_2O , H_3PO_4 — $\text{Ba}(\text{OH})_2$ — CO_2 — H_2O , and H_3PO_4 — $\text{Ca}(\text{OH})_2$ — CO_2 — H_2O . 235, Catalysts for production of H_2 by the water-gas reaction. 238, Prep. of cryst. $\text{Ca}(\text{OH})_2$. Synthesis of carbides. 239, Prep. of H_2SO_4 free from HNO_3 , and of anhyd. AlBr_3 . 240, Analytical reagents (specifications). 251, Cryst. Na α -glycerophosphate.

PATENTS.

Manufacture of sulphuric acid from flue gases. CHEM. ENG. & WILTON'S PATENT FURNACE CO., LTD., T. O. and N. WILTON, H. E. J. GREEN, and H. C. MANN (B.P. 365,090, 14.10.30).—The sludge obtained from the process described in B.P. 360,127 (B., 1932, 133) is dried and passed continuously through a rotary furnace (at $>1000^\circ$). The products are chiefly CaO (for use again) and oxides of S (for conversion into H_2SO_4 by known means).

H. ROYAL-DAWSON.

Recovery of sulphuric acid from the acid sludge of oil refineries. DU PONT AMMONIA CORP. (B.P. 365,945, 29.5.31. U.S., 31.5.30).—The sludge is stirred with a solution of $(\text{NH}_4)_2\text{SO}_4$ in H_2SO_4 , in proportions such that the NH_3 content of the resultant mixture is 0.8—1.2 mol. NH_3 per 1 mol. H_2SO_4 , and, after settling, resin, tar, etc. are skimmed from the surface. Part

of the acid solution, after treatment with sufficient liquid NH_3 , is returned for treatment of fresh sludge, and the remainder is used, *e.g.*, for the manufacture of superphosphates. L. A. COLES.

Denitration of acid which contains nitro-compounds dissolved therein. H. PAULING (B.P. 365,949, 2.6.31. Ger., 2.6.30).—The waste acid is treated with steam and, if desired, hot gas under conditions (*i.e.*, using sufficient steam or diluting the acid during condensation) such that the condensed HNO_3 is sufficiently dil. (*e.g.*, 20–30 wt.-% HNO_3) to cause complete separation of the NO_2 -compounds on cooling. Uncondensed nitrous gases are freed from NO_2 -compounds by washing with 50–60% HNO_3 , and are then absorbed in the dil. acid from the condenser. L. A. COLES.

Production of sodium hydroxide low in sodium chloride. A. L. MOND. From I. G. FARBENIND. A.-G. (B.P. 366,404, 15.6.31).— NaOH liquor containing NaCl is conc. until it contains about 50% NaOH , and cooled with agitation to 18–20° to separate the greater part of the NaCl . The solution is then slowly cooled to 10°, whereby $\text{NaOH} \cdot 2\text{H}_2\text{O}$ crystallises. The crystals are separated by centrifuging and are further heated to expel H_2O ; the resulting fused NaOH contains about 0.8% NaCl . The mother-liquor containing about half the NaOH originally present is heated to 18–20°, whereby more NaCl separates, and the cooling process can then be repeated. A. R. POWELL.

Manufacture of barium hydroxide [from barium sulphide]. I. G. FARBENIND. A.-G. (B.P. 365,198, 21.10.30. Ger., 21.10.29).— BaS liquors containing Ba polysulphides are subjected to partial oxidation at above 50°. After settling the clear liquor is drawn off, cooled to 12–13°, and the $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ cryst. out and centrifuged; the mother-liquor is returned to the process. H. ROYAL-DAWSON.

Manufacture of barium hydroxide. I. G. FARBENIND. A.-G. (B.P. 365,651, 25.10.30. Addn. to B.P. 365,198; preceding abstract).—Gases rich in O_2 , and increased pressure, are employed in the oxidation process. F. YEATES.

Production of barium-oxygen compounds [barium hydroxide]. INTERNAT. INDUSTRIAL & CHEM. Co., LTD. (B.P. 366,169, 12.11.30. Ger., 17.2.30).— BaCO_3 is calcined at 1200–1500° with BaSiO_3 and about 10% C and the clinker is lixiviated with H_2O to obtain a solution from which $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ can be cryst. To prevent accumulation of SiO_2 in the BaSiO_3 residue, which is used again in the process, it is occasionally treated with Na_2CO_3 and CO_2 to convert it into BaCO_3 and gelatinous SiO_2 ; the latter is then extracted by heating with NaOH under pressure. A. R. POWELL.

Heat treatment of alkaline-earth carbonate and other materials. R. W. HYDE, Assr. to DWIGHT & LLOYD METALLURG. Co. (U.S.P. 1,810,313, 16.6.31. Appl., 16.4.26).—Shallow layers of the materials are charged by hoppers into an endless chain of carriages which pass successively through a preheating zone, a heating zone, and an insulated "soaking" zone in which the material retains its heat for a length of time sufficient for the completion of the reaction. The heating zone is

provided with laterally disposed burners, and the hot gases are drawn through the material by suction boxes below the carriages. L. A. COLES.

Manufacture of soda, ammonium chloride, sodium nitrate, and hydrochloric acid. A. MENTZEL (B.P. 366,420, 24.7.31. Ger., 15.8.30).— NaHCO_3 from the NH_3 -soda process is mixed with coke obtained by the low-temp. carbonisation of lignite and the mixture is heated in N_2 at 1000° to produce NaCN . After cooling to 450°, steam is passed over the mass to liberate NH_3 , and the residue is again treated with N_2 at 1000°. After another repetition of the treatment Na_2CO_3 is recovered from the residue by leaching. The NH_3 produced in the process is partly returned to the first stage and partly utilised for the manufacture of NO_2 by passage over a heated $\text{Fe-Bi}_2\text{O}_3$ catalyst. The NO_2 is absorbed in NaCl solution to obtain NaNO_3 and HCl . A. R. POWELL.

Production of coarse-grained ammonium sulphate. HOESCH-KÖLN NEUESSEN A.-G. F. BERGBAU U. HÜTTENBETRIEB, Assees. of KÖLN-NEUESSENER BERGWERKSVEREIN (B.P. 365,935, 19.5.31. Ger., 5.6.30).—Compressed gas or air, cooled to a low temp., is expanded, near the bottom of the saturator, in contact with the lye so that the cooling becomes effective at the point of crystal formation. A suitable form of nozzle for introducing the gas is described. F. YEATES.

Flotation treatment of cryolite. HUMBOLDT-DEUTZMOTOREN A.-G. (B.P. 365,097, 12.9.30. Ger., 12.5.30).—The addition of an alkali fluoride (NaF) to the cryolite suspension and usual froth-flotation agents is claimed to give increased concn. of mineral (*cf.* B.P. 363,988; B., 1932, 311). H. ROYAL-DAWSON.

Removal of colloidal silica from mixed solutions obtained during the treatment of powdered silicates with acids. G. A. BLANC (B.P. 366,002, 25.8.30. It., 23.8.29).—The acid solution containing colloidal SiO_2 is filtered through a bed of granular SiO_2 , aq., obtained by acid treatment of granular leucite and removal of sol. salts, whereby the colloidal SiO_2 is adsorbed by the granular SiO_2 . A. R. POWELL.

Manufacture of siliceous material [base-exchange zeolites]. A. S. BEHRMAN, Assr. to PERMUTTI Co. (U.S.P. 1,811,531, 23.6.31. Appl., 4.11.27).—Dried SiO_2 -gel granules are boiled, *e.g.*, for 2 hr. with dil. NaAlO_2 solution containing, *e.g.*, 3 g. of Na_2O and 2.2 g. of Al_2O_3 per litre, and then for the same time with a similar solution but twice as conc.; the product, after washing and drying, is ready for use in softening H_2O . (*Cf.* U.S.P. 1,756,623; B., 1930, 1027.) L. A. COLES.

Manufacture of [adsorbent and catalytic] tin oxide [or mixed] gels. SILICA GEL CORP., Assees. of E. H. BARCLAY (B.P. 364,663, 2.10.30. U.S., 3.10.29).—A solution containing a Sn salt and, if desired, a Ti or Fe salt, is treated with an alkali (aq. NH_3) to yield a mixture having an acidity of 0.0–0.5N (0.13–0.18N) and setting to a hydrogel on keeping. Alternatively, a Sn salt solution is treated with an alkali aluminate, silicate, or tungstate solution; an acid or alkali may be added to adjust the acidity to within the above limits. [Stat. ref.] L. A. COLES.

Preparation of titanium compounds. W. B. LLEWELLYN, H. SPENCE, and P. SPENCE & SONS, LTD. (B.P. 364,613, 5.7.30).—Impure Ti sulphate solution is partly neutralised, *e.g.*, with CaCO_3 , and, after removal of CaSO_4 , the greater part of the Ti is pptd. as basic sulphate (0.5–0.25 mol. SO_3 per 1 mol. TiO_2) by dilution with H_2O below 50° . CaCl_2 or NaCl may be added to the solution or, when a TiCl_4 solution is used, H_2SO_4 or a sol. sulphate is added to supply the necessary SO_4^{--} .

L. A. COLES.

Recovery of cyanide from alkaline liquors [used for extraction of gold, silver, etc.]. C. W. LAWR (U.S.P. 1,810,487, 16.6.31. Appl., 14.12.28).—The liquor remaining after the pptn. and removal of Au and Ag is neutralised (to phenolphthalein) with SO_2 , pptd. CaSO_3 is removed, and the liquor is acidified with excess SO_2 ; pptd. Cu, Ag, etc. are removed and HCN , $(\text{CN})_2$, etc. recovered by blowing with air.

L. A. COLES.

Apparatus for electrolytic revivification of potassium ferrocyanide formed in the purification of gases by oxidation of hydrogen sulphide with potassium ferricyanide. R. BRANDT (B.P. 365,983, 29.7.31. Ger., 8.12.30. Addn. to B.P. 319,147; B., 1929, 978).—The battery for the anodic oxidation of the $\text{K}_4\text{Fe}(\text{CN})_6$ is formed after the fashion of a filter-press by bipolarly-acting electrode plates made of Fe–Cr–Ni alloys (V2A metals). The plates are packed at the edges by rubber packing pieces, chambers being thus formed which communicate by means of openings provided alternately at the bottom and near the top of the plates through which the washing liquid flows serially. Another opening at the top of each plate enables the H_2 evolved to pass into a central chamber.

F. YEATES.

Purifying hot spent pickle liquors from steel mills and the like. H. D. ELKINGTON. From OHIO SANITARY ENG. CORP. (B.P. 365,981, 24.7.31).—The hot liquors containing H_2SO_4 and FeSO_4 are maintained at p_{H} 6.0–7.0 by adding an alkaline-earth carbonate in sufficient excess to increase the available neutralising val. from 15% to 20% over that theoretically required to neutralise the entire free acid, agitating the liquor for a time sufficient to attain this p_{H} (at which point the FeSO_4 hydrolyses), and oxidising the $\text{Fe}(\text{OH})_2$ to $\text{Fe}(\text{OH})_3$ by maintaining the solution at 100° and passing in air under pressure. The operation may be carried out in two stages, which are outlined.

F. YEATES.

Manufacture of material for purification [desulphurisation] of gaseous mixtures. G. E. SEIL, Assr. to E. J. LAVINO & Co. (U.S.P. 1,809,990, 16.6.31. Appl., 11.6.28).—Mixtures of Fe oxides etc., obtained as by-products in reductions in which Fe is treated with insufficient acid, are calcined together with alkalis (*e.g.*, $\text{Na}_2\text{CO}_3 + \text{K}_2\text{CO}_3$) at 200 – 400° in a current of air, and the product is quenched with H_2O .

L. A. COLES.

Oxidation of metal sulphides and making sulphur dioxide. H. FREEMAN, Assr. to SULPHIDE RESEARCH CORP., LTD. (U.S.P. 1,812,397, 30.6.31. Appl., 17.1.29).—A suspension of finely-divided sulphide (*e.g.*, of Fe or Zn) in insufficient air for complete oxidation is blown into the top of a tower heated by the combustion of the sulphide therein; the product falls into running H_2O

or on to a travelling grate on which combustion is completed by a current of air drawn downwards through the material outside the tower and then forced up through the portion of the grate under the tower.

L. A. COLES.

Converting into soluble salts lead and other metals contained in lead-bearing ores. P. GAMICHON (B.P. 365,964, 15.6.31. Fr., 17.6.30).—The ores are roasted at a moderate temp. with a small quantity of CaSO_4 and an alkali or alkaline-earth chloride, washed with H_2SO_4 or HCl to convert into sulphates or chlorides, respectively, the sulphides or traces of oxides left after the roasting, and lixiviated for the separation of sol. salts, *e.g.*, of Zn or Cu. The mass is then treated with brine to dissolve the Pb, Ag, and like metals, other metals being pptd. in known manner in the hot liquor, which is then filtered and cooled to ppt. cryst. PbCl_2 .

F. YEATES.

Production of hydrogen. A. T. LARSON, Assr. to DU PONT AMMONIA CORP. (U.S.P. 1,809,978, 16.6.31. Appl., 21.7.28).—The reaction $\text{CO} + \text{H}_2\text{O} = \text{H}_2 + \text{CO}_2$ is effected, *e.g.*, at 1–100 atm. and at 300 – 600° , in the presence of catalysts comprising Zn, Cu, and one or more of the oxides of Cr, W, Si, V, and Mo, preferably Zn Cu chromate prepared, *e.g.*, by adding $(\text{NH}_4)_2\text{CrO}_4$ to a solution containing 1 mol. of CuSO_4 per 2 mols. of ZnSO_4 . Reduction of the catalyst may be effected *in situ*, or by pretreatment with H_2 at 100 – 300° .

L. A. COLES.

Production of hydrogen peroxide. PEROXYDWERK-SIESEL A.-G. (B.P. 366,417, 22.7.31. Ger., 25.7.30).—Dil. H_2O_2 solutions obtained from BaO_2 and H_2SO_4 are fractionally distilled in vac. and the vapours are passed through fine-grained ceramic material, treated electrostatically, or introduced into a chamber of such dimensions that the rate of flow is diminished, so that the constituents present as mist or drops are removed or caused to condense.

A. R. POWELL.

Manufacture of phosphorus sulphochloride. W. H. WOODSTOCK and G. A. McDONALD, Assrs. to VICTOR CHEM. WORKS (U.S.P. 1,811,602, 23.6.31. Appl., 13.3.30).—Finely-ground ferrophosphorus is chlorinated to $\text{PCl}_5 \cdot 2\text{FeCl}_3$, the product is heated with S in slight excess of that required by the equation $\text{PCl}_5 \cdot 2\text{FeCl}_3 + 5\text{S} = 2\text{FeCl}_2 + 2\text{S}_2\text{Cl}_2 + \text{PSCl}_3$, and a mixture of S_2Cl_2 and PSCl_3 is recovered by distillation. The mixture is separated by fractional distillation, or is heated with ferrophosphorus to convert the S_2Cl_2 into PSCl_3 , which is distilled off with that originally present.

L. A. COLES.

Obtaining iodine as iodide from iodine-containing adsorption carbon. F. ELLINGER, Assr. to MIJNBOW EN HANDELSMAATS. "WONOH GEDEH" (U.S.P. 1,810,039, 16.6.31. Appl., 7.3.29. Holl., 12.6.28).—The C is boiled with excess of aq. Na_2CO_3 (*e.g.*, 10% solution) and, after filtration, is washed repeatedly with hot H_2O .

L. A. COLES.

Apparatus for production of [blocks of] solid carbonic anhydride. G. WEBER (B.P. 367,492, 13.12.30. It., 19.12.29).

Reactivation of absorbent clay. Separation of gases.—See I. NH_3 from gas. $(\text{NH}_4)_2\text{SO}_4$ from

gases. H_2 from hydrocarbons.—See II. W carbide.—See VIII. Mg oxychloride cement.—See IX. Sn from aq. Na_2SnO_3 .—See X.

VIII.—GLASS; CERAMICS.

New light-source for absorption measurements of glasses in the blue and ultra-violet. W. M. COHN (J. Amer. Ceram. Soc., 1932, 15, 122—125).—The blue glow emitted from a metallic Th anode when bombarded by cathode rays has a continuous spectrum from 2200 to 6000 \AA , with a photographic max. at 4500 \AA . For absorption measurements on glass the Th lamp has the following advantages over the H_2 tube: the lines at longer wave-lengths are absent, and therefore the use of screens is unnecessary; temp. effects on the spectral transmission of glass are not present as is the case when the other sources emitting long waves are used. The one disadvantage of the Th lamp is its small intensity, but by suitable modification of the anode this may be overcome. J. A. SUGDEN.

Viscosity measurements in molten glass. H. R. LILLIE (J. Rheology, 1932, 3, 121—126).—A review of applications in glass manufacture. C. W. DAVIES.

Effect of firing at 1500° on the porosity and specific gravity of quartzites. S. S. COLE (J. Amer. Ceram. Soc., 1932, 15, 87—95).—The rate of inversion of a quartzite increases with the fineness of the grain and is most rapid with the cryptocryst. varieties ("findlings"). After firing for 2 hr. at 1500° the porosity varied from 2 to 30% (apparent d 2.30—2.44) and tends to decrease with the fineness of grain. There is no relationship between the hardness of a stone and its porosity after firing. J. A. SUGDEN.

Development of low-temperature enamels on a fluoride eutectic basis. J. F. HUNT and R. M. KING (J. Amer. Ceram. Soc., 1932, 15, 116—121).—The cryolite and fluorspar in three standard enamels were substituted by fluoride eutectics with a view of lowering the maturing temp. No change was evident in cast-Fe enamels, but substitution in ground-coats produced inferior enamels. With sheet-steel cover-coats, satisfactory enamels were obtained with a maturing temp. lowered from 790° to 700° . J. A. SUGDEN.

Apparatus for testing enamels and glazes for resistance to crazing under thermal shock. C. J. KINZIE (J. Amer. Ceram. Soc., 1932, 15, 112—115).—In the apparatus described, the test-pieces are repeatedly heated to temp. up to 500° and quenched in H_2O , under accurately controlled conditions. J. A. SUGDEN.

Design and testing of a laboratory kiln. W. H. VAUGHAN and J. P. BREEN (J. Amer. Ceram. Soc., 1932, 15, 149—153).—The design of a cross-fired, natural-gas, laboratory kiln with a range of cone 010 to 26 (with $\frac{1}{2}$ -cone variation throughout the ware space) and an efficiency of 5.7% is described. The flames from two under-floor burners pass up behind the opposite bag wall, mix with the gases from two burners set tangentially to the crown, pass across the crown, down behind the other bag wall, and again through the under-floor flues. The gases thus circulate around the kiln structure more than once before they are drawn

down through the ware and the perforated floor. Full details of efficiency tests and suggested structural modifications are given. J. A. SUGDEN.

Laboratory test kilns. A. S. WATTS and J. L. CARRUTHERS (J. Amer. Ceram. Soc., 1932, 15, 154—157).—Three gas-fired, down-draught kilns are described in detail. Firing with natural gas (1000 B.Th.U.), temp. up to cone 30 have been obtained in a kiln with a setting space of 4.5 cu. ft. J. A. SUGDEN.

Shrinkage of diaspore clays. II. S. M. PHELPS (J. Amer. Ceram. Soc., 1932, 15, 96—106; cf. B., 1927, 556).—The shrinkage takes place mainly in the bond (cf. *loc. cit.*) and is brought about at lower temp. and in shorter times by the addition of small amounts of "mineralisers" (especially phosphate rock) which do not appreciably affect the refractoriness. The clay is finely ground with about 2% of phosphate rock, pressed, fired to cone 12—18, and this pre-shrunk material used for the manufacture of the brick, the general improvement in the qualities of which has been confirmed by plant trials. The shrinkage may be increased by the suitable choice of (reducing) kiln atm., but the effect of atm. is not the same with all clays. J. A. SUGDEN.

Testing clay bodies and body materials on a laboratory scale. G. A. WILLS (J. Amer. Ceram. Soc., 1932, 15, 135—139).—The test-piece of the material to be tested for shrinkage, warpage, and adsorption takes the form of a rectangular bar terminating at one end in a fork, the limbs of which are parallel to the axis of the bar. The warpage is obtained by measuring the separation at each end of the fork before and after firing. J. A. SUGDEN.

Florescence. IV. Effect of firing conditions on the soluble sulphate content of clayware. F. L. BRADY and E. H. COLEMAN (Trans. Ceram. Soc., 1932, 31, 58—74).—Tests on four red-burning clays confirmed the previous conclusion (B., 1931, 719) that with respect to the adsorption of SO_2 during firing, clays may be divided into two classes. A calcareous clay has a high sulphate content at the highest temp., but clays rich in K_2O and Na_2O have a lower content and readily lose SO_2 at similar temp. The adsorption of SO_2 by a clay from the kiln gases is rapid at 600 — 700° , but less rapid above 700° ; SO_2 is eliminated from the clayware. Increasing the SO_2 in the kiln gases increases the sulphate content of the ware. Although "soaking" at high temp. is capable of producing a marked reduction in sulphate content, even though the gases are rich in SO_2 , a low sulphate content in the ware is more readily achieved if, at lower temp. (600 — 700°), the SO_2 content of the gases is low. The effect of reducing the amount of SO_2 in the gases below 0.5% is marked. J. A. SUGDEN.

Relation of soda-lime ratio to blending of feldspars. C. R. AMBERG (J. Amer. Ceram. Soc., 1932, 15, 140—143).—Fifty feldspars were analysed and the $Na_2O:CaO$ ratio was plotted against the frequency. A max. occurred at the ratio 4.5 (and with 183 analyses taken from the literature a sharper peak was at 5.0), indicating that each of the feldspars is probably an oligoclase very close to the albite-oligoclase borderline.

Commercial feldspars contain plagioclase of approx. the same composition, and the apparent variations in the $\text{Na}_2\text{O} : \text{CaO}$ ratio are due to defects of chemical analysis. This conclusion is supported by petrological examination. Any feldspar analysis giving a $\text{Na}_2\text{O} : \text{CaO}$ ratio differing widely from 5.25 should be checked before being used for blending calculations. J. A. SUGDEN.

Proposed method for feldspar fusion trials. H. B. DuBois (J. Amer. Ceram. Soc., 1932, 15, 144—148).—The test-piece is a truncated cone the height of which is measured before and after firing in a pottery kiln (cone 9—10). Along with each test, a "standard" feldspar test is fired in order to indicate any abnormal deviation from the usual firing schedule. The uniformity of moulding of the test-pieces is important. J. A. SUGDEN.

Dielectric strength of porcelain: influence of firing temperature. A. J. MONACK, L. R. SHARDLOW, and D. H. WAMSLEY (J. Amer. Ceram. Soc., 1932, 15, 126—129; cf. B., 1932, 229).—The puncture voltage increases rapidly between cones 7 and 9 and more gradually between cones 9 and 15. The most uniform body, electrically, was obtained at cone 9; a determination of the firing temp. at which this is produced (as shown by statistical measures of the variation) affords a means of finding the correct firing temp. J. A. SUGDEN.

Production of paving brick by the dry-press process. J. O. EVERHART (J. Amer. Ceram. Soc., 1932, 15, 107—111).—With the three shales tested, dry-pressing gave a lower "rattler" loss than the stiff-mud process, and there was an optimum forming pressure and H_2O content. Evacuation of the mould always resulted in lower losses, and a brick made with bottom pressure only had a 30% greater resistance to abrasion on the bottom than on the top face. J. A. SUGDEN.

Degree of dispersion of clays.—See XVI.

See also A., Mar., 230, **Ionic transport in glasses.**
245, **Silvering of small mirrors.**

PATENTS.

Ceramic furnace. J. A. DEDOUCH (U.S.P. 1,811,307, 23.6.31. Appl., 22.12.28).—A horizontal muffle furnace is provided with suitable strands on which the ware is supported and conveyed along it and with a device for pressing the hot ware as it emerges from the furnace. The muffle chamber is divided into two parts in a horizontal plane to facilitate repairs. J. A. SUGDEN.

Manufacture of composite glass sheets. FORD MOTOR CO., LTD., Assees. of H. FORD and R. H. MCCARROLL (B.P. 365,828, 12.2.31. U.S., 12.2.30).—Sheets of rough, translucent glass and an interposed sheet of cellulose are united by a composition having the same n as the glass, e.g., 50—55% of cellulose nitrate, 20—25% of a urea- CH_2O condensation product, 10—15% of camphor, and 10—15% of tolyl phosphate. L. A. COLES.

Quartz tubes, vessels, and similar bodies having a protective layer of a metal of comparatively low m.p. JENAER GLASWERK SCHOTT & GEN. (B.P. 365,930, 11.5.31. Ger., 14.5.30).—Such protective layer, circumfused on quartz tubes etc., is enveloped by an Fe

jacket which serves as the mould by means of which the metal layer is cast on. F. YEATES.

Production of white opaque glazes and enamels.

I. KREIDL (B.P. [A] 364,529 and [B] 364,554, 25.6.30. Austr., 8.8.29).—The number, size, and distribution of the gas bubbles liberated in firing to impart opacity as described in B.P. 297,724—5 and 297,737 (B., 1929, 979, 1930, 326) are regulated, in (A), by adjusting, prior to firing, the grain size and/or the adsorptive capacity of the substances adsorbing the gas-clouding agent by peptisation, coagulation, or by colloid-grinding; or in (B) by varying the proportion of the adsorptive agent and/or by replacing it by another adsorptive agent. In (B), the gas-clouding agent, dissolved in H_2O or other suitable solvent, is adsorbed on the adsorptive agent before addition to the enamel slip. L. A. COLES.

Manufacture of moulds and moulded objects [of porcelain or cast metal]. SCHERING-KAHLBAUM A.-G., Assees. of E. BRILL (B.P. 365,886, 1.4.31. Ger., 3.4.30).—A colloidal metal solution (e.g., of PtCl_4 or CuCl_2) is painted or sprayed on the wall of the mould for making tooth fillings etc. The solution may be added either to the impression material, which, on being burned out, leaves a colloid metal ppt. adhering to the wall of the mould, or added to the material used for making the mould, a colloid metal ppt. coating the surface after heat treatment. F. YEATES.

Refractory materials [especially blocks for glass tanks]. HARTFORD-EMPIRE CO., Assees. of P. G. WILLETTS (B.P. 364,850, 12.1.31. U.S., 21.2.30).—A finely-ground mixture of, e.g., 62.5% of non-plastic (Georgia Klondyke) kaolin, 30% of plastic bond (Georgia G_1) clay, and 7.5% of feldspar is fired at about 1565° to yield a product comprising microscopic mullite crystals in a glassy matrix; a mixture (35 : 65) of the original mixture with the product (ground less finely than the original material) is then shaped into blocks etc., and these are fired at about 1565° , yielding a product containing $>1.5\%$ total Fe and alkali oxides. L. A. COLES.

Production of refractory bodies [from vitreous silica]. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of A. LER. ELLIS and G. A. F. WINCKLER (B.P. 364,993, 16.5.31. U.S., 17.5.30).—Apparatus, e.g., for covering a mirror blank with a layer of clear SiO_2 comprises a number of jets supplied with H_2 (or other combustible gas) and O_2 in combustion ratio and at velocities such as to produce a flame condition capable of consolidating by fusion particles of SiO_2 fed automatically in a regulated stream into the flame. L. A. COLES.

Refractory material. T. R. HAGLUND (U.S.P. 1,811,314, 23.6.31. Appl., 6.10.28. Ger., 4.6.27).—A highly refractory and chemically resistant material consists of a fused mass containing, e.g., $<15\%$ of MgO , $<5\%$ of Cr_2O_3 , $<75\%$ of $(\text{MgO} + \text{Al}_2\text{O}_3 + \text{Cr}_2\text{O}_3)$, $<12\%$ of SiO_2 , and $<5\%$ of Fe_2O_3 . J. A. SUGDEN.

Refractory heat-insulating material. D. W. ROSS and J. M. LAMBIE (U.S.P. 1,812,376, 30.6.31. Appl., 26.7.27).—A composite block consists of a porous mass of coarse cyanite particles bonded with ball-clay insufficient to fill the interstices, faced with a layer of

similar (finely-ground) material, and bonded with an excess of clay. J. A. SUGDEN.

Heat-conducting high-temperature resistant refractory. J. D. MORGAN, W. G. BJORKSTEDT, and R. E. LOWE, Assrs. to DOHERTY RESEARCH CO. (U.S.P. 1,811,242, 23.6.31. Appl., 11.6.28).—Equal pts. of $ZrO_2 \cdot SiO_2$ and Si (or ferrosilicon) are mixed with 4–6% of H_3PO_4 , shaped, and fired at 1400° .

J. A. SUGDEN.

Manufacture of tungsten carbide [for use in drill bits]. O. L. MILLS, Assr. to MILLS ALLOYS, INC. (U.S.P. 1,812,357, 30.6.31. Appl., 21.1.30).—Mixtures of powdered W (1–50%) with W carbide contained in a shallow vessel placed on a bed of C and forming the lower electrode are subjected until molten to the action of an electric arc struck between the vessel and an upper C electrode having a blunt lower end of larger diam. than that of the vessel. L. A. COLES.

Cu-Ni alloy [for glass moulds]. Joining metal to SiO_2 .—See X. **Synthetic resin [for reinforced glass].**—See XIII.

IX.—BUILDING MATERIALS.

Effect of dissolution on durability of Fletton bricks. G. P. McHUGH and E. L. KNIGHT (J.S.C.I., 1932, 51, 107–110 T).—Determinations of absorption, true porosity, and crushing strengths of Fletton bricks, dry and after soaking in H_2O and in aq. HCl and NaOH, lead to the conclusion that the behaviour of the bricks in damp situations is probably due to the amount of H_2O -sol. material present in the bricks. Thorough soaking of the bricks causes a considerable decrease in strength, and that loss is not regained after drying. It is suggested that Fletton bricks contain adsorbed free acid (probably H_2SO_4), which combines with free alkali present in the bricks when they are soaked in various solutions, and such combination may explain the efflorescence.

Preparation of andesite acid-resistant cement and concrete. I. I. LAGUTIN and L. N. MURAVLEV (J. Chem. Ind. Russ., 1931, 8, No. 19, 16–20).—A rapid-setting cement is prepared by mixing 50 g. of powdered andesite with 50 g. of sand and 4 g. of Na_2SiF_6 , and making into a paste with 16 c.c. of aq. Na_2SiO_3 (d 1.35). R. TRUSZKOWSKI.

Fineness and sieving of Portland cement. A. C. DAVIS (Cement, 1932, 5, 72–80).—The strength of concrete from a given cement increases with the fineness for all mixtures and ages of the concrete, due to the greater surface area and increased covering power of the particles. The principal result of finer grinding is to hasten the hydration and early hardening of cement, though chemical composition is of greater importance as regards quality. The methods of grading are described. C. A. KING.

Mixed cement from Portland cement and arsenious oxide. T. A. SHANN (Zement, 1931, 20, 816–817; Chem. Zentr., 1931, ii, 2376).—The CaO which can be extracted by H_2O is reduced by the addition of As_2O_3 (20%–100% cement). The removable As_2O_3 is lessened by heating the mixture to 190° .

L. S. THEOBALD.

Determination of sulphur present as sulphide in Portland cement. D. I. WATSON (Cement, 1932, 5, 49–51).—The usual evolution method is modified by adding a considerable excess of $SnCl_2$ to the cement before liberating H_2S by the addition of acid; this prevents oxidation of sulphides by any Fe^{+++} salts present. More highly conc. HCl is used to ensure the decomp. of SnS , together with a larger vol. of liquor to prevent trouble with gelatinous SiO_2 .

C. A. KING.

Determination of free lime in cement. G. A. ASH-KENASI (Cement, 1932, 5, 63–66).—The titration of CaO extracted from cement as Ca glycerate with alcoholic aq. NH_4OAc is inaccurate. Titration with tartaric acid or $BzOH$ is more successful and Rathke's tedious standardisation of 0.1N-tartaric acid for this purpose is modified. 7.5 g. of tartaric acid are dissolved in 1 litre of abs. MeOH. 50 mg. of CaO are rubbed with 2 c.c. of glycerin (d 1.26) in an agate mortar and washed into a flask with fractions of 8 c.c. of glycerin and finally with 40 c.c. of MeOH. The muddy liquor becomes clear after boiling for 3–4 min. and is titrated with the acid, using phenolphthalein in MeOH as indicator. The % CaO is always above the theoretical. C. A. KING.

Determination of free calcium oxide and hydroxide [in building materials]. B. BAKEWELL and G. E. BESSEY (Dept. Sci. Ind. Res., Building Res., Spec. Rept. 17, 1931, 21 pp.).—From a crit. examination of various methods it is shown that glycerol-extraction methods are accurate for unhydrated cements, sand-CaO bricks, and hydraulic CaO; the calorimetric method can be used for hydrated cements, mortar, and concrete, and the $Ca(OH)_2$ solution extraction method is restricted to CaO mortars and hydrated CaO. In the glycerol method the sample, containing < 0.05 g. of free CaO, is added to 20 c.c. of anhyd. glycerol, the mixture is shaken for 24 hr. at 60 – 80° , 20–30 c.c. of anhyd. EtOH are added, and the solution is titrated with $BzOH$ (phenolphthalein). In the aq. $Ca(OH)_2$ extraction method the sample (through 100-mesh) is agitated for 24 hr. with half-saturated $Ca(OH)_2$ solution and an aliquot portion of the filtrate is titrated with HCl.

A. R. POWELL.

Damp cupboard for use in cement testing. S. J. JOHNSTONE (Engineering, 1932, 133, 199).—To comply with the revised British Standard Specification for Portland cement a cupboard internally divided into 3 compartments has been devised. The hygroscopic conditions are maintained by jute sheets which dip into H_2O -tanks fixed around the top of the chambers, and loosely cover the sides and back of the chamber. H_2O drains down the material into collecting trays.

C. A. KING.

Theory of cement formation. R. ZOLLINGER (Cement 1932, 5, 67–71).—The theoretical and possible equilibria of CaO, SiO_2 , and Al_2O_3 are discussed graphically. C. A. KING.

Decomposition of hardened concrete to discover its original constituents. R. LOMAN (Erste Mitt. neuen Int. Verband. Mat.-prüf., 1930, B, 167–179; Chem. Zentr., 1931, ii, 2198).—The concrete is heated at 800 – 900° and quenched in H_2O ; after separation from

cement the aggregate is dried in air free from H_2O and CO_2 . A. A. ELDRIDGE.

Prediction of the composition of concrete necessary to produce a particular strength and elasticity. M. ROŠ (Erste Mitt. neuen Int. Verband. Mat.-prüf., 1930, B, 123—136; Chem. Zentr., 1931, ii, 2198).—Experiments based on Feret's formulæ are described.

A. A. ELDRIDGE.

Resisting power of concrete pipes towards water corrosion. J. O. ROOS AF HJELMSÄTER (Erste Mitt. neuen Int. Verband. Mat.-prüf., 1930, B, 144—148; Chem. Zentr., 1931, ii, 2376).—An investigation of attack by pure H_2O and by CO_2 . L. S. THEOBALD.

Paving brick.—See VIII.

PATENTS.

Lime kiln. A. ACKERMAN (U.S.P. 1,812,672, 30.6.31. Appl., 24.1.28).—Powdered $CaCO_3$ is blown around the blast flame of a horizontal rotary kiln in which it is partly calcined. The solid and gaseous products pass into a settling chamber in which calcination is completed, the gases escaping from an exit away from the solids to avoid dust being entrained. C. A. KING.

Manufacture of a magnesium oxychloride [cement] mixture. H. S. LUKENS, Assr. to SOLIDON PRODUCTS, INC. (U.S.P. 1,811,799, 23.6.31. Appl., 12.11.29).—The mixture comprises MgO , $MgCl_2$, and aggregate in proportions such that $MgO : MgCl_2 : 6H_2O = 1 : 0.84 : 1.25$, and the ratio of aggregate to $MgO + MgCl_2 : 6H_2O$ is such that the amount of H_2O required to yield a mix of suitable consistency is $>$ the amount required to produce a solution of d 1.125 if all the $MgCl_2$ in the mixture were dissolved therein, and is $>$ the amount required for the combination of the $MgCl_2$ with the MgO . L. A. COLES.

Manufacture of tridymite stones. H. SALMANG (B.P. 366,114, 25.10.30. Ger., 14.5.30).—Ground SiO_2 , of which at least 50% is as fine powder, is mixed with sulphite lye, 2% of $CaCO_3$, 1.5% of Na_2CO_3 , and 1.5% of Fe_2O_3 , and the mixture is burned for 20 hr. at about 1250° , whereby almost complete conversion of quartz into tridymite is obtained. A. R. POWELL.

Manufacture of a mixture containing mineral and bituminous substances [for road-making]. I. G. FARBENIND. A.-G. (B.P. 366,174, 17.11.30. Ger., 15.11.29).—A mixture of sand, cement, and basalt or porphyry chips with finely-ground lignite rich in humic acid, or with crude lignic acid and aq. NH_3 , is thoroughly incorporated with a mixture of petroleum pitch and tar or C_6H_6 until a homogeneous paste is obtained which is spread on to the road surface and rolled in the usual way. A. R. POWELL.

Treatment of road-making materials. C. G. FOX (B.P. 365,511, 13.8.30).—Stone chippings etc. are treated with pyridine bases free from aromatic OH-compounds, before being impregnated with tar or bitumen (which may contain added bases).

L. A. COLES.

Construction of acid-proof masonry from non-acid-proof stones. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 366,158, 7.11.30).—The bricks

are dipped into an asphalt emulsion consisting of 4% of lignite rich in humic acid, 50% of petroleum asphalt, and 46% of H_2O and then allowed to dry in the air. Joints are made with a mortar comprising 20% of the above emulsion and 80% of sand. A. R. POWELL.

Preparation of asphaltic material. W. C. WEST, Assr. to WEST PROCESS PAVEMENT CO., INC. (U.S.P. 1,812,730, 30.6.31. Appl., 21.8.28).—For purposes of storage or shipment, powdered hard asphalt is mixed with an earth below the temp. of blending with the semi-liquid asphalt, which is then incorporated. Finally the balance of pulverised cool earth is added.

C. A. KING.

Manufacture of moulded articles, e.g., tiles, plates, floor- and wall-coverings. N. VAN DER WILLIK (B.P. 366,304, 20.2.31. Holl., 4.6.30).—An asphalt emulsion of woollen fibres is mixed with cement and small chips of the same or differently coloured natural or artificial stones, and the mixture is applied as a paste to the surface to be covered. When hard the coating is ground until the chips show through the asphalt layer.

A. R. POWELL.

Heat-insulating composition. C. H. OWEN (B.P. 365,525, 15.10.30).—A mixture of ("Ferrocete") cement (2 pts.), ground fireclay (2 pts.), and slag dust or pumice powder (1 pt.) is worked to a plaster with H_2O . [Stat. ref.] L. A. COLES.

Wood colouring. C. E. LENTZ, Assr. to SINGER MANUFG. CO. (U.S.P. 1,809,980, 16.6.31. Appl., 20.10.28).—Timber is rendered porous in a closed container by evacuation, 25 lb. of anhyd. NH_3 per 1000 board feet are admitted, and the temp. is maintained at 128° for some time by means of direct steam. C. A. KING.

Treatment [colouring] of [sap] wood. W. KRITCHEVSKY and C. J. BECKERT (U.S.P. 1,810,659, 16.6.31. Appl., 14.2.29).—Wood, e.g., sap walnut, is soaked in H_2O in a container and after closing the latter the temp. is raised to 120 – 160° , with corresponding increase in pressure, by means of steam. C. A. KING.

Manufacture of cork-board substitute or artificial lumber. M. SHIKATA (B.P. 365,536, 16.10.30).—Moist, fibrous, vegetable material, e.g., "Tundra," straw, sawdust, bagasse, is treated with an electric current while under compression in a press provided with perforated sides made of insulating material and containing movable electrodes and a high-resistance plate between them embedded in the material under treatment. L. A. COLES.

Apparatus for manufacturing concretes and mortars and generally all mixtures free from air. E. FREYSSINET (B.P. 367,242, 28.4.31. Fr., 28.5.30).

Floor coverings.—See XIII.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Experimental smelting in a blast furnace with screened raw materials. B. V. VUISTAVKIN, M. M. KATOK, and I. A. OSTASHKEVICH (Domez, 1930, No. 12, 222—244).—Tables show the results for sizes 0—6, 6—35, and 35—75 mm. CHEMICAL ABSTRACTS.

Gruner's principle—increase of indirect reduction in the iron blast-furnace results in decrease of coal consumption—is found to be correct. N. A. KOSTULEV (Domez, 1930, No. 8—9, 1—63).—Various views on direct and indirect reduction are examined.

CHEMICAL ABSTRACTS.

Occurrence of oil in blast-furnace gas flues. H. A. BAHR and V. JESSEN (Stahl u. Eisen, 1932, 52, 13—14).—The presence of oil in the flue gases from an Fe blast furnace was found to be due to the addition of rolling-mill scale containing 0—13% of oil to the charge. When sufficient fine flue dust was produced, all or most of the oil was absorbed in the dust collectors, but otherwise part of the oil passed through the dry gas purifiers into the clean gas pipes. The possibility of oil synthesis in the furnace is discussed; the flue gases from the furnace described contained 0.3% CH₄, only 4% of which could be produced by heating the coke above 1000°, hence the remainder must have been synthesised in the smelting. There is thus a possibility of oil being formed in the furnace by the Fischer-Tropsch process. A. R. POWELL.

Caustic embrittlement of steel. F. HUNDESHAGEN (Chem.-Ztg., 1932, 56, 4—5, 17—18, 39—40).—From a review of recent work on the subject it is concluded that the phenomenon of caustic embrittlement in boilers is due to the presence of minute fissures in the neighbourhood of rivets, lapped joints, and other parts where the steel has been subjected to stresses above the yield point. When alkaline H₂O is used in such boilers the alkali tends to concentrate in the fissures and by its action relieve the internal stresses in the steel, which leads to intercryst. fracture. Precautions taken to prevent caustic embrittlement by control of the composition of the H₂O are merely palliatives; the only true safeguard is to select suitable steel for the manufacture of the boiler and to ensure the absence of unrelieved stresses during its manufacture. A. R. POWELL.

Cause of the abnormal behaviour of steels during case-hardening. F. DUFTSCHMID and E. HOUDREMONT (Stahl u. Eisen, 1931, 51, 1613—1616).—Pure steels containing <0.001% O, prepared by cementation or sintering of electrolytic or carbonyl Fe with C, have a structure characterised by the presence of large segregations of cementite and a coarse grain. This abnormal structure is due to the high rate of diffusion of Fe₃C in pure Fe-C alloys below the A1 point and to the close proximity of the Ar1 and Ac1 points; it is not caused by the presence of O in the alloy. Addition of small proportions of Mn or Cr to the steel lowers the A1 point and increases the hysteresis between the Ac1 and Ar1 points; hence these steels have no tendency to exhibit this abnormal behaviour, which is a sp. property of pure Fe-C alloys. A. R. POWELL.

High-chromium steels in the chemical industry. F. M. BECKET (Chem. and Ind., 1932, 49—52).—The history and applications of steels containing up to 30% Cr are reviewed. A new steel having 18% Cr, 6% Mn, 4% Ni, and 1% Cu has exceptional deep-drawing properties and somewhat greater high-temp. strength and resistance to chemical attack than have the Cr-Mn-Cu steels. C. HOLLINS.

Improvement of an austenitic high-chromium-nickel steel by precipitation hardening. E. GREULICH (Arch. Eisenhüttenw., 1931—2, 5, 323—330).—Ni-Cr steels containing 33.5—36% Ni, 9.5—11.5% Cr, 1.5—2.5% Mn, 0.1% Si, and 0.2—0.5% C may be age-hardened by quenching from above 900° and tempering above 600°. The hardening effect increases slowly at first, then more rapidly with rising quenching temp. and is relatively small when the alloy is quenched from below 1150°. When quenched from 1200° the hardness, yield point, and tensile strength begin to increase on ageing at 600° and reach their max. after ageing at 650—750°; at higher temp. the effect rapidly falls off. After 33 hr. at 650° a max. tensile strength of 80 kg. per sq. mm., yield point of 52.3 kg. per sq. mm., and Brinell hardness number of 190 are obtained with an elongation of 15% and a reduction in area of 38%. Rapid quenching is essential for the production of high hardening effects; air-cooling produces little tendency to hardening. The phenomenon is well marked in alloys with 0.2% C, but reaches its max. with 0.3% C and decreases slowly with an increase in the C content above 0.4%. The age-hardened alloys have a higher limit of creep and a lower rate of creep at temp. above 450° than ordinary austenitic steels of a similar composition. The rate of dissolution in conc. HCl is increased fourfold by ageing, but this effect appears only after very prolonged ageing. The separation of carbides from solid solution can be observed in the structure of aged alloys; a hardening effect is obtained only when the carbide particles exceed a definite number provided that they are disposed along the slip planes. Cold-working prior to tempering accelerates the hardening effect by inducing more rapid pptn. of carbide. A. R. POWELL.

Influence of nitrogen in mild steel on the ability of developing flow layers. C. W. MACGREGOR and F. R. HENSEL (J. Rheology, 1932, 3, 37—52).—The etchability of the flow layers is improved in certain steels by subjecting them to a stream of NH₃ before or after stressing. C. W. DAVIES.

Forging and rolling ledeburitic chromium steels. W. ZIELER (Stahl u. Eisen, 1932, 52, 38—42).—The development of minute fissures in steel containing about 14% Cr and 1% C used in the manufacture of non-rusting razor blades is due to the presence of a ledeburitic network between the grain boundaries. This network can be broken down only by a very thorough forging at the max. possible temp. so that severe deformation is produced in the centre of the ingot. Prolonged annealing does not result in a sufficient refining of the grain structure to prevent development of fissures during subsequent rolling. All heat-treatments must be carried out below 1150°, the m.p. of the ledeburite. A. R. POWELL.

Influence of pickling and galvanising on the tensile properties of drawn steel wire. H. VAN DE LOO, W. PÜNGEL, and E. H. SCHULZ (Stahl u. Eisen, 1931, 51, 1585—1590).—A cold solution containing 30% of conc. HCl is the best pickling medium for steel wires prior to galvanising; the small amount of H₂ occluded by the metal reduces its bending strength only slightly, and the low-temp. anneal afforded by the

molten Zn bath is sufficient to restore the original bending properties. If H_2SO_4 is used as a pickle the concn. should never be allowed to fall below 20% and the bath should be kept as hot as possible; low acid concn. and low temp. favour the production of brittle wires, especially when only a small degree of cold-work has been done prior to pickling. To obtain max. bending and torsion strength the wires should be drawn cold to a reduction of at least 80–85% before galvanising and should be made of steel with about 0.7% C. Such wires suffer a reduction of only 20% in the bending strength and 10% in the torsion test after galvanising compared with reductions of 40–50% and 60–80%, respectively, suffered by less strongly drawn wires made of milder steel. Resistance to corrosion is greatest when the wire is drawn at high speed through a galvanising bath which is maintained at the lowest possible temp. consistent with the production of a satisfactory coating.

A. R. POWELL.

Testing of materials for service in high-temperature steam plant. R. W. BAILEY and A. M. ROBERTS (Inst. Mech. Eng., Feb., 1932. Advance copy. 75 pp.).—The effect of operating and testing temp. below 600° is discussed with special reference to steel. A definite reduction in the creep-resistance of C steels was indicated when the pearlite was changed from the lamellar to the spheroidised form. In certain proportions, Ni, Mn, and Cu will render steel liable to embrittlement at steam-plant temp.; e.g., 1.5–3.5% Ni or 1–2% Mn renders a steel containing < 0.7% Mo brittle, but steels with 5% Ni appear to be free from this defect. The high-temp. tensile test has little val. in the determination of the true creep resistance, but may give relative vals.; standardised conditions of 550° and 0.001 strain per min. are suggested for strain tests.

C. A. KING.

Working up the filtrate from the determination of phosphorus in iron and steel analysis. A. COTTI (Chem.-Ztg., 1931, 55, 976).—The Fe is removed by addition of aq. NH_3 and the filtrate from the $\text{Fe}(\text{OH})_3$ is boiled down to expel NH_3 . At the point when the solution becomes feebly acid MoO_3 .aq. is pptd. in curdy aggregates. Further evaporation affords crystals of NH_4NO_3 which may be utilised in making up the molybdate reagent for P determinations.

A. R. POWELL.

Physical chemistry of flotation. I. W. WARK (Trans. Amer. Electrochem. Soc., 1932, 61, 115–122).—Papers submitted at the symposium on flotation (B., 1931, 978–979) are discussed. H. J. T. ELLINGHAM.

Accelerated test for determination of the limiting creep stress of metals. W. BARR and W. E. BARDGETT (Inst. Mech. Eng., Feb., 1932. Advance copy. 13 pp.).—The test depends on the measurement of the diminishing rate of creep in a stressed test-piece by means of a steel weigh-bar, so that the creep of the test-piece is accompanied by a proportionate decrease in the applied stress. The test-piece, 6 in. long and 0.25 in. diam., is heated in a thermostatically controlled resistance-wound furnace, and the extension of the weigh-bar is measured by means of an Ames dial gauge in conjunction with a lever device which allows an accuracy of 0.0015

ton. A period of 48 hr. gave the best combination of accuracy and limited test duration. C. A. KING.

Simple model explaining the [strain]-hardening effect in polycrystalline metals. H. HENCKY (J. Rheology, 1932, 3, 30–36).—A plastic medium in which small unyielding rods are embedded is statistically treated, and provides a model which reproduces the features of tension and compression tests.

C. W. DAVIES.

Parker process for rust-proofing. O. W. ROSKILL (Ind. Chem., 1932, 8, 59–61).—Insol. phosphates are not formed on Fe unless a phosphate of the formula $\text{M}(\text{H}_2\text{PO}_4)_2$, free H_3PO_4 , and some ferrous monohydrogen phosphate are present in the treatment bath. A mixture of Mn and Fe salts gave the best results; the latter may be prepared in quantity by dissolving 1 pt. of Fe filings in 10 pts. of 65% H_3PO_4 at 100°. After filtration the solution is cooled slowly and the large crystals formed are centrifuged and dried rapidly at 60°. The Mn salt (mixed with Fe) is prepared similarly from ferromanganese, and if the bath is boiled before use partial hydrolysis occurs with the formation of ferrous monohydrogen phosphate and free acid. The optimum ratio of Fe to Mn in the protective coating is 1:1, which is formed by selective deposition from a solution of ratio 2:1; consequently the bath must be constantly replenished with Mn. The standard concn. adopted was 35 lb. of $\text{Fe}(\text{H}_2\text{PO}_4)_2$ per 125 gals. of H_2O and the temp. was maintained at 99°. Cu phosphate in small quantity acted as an accelerator.

C. A. KING.

Effect of small additions [of metals] on the annealing of copper. A. BURKHARDT (Metall.-Wirt., 1931, 10, 657–659; Chem. Zentr., 1931, ii, 2380).—Annealing temp. have been determined for Cu with additions of 0.1 and 0.5% of Ag, Si, Fe, Zn, Cd, Al, Ni, Cr, Mg, Sn, Mn, and P; a rise occurs with 0.5% of Fe, Cr, Ag, Mn, Sn, and Mg.

L. S. THEOBALD.

Bright annealing of metals with hydrocarbon gases. E. G. DE CORIOLIS and R. J. COWAN (Ind. Eng. Chem., 1932, 24, 18–20).—18-gauge brass wire was threaded through a tube furnace on to a reeling device so that its rate of travel could be controlled, and various hydrocarbon gases were passed through the tube. The wire could not be made bright below 677°; to obtain a bright surface at a temp. equal to or above the desired annealing temp. for brass it is necessary that some cracking of the hydrocarbon must have taken place and that the gas itself must have been exposed to at least 677°. H_2 does not produce a bright anneal at 538°; at 648° the reaction proceeds rapidly and an excellent surface is obtained; if the H_2 itself is heated to 677° the brass can be annealed at 427–482°.

C. B. MARSON.

Effect of products of combustion on shrinkage of metal in the brass industry. C. UPTEGROVE and A. J. HERZIG (Dept. Eng. Res. Univ. Michigan, Eng. Res. Bull., 1931, No. 22, 66 pp.).—The shrinkage of a brass is influenced chiefly by the furnace atm. which controls the conditions on the surface of the metal. Solubility of gases in the metal is not a significant factor. The predominating metal loss may be either by volatilisation or by oxidation, dependent on the

constitution of the alloy, and comparatively little can be done practically to reduce losses by alteration of the furnace atm.; oxidising conditions tend to reduce volatility. The formation of a crust on the surface of the metal is a more practical protection, and this may be effected by a limited oxidation of the metal or by a suitable covering of slag; C deposits are of little val. in this respect. In general, high-Zn brasses should be melted under oxidising conditions and low-Zn brasses in neutral atm. C. A. KING.

Chemical composition of prehistoric bronzes. J. SEEBELIEN (Chem.-Ztg., 1931, 55, 973—974).—Analysis of ancient Egyptian and Babylonian bronzes indicates that the "bronze age" was preceded by a "copper age" beginning about 4000 B.C. Sn first appears in bronzes of the 12th Dynasty, about 1200 B.C., prior to which all so-called bronzes appear to consist of practically pure Cu. A. R. POWELL.

Lead refining by the Harris process. H. LAUTERBACH (Metall u. Erz, 1931, 28, 317—326; Chem. Zentr., 1931, ii, 2380).—An investigation of the action of NaNO_3 on Pb. The absorbing power of the fused mass for As is 17.9%, Sn 25%, and Sb 29.5%. Sn and Sb lower the solvent power of the melt. L. S. THEOBALD.

[Lubrication] tests on tin-base and lead-base bearing metals. C. JAKEMAN and G. BARR (Engineering, 1932, 133, 200—202).—Bearings of high-Pb alloys showed rather more frictional wear than those of high-Sn alloys, but the chemical action of castor oil or of certain motor-cylinder oils was negligible. Olive and sperm oils caused a sludge, Pb giving the greater quantity. Alkali metal (<2%)—Pb alloys were satisfactory at moderate loads when lubricated with mineral or compounded oils, but dissolved freely in olive or sperm oils. C. A. KING.

Physical properties of wiping solders. D. L. McLEAN, R. L. PEEK, JUN., and E. E. SCHUMACHER (J. Rheology, 1932, 3, 53—74).—Plastometer measurements in the working temp. range are sensitive to composition changes, and also indicate the workability of the solder. Segregation is not an important factor in porosity, which is probably due to large particle size at the working temp. C. W. DAVIES.

Mercury purification. B. MOORE (Ind. Chem., 1932, 8, 63—64).—The removal of metallic impurities in Hg is effected more efficiently by a washing process than by vac. distillation, the latter method being almost useless when the impurities were of the order of 0.002%. A suitable apparatus for cleaning Hg is described which consists essentially in dropping Hg from a reservoir into a vertical tube packed with beads where it is dispersed among the cleaning solution, finally leaving through a U-tube to a heated drying tube. One treatment with 10% aq. KOH, followed by two with 10% HNO_3 and one with 1% HNO_3 , reduced the Cu, Pb, and Bi contents to zero and the Fe by 50%. C. A. KING.

Behaviour of light metals at low temperatures. F. BOLLENRATH and J. NEMES (Metall.-Wirt., 1931, 10, 609—613, 625—630; Chem. Zentr., 1931, ii, 2207—2208).—The mechanical properties of various malleable Mg and Al alloys for temp. down to -190° are recorded. A. A. ELDRIDGE.

Corrosion in metal seaplanes. G. GIUDI (Metall.-Wirt., 1931, 10, 645—646; Chem. Zentr., 1931, ii, 2208—2209).—Dangerous intercryst. corrosion causes practically no change in wt. The effect of corrosion on strength was examined by determination of the p.d. between metal parts. A. A. ELDRIDGE.

Aluminium and its welding. A. VORONIN (Avtogennoe Delo, 1930, No. 3, 14—16).—Flux compositions are specified. CHEMICAL ABSTRACTS.

Electric welding of aluminium by means of carbon electrodes. A. P. GORYACHEV and R. R. SUIROMYATNIKOV (Avtogennoe Delo, 1931, No. 6, 6—8).—A flux containing NaCl 7.6, KCl 65.1, LiCl 27.3% is recommended. CHEMICAL ABSTRACTS.

Fully organised anodic layers on aluminium. J. E. LILIENFELD, L. W. APPLETON, W. M. SMITH, and J. K. NIEH (Trans. Amer. Electrochem. Soc., 1932, 61, 55—72; cf. A., 1931, 173).—By slightly varying the pretreatment of the metal surface, subsequent anodic treatment in 4% aq. H_3BO_3 produces either (a) a "pure active layer," the capacity of which is unchanged by desiccation, or (b) a "compound layer" the capacity of which is different according to whether the plate is in the electrolyte, exposed to a moist atm., or dried by P_2O_5 . Layers of the former type are believed to be built up of regular chains of Al_2O_3 mols. formed under the influence of the electric field and linked together in a manner which precludes hydration, whereas those of the latter type contain groups of unorganised mols. which can readily be hydrated and subsequently dehydrated. The capacity of these anodic layers is found to be inversely proportional to the formation voltage, a relation which is in harmony with the theory advanced. For aq. solutions the breakdown voltage increases with the resistance of the solution, and for a given resistance it is higher for aq. than for alcoholic solutions. H. J. T. ELLINGHAM.

Dilatometric study of chromium-nickel-iron alloys. V. N. KRIVOBOK and M. GENSAMER (Amer. Inst. Min. Met. Eng. Tech. Pub., 1931, No. 434, 23 pp.).—The increase in hardness of the steels (15—20% Cr, 0—12% Ni) on cooling is due to the decomp. of austenite. Only a few min. are required to establish a quasi-equilibrium between the retained metastable austenite and the ferrite and carbides at any temp. Ni in 18% Cr steels lowers the temp. at which the γ -phase changes to α on cooling, and opposes raising this temp. by "soaking." C acts similarly but less markedly. CHEMICAL ABSTRACTS.

Determination of tin in tin pyrites containing cassiterite. B. HIRSCH (Chem.-Ztg., 1932, 56, 127).—The sample (1 g.) is treated with 10 c.c. of HNO_3 , and after evaporation of the mixture to dryness the residue is evaporated with 10 c.c. of a solution containing 20 g. of Br per litre of 30% HCl. After again evaporating with 10 c.c. of 30% HCl, 50 c.c. of 30% HCl are added, the whole is diluted to 250 c.c., and 1 g. of reduced Fe and a few pieces of Swedish Fe are added. Reduction is completed by boiling for 30 min., and the cooled solution is titrated, without being filtered, with I solution. This method gives directly the pyrites Sn. Details are given of two other methods which yield equally satisfactory results, but are rather more tedious. H. F. GILLBE.

Magnesium industry in France. F. RAVIER (Chim. et Ind., 1931, 26, 1263—1269; 1932, 27, 31—40).—The manufacture of Mg in France commenced in 1915, but has been continued only on a comparatively small scale. A suitable electrolyte bath contains 47—67% MgCl_2 , 25—45% KCl , and 3% CaF_2 . In America KCl is replaced by NaCl . $\text{Atm. H}_2\text{O}$ leads to the formation of MgOCl_2 and, owing to the necessity of removing the Cl_2 , enough air comes in contact with the bath to make the loss very considerable. This explains the variation between summer and winter yields; it adds to the loss of electrodes and the floating crusts of MgOCl_2 are a nuisance. A recent type of closed furnace with the cathodes cooled by dry cold air is described, together with the procedure of starting. A continuous feed is desirable and a preliminary electrolytic bath which removes all H_2O from the more or less dehydrated salt is often used. In this a partial electrolysis of MgCl_2 is performed and the process is finished with good yield (80—85%) in a second stage. The Mg is recovered by "fishing," which necessitates opening the furnace. It is necessary to stop a furnace for cleaning once or twice a month, and in a few months the anodes must be renewed. Temp. must be carefully controlled. A second process consists in the electrolysis of MgO from the calcination of magnesite in a mixed bath of fluorides. 0.1—0.35% of the MgO is dissolved and a surplus remains in suspension. The best yield of many baths tested was given by one containing MgF_2 38%, CaF_2 16%, BaF_2 39%, NaF 4%, MgO 3%. This has m.p. 790° , but remains pasty until about 900° , which temp. should be exceeded by as little as possible. The c.d. should be ≥ 20 amp./sq. dm. and the anodes may have their porosity reduced by impregnation. The Seward furnace operates this process in the U.S.A., and another furnace is described which has been tested in France. The feed is intermittent and the difficulty of maintaining a uniform composition is a main drawback. Indirect methods of manufacture of Mg, in which alloys are first produced, use a cathode of molten Pb, Sn, Zn, or Al. Yields are good, but there are many practical difficulties, especially in the formation of crusts on the surface of the molten metal. C. IRWIN.

Viscous extension of hot metals. G. RANQUE and P. HENRY (Compt. rend., 1931, 193, 1061—1063).—Apparatus is described for the determination, as a function of the duration of application of a definite load, of the max. temp. at which a sample of metal undergoes no extension. A practical limit of viscosity can be deduced by determining a load-temp. curve to show the max. load which at the given temp. causes an extension not exceeding some given amount, e.g., 0.005% per hr. C. A. SILBERRAD.

Status of chromium plating. W. BLUM (J. Franklin Inst., 1932, 213, 17—39).—At the present time the applications of Cr plating are more extensive for appearance than for wear-resistance, though the latter is increased by the use of a thin deposit of Cr on an intermediate metal, e.g., Ni, rather than of a thicker primary coating of Cr. When deposited at relatively high temp. (45°) the film is less brittle and less porous, due probably to a lower H content. The poor "throwing power"

during electrolysis makes it difficult to obtain a uniform bright deposit; this difficulty has been overcome more by ingenuity in design of the cathode and the shielding of parts exposed to non-uniform current densities than by fundamental research. The hardness of Cr plating has extended its use to printing plates and dies for moulding plastic materials, e.g., rubber, bakelite, clay, and glass. C. A. KING.

Chromium plating of steel at high temperatures and high current densities for wear-resistance. A. WILLINK (Trans. Amer. Electrochem. Soc., 1932, 61, 73—80).—Raising the temp. of a Cr-plating bath greatly increases the range of c.d. giving hard, bright deposits. At 72° a bath containing 248 g. CrO_3 and 2.3 g. H_2SO_4 per litre yields hard deposits between 110 and about 200 amp./sq. dm., and the higher the c.d. within this range, the greater is the current efficiency, throwing power, and range of permissible SO_4^{2-} content. Deposits at these higher temp. seem to wear better. The use of C_2HCl_3 vapour for removing grease from the steel surface before plating is advocated. Alkaline cleaners may leave a film of alkali on the surface and thus cause poor adhesion of the deposit. H. J. T. ELLINGHAM.

Large electric furnace installations. I. Annealing. II. Heat-treatment of steel. A. G. LOBLEY (Metallurgia, 1932, 5, 123—126, 151—154).

Trend of X-ray analysis in metallurgy. L. PICKUP (Metallurgia, 1932, 5, 177—179).

Handling corrosive gases. X-Rays in research.—See I. Electric furnaces.—See XI. Rust-preventive paints.—See XIII.

See also A., Mar., 219, B.p. of alloys at atm. pressure. 220, Chemistry of alloys. 221, Diffusion of Mo in W. Fe-Cr, Pt-Cu, Pt-Ni, Au-Pt, Pd-Fe, Ag-Pd, Au-Pd, Pd-Pt-Rh, and Fe-Ni-P alloys. 231, Electrolytic transfer of Pt in aq. HCl . 234, Corrosion of Fe and Ni by aqua regia. Dissolution of Cu in H_2SO_4 . 236, Electrolysis of $\text{Cr}_2(\text{C}_2\text{O}_4)_3$ baths. Electrodeposition of Po. Electrolysis of aq. KReO_4 . Pt in electrochemistry. 237, Cathodic disintegration of alloys. 245, Silvering of small mirrors. 246, Separation of large samples of minerals.

PATENTS.

Furnaces for melting metals etc. H. R. HIGGINS, LTD., and R. H. B. FORSTER (B.P. 365,704, 20.11.30).—Claim is made for a tilting furnace having an arch extending across the furnace over the molten metal and oil or gas burners arranged to direct the flame into the space above the arch so that the hot gases pass across the melting chamber and back over the metal surface. The waste gases leave the furnace through ports under the arch leading to flues, passing upwards on either side of the burner block to a recuperator for preheating the air supply. A. R. POWELL.

Manufacture of metals from metal carbonyls. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 363,146, 24.12.30).—Decomp. of the carbonyl is effected by introducing it into the interior of a vessel maintained at 280° and provided with a number of longitudinal ribs forming narrow decomp. chambers. $\text{Fe}(\text{CO})_5$ treated in

such a vessel yields 20 kg. of Fe powder (containing 0.9% C) per hr. per cu. m. of space. A. R. POWELL.

Manufacture of metallic masses from pulverulent initial materials [iron or nickel powder from carbonyls]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 366,059, 22.8.30).—Finely-powdered Fe from $\text{Fe}(\text{CO})_5$ is mixed with a small quantity of powdered Fe-Al alloy, $\text{Al}(\text{NO}_3)_3$, or MnCO_3 and pressed into a block which is subsequently heated in H_2 at 1200° and forged and rolled into a rod having a high notched-bar impact strength. A Ni-Cu alloy can be obtained in the same way, using Ni powder, cement Cu, and MnCO_3 and heating in H_2 at 1000° . The addition material in each case forms a fusible slag with the impurities in the Fe or Ni powder, which behaves similarly to the slag inclusions in wrought Fe. A. R. POWELL.

Production of sponge iron. GUTEHOFFNUNGSHÜTTE OBERHAUSEN A.-G. (B.P. 364,699, 14.10.30. Ger., 14.10.29).—The ore is passed over a continuous travelling grate in a long closed chamber. The grate moves below a series of chambers from which reducing gas at gradually rising temp. is passed through the ore layer. The gas is obtained directly from a blast furnace and is exhausted again from the reduction chamber by means of flues connected to the raw gas pipe or to a zone of low pressure in the blast furnace. The hot or reduced ore from the chamber is cooled by means of cold reducing gas, which is returned to the reducing circuit. A. R. POWELL.

Increasing the resistance to corrosion of steel and cast iron. VEREIN. STAHLWERKE A.-G. (B.P. 366,193, 28.11.30. Ger., 30.11.29).—Steel containing Cu and a metal which forms a gelatinous hydroxide film, e.g., Al, Si, Ni, or Sn, is allowed to remain in contact with a more noble metal in the corroding solution, e.g., sea-water, whereby a film of Cu cemented together with an adherent $\text{Si}(\text{OH})_4$, $\text{Al}(\text{OH})_3$, $\text{Ni}(\text{OH})_2$, and/or $\text{Sn}(\text{OH})_4$ film is produced on the steel and protects it from further corrosion. A. R. POWELL.

Treating metallic articles [steel coated with other metals]. O. A. BASSETT, Assr. to NAT. INDUSTRIAL LABS. CORP. (U.S.P. 1,811,909, 30.6.31. Appl., 6.11.25).—Galvanised, tinned, or Pb-coated steel is thickly covered with a paste containing 30% KCN, 20% $\text{Na}_2\text{B}_4\text{O}_7$, 20% Na_2CO_3 , 20% powdered graphite, and 10% H_2O (containing glue as a binder), then heated at a carburising temp., quenched in oil or H_2O , and tempered in the usual way. A. R. POWELL.

Manufacture of castings [cast iron] having wear-resistant surfaces. L. MELLERSH-JACKSON. From AMER. ABRASIVE METALS Co. (B.P. 364,870, 26.1.31).—The walls of the mould are coated with grains of emery, corundum, SiC , or other wear-resistant substance mixed with fireclay, rye flour, neutralised and conc. sulphite-cellulose waste liquor, or water-glass in which $\text{SiO}_2 : \text{Na}_2\text{O} < 3.2 : 1$, and, after drying, the molten metal is cast into the mould so that the surface of the casting becomes coated with the wear-resisting grains. A. R. POWELL.

Stain-resisting [iron] alloys. ELECTRO METALLURGICAL Co., Assees. of F. M. BECKETT (B.P. 366,060, 28.8.30. U.S., 18.4.30).—A non-rusting Fe alloy for deep-drawing contains 16–22 (17)% Cr, 5–15 (8.7)%

Mn, 0.25–3 (2)% Cu, and < 0.3 (0.1)% C. [Stat. ref.] A. R. POWELL.

Manufacture of vanadium steel. B. D. SAKLAT-WALLA, Assr. to VANADIUM CORP. OF AMERICA (U.S.P. 1,811,698, 23.6.31. Appl., 20.12.28).—V is introduced into molten steel in an electric furnace by direct reduction from a slag covering the metal. Reduction may be effected by addition of Al, Mg, Si, or C to the slag or by the action of similar reducing agents alloyed with the steel. A. R. POWELL.

Non-magnetic [manganese] steel. F. KRUPP A.-G. (B.P. 366,326, 18.3.31. Ger., 11.12.30).—The steel contains 16–25 (17–20)% Mn 0–1.5% Si, 0.1–0.4 (0.3–0.4)% C, and $< 5\%$ Ti, Cr, V, or Mo (1% Cr), and is quenched from above 1000° to retain an austenitic structure. A. R. POWELL.

Manufacture of [compound cast steel] ingots. KLÖCKNER-WERKE A.-G. ABT. GEORGS-MARIENWERKE (B.P. 366,377, 5.5.31. Ger., 30.5.30).—The separating plate which remains in the ingot consists of a soft, readily weldable ingot steel containing 0.05–0.15% C. A. R. POWELL.

Welding [rod for arc welding]. SOC. ANON. DES ATELIERS DE SECHERON (B.P. 363,921, 26.3.31. Austr., 27.3.30).—The rod comprises a metal (e.g., Fe) core coated with a thermit mixture containing carbonates and/or hydroxides together with alloying constituents which it is desired to incorporate in the weld. The gases evolved (CO and H_2) by the thermit reaction serve to prevent oxidation, and the flux produces a clean weld. A. R. POWELL.

Separation of metals and metalliferous minerals from ore-containing pulp. K. G. SMIT (B.P. 362,127, 12.11.30).—The ore pulp is fed down the central shaft of a rotating cylindrical vessel and a current of H_2O is fed upwards through the vessel against the direction of rotation, so that the heavy particles are pressed against the perforated walls of the cylinder and the lighter particles are carried by the H_2O stream out at the top. A. R. POWELL.

Flotation process. I. H. DERBY and O. D. CUNNINGHAM, Assrs. to P. C. REILLY (U.S.P. 1,812,839, 30.1.31. Appl., 19.3.26).—The use as collectors is claimed of the reaction products of P_2S_5 with alkali or alkaline-earth ethoxides or phenoxides or their homologues, or with alkyl or aryl mercaptans. A. R. POWELL.

Manufacture of porous metal [e.g., bronze bearing metal]. C. F. SHERWOOD (B.P. 365,068, 30.9.30. U.S., 13.11.29).—A mixture of powdered Sn and Cu with a small quantity of stearic, oleic, palmitic, or other fatty acid dissolved in Et_2O or other suitable solvent is warmed to expel the solvent, compressed to the desired form, and sintered in a reducing atm. (coal gas or H_2) by means of electrical-resistance or induction heating. A. R. POWELL.

Non-ferrous [copper-nickel] alloy. R. L. BINNEY, Assr. to BINNEY CASTINGS Co. (U.S.P. 1,811,682, 23.6.31. Appl., 31.7.29).—An alloy with a low coeff. of expansion and resistant to scaling at high temp. comprises 40–80 (64)% Cu, 10–30 (19)% Ni, 6–9 (8)% Al, 6–9 (8)% Zn,

and 0.1–5 (0.2)% V. The alloy is suitable for the manufacture of glass moulds. A. R. POWELL.

Protection of metals [from corrosion]. W. GÖTZL (B.P. 364,226 and 365,023, 25.10.30. Ger., 25.10.29).—To prevent breakdown of the film at sharp edges of anodically oxidised metals, the edge is first (A) rounded or retroverted and insulating material is inserted within the retroverted portions, or (B) provided with an edging in the form of a C-shaped piece of the same metal secured by welding or soldering or by means of a cement. A. R. POWELL.

Protected metal article. J. H. YOUNG, Assr. to H. H. ROBERTSON Co. (U.S.P. 1,812,732, 30.6.31. Appl., 20.9.29).—Sheet metal coated first with a thin layer of asphalt, then with felt impregnated with a fire-resisting mixture of asphalt and chlorinated Ph₂, and finally with a second thin layer of asphalt is claimed. A. R. POWELL.

Recovery of tin from alkaline stannate solutions. W. T. LITTLE (U.S.P. 1,811,142 and 1,811,360, 23.6.31. Appl., [A] 6.10.28, [B] 1.11.28).—(A) Na₂SnO₃ solutions obtained by treatment of tinned scrap Fe with NaOH solutions containing NaNO₃ and NaNO₂ are cooled to recover Na₂SnO₃ crystals, which are separated and dissolved in warm H₂O. The solution is treated at 70–80° with nitrous gases obtained by the catalytic oxidation of NH₃, whereby SnO₂.aq. is pptd. in a readily filtrable form and a NaNO₂–NaNO₃ solution is obtained for use in detinning further quantities of scrap. (B) The process is applied to Na₂SnO₃ solutions obtained in the Harris process. A. R. POWELL.

Production of bismuth. W. C. SMITH, Assr. to CERRO DE PASCO COPPER CORP. (U.S.P. 1,809,871, 16.6.31. Appl., 31.12.28).—Flue dust containing Bi and Pb is smelted to obtain a Pb alloy containing Bi, Cu, and small quantities of Au, Ag, As, and Sb. This alloy is cupelled until the metal left contains about 65% Bi and 33% Pb; this metal is then smelted with Cu, S, and FeS to obtain a leady Cu–Fe matte and Bi bullion containing 97–98% Bi, and finally this bullion is liquated and further purified by known means. A. R. POWELL.

[Bismuth–antimony–]aluminium alloys. Soc. DES BREVETS BERTHELEMY DE MONTBY (B.P. 366,088, 28.10.30. Fr., 29.10.29).—Homogeneous alloys of Al with Bi and Sb are obtained by adding both elements simultaneously, preferably as a Bi–Sb alloy, to molten Al. A. R. POWELL.

Solder for aluminium and its alloys. F. STRASSER (U.S.P. 1,812,567, 30.6.31. Appl., 10.2.30).—The solder comprises an alloy of Sn (50%) with 10–30 (25)% Zn, 7–15 (12)% Al, 1–5 (5)% Cu, and 1–8 (8)% Bi. 1–4% Sb may also be added. A. R. POWELL.

Production of insulated ferromagnetic powder. HARTSTOFF-METALL A.-G. (HAMETAG) (B.P. 366,230, 30.12.30. Ger., 2.1.30).—Cores for electromagnetic apparatus are prepared by stirring rounded Fe powder with 1% of shellac dissolved in EtOH and with 2% of finely-powdered asbestos, with or without a small quantity of Na₂B₄O₇, drying, grinding, and forming into cores under pressure. A. R. POWELL.

Electrolytic deposition of metals. Soc. ANON. WALDBERG (B.P. 362,191, 29.12.30. Fr., 27.12.29).—Apparatus for plating Fe and steel comprises an inclined revolving vat with electromagnets above and below, by the use of which the goods are kept in position and withdrawn automatically. A. R. POWELL.

Plating of metals [iron with brass]. W. E. WATKINS, Assr. to COPPER PLATE SHEET & TUBE CO. (U.S.P. 1,810,409, 16.6.31. Appl., 29.5.29).—Fe sheet or strip is galvanised by the hot-dipping process, then coated with a layer of finely-divided Cu dispersed in an asphaltic-base hydrocarbon, and finally heated to a temp. at which the Cu diffuses into the Zn to form a uniform, highly adherent brass coating on the Fe. A. R. POWELL.

Electrodeposition of copper. COPPER DEOXIDATION CORP. (B.P. 365,052, 10.9.30. U.S., 18.9.29).—Brittle, coarsely cryst. deposits of Cu are obtained by coating the cathode with a thin film of an oil, containing preferably unsaturated hydrocarbons or their derivatives, e.g., an emulsion of asphalt, linseed oil, sulphonated maize oil, crude fuel oil, or cerowax. Glue and similar modifying agents are omitted from the electrolyte. A. R. POWELL.

Copper-extraction process. W. E. GREENAWALT (U.S.P. 1,810,895, 23.6.31. Appl., 14.2.27).—Cu ore containing the metal partly in the sulphide and partly in an oxidised form is leached with dil. H₂SO₄ and the residue is subjected to flotation to obtain a rich Cu–Fe–S concentrate which is given a sulphatising roast before leaching with H₂O to obtain relatively pure aq. CuSO₄. The latter is electrolysed for the recovery of Cu and the H₂SO₄ solution is utilised in leaching the residue from the H₂O extraction. The resulting impure CuSO₄ solution is electrolysed in a second circuit, the Fe₂(SO₄)₃ solution thus obtained is reduced by addition of Cu ppt. obtained by treatment of the original acid leach liquor with Fe, and the solution containing CuSO₄ and FeSO₄ is returned to the electrolysis tanks. A. R. POWELL.

Formation of an insulating [fluoride] layer on metals [e.g., copper]. INTERNAT. GEN. ELECTRIC CO., INC., Assees. of ALLGEM. ELECTRICITÄTS-GES. (B.P. 365,422, 7.4.31. Ger., 7.4.30).—Cu wire is drawn through fused KF in an atm. of CO₂ and allowed to cool in the same gas. The resulting fluoride film on the Cu does not crack on bending. A. R. POWELL.

Electroplating [aluminium printing plates with zinc]. K. D. ROBINSON, Assr. to MERIDEN GRAVURE CO. (U.S.P. 1,807,875, 2.6.31. Appl., 21.10.26).—An Al plate is cleaned with dil. Na₂CO₃ and then with dil. HCl, coated with gelatin containing a little HCl, and, after allowing the gelatin to dry, plated with Zn so that the Zn fills the interstices in the gelatin film. Finally the deposit is covered by an outer gelatin film. A. R. POWELL.

Forming of metal foils. G. YUNGBLUT and H. C. FISHER, Assrs. to RICHARDSON CO. (U.S.P. 1,811,485, 23.6.31. Appl., 9.1.25).—Finely-divided metal, e.g., Cu, Ag, Au, is emulsified with a volatile liquid, e.g., C₆H₆, and the emulsion is passed in a thin layer over the surface of a warm electrolyte containing a salt of the

same metal, whereby the liquid is vaporised and the film of metal on the warm aq. solution is then caused to cohere and thicken by electrolysis. A. R. POWELL.

Electrodeposition of chromium. W. S. BOHLMAN, Assr. to CHROMIUM CORP. OF AMERICA (U.S.P. 1,809,826, 16.6.31. Appl., 6.9.27).—The CrO_3 plating solution is continuously sprayed against the surface to be plated from a metal nozzle which forms the anode. In this way the H_2 generated at the cathode is rapidly dispersed and the current is used as the heating medium to maintain a temp. of 35–40° at the cathode surface. A. R. POWELL.

Refining of lead. P. W. DAVIS (U.S.P. 1,809,835, 16.6.31. Appl., 30.1.26. Renewed 30.10.30).—Old accumulator plates and other scrap Pb alloys are melted together under such conditions that the PbO_2 present oxidises the alloying elements (Sb, Sn, and Cu) in the charge. PbO is added when there is a deficiency of PbO_2 , and wood, rubber, or other scrap carbonaceous material is added when there is an excess of oxidising material. A. R. POWELL.

Manufacture of carbonised nickel. BRIT. DRIVER-HARRIS CO., LTD. (B.P. 366,236, 1.1.31. U.S., 2.1.30).—Anode plates for radio valves are prepared from Ni strip which has been sand-blasted and then carburised by passing it through a furnace containing an atm. of C_4H_{10} . A. R. POWELL.

Introducing pure [alkali] metals, alloys, or metallic mixtures into the interior of highly exhausted or gas-filled tubes. VATEA RADIOTECHNISHE & ELEKTRIZITATS A.-G. (B.P. 363,840, 30.12.30. Hung., 4.3.30).—Bulbs made of soda-glass are electrolysed in baths of fused alkali nitrates, the anode being inside the bulbs so that a thin layer of the alkali metal (K, Li, or Cs) is deposited in the inner glass wall. On subsequent electrolysis of the bulb after exhaustion the alkali metal is caused to separate from the walls and act as a getter. A. R. POWELL.

Securing a metal support to an article of fused silica [mercury-vapour lamp]. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of L. J. BUTTOLPH (B.P. 364,188, 7.10.30. U.S., 7.11.29).—A metal terminal cap is forced over the SiO_2 while hot, so that on cooling it forms a tight joint by contraction. A. R. POWELL.

Metal ribbon making [from wire]. GRISCOM-RUSSELL CO., Assees. of E. A. DEWALD (B.P. 367,197, 5.3.31. U.S., 8.1.31).

Fuel [for steel furnaces].—See II. **Purifying steel-pickling liquors. Recovering cyanide from liquors.** Pb-bearing ores.—See VII. **W carbide for drill bits. Cast-metal moulds.**—See VIII. **[Metal-melting] furnace. Insulated wire.**—See XI. **Rubber-metal joints.**—See XIV.

XI.—ELECTROTECHNICS.

New electric furnaces. E. F. RUSS (Trans. Amer. Electrochem. Soc., 1932, 61, 109–113).—Operating data are given for Russ induction furnaces melting brass and for hearth-type furnaces melting Al in European practice. Furnaces for continuous annealing of brass and Cu strip are illustrated. H. J. T. ELLINGHAM.

Control of acid baths. X-Rays in research.—See I. **Light-source for absorption measurements. Electrical porcelain.**—See VIII. **Mg industry. Cr-plating steel. Welding Al. Anodic layers on Al.**—See X. **Control of p_{H} of H_2O .**—See XXIII.

—See also A., Mar., 231, **Al rectifying cell. Electrolytic transfer of Pt in dil. HCl.** 236, **Electrolysis of $\text{Cr}_2(\text{C}_2\text{O}_4)_3$ baths. Mo bronzes. Electrodeposition of Po. Electrolysis of aq. KReO_4 . Pt in electrochemistry.** 237, **Cathodic disintegration of alloys.** 240, **Magneto-optical method of analysis.** 245, **Thermostat for electric furnace. Potentiometric pyrometer. Measuring X-ray intensities.** 246, **Diaphragm electrolyzers.** 261, **Electrochemical nitration of C_{10}H_8 .**

PATENTS.

Induction electric furnace. E. F. NORTHROP, Assr. to AJAX ELECTROTHERMIC CORP. (U.S.P. 1,811,644, 23.6.31. Appl., 14.3.29).—A moving magnetic field is arranged to cause unidirectional flow of molten metal in a submerged vertical channel which loops both the heating and the braided stirring inductors.

J. S. G. THOMAS.

[Air-depolarised primary] electric batteries. W. W. TRIGGS. From NAT. CARBON CO., INC. (B.P. 366,080 and 366,101, 27.8.30).—(A) A cell comprising a metal, e.g., Zn, electrode, a caustic alkali electrolyte, and an amorphous C electrode having part exposed to the air and impregnated with material, e.g., hydrocarbon oil, petroleum jelly, stearic acid, or a solution of rubber, which is permeable to H_2O but not to the electrolyte, is claimed. (B) The electrolyte consists essentially of solid $\text{NaOH}\cdot\text{H}_2\text{O}$, and CaO , bentonite, or zeolites are placed at the bottom of the cell. J. S. G. THOMAS.

Electrodes for batteries, accumulators, etc. SOC. ANON. LE CARBONE (B.P. 365,754, 30.12.30. Fr., 17.11.30).—Carbonised fabric, treated so as to be permeable to gases but impermeable to liquids, is wrapped around a support. [Stat. ref.]

J. S. G. THOMAS.

Manufacture of electrical rectifiers. D. G. ACKERLY, Assr. to UNION SWITCH & SIGNAL CO. (U.S.P. 1,811,603, 23.6.31. Appl., 11.9.29).—A Cu blank coated with Cu_2O by heating at about 1000° is treated in molten metal, e.g., Pb, at 500–600°, to reduce the outer surface of Cu_2O to Cu, and quenched. J. S. G. THOMAS.

Using electrolytic rectifiers in series. E. W. ENGLE, Assr. to FANSTEEL PRODUCTS CO., INC. (U.S.P. 1,810,395, 16.6.31. Appl., 7.1.27).—The terminals of each cell having a filmed Ta electrode are shunted by a high resistance, e.g., 3500 ohms, through which current flows in the reverse direction to that of the normal flow and re-forms the film. J. S. G. THOMAS.

Cathodes of vacuum tubes. SOC. DES LAMPES FOTOS (B.P. 364,563, 3.9.30. Fr., 5.9.29).—An electron-emitting core, e.g., composed of compounds of Cs, Ba, or Th, is coated electrolytically with a metal deposit, e.g., of Pt, Pd, or Ni, 0.001–0.01 mm. thick, this being transparent to electrons. J. S. G. THOMAS.

[Electrodes for] gaseous electric-discharge devices. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of T. E. FOULKE (B.P. 365,147, 7.10.30. U.S., 7.10.29).—

A small amount of metal having a high affinity for O_2 , e.g., Mg or Ca, is mounted near one of the electrodes, of which at least one is coated with, e.g., a mixture of $BaCO_3$ and $SrCO_3$, contained in an envelope which is evacuated and heated to drive off occluded gases and vapours and then filled with rare gas, e.g., Ne with 0.7% of A at 40–50 mm. pressure. The coating is then reduced to oxide and a small proportion of metal, by chemical action between the compound and metal, promoted by ionic bombardment of both. J. S. G. THOMAS.

[Indirectly heated] incandescence cathode structures for electric-discharge tubes. EGYESÜLT IZZÓ-LÁMPÁ VILAMOSSÁGI RÉSZVÉNYTÁRSASÁG (B.P. 365,687, 7.11.30. Hung., 8.11.29).—An electron-emitting cylinder composed of a mixture of an alkaline-earth metal, e.g., Ba, and one or more alkaline-earth metal oxides, e.g., BaO , MgO , is heated by an incandescent W spiral or filament. J. S. G. THOMAS.

Electric-discharge tubes. H. J. SPANNER (B.P. 365,510, 1.7.30. Ger., 2.7.29).—A negative glow-discharge tube is filled with one or more inert gases other than Ne, e.g., a mixture containing A about 80%, He about 20%, Hg vapour, and the vapour of Ba, Cs, Mg, Cd, or Tl. [Stat. ref.] J. S. G. THOMAS.

Luminous electric-discharge tubes. GEN. ELECTRIC CO., LTD., Assees. of PATENT-TREUHAND GES F. ELEKTR. GLÜHLAMPEN M.B.H. (B.P. 365,434, 16.4.31. Ger., 9.7.30).—Heat-resistant discs, e.g., of mica, are arranged between the hot electrodes and the foot-tubes made of Pb- or Mg-glass in discharge tubes having a metal vapour filling. J. S. G. THOMAS.

Electron tube with incandescence cathode. J. KREMENEZKY (B.P. 365,303, 5.1.31. Austr., 8.1.30).—All internal structural parts, more especially the grid, from which electron emission has to be prevented, are coated with Sn, Ag, or Au. A process for preparing the coating is claimed. J. S. G. THOMAS.

Magnetic cores for electrical apparatus. SIEMENS & HALSKE A.-G. (B.P. 365,160, 14.10.30. Ger., 17.12.29).—Wound strip forming the core is heat-treated and impregnated with a liquid or liquefied insulator which sets hard between the windings. J. S. G. THOMAS.

Apparatus for performing electrometric volumetric analyses. I. G. FARBEININD. A.-G. (B.P. 364,939, 18.3.31. Ger., 31.3.30. Addn. to B.P. 309,038; B., 1930, 516).—The electron valve used as a meter in the prior patent generates the alternating current employed, and the condenser used for generating oscillations is employed also to measure the dielectric const. of the medium investigated. J. S. G. THOMAS.

Apparatus for electrical precipitation of suspended particles from gaseous fluids. LODGE-COTTRELL, LTD. From METALLGES. A.-G. (B.P. 365,018, 29.7.31).—Semi-conducting and conducting parts of the collecting electrode are arranged respectively opposite and between adjacent discharge electrodes. J. S. G. THOMAS.

Apparatus for electrical separation of suspended material from gases. A. P. KNIGHT, ASST. to INTERNAT. PRECIPITATION CO. (U.S.P. 1,810,614, 16.6.31. Appl.,

11.9.29).—Collecting rods are arranged in intersecting rows dividing the pptr. chamber into compartments in each of which discharge electrodes are placed. Means are provided for passing the gas in a direction either parallel or transverse to the rods. J. S. G. THOMAS.

Preventing electrolytic disintegration [of conduits conveying fluid]. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of E. J. REMSCHEID (B.P. 364,538, 22.9.30. U.S., 23.9.29).—A connector for conduits supplying fluid to electric apparatus, e.g., to tank-type Hg arc rectifiers, is composed of a C tube sheathed by a metal tube, the projecting end of the C tube being adapted to receive the conduit. J. S. G. THOMAS.

Optical pyrometers. SIEMENS & HALSKE A.-G. (B.P. 366,292, 13.2.31. Ger., 11.3.30).—Two incandescence filaments, e.g., of W, Ta, or C, preferably crossed, are arranged in a glass bulb. J. S. G. THOMAS.

[Electrical] smoke-detecting apparatus. J. LYONS & CO., LTD., C. R. PASSMORE, and T. W. CHIPLIN (B.P. 364,661, 1.10.30).—A sample of flue gases passes between a source of light and a light-sensitive (Se) cell the resistance of which is determined and indicated by a valve circuit including a milliammeter and signal lamp. J. S. G. THOMAS.

Dielectric materials [for condensers]. STEATIT-MAGNESIA A.-G. (B.P. 366,282, 6.2.31. Ger., 10.2.30).—Cellulose hydrate is converted into pure cellulose during or at the end of the process of manufacture of the condenser. J. S. G. THOMAS.

Insulated resistance wire and methods of forming an insulating coating thereon. SIRIAN LAMP CO., Assees. of S. RUBEN (B.P. 366,004, 22.9.30. U.S., 23.9.29).—A layer of a refractory compound of a metal of low at. wt. e.g., Be aluminosilicate, fused to the wire is coated with a refractory oxide of a metal of low at. wt. e.g., BeO . If desired, a binder, e.g., NH_4 borate, may be added to each coating before sintering. J. S. G. THOMAS.

Manufacture of [flexible] mica products [for electrical insulation]. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of E. M. HAUSHEER (B.P. 366,354, 13.4.31. U.S., 12.4.30).—Superposed flakes of mica are cemented together with resinous material composed of a condensation product of glycerin, phthalic anhydride, and a substance containing acids derived from drying oils. J. S. G. THOMAS.

Anodes for electrolysis. E. and O. CONRADTY (C. CONRADTY) (B.P. 365,815, 3.2.31).—The current supply is connected to ribs on the anode outside the electrolyte. J. S. G. THOMAS.

Anode for large mercury-vapour rectifiers. MASCHINENFABR. OERLIKON (B.P. 365,479, 19.6.31. Switz., 27.6.30).

X-Ray tubes. N. V. PHILIPS' GLOEILAMPENFABR. (B.P. 365,285 and Addn. B.P. 365,297, [A] 23.12.30, [B] 1.1.31. Holl., [A] 16.1.30, [B] 13.6.30).

[Contact clip for electrodes of] light-sensitive cells. F. H. CONSTABLE, and RADIOVISOR PARENT, LTD. (B.P. 366,932, 3.11.30).

Luminous electric-discharge tubes [with brush-type starting electrodes]. GEN. ELECTRIC CO., LTD.,

Assees. of PATENT-TREUHAND GES. F. ELEKTR. GLÜH-LAMPEN M.B.H. (B.P. 367,271, 9.6.31. Ger., 26.7.30.)

[Cathode carrier for] electric-discharge tubes. H. J. SPANNER (B.P. 364,578, 1.7.30. Ger., 2.7.29.)

Light-sensitive cell. ARCTURUS RADIO TUBE CO. (B.P. 365,838, 20.2.31. U.S., 25.3.30.)

Electrical apparatus [voltmeter] utilising phenomena associated with the ionisation of gases. W. J. JOHN (B.P. 365,649, 25.10.30.)

[Shaking] arrangement for galvanic coating of articles in bulk. SIEMENS & HALSKE A.-G. (B.P. 366,401, 5.6.31. U.S., 19.7.30.)

Sludge control in boilers.—See I. Carbonaceous product. Testing for firedamp.—See II. Revivifying $K_4Fe(CN)_6$. W carbide.—See VII. Cork-board substitute.—See IX. Ferromagnetic powder. Electrodeposition. Plating Fe with brass. Cu. Zn-plated printing plates. Metal foils. Cr. Refining Pb. Carbonised Ni [for valves etc.]. Introducing alkali metals etc. into tubes. Support for Hg-vapour lamp.—See X. Joining thermoplastic materials.—See XIII. Porous rubber.—See XIV. Germicidal gas.—See XXIII.

XII.—FATS; OILS; WAXES.

Report of the Convener of the European Oils and Fats Commission to the I.V.L.I.C. H. GNAMM (Collegium, 1931, 846—848).—The recommendation of the Pan-European Oils and Fats Commission for a provisional official method (B., 1932, 69) has been accepted by the I.V.L.I.C. Methods for the analysis of dégras and sulphonated oils are under consideration.

D. WOODROFFE.

Ubbelohde's dropping point [of fats]. R. JACQUES (Ann. Falsif., 1931, 24, 596—598).—Serious errors may arise by introduction of modifications of the original apparatus (B., 1905, 941).

W. J. BOYD.

Detection of benzene in [bone]-extraction apparatus after completed extraction. A. DEREVITSCHER (J. Chem. Ind. Russ., 1931, 8, No. 19, 33).—Residual benzene in bone-extraction apparatus which has been swept out by steam after extraction is complete is detected by passing the steam through aq. 0.05% I solution, when a violet ring forms on the surface of the solution.

R. TRUSZKOWSKI.

Dehydrogenation of fats. N. TZONEV and V. YAVNEL (Masloboino Zhir. Delo, 1930, No. 62—63, 19).—Sunflower oil treated for 4 hr. at 320° with 1% Ni + 0.25% Hg had I val. 144.4 and satisfactory drying properties.

CHEMICAL ABSTRACTS.

Fatty acids and glycerides of solid seed fats. I. Composition of the seed fats of *Allanblackia Stuhlmannii*, *Pentadesma butyracea*, *Butyrospermum Parkii* (shea), and *Vateria indica* (Dhupa). T. P. HILDITCH and S. A. SALETORÉ (J.S.C.I., 1931, 50, 468—472 T).—The above seed fats contained respectively the following component fatty acids: palmitic 3, 5.5, 8.5, 10; stearic 53, 46, 36, 39; oleic 44, 48.5, 50, 48%. Shea butter also contained 5.5% of linoleic acid, and Dhupa 3% of arachidic acid. The first three had fully-saturated glyceride contents of ≥ 1.5 , approx. 3, and approx. 2%,

in which palmitic and stearic acids were present in the respective approx. wt. ratios 1:2, 1:3, and 1:1. The first is considered to contain $>65\%$ of mono-oleodistearins; the second, mainly a mixture of approx. equal proportions of mono-oleo-disaturated and dioleomonosaturated glycerides, and the third the same in the approx. amounts 30% and 65% respectively. As regards glyceride structure, the new evidence goes to confirm the "evenly-distributed" nature of the fatty acids amongst the glyceride mols. of seed fats. In the first three cases palmitic acid conc. to a marked extent in the fully-saturated portions.

Horse fat. J. PRITZKER and R. JUNGKUNZ (Z. Unters. Lebensm., 1932, 63, 30—37).—The analytical data of previous workers are summarised and compared with full analyses of 4 laboratory-prepared horse fats. Data found include n_D^{40} 51.5—53.1, I val. 74.4—78.5, Reichert-Meissl val. 0.33, Polenske val. 0.8, d_4^{15} 0.9125—0.9198, unsaponifiable matter 0.31—0.50% (0.1% cholesterol). The max. val. of 69 frequently given in the literature for the n_D is probably a missprint for 59 perpetuated from König's original work (1910). Neither Bömer's val. (Pharm. Acta Helv., 1931, 6, 1) nor fractional pptn. of Pb salts by the method of Kreis and Roth (B., 1913, 150) will detect adulteration of lard with 20% of horse fat, though the latter method will distinguish these fats when pure. Grossfeld's method (B., 1930, 381, 466, 790) for the separation of solid and liquid fatty acids showed the presence of 24.3—27.0% of the former in horse fat (i.e., higher than the figure of Kreis and Roth), but little or no solid unsaturated fatty acids (0.17—0.23% as isooleic acid). J. GRANT.

Fat from the tarbagan. E. MIRKIN and S. S. LIBERMAN (Masloboino Zhir. Delo, 1930, No. 62—63, 42—43).—Fat from the Mongolian rodent had d_4^{20} 0.918, 0.9169; acid val. 21.7, 22.4; sap. val. 198.5, 195.9; I val. 99.4, 101.8; unsaponifiable matter 2.6, 1.9%; f.p. —8°, —4°. Fatty acids had neutralisation val. 205.9, sap. val. 220.2, I val. 102.6. The fat should be suitable for the leather and soap industries.

CHEMICAL ABSTRACTS.

Soap-stock and detergents. B. MENES (Allgem. Oel- u. Fett-Ztg., 1932, 29, 69—72).—In suitable conditions, e.g., hot-water washing, tallow-base soaps display superior colloidal properties and surpass vegetable (coconut etc.) oil soaps; a 50% tallow soap produced much more, and more stable, lather (Stiepel test) in oily (soiled) H_2O than a vegetable oil soap, although the two behaved alike in clean H_2O at the same temp.

E. LEWKOWITSCH.

Problems of oil production. E. I. BETTER and F. MUNK (Allgem. Oel- u. Fett-Ztg., 1932, 29, 79—87).—The physico-chemical aspects of the processes involved in oil expression are considered; coagulation of emulsifying agents and displacement of adsorbed oil from the cell tissues by, e.g., steaming, are especially discussed in relation to the experiments of Talanzev (Masloboino Zhir. Djelo, Jan., 1931) on the treatment of preheated meal with dry steam.

E. LEWKOWITSCH.

Vitamin-containing salmon oil. W. OBST (Allgem. Oel- u. Fett-Ztg., 1932, 29, 88—89).—A brief review.

E. LEWKOWITSCH.

Determination of oil in cod-liver oil emulsions. G. BÜMMING (Pharm. Ztg., 1932, 77, 201—202).—Application of the Gerber method for milk fat (cf. Scheunemann, B., 1932, 240) gives low and discordant results, whilst Valentin's method (B., 1932, 152) has been previously employed by the author with satisfactory results. F. O. HOWITT.

Determination of oil and fat-soluble vitamins in cod-liver oil emulsions. W. BRANDRUP (Pharm. Ztg., 1932, 77, 201).—The colour tests for vitamins employed by Valentin (B., 1932, 152) are considered unsatisfactory, animal tests being preferable.

F. O. HOWITT.

Antioxygens present in natural fats. I. Separation of fatty derivatives from "antioxygens" by distillation. T. P. HILDITCH and J. J. SLEIGHTHOLME (J.S.C.I., 1932, 51, 39—44 r).—The rates of absorption of O_2 during the initial phases of oxidation of olive, tung, and codling-liver oils (at 100°) and of linseed oil (at 70°) have been compared with those of the corresponding mixed fatty acids of the oils (before and after distillation in vac.), of the corresponding mixed Me esters (before and after distillation in vac.), and of triglycerides resynthesised from the distilled fatty acids and glycerol. The induction period preceding steady absorption of O_2 was much reduced during the saponification of the fats and liberation of the mixed acids, but was restored in a very minor degree when the latter were esterified. Distillation of either the acids or the esters led to a further decline in the duration of the induction period. The max. rates of absorption of O_2 thereafter were of much the same order for any original oil or its corresponding mixed acids or esters. Glycerides prepared synthetically from the distilled acids of olive or linseed oil possessed the shortest induction period of all in their respective series. The mixed esters of olive oil and also of linseed oil acids were separated into five fractions by vac. distillation; the induction period was greatest in the fractions of lowest b.p. and the residue, and at a min. in the penultimate fractions which consisted almost wholly of unsaturated esters of the C_{18} acids. It is considered that the results confirm the view that natural antioxygenic compounds accompany the original fatty oils, and are the cause of the "induction periods" observed when the oils are exposed to the action of O_2 . It is suggested that such compounds may not all be of the same type; in some cases proteins or their degradation products may perhaps possess antioxygenic properties. Preliminary experiments with olive oil indicate that the induction period is almost eliminated when the oil is boiled with dil. HCl or given a very mild treatment with insufficient NaOH to effect appreciable hydrolysis; agitation with conc. H_2SO_4 yielded an oil more resistant to the action of O_2 than the original.

Effect of antioxidants in the oxidation of fatty oils. Mechanism of the action of diphenylhydrazine and α -naphthylamine. B. Y. RIGAKUSI (Bull. Mat. grasses, 1931, 15, 65—84; Chem. Zentr., 1931, ii, 1218).—The action of O_2 on olive oil and castor oil exhibits a definite induction period, after which the reaction is unimol. The velocity increases with a rise

in temp. *as*. Diphenylhydrazine acts as a strong anti-oxidation catalyst, whilst α -naphthylamine is less active and does not prolong the induction period.

L. S. THEOBALD.

Fatty acids from peat bitumen.—See II. Ketones as solvents.—See III.

See also A., Mar., 252, Selective hydrogenation of unsaturated fatty acids. Constitution of linolenic acid etc. 313, Grape-seed oil. Oil of *Ruvettus pretiosus*. Dibasic acids of Japan wax, and of sumach-berry waxes.

PATENTS.

Drying of oxidisable fatty oils and paints, varnishes, and resins prepared therefrom. A. E. MELHUISE. From RESINOUS PRODUCTS & CHEM. CO., INC. (B.P. 363,394, 9.9.30).—The Co, Mn, Pb, or other multivalent metal salt of a keto-aromatic acid is used as a drier for oils, paints, etc. or as a hardening catalyst for polyhydric alcohol-polybasic acid resins. Suitable keto-aromatic acids are obtained by condensing phthalic anhydride with $C_{10}H_8$, tetrahydronaphthalene, Ph_2 , *p*-cymene, *p*- $C_6H_4Cl_2$, turpentine, $PhEt$, diphenylene oxide (product, m.p. 192—194°), Ph_2O , or butyric anhydride.

C. HOLLINS.

Separation of oxygenated products from hydrocarbons. Wetting etc. agents.—See III. Coatings for paper.—See V. Prep. for washing human hair. Moth-proofing soap.—See VI.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Durability and rust-preventive properties of exterior white paints. E. MAASS and R. KEMPF (Farben-Ztg., 1932, 37, 516—518).—Details and summarised results of a comprehensive series of exposures on plaster, wood, and iron are given. The use of tung oil, stand oil, or mixtures of these in the vehicles was found to be advantageous, whilst the addition of white spirit to the paints (except in cases where these vehicles were used) lessened durability. Low-oil-absorption lithopone gave surprisingly good results, and incorporation of $PbCrO_4$ increased durability. S. S. WOOLF.

Consistency measurements on brushable paints. W. DROSTE (Farben-Ztg., 1932, 37, 619—620, 655—657, 694—695).—The derivation of the Maxwell-Bingham relationships on the flow of plastic fluids is outlined. From capillary plastometer measurements, the usual equation $dv/dr = (1/\mu)(F - f)$ was found to hold satisfactorily for white paints at brushing consistency. It is shown that measurements of reciprocal mobility ($1/\mu$) and plasticity (f) of paints of different consistencies enable their brushing qualities to be evaluated, typical results being discussed at length. The "brushability" limits of white linseed oil paints at 26° were $f = 400$ —1400 dynes/sq. cm., $1/\mu = 3.5$ —4.0 cm.⁻¹ g. sec.⁻¹ For everyday use the Gardner mobilometer is capable of giving results in reasonable concordance with the more complicated capillary plastometer. S. S. WOOLF.

Influence of oil content on oxidation of oil in paints. H. WOLFF (Farben-Ztg., 1932, 37, 801—803).—Ti- and Sb-whites were ground in various quantities of linseed oil, and the two series of paints produced

were tested for progressive increase of wt. on drying up to 20 hr., sap. val. and content of unoxidised and oxidised acids, etc. of 24-hr.-old films. It is shown that the properties vary appreciably according to whether the paint contains more or less than the "crit. oil content" (25% for Sb-white, 32.3% for Ti-white), although the variations are not necessarily in the same sense for the two pigments examined. No explanation for this is at present forthcoming. S. S. WOOLF.

Use of lead chromates in floor paints. ANON. (Farben-Ztg., 1932, 37, 617—619).—The pigments used in floor paints generally comprise earth colours tinted with various white, Mn, and C pigments. The use of various Pb chromes in such paints is recommended, their advantages including a beneficial hardening effect on the paint film etc. Fears as to possible poisonous action are considered groundless. S. S. WOOLF.

Optimum pigment content [of paints]. F. WACHHOLTZ (Farben-Ztg., 1932, 37, 729—731, 762—764, 803—805).—The physical properties, *e.g.*, tensile strength, elasticity, density, degree of swelling in solvents, surface absorption of dye, of fresh and aged films of a range of white lead-linseed oil paints varying in pigment content were determined. The results are graphed and analysed in detail. It is shown that a paint containing 71.1 wt.-% (26.7 vol.-%) of white lead has optimum behaviour in all cases. The results are considered to support Wolff's views (B., 1932, 194) on "crit." oil absorptions, and the division of the oil into "pigment sheaths" and "free oil."

S. S. WOOLF.

Pigment and oil. E. KLUMPF (Farben-Ztg., 1932, 37, 764—765; cf. B., 1931, 768).—Wolff's views (B., 1932, 194) are discussed, criticism being offered mainly on the ground that assumptions based on simple particles cannot be extended to cover the normal mixture of "primary" and "secondary" particles met with in paints. Although the general premise of "bound" and "free" oil is accepted, it is considered that the postulation of a "mechanically resistant oil sheath" cannot be justified. S. S. WOOLF.

Effects of light on paints. VII. Luminescence. A. EIBNER (Chem.-Ztg., 1931, 55, 593—595, 614—615, 635—637, 655—656).—The behaviour under ultra-violet light of various pigments in the dry state and in the form of dried paint films is summarised, and the analytical applications of these phenomena are discussed.

S. S. WOOLF.

Detection of nitrocellulose in paints and varnishes. P. SLANSKY (Chem.-Ztg., 1932, 56, 20).—The material is extracted with CO_2 and the extract evaporated to 2—3 c.c. and diluted with 15—20 c.c. of CHCl_3 to ppt. the nitrocellulose in a gelatinous form. The ppt. is washed with CHCl_3 and hydrolysed with NaOH, and the solution is tested for NO_3^- with NHPh_2 or with FeSO_4 and H_2SO_4 . A. R. POWELL.

Lead chromates. Effect of hydrogen-ion concentration on colour of lead chromate pigments from lead nitrate and lead acetate. R. C. ERNST and A. J. SNYDER (Ind. Eng. Chem., 1932, 24, 227—228).—Pb chromates prepared from either $\text{Pb}(\text{OAc})_2$ or $\text{Pb}(\text{NO}_3)_2$ by pptn. with $\text{Na}_2\text{Cr}_2\text{O}_7$ or $\text{K}_2\text{Cr}_2\text{O}_7$ of

varying p_H are medium yellow up to p_H 9. Above this point there is a sharp change to orange except when the $\text{Pb}(\text{NO}_3)_2$ of varying p_H is added to $\text{Na}_2\text{Cr}_2\text{O}_7$. Acetate-yellows are redder than nitrate-yellows, softer, and more easily ground in oil. In the orange range the nitrate gives the brighter colour. $\text{K}_2\text{Cr}_2\text{O}_7$ gives a rather deeper tint than $\text{Na}_2\text{Cr}_2\text{O}_7$. The colours are those of the dried pigment rubbed in bleached linseed oil. C. IRWIN.

Determination of the particle size of pigments. G. ELSEN (Chem. Weekblad, 1932, 29, 120—122).—A review of available methods. H. F. GILLBE.

Testing of boat varnishes. H. WOLFF (Farben-Ztg., 1932, 37, 621).—Immersion tests on varnish films on glass, whilst revealing slight milkiness which might not be detected in corresponding tests on wood, must be supplemented by tests on typical undercoat systems. Tap-water, freed (by heating) from temporary hardness, is recommended for immersion tests. The temp. at which the film is dried before immersion is of considerable significance, the relative resistance to whitening of two varnishes being reversed in raising the temp. from 14° to 24°. For comparison of the merits of different varnishes in this connexion, the films should be dried within a crit. temp. range (24—28°). S. S. WOOLF.

Lacquer cellulose. F. WACHHOLTZ, F. WILBORN, and C. FINCK (Farben-Ztg., 1932, 37, 514—516, 550—551, 582—584).—The structure of cellulose is briefly discussed with reference to mol. cohesion, viscosity, and the variations introduced by nitration of the cellulose. The tensile strength (R) and elasticity (D) of films of six types of nitrocellulose, alone and with additions of plasticiser (tolyl phosphate) and resin (a mixture of ester gum and "Cellodammar"), were determined after various ageing periods at normal, raised, and reduced temp., and after exposure to ultra-violet light. The results are graphed and considered in detail. For durability, high tensile strength as well as retention thereof are essential. The variation with time of the quotient R/D ("solidity of the film") and of derived functions are also examined. S. S. WOOLF.

Bakelite from shale oil. G. S. BRODSKI (Plast. Massi, 1931, 1, 46—49).—The prep. and properties of bakelite from the phenolic fraction of Baltic shale oil are described. This fraction constitutes 23% of the oil and contains no PhOH or cresols and probably no xlenols; the fraction b.p. 170—320° can also be used direct, but gives only a 25% yield of resin.

G. A. R. KON.

Acrolite resins. G. S. PETROV and J. A. SCHMIDT (Plast. Massi, 1931, 1, 27—30).—The formation of resin from phenols, glycerin, and 4—12% of CH_2O has been examined, using acid catalysts such as H_2SO_4 , NaHSO_4 , and naphthensulphonic acids (G.P. 407,002; B., 1925, 461). The unchanged starting materials were quantitatively recovered by prolonged washing and steam-distillation; both phenol and glycerin may be left over in the same sample. Resins derived from cryst. phenol are devoid of phenolic odour; the use of NaHSO_4 leads to a less coloured resin, whilst naphthensulphonic acids give a H_2O -resisting product. These resins are suitable for use in lacquers containing cellulose esters

and, in conjunction with fillers, for the manufacture of pressed articles. Glycol cannot replace glycerin in the formation of acrolite resins. G. A. R. KON.

Handling corrosive gases. Thixotropy [of paints].—See I. Ketones as solvents. Retene from rosin oil.—See III.

See also A., Mar., 225, Solvation of cellulose acetate sols. 236, Mo bronzes. 244, Inoculation crystals. 270, [Lakes from] 3:4-dihydroxynaphthalic acid. 275, New constituent of Tsuga resin.

PATENTS.

Manufacture of synthetic resins. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 361,951, 20.8.30).—A non-basic, partly hydrogenated, non-sulphonated, aromatic compound is condensed with > 4 mols. of an aralkyl halide carrying at least one further aliphatic radical, or with > 4 mols. of an *ar*-di- or -tetra-hydro-naphthylmethyl halide, in presence of ZnCl_2 , AlCl_3 , FeSO_4 , CuCl_2 , Zn resinate, Sn, Zn, or Fe, to give copal substitutes; acid groups may be esterified. Examples are: dihydronaphthalene with dimethylbenzyl chloride; colophony with methylbenzyl chloride; tetrahydrobenzene with dimethylbenzyl chloride; tetrahydronaphthalene and colophony with dimethylbenzyl chloride; " α -methyl- ω -chloromethylnaphthalene" and colophony with $p\text{-C}_6\text{H}_4\text{Cl}_2$ etc. C. HOLLINS.

Manufacture and use of synthetic resins. BRIT. CELANESE, LTD. (B.P. 365,093, 15.10.30. U.S., 15.10.29).—Allyl alcohol or an ester thereof is condensed with a phenol, *e.g.*, *o*-cresol, in the presence of a catalyst, *e.g.*, ZnCl_2 , the reaction product being distilled with or without steam. Mixtures of such synthetic resins with cellulose derivatives, *e.g.*, cellulose acetate, and suitable solvents are also claimed as lacquers, adhesives (especially for reinforced glass), etc. S. S. WOOLF.

[Flexible] synthetic resins. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of R. H. KIENLE and H. C. ROHLFS (B.P. 365,140, 15.9.30. U.S., 16.9.29).—The ingredients of an "alkyd" resin are caused to react with a dibasic aliphatic acid ester of a dihydric alcohol, *e.g.*, glycol succinate, as such or prepared *in situ*, a cellulose ester being incorporated if desired. [Stat. ref.] S. S. WOOLF.

Compositions of matter containing synthetic resins and products obtained therefrom. BRIT. CELANESE, LTD. (B.P. 365,094, 15.10.30. U.S., 15.10.29).—Mixtures of cellulose derivatives, *e.g.*, cellulose acetate, and synthetic resins obtained by condensing a hydroxy-aryl alcohol, *e.g.*, hydroxybenzyl alcohol, with the reaction product of an aldehyde, *e.g.*, CH_2O , and glycerol or polyglycerol, together with suitable solvents, pigments, etc., are claimed as lacquers, adhesives (especially for reinforced glass), plastics, filaments, etc. S. S. WOOLF.

Production of composite articles. BRIT. CELANESE, LTD. (B.P. 365,143, 3.10.30. U.S., 3.10.29).—A fabric made of or containing cellulose acetate or other thermoplastic derivative of cellulose is caused to adhere to a suitable core, *e.g.*, papier maché, clay, shellac, by application of heat and pressure. Ornamental effects on small articles, *e.g.*, buttons, are obtained. S. S. WOOLF.

Manufacture of [linoleum] materials suitable for floor coverings etc. GREENWICH INLAID LINOLEUM (F. WALTON'S NEW PATENTS) CO., LTD., and A. H. DEWAR (B.P. 364,837, 6.1.31).—The materials are prepared from mixtures of the usual linoleum material, highly seasoned by passage with a current of air through long tubes leading to a cyclone collector, and/or fully-seasoned scrap together with a plastic (preferably nitrocellulose), a plasticiser (Ph_3PO_4 or tolyl phosphate), and castor or stand oil. L. A. COLES.

Transparent [sheet] material. CELLULOID CORP. (B.P. 366,077, 29.7.30. U.S., 29.7.29).—The sheets are made from polymerised vinyl compounds, *e.g.*, the acetate reinforced with an open-mesh or reticulated material and containing plasticisers, *e.g.*, aryl phosphates, and, if desired, resins and/or fire retardants. S. S. WOOLF.

Manufacture of plastic masses. I. G. FARBERIND. A.-G. (B.P. 366,116, 27.10.30. Ger., 7.11.29).—Cellulose tri-esters, mixed tri-esters, and ether esters, derived from lower fatty acids, *e.g.*, cellulose acetate-butyrate, hydroxyethylcellulose acetate, are kneaded at 90–120°, in the absence of a solvent, with a liquid of swelling action when warm, *e.g.*, PhCl , *p*-toluenesulphonamide. Softening agents, *e.g.*, tolyl phosphate, and fillers, *e.g.*, kieselguhr, may be incorporated. S. S. WOOLF.

Joining of thermoplastic materials. WESTERN ELECTRIC CO., LTD. From E. STUDDT, A. R. KEMP, and F. S. MALM (B.P. 366,125, 30.10.30).—The prepared ends of material to be joined, *e.g.*, thermoplastic insulation of submarine cables, are heated by steam or hot H_2O vapour, and a suitable thermoplastic joint-filling material containing a greater proportion of H_2O (1.5–3%) than does the main body (0.75%) is applied by extrusion etc. The surrounding material is masticated or worked to secure better contact and adhesion. S. S. WOOLF.

Manufacture of inlaid linoleum and the like. GREENWICH INLAID LINOLEUM (F. WALTON'S NEW PATENTS) CO., LTD., and H. MONTGOMERY (B.P. 367,169, 12.2.31).

Azo pigments.—See IV. **Drawing material.**—See V. **Mica products.**—See XI. **Paints etc. from dried fatty oils.**—See XII. **Artificial horn.**—See XV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Latex and crude rubber. E. A. HAUSER (Trans. Inst. Rubber Ind., 1931, 7, 298–302).—A review of the prospects of manufacturing processes based on the use of rubber latex. Typical processes are discussed. Progress has been slower than was anticipated; there are already lines, however, in which latex not only shows distinct advantages but has no competitor. D. F. TWISS.

Concentration and compounding of [rubber] latex for industrial use. D. F. TWISS (Trans. Inst. Rubber Ind., 1931, 7, 280–289).—A review, with particular reference to concn. by creaming processes and to special methods of compounding. The careful addition of H_2O -sol. substances, *e.g.*, MeOH , to latex is a possible means for reducing the likelihood of freezing in storage with consequent coagulation. D. F. TWISS.

Mastication of rubber. Oxidation process. W. F. BUSSE (Ind. Eng. Chem., 1932, 24, 140—145).—Smoked sheet and pale crêpe rubber, and balata, after being milled or exposed to light, affect a photographic plate on account of the formation of a volatile peroxide, probably H_2O_2 . Sprayed latex rubber, fine Para, and guayule do not give this effect after milling or after irradiation; this is probably owing to the presence of some agent which rapidly destroys the peroxide, because H_2O_2 introduced into these rubbers extraneously rapidly disappears. The presence of a Co or Cu soap also decompose the peroxide in some instances, but in some cases Co soaps greatly increase the formation of peroxide. Most antioxidants for rubber themselves affect a photographic plate without exposure to light, so that the phenomenon does not offer a general test for antioxidant character. The formation of peroxide, luminescence during milling, and importance of the presence of free O_2 for the plasticising effect of mastication suggest that during the milling process chemical reaction occurs between rubber activated by mechanical deformation and O_2 activated by electrical charges. D. F. TWISS.

Temperature coefficient of vulcanisation [of rubber]. C. R. PARK and R. B. MAXWELL (Ind. Eng. Chem., 1932, 24, 148—151).—Experiments with a no. of mixtures accelerated with mercaptobenzthiazole show that between 104° and 154° the average temp. coeff. of vulcanisation, based on tensile characteristics, is 1.91 per 10° , whereas based on the rate of combination of S and rubber the coeff. is 2.30. For mixtures accelerated with crotonaldehyde- NH_2Ph the vals. are 2.32 and 2.67, respectively. D. F. TWISS.

X-Rays in research.—See I. [C black from] cracked gaseous hydrocarbons.—See II. Rubber hose [for breweries etc.].—See XVIII.

See also A., Mar., 222, Absorption of N_2 by rubber. 275, Modifications of gutta-percha hydrocarbon. 276, Products of destructive distillation of Na rubber.

PATENTS.

Manufacture of rubber and the like. SOC. ITAL. PIRELLI (B.P. 365,037, 12.9.30. Ital., 13.9.29).—Rubber, reclaimed rubber, or similar plastic material, previously compounded, if desired, is emulsified into a dispersion of an oxygenated alicyclic compound such as cyclohexanol or cyclohexanone in an aq. solution of a H_2O -miscible colloid, e.g., soap or saponin. Natural latex may be added and also an aq. dispersion of brown factice. The emulsions so produced are applied to the manufacture of articles, e.g., by immersion processes. D. F. TWISS.

Manufacture of rubber. IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 365,493, 23.7.31. U.S., 24.7.30).—The ageing properties of rubber are improved by incorporating, prior to vulcanisation, a salt of a primary aromatic diamine with an aromatic carboxylic acid or an aliphatic di- or tri-carboxylic acid, in which only one NH_2 group of the base is neutralised. D. F. TWISS.

Manufacture of goods of rubber or similar material. DUNLOP RUBBER CO., LTD., ANODE RUBBER CO., LTD., E. A. MURPHY, and E. W. B. OWEN (B.P. 365,546, 20.10.30. Addn. to B.P. 332,526; B., 1930,

1040).—A backing stratum, e.g., a mould, coated with, or capable of acting as, a dehydrating and/or setting agent, is contacted with a frothed dispersion of rubber or similar material so that coagulation proceeds outwards; a further coagulating agent may be applied subsequently to assist coagulation or to permit repeated contact with the dispersion. Articles of sponge-like or cellular structure are thus produced. D. F. TWISS.

Manufacture of articles of or containing rubber or similar material. DUNLOP RUBBER CO., LTD., ANODE RUBBER CO., LTD., and E. A. MURPHY (B.P. 365,547, 20.10.30).—A coagulating medium consisting of a coagulant, e.g., H_2SO_4 or ZnCl_2 , mixed with a H_2O -insol. material of resinous, fatty, or waxy nature, e.g., rosin or shellac, in a solvent such as $\text{C}_2\text{H}_5\text{O}_2$ or EtOH , is applied to a backing stratum which is then contacted with an aq. dispersion of rubber or similar material. D. F. TWISS.

Manufacture of rubber articles. DUNLOP RUBBER CO., LTD., ANODE RUBBER CO., LTD., E. A. MURPHY, E. W. B. OWEN, and D. F. TWISS (B.P. 365,548, 20.10.30).—Rubber articles manufactured from aq. dispersions, e.g., by dipping or spreading, are given a wrinkled surface effect by bringing them into localised contact with agents e.g., grains of NaCl or particles of plaster of Paris, which cause concurrent coagulation and contraction by dehydration or syneresis. Ceramic or metallic reproductions of master articles with such grained markings may be used for further direct manufacture from dispersions or solutions. D. F. TWISS.

Manufacture of [porous or micro-porous] rubber and similar material. DUNLOP RUBBER CO., LTD., ANODE RUBBER CO., LTD., and E. W. MADGE (B.P. 366,120, 29.10.30. Addn. to B.P. 346,810; B., 1931, 644).—An aq. dispersion of rubber (etc.) is electrolysed, using a reactive anode, e.g., of Zn, so that a reversible creamy or paste-like deposit is obtained which contains a sufficient quantity of reactive ion from the anode. The deposit is then shaped, caused to gel by the application of heat, and finally vulcanised with prevention of evaporation of the liquid in the pores of the product. D. F. TWISS.

Manufacture and application of compositions of depolymerised india-rubber, gutta-percha, balata, or like materials. ELECTRICAL RESEARCH PRODUCTS, INC., J. J. GILBERT, and F. S. MALM (B.P. 366,136, 31.10.30).—A viscous impregnating substance for the conducting core of an electric cable comprises rubber or similar material depolymerised, e.g., by kneading dried rubber at a high temp., together with an added proportion of one or more anti-oxidants. D. F. TWISS.

Vulcanisation of rubber. RUBBER SERVICE LABS. CO., ASSEES. OF S. M. EVANS (B.P. 365,060, 10.10.30. U.S., 17.6.30).—The age-resisting properties of vulcanised rubber are enhanced by incorporating the reaction product of a hydroxydiaryl sulphide, e.g., dihydroxydiphenyl sulphide, and an arylamine, e.g., NH_2Ph (preferably in bimol. proportion), formed at about 180° . D. F. TWISS.

Vulcanisation accelerators and their application. IMPERIAL CHEM. INDUSTRIES, LTD., H. M. BUNBURY, J. S. H. DAVIES, and W. J. S. NAUNTON (B.P. 361,917,

22.8.30).—A 2-thiolarylenethiazole is converted into compounds of the type $\text{Ar} \langle \text{N} \rangle \text{C} \cdot \text{S} \cdot \text{CH}_2 \cdot \text{COR}$, where

$\text{R} = \text{alkyl, aralkyl, aryl, or } \text{Ar} \langle \text{N} \rangle \text{C} \cdot \text{S} \cdot$ Products from 2-thiolbenzthiazole and chloroacetone (m.p. 69–70°), phenacyl bromide (m.p. 111–122°), and $\alpha\alpha'$ -dichloroacetone (m.p. 124–125°), and from 2-thiol- α -naphthathiazole and chloroacetone (m.p. 131–132°) and $\alpha\alpha'$ -dichloroacetone (m.p. 162–164°), are described.

C. HOLLINS.

Storage of rubber material. GOODYEAR TIRE & RUBBER Co., Assees. of W. D. WOLFE (B.P. 366,160, 8.11.30. U.S., 17.2.30).—Plies of tacky rubber material are separated, during storage, by sheets of liner material coated with an emulsion of a drying oil containing preferably an agglutinant. A suitable mixture comprises boiled linseed oil 18%, gasoline 18%, casein 7%, H_2O 53%, other ingredients 4%.

D. F. TWISS.

Applying rubber to metal. J. ROCKOFF (B.P. 365,755, 31.12.30. U.S., 28.7.30).—The roughened or sand-blasted surface of a difficultly fusible metal is coated with a uniform layer of easily fusible metal, such as brass, by spraying. After cooling, the rubber layer is applied and vulcanised in position at about 138°.

D. F. TWISS.

Rubber substitute. M. BANDLI (B.P. 365,526, 15.10.30).—A mixture of cellulose acetate with at least one plasticiser is pptd. from solution in a mixture of solvents of which at least one, e.g., COMe_2 , is readily miscible with the pptg. agent, e.g., H_2O , and at least one is not readily miscible. The character of the product is improved by treatment with an aldehyde, e.g., CH_2O , by addition to the solution before pptn. or by application as vapour subsequently.

D. F. TWISS.

Devices for forming threads from natural or artificial dispersions of rubber. DUNLOP RUBBER Co. LTD., ANODE RUBBER Co., LTD., and E. A. MURPHY (B.P. 367,104, 1.1.31).

Manufacture of [rubber] coverings for floors. LINOLEUM MANUFG. Co., and A. A. GODFREY (B.P. 367,264, 4.6.31).

Carbonaceous product.—See II. Gas-cell fabric. Coatings for paper.—See V. Artificial leather.—See VI. Joining thermoplastic materials.—See XIII.

XV.—LEATHER; GLUE.

Report of the [European] Commission on the Sampling of Tanning Materials. F. MÜLLER and R. O. PHILLIPS (Collegium, 1931, 870–874).—Methods for sampling for analysis are given. D. WOODROFFE.

Report of the Committee [of I.V.L.I.C.] for Qualitative Tannin Analysis on detection of sulphite-cellulose in vegetable tannin extracts. O. GERNGROSS and H. HERFELD (Collegium, 1931, 832).—1% of sulphite-cellulose extract can be detected in vegetable tannin extracts by means of the Procter-Hirst reaction if the prescribed method is adhered to in all details. The test is affected if decayed wood has been used in the manufacture of the extract, but not y sulphiting. A min. of 3% of sulphite-cellulose

extract can be detected by the cinchonine test (which is unaffected by the use of decayed material, but gives positive results with sulphited extracts) and a min. of 10% by the rather more sensitive fluorescence test. Positive tests are obtained by all three methods if extracts are sulphited in presence of sawdust, or if synthetic tannins are present. D. WOODROFFE.

Report of the Convener of the European Commission on Tannin Analysis to the I.V.L.I.C. W. VOGEL (Collegium, 1931, 864–869).—The p_{H} val. should be included in the official method of tannin analysis, and should be determined on the solution of analytical concn. A simple and speedy method is required to be found by the Commission. Methods are required for determining the colour of the leather produced by tanning materials and extracts and of the insol. matter in tanning extracts at high concn. D. WOODROFFE.

Hide powder [for tannin analysis]. Report of the International Commission. F. STATHER (Collegium, 1931, 833–835).—The ash content shall be $< 0.3\%$. If 7 g. of air-dry powder are shaken twice for 24 hr. with 100 c.c. of 0.1N-KCl brought to p_{H} 5.5 by means of 0.01N-AcOH, and then filtered, the p_{H} of the filtrate must be 5.0–5.5. Hide powder of ash content 0.5% and p_{H} 5.0–6.5 is permissible if non-tan results obtained by its use are concordant with those obtained with the official powders. These proposals have been accepted by the I.V.L.I.C. and the I.S.L.T.C.

D. WOODROFFE.

Are frozen liquid tanning extracts still suitable for sampling? F. STATHER (Collegium, 1931, 874–876).—Such extracts are unsuitable for sampling, although they may be very valuable for tanning purposes after suitable treatment. D. WOODROFFE.

Report of the Committee of I.V.L.I.C. on Leather Analysis. L. JABLONSKI (Collegium, 1931, 840–845).—Graphs are given of the results of determinations of sp. gr., H_2O -sol. matter, and hide substance of 16 different parts of vegetable-tanned fresh market and Argentine hide sides, respectively, as obtained by different members. D. WOODROFFE.

Report of European Commission II for Analysis of Vegetable-Tanned Leathers. P. CHAMBARD (Collegium, 1931, 835–840; cf. B., 1931, 771).—The leather should be shaved into pieces 0.5 mm. thick. The fat must be extracted with light petroleum (b.p. $> 60^\circ$) and the residue of fat dried for 5 hr. in an oven at 100–105°. Moisture is to be determined by drying 4 g. of leather in an oven at 100–105° until two successive weighings at an interval of 2 hr. differ by > 0.015 g. The moisture content should be calc. from the greater loss in wt. Hide substance is to be determined as at present. Leathers containing $> 5\%$ of fat must be degreased with light petroleum before the determination. The results obtained on the leather as used for the analysis must be given in all cases.

D. WOODROFFE.

Free [mineral] acids in the analysis of vegetable [-tanned] leather. IV. V. KUBELKA and K. ZIEGLER (Collegium, 1931, 876–886; cf. B., 1931, 1064).—The Innes and Atkin-Thompson figures for leathers treated with HCl remained unchanged after 5 weeks,

but lower acidity was shown by leathers which contained HCO_2H and AcOH . The aq. extract of the leather containing HCl was practically unaffected by drying the leather for 24 hr. at 100° , but other leathers when so treated showed reduced acidity. Leather containing HCl was unaffected by drying for 4 hr. at 130° , whereas most of the acid was removed from leathers containing HCO_2H or AcOH by the same treatment. The HCl appears, therefore, to be combined with the leather substance.

D. WOODROFFE.

Skin diseases as the cause of leather defects. M. BERGMANN (Collegium, 1931, 823—830).—Certain defects in leather, e.g., "Salzstippen" and damaged papillary layer, have been traced to the action of fungi on the raw skin. "Salzstippen" are compact keratinous masses formed by the animal on the skin to counteract fungoid growths. Spores of *Trichophyton* have been found in damaged parts of the grain of finished leather, in the tissues of leathers tanned from certain diseased Bavarian hides, and in the hair canals in finished leathers. The proteinases in the fungi can attack skin collagen, forming therewith a compound which possesses different colloid-chemical properties from those of the collagen. Neither limed pelt nor limed pelt which has been treated first with papain and subsequently with $\text{Ca}(\text{OH})_2$ is swollen by naphthalene-2-sulphonic acid, whereas both are swollen by this acid after further treatment with papain.

D. WOODROFFE.

Opacity in gelatins. P. R. EDWARDS (Food Tech., 1931, 1, 100—102).—Turbidity is attributed to (a) dust, animal tissue, or fibre, (b) moulds, (c) emulsified grease and Ca salts of fatty acids, (d) proteins other than gelatin (e.g., mucin, chondrin), (e) Ca complexes held in solution by H_2SO_3 , e.g., $2\text{CaHPO}_4 \cdot \text{CaSO}_3 \cdot \text{H}_2\text{O}$ or $\text{Ca}_3(\text{PO}_4)_2 \cdot \text{SO}_2 \cdot 2\text{H}_2\text{O}$, (f) colloidal S. Samples displaying (a) or (b) should be rejected. (c) is due to the employment of unsuitable raw materials or methods of extraction and can be cured by filtration through paper pulp. (d) cannot be removed without degradation of the product. (e) is due to the interaction of SO_2 in the bleach with H_2S from the degradation of the protein by bacterial action; such samples should be rejected. The requirements to prevent the formation of "foots" in the gelatin filling of goods packed in glass containers (e.g., tongues) are low contents of CaO , SO_2 , and Cu. Excess of SO_2 , although it gives good clarity with low-grade gelatin, causes corrosion of the metal lids of containers.

H. J. DOWDEN.

Opacity in gelatin. J. W. BLACK (Food Tech., 1931, 1, 162).—The necessity for using Cu-free gelatin in foodstuffs is emphasised. Cu contents as low as 20—50 p.p.m. cause discoloration in potted meats.

E. B. HUGHES.

Tarbagan fat.—See XII.

PATENTS.

Tanning processes. G. B. STOOLE (B.P. 366,337, 30.3.31).—The delimed hides are treated first with dil. "acetylenesulphonic acid" (a saturated solution of C_2H_2 in pyrosulphuric acid) and subsequently with a 3% solution of hexamethylenetetramine, which may be followed by a Zn tannage.

D. WOODROFFE.

Treatment of bone material before deglueing.

A. MENTZEL, Assee. of A.-G. F. CHEM. PROD. VORM. H. SCHEIDEMANDEL (B.P. 366,353, 13.4.31. Ger., 12.4.30).—Dried bone material is treated for up to 48 hr. at room temp. with a solution of a mild alkali, e.g., NH_3 or an amine, at room temp.

D. WOODROFFE.

Production of a glue powder having casein as base. C. ROY (B.P. 364,968, 17.4.31. Fr., 18.4.30).—The product comprises, e.g., 23 pts. of lactic casein, 4 pts. of $\text{Ca}(\text{OH})_2$, 4 pts. of borax, and 1 pt. each of KClO_4 , NaF , Na_2CO_3 , alum, and TiO_2 .

L. A. COLES.

Production of artificial horn. F. SCHMIDT (U.S.P. 1,811,972, 30.6.31. Appl., 20.2.25. Ger., 27.11.24).—Mixtures comprising, e.g., (a) about 30 pts. of nitro-, acetyl-, ethyl-, or benzyl-cellulose and 20 pts. of EtOH and H_2O , and (b) 60 pts. of casein, 10 pts. of H_2O , and 5 pts. of EtOH are kneaded together to yield a homogeneous mass.

L. A. COLES.

Production of artificial masses [artificial horn] similar to albumin. PFENNING-SCHUMACHER-WERKE, G.M.B.H. (B.P. 366,009 and 366,065, 18.10.30. Ger., 18.10.29. Addns. to B.P. 313,455; B., 1931, 266).—(A) Products obtained as described in the prior patent, but with the use of > 2 mols. of CH_2O per mol. of urea, may be rendered sol. in H_2O or EtOH by the addition of NH_4CNS , and/or treated with extra CH_2O and/or clarified by treatment with acid anhydrides (e.g., Ac_2O); fillers, plasticisers, etc. may be added subsequently. (B) The liquid products obtained by effecting in the cold the reaction described in the original patent are allowed to set to a cryst. mass by keeping for 2—4 days, preferably in contact with Al. The products are worked up as usual, preferably with the use of S or red P as filler.

L. A. COLES.

Dyeing bone. Artificial leather.—See VI.

XVI.—AGRICULTURE.

Degree of dispersion of clays. I. Technique and accuracy of mechanical analysis using the centrifuge. II. Influence of cations on degree of dispersion. C. E. MARSHALL (J.S.C.I., 1931, 50, 444—450 r, 457—462 r).—I. The factors affecting the accuracy of the author's centrifugal method (A., 1930, 411) for the mechanical analysis of the clays in the range $2\ \mu$ — $50\ \text{m}\mu$ are discussed. The pipette method shows satisfactory agreement under proper conditions, and ultramicroscopic counts have also shown that fractions separated by the centrifuge are correctly graded. The effects of departure from the spherical form are fully discussed in the light of observations on the shapes of clay particles. The effect of hydration is also considered, and a more convenient way of determining the actual density of clay particles is given.

II. Using the centrifugal method, it is shown that clays may be divided into different types by a consideration of their degrees of dispersion when saturated with various cations. The kaolin type shows extreme sensitiveness combined with a very small base-exchange capacity. The montmorillonite type is equally well dispersed whatever the cation. The beidellite type shows a very marked variation in the degree of dispersion with various cations, and is the type which most readily

undergoes oriented coagulation. In this process the particles < 200 m μ are chiefly concerned.

Silt soils of Picardy and their state of fertility.

I. G. JORET (Ann. Agron., 1932, N.S., 2, 30—60).—Normal fertility in these soils is associated with p_H 7.2—7.5, V (Hissink) = 55—60%, and exchangeable Ca = 80% of S (Hissink). The CaO required (by Hissink's method) to produce V = 57.5% averaged 2.5—5.0 times as great as that by the Hutchinson method. In soils of good fertility the ratio of humus sol. in 0.2% aq. $NaOH$: total N was 3.5 approx., and total org. matter : sol. humus was 5.0 approx.

A. G. POLLARD.

Dehydration, soil acidity, and exchangeable bases. H. G. COLES and C. G. T. MORISON (Soil Sci., 1932, 33, 115—124).—Heating of soil did not alter the amount of bases removed by aq. NH_4Cl or $NaCl$, but the proportion of H_2O -sol. base was increased. With certain exceptions, alternate washing and heating of soils reduced their p_H vals. to points approximating to those of base-free soils. Bases pass into solution as sulphates. Fe^{+++} and Al^{+++} continue to become sol. after all Ca has been removed. The proportion of bases appearing in aq. extracts of heated soils depends on the amount of SO_4^{--} which can become sol. Soils contain residual SO_4^{--} after the complete removal of bases by alternate washing and heating.

A. G. POLLARD.

Mineral acidity of soil. J. WUNSCHIK (Mitt. Lab. Preuss. Geol. Landesanst., 1930, No. 12, 1—53; Chem. Zentr., 1931, ii, 1182).— Na permutit was prepared from materials free from Fe_2O_3 and after treatment with acids and salts its interaction with KCl was followed. The exchange acidity depends on the degree of decomp. of the permutit, the temp., and concn. of the neutral solution. Kappen's supposed equivalence between the Al_2O_3 found and calc. could not be observed, the former being the higher. The exchange acidity cannot be attributed to adsorption of acids and acid salts caused by the neutral salt.

A. A. ELDRIDGE.

"Real" neutral-salt decomposition. T. ARND, W. SIEMERS, and W. HOFFMANN (Z. Pflanz. Düng., 1932, 23A, 398—401).—The views of Behrens (B., 1931, 939) as to the nature of acidity in org. soils are not confirmed. The acidity of neutral-salt extracts of humus soils is the result of the formation of free mineral acid (cf. Tacke and Arnd, B., 1928, 311).

A. G. POLLARD.

1. Quinhydrone electrode and soil reaction. 2. Gravimetric determination of carbonates in soil. 3. Application of the quinhydrone electrode to investigations on base exchange in soils. E. R. COLLINS (Iowa State Coll. J. Sci., 1931, 5, 321—322, 322—323, 323—325).—1. Soils were passed through a colloid mill and allowed to settle through a long tube. p_H vals. of samples taken at different heights showed that this treatment increased the differences between the p_H of the soil and that of the supernatant liquid.

2. Aq. HCl (10:1) was used to free the CO_2 and ascarite to absorb it.

3. With Iowa soils, titration against $Ca(OH)_2$ gave the lowest, titration with $NaOH$ in presence of $NaCl$ an intermediate, and titration against $Ca(OH)_2$ in presence of

$CaCl_2$ the highest, CaO requirement. Titration vals. increased with the time of stirring.

CHEMICAL ABSTRACTS.

Determination of p_H in soils by electrometric and colorimetric methods. K. UTESCHER (Z. Pflanz. Düng., 1932, 23A, 381—392).—Differences between p_H determinations by Trenel's electrometric method and the colorimetric methods of Wulff and of Tödt are small, except in the cases of soils having $> 1.5\%$ $CaCO_3$. Where the colloid content is high, electrometric methods yield slightly low p_H vals. in acid soils and slightly high ones in alkaline soils.

A. G. POLLARD.

Carbon-nitrogen ratios in cacao soils. F. HARDY and G. GRIFFITH (Nature, 1932, 129, 132).—Correlation of yielding capacity with C:N ratio of org. matter indicates that the nature rather than the amount of org. matter is the primary factor in the productivity of cacao soils under the conditions which obtain in Tobago.

L. S. THEOBALD.

Phosphorus studies in Alberta soils. J. L. DOUGHTY (Sci. Agric., 1931, 12, 43—51).—In the soils examined, no relationship exists between the total, H_2O -sol. (soil : H_2O = 1:5), and easily sol. (soil : 0.002N- H_2SO_4 = 1:200) phosphate contents. Changes in sol. P with p_H indicate a min. solubility at p_H 6.0—6.5. Increasing solubility on the alkaline side is attributed to the hydrolysis of Fe and Al phosphates or org. compounds. The pptg. effect of Ca in alkaline areas is largely prevented by the presence of org. matter. Increased solubility of P between p_H 6 and 7 results from the presence of Ca and Mg phosphates, between p_H 6.0 and 3.0 of Al compounds, and at p_H < 3.0 of Fe compounds. Addition to soil of KH_2PO_4 at the rate of 500 lb. of PO_4^{--} per acre was followed during 12—16 hr. by the fixation of 50—85% of the PO_4^{--} in all soils. The loss of sol. P in bi-weekly leachings was very rapid. No relationship existed between the total P content and the concn. of the final leaching. CaO reduced and superphosphate increased the P solubility.

A. G. POLLARD.

Distribution of certain fungi in Colorado soils. E. L. LE CLERG (Phytopath., 1931, 21, 1073—1081).—Fungi were more abundant in cropped than in uncropped soils and greatest numbers accumulated under red clover. Alkali soils showed reduced fungal numbers.

A. G. POLLARD.

Determining the available phosphorus in Saskatchewan soils. J. MITCHELL (Sci. Agric., 1932, 12, 346—351).—Truog's method (B., 1931, 266) is modified by the use of a solution of $KHSO_4$ buffered by K_2SO_4 to p_H 3 (0.39 g. $KHSO_4$ + 5 g. K_2SO_4 per litre) for extraction of soil phosphate. Soils, lighter than clays, having 0—20 p.p.m. of available P respond well to P fertilisers, those with 20—40 p.p.m. respond to a smaller extent, and those with > 50 p.p.m. are not generally affected.

A. G. POLLARD.

Permeability to different gases of sands and soils at high temperatures. F. ROLL (Z. Pflanz. Düng., 1932, 23A, 392—397).—The permeability of various soil fractions to gases decreases rapidly with rising temp., ultimately approaching const. vals. (600—800°) which are characteristic of the mean diam. of the

particles and the state of compactness of the mass. At 20° the permeability of sand-clay mixtures is a max. at 5% H₂O content. In all cases the order of permeability of gases was CO₂ > air > O₂.

A. G. POLLARD.

Preservation of samples of water and aqueous soil extracts. S. M. DRATCHEV and R. A. KALACHNIKOVA (Z. anal. Chem., 1932, 87, 173—179).—The concns. of NO₂', NO₃', and phosphate in aq. soil extracts changed slowly on keeping at room temp.; CHCl₃, PhMe, and thymol retarded the change, but did not prevent it. Of the various preservatives examined, HgO and amalgamated Cu had the greatest bactericidal action on a potable H₂O and an industrial effluent, and they also exerted a marked stabilising action on NO₃' and SO₄'', but no substance effecting permanent preservation was discovered.

R. CUTHILL.

Microdetermination of phosphorus and arsenic by the molybdenum-blue method. Use of soil extracts. ZINZADZE (Z. Pflanz. Düng., 1932, 23A, 447—454).—The method described previously (A., 1930, 725) is applied to the analysis of soil extracts.

A. G. POLLARD.

Dependence of [the growth of] cultivated plants on the reaction and nutrient content of soils. ÅSLANDER (Z. Pflanz. Düng., 1932, 23A, 362—381).—The injurious effect on plants of acid nutrient solutions may be partly or wholly obliterated by the use of a sufficient concn. of nutrients. Barley was grown successfully in conc. nutrients having p_H 3.75—4.0. Cations counteract the effects of acidity in the order Fe''' > Ca'' > Mg'' > K' = Na'. Acid injury is influenced not only by the actual p_H , but also by the nature of the active anions present. For barley the inorg. acids are injurious in the order NO₃' > Cl' > SO₄' > PO₄''' and org. acids in the order AcOH > HCO₂H > malic > tartaric > citric > peat acids. Humic acid is little if at all injurious. Liming may improve plant growth in acid soils merely by adding Ca, even if insufficient is used to change the p_H .

A. G. POLLARD.

Analytical formulation, nature, and properties of nitrogen and potash growth curves. W. JESSEN (Z. Pflanz. Düng., 1932, 23A, 401—427).—N growth curves derived from the results of pot cultures approximate closely to those of logarithmic functions whether based on total crop wts. or on the separate yields of grain, straw, roots, or tops. Over the range examined, the hyperbolic curve of Boresch is also closely fitted; K growth curves conformed less closely to theoretical vals. The "effect val." of K varied with the dosages used in its calculation. With cereals the K intake was directly proportional to the amount supplied, but with increasing applications the crop yield fell below the calc. figure and the K content of the straw increased. Neither with N nor K was there any indication of an S-form of growth curve. The falling branch of the growth curve is largely dependent on the concn. of nutrient present.

A. G. POLLARD.

Inconstancy of the nitrogen and potash "effect factors" and their practical significance. W. JESSEN (Z. Pflanz. Düng., 1932, 23A, 427—446).—The N factor in growth curves varied for different plants. Among cereals differences in vals. based on total and

straw yields were not great, but widened where grain yields were utilised. "Effect vals." in many cases were considerably greater than those recorded by Mitscherlich. For K, the "effect vals." varied with the methods of application of fertiliser, but the experimental conditions (lighting, moisture, etc.) had little influence. The "effect factor" for K determined from either grain or straw yields was higher than that based on total yields and was not increased by the simultaneous application of Na.

A. G. POLLARD.

Nature of the reserve nitrogen remaining in soil after cropping with sugar beet. LEMOIGNE and H. DUPIC (Compt. rend. Acad. Agric. France, 1932, 18, 244—250).—In silty soils examined, N accumulated as NO₃' in subsoils after fallowing but not after cropping with beet. In very wet seasons soils after sugar beet have a reserve of org. N, but no NO₃'.

A. G. POLLARD.

Relation between the mobilised reserves in the sap of vines and the fruit crop produced. L. MOREAU and E. VINET (Compt. rend. Acad. Agric. France, 1932, 18, 193—197).—Productivity in vines is related to the proportion of reserve material (notably carbohydrates and asparagine) present in the sap when the buds are breaking. Artificial injection of glucose at this time increased the yield of fruit.

A. G. POLLARD.

Treatment of wheat rust. H. G. ARNAUD and M. GAUDINEAU (Compt. rend. Acad. Agric. France, 1932, 18, 208—214).—With suitable selection of materials equally good results are obtained by dipping and by dusting. The most satisfactory dips were CH₂O, CuSO₄, and Bordeaux mixture with casein (used after washing the grain with H₂O). For dusting, CuCl₂ was superior to the oxychloride.

A. G. POLLARD.

Acid injury of cotton roots. J. J. TAUBENHAUS and W. N. EZEKIEL (Bot. Gaz., 1931, 92, 430—435).—In soils rendered acid by heavy applications of S a swollen and cracked condition appeared in cotton roots. The injured areas of tap roots corresponded with soil layers having p_H 2—4, although isolated cases of injury at p_H 6.1 are noted.

A. G. POLLARD.

Fertilising coniferous seedlings. A. C. MCINTYRE and J. W. WHITE (J. Amer. Soc. Agron., 1932, 24, 72—73).—The action of fertilisers varied with the period during which seedlings remained in seed beds. Dried blood produced the largest and heaviest seedlings.

A. G. POLLARD.

Chlorosis of the rose. R. P. WHITE (Phytopath., 1932, 22, 53—69).—Mosaic and other forms of chlorosis are examined. Fumigation with HCN causes a chlorosis characterised by chlorophyll destruction around leaf margins, particularly towards the tips.

A. G. POLLARD.

Relation of nitrogen to potassium in the nutrition of fruit trees. E. J. GILDEHAUS (Bot. Gaz., 1931, 92, 384—395).—Leaf scorch in sand-cultured apple trees was minimised by increasing the relative proportion of K and/or diminishing that of N. No correlation was observed between the N:K ratio and carbohydrate content of 1- and 2-year wood. The response of plants to K deficiency varied somewhat with the N content.

A. G. POLLARD.

Effect of ethylene on the ripening of bananas. H. S. WOLFE (Bot. Gaz., 1931, 92, 337—366).—An atm.

containing 1:1000—1:10,000 of C_2H_4 slightly accelerated the yellowing of bananas. Treated fruit showed rather higher day-to-day increases in sugar and decreases in starch content than did controls. Respiratory activity was not appreciably affected. Bananas in a quasi-dormant condition are stimulated to commence ripening immediately after C_2H_4 treatment.

A. G. POLLARD.

Action of uranium radiation on plants. M. DEMOUSSY (Compt. Rend. Acad. d'Agric. France, 1932, 18, 28—31).—Admixture of UO_2 with soil (up to 0.17 g. per kg.) increased wheat yields. Higher proportions were injurious and with >1.7 g. per kg. plants were killed.

A. G. POLLARD.

Fungicidal efficiency of dusts containing furfuraldehyde derivatives. J. J. WILSON and C. S. REDDY (Phytopath., 1931, 21, 1099—1113; cf. B., 1930, 681).—A new fungicidal dust for seed grain is prepared from the pptd. reaction product of $HgCl_2$ and furfuraldehyde; $EtOH$, $COMe_2$, or aq. NH_4Cl may be used as solvent for both parent substances. The dried and ground ppt. is mixed with talc (5:95) for use as a dusting powder against *Diplodia zeae*, *Basisporium gallarum*, and *Gibberella saubinetii*.

A. G. POLLARD.

Soya-bean caterpillar in Louisiana. W. E. HINDS and B. A. OSTERBERGER (J. Econ. Entom., 1931, 24, 1168—1173).—Dusting with Na_2SiF_6 (or Ba salt) gave good control.

A. G. POLLARD.

Bait trapping of the Oriental fruit moth in Indiana and Georgia. W. P. YETTER and L. F. STEINER (J. Econ. Entom., 1931, 24, 1181—1197).—Among numerous attractants tried, Me cinnamate used in brown sugar syrups proved very successful.

A. G. POLLARD.

Phosphate blast furnace.—See VII.

See also A., Mar., 249, I salts as fertilisers. Soils (various). 313, Fertilisers and growth of *Lobelia inflata*.

XVII.—SUGARS; STARCHES; GUMS.

New magnesia process at Wismar [beet-sugar factory] last campaign. E. MODROW (Z. Ver. deut. Zucker-Ind., 1932, 82, 52—56; cf. B., 1931, 777).—A 1:1 mixture of MgO and wood charcoal was adopted finally, as it yielded more uniform filtering cakes than mixtures containing less C, and also because the juice to be treated was already very pale owing to adoption of pre-liming and triple saturation. About 10% of the colour of the juice was removed, and the p_H was changed from about 7.8 to 8.5. The juice dissolved 5 mg. of MgO per litre, but this was completely eliminated by liming and carbonatation at the syrup stage. The spent filtering mixture was regenerated at red heat. J. H. LANE.

Pre-liming [beet juices] and advantages attainable by it. O. SPENGLER, S. BÖTTGER, and F. TÖDT (Z. Ver. deut. Zucker-Ind., 1932, 82, 1—51).—Methods of liming were studied on 2-litre portions of raw juice subsequently carbonated to the usual alkalinity, filtered at 95° through a Buchner funnel, further carbonated, filtered, boiled, and evaporated to syrup in 4—8 min. in a laboratory vac. apparatus. Addition of 0.2—0.25% of CaO , calc. on beets, to the juice at 80° a few

min. before the main liming markedly accelerated filtration after carbonatation, and when the interval between pre-liming and main liming was < 5 min. there was also some improvement in the colour and composition of the juice. Very much better results were obtained by pre-liming at 40° and, after a few min., heating rapidly to 80° for the main liming, or carrying out the main liming at 40° a few min. after pre-liming and then heating rapidly to 80°; compared with the usual process, with the same total amount of CaO , this procedure increased the rate of filtration after first carbonatation 5-fold, besides improving the colour of the juice, lessening discoloration during evaporation, raising the true purity of the syrup, and lowering its ash and Ca contents. The best results were obtained with a sharply-defined optimum amount of CaO for pre-liming, sufficient to bring the juice to p_H 10.9 at 80°. This amount may vary with different juices, between 0.15 and 0.3% (calc. on beets), but it is independent of the temp. of pre-liming and of the total amount of CaO employed. Better results are obtained with 2% than with 1% of total CaO , but with the latter amount optimum pre-liming at 40°, as described above, proved superior to the usual process with 2% of CaO ; filtration of the juice was much more rapid, the syrup purity was higher by 0.5—0.7% (corresponding to an extra recovery of 0.16% of sugar, calc. on beets), and the only disadvantage was a slightly higher Ca content of the syrup solids, e.g., 0.008 instead of 0.002%. Pre-liming can be carried out with limed juice instead of milk-of-lime, but the results are not quite so good. If portions of a juice are pre-limed with different amounts of CaO , the optimum amount will be indicated, after completed liming, by the max. rate of settling of the ppt. A more rapid method of ascertaining the optimum amount is to treat 1 litre of the juice at 35—40°, during const. stirring, with a well-mixed 3% suspension of CaO , until a portion, after heating to 80°, gives a pale blue colour with thymolphthalein paper (p_H 10.9). Reports from several factories confirm the advantages of pre-liming as described, showing saving in CaO and/or improved working and products. Pre-liming should be carried out in the juice-measuring vessels, as even slight irregularities in the proportion of CaO added, or imperfect mixing, may impair the texture of the carbonatation cakes. Rapid juice heaters are necessary for heating the pre-limed juice from 40° to 80°. J. H. LANE.

[Beet-sugar] 1930/1 campaign in Moravia and Silesia. J. DĚDEK (Z. Zuckerind. Czechoslov., 1931, 56, 121—142, 145—168).—Replies from 40 factories to a questionnaire relating to output, control data, types of plant, and methods of working in use are summarised and many points of technical interest are discussed. Pre-liming in the juice-measuring vessels, with amounts of CaO up to 0.4%, was practised last campaign in nearly 75% of the factories. An alternative to the control of supersaturation of after-product massecuites by addition of H_2O , according to Claassen's classical method, is provided by modern types of crystallisers; in these, massecuites from which as much H_2O as possible has been removed in the pans may be cooled rapidly in energetic motion without separation of fine grain.

J. H. LANE.

Crystallisation of [beet-sugar] after-product massecuites. H. CLAASSEN (Z. Zuckerind. Czechoslov., 1931, 56, 255—256).—The author condemns Dédéck's advice (preceding abstract) to evaporate as much H_2O as possible from after-product massecuites and, without control of supersaturation or addition of H_2O , to cool rapidly and centrifuge at low temp. Control of supersaturation is important, but whether addition of H_2O is necessary or not depends largely on whether a massecuite has been boiled under low vac. at high temp., or under high vac. at low temp. J. H. LANE.

Testing the titrimetric determination of sugars by the Bertrand-Meissl method. C. LUCKOW (Z. Unters. Lebensm., 1932, 63, 77—80).—Modified details of the method for application to spirituous liquors and fruit juices are described. For the purposes of inversion samples are divided into three classes according to sugar content: (a) < 2 g./100 c.c. (wine brandies and raw fruit juices); 50 c.c. are diluted with 25 c.c. of H_2O , heated with 5 c.c. of HCl for 5 min. at 70° , neutralised, and diluted to 100 c.c. (b) Up to 45% (liqueurs); 10 g. are taken with 75 c.c. of H_2O and treated as in (a). (c) About 5% (sugar solutions and fruit concentrates); 5 g. are taken. J. GRANT.

Saccharification of wood.—See V. **Determining sucrose in beer.**—See XVIII.

See also A., Mar., 229, **Ca saccharates.** 237, **Photo-synthesis of carbohydrates.** 255, **Differential analyses of starches.**

PATENT.

Electrolytic oxidation of aldoses. W. W. TRIGGS. From RÖHM & HAAS Co. (B.P. 365,414, 27.3.31).—A solution containing the aldose with about 10% of the equiv. amount of sol. bromide or iodide and a neutralising agent such as $Ca(OH)_2$, $CaCO_3$, or Na_2CO_3 is electrolysed in presence of an insol. anode at a c.d. depending on the concn. of halide salt, e.g., 25 amp./sq. ft. for 0.1M concn. The same solution can be used several times after recovery of the aldones by crystallisation, further quantities of aldose and neutralising agent being added, and ultimately the Br or I can be recovered. The process can be applied to the separation of ketoses from aldoses, e.g., to the prep. of fructose from invert sugar. J. H. LANE.

XVIII.—FERMENTATION INDUSTRIES.

Catalase in Swedish brewing barleys. K. MYRBÄCK and S. MYRBÄCK (Woch. Brau., 1932, 49, 25—30).—Catalase is only slowly extracted from barley by H_2O , and is readily damaged by exposure to slight heat or to acidity only slightly greater than the optimum for its activity, pH 7.0—7.7. Green malt, therefore, cannot be ground sufficiently finely in a mill to enable extracts to be made, even with the use of buffers, without danger of weakening the enzyme. The authors determined catalase by acting on a known excess of H_2O_2 , at 0° , with a suspension obtained by grinding the material with sand and a little phosphate buffer in an agate mortar. The reaction is unimol., proportional to time and to concn. of enzyme, and independent of concn. of H_2O_2 . A no. of Swedish barleys of the seasons 1928—1930 gave activities (reaction const. per g.)

varying from 0.025 to 0.150; the barleys of 1929 gave lower vals. than those of the other years. In malting, barleys with high catalase generally germinated more readily, though there were one or two striking exceptions. A set of Russian barleys had a similar catalase range. Catalase diminished during steeping, but increased by from 6 to nearly 40 times during germination. At 21° the max. was reached about the 7th day, and it was not influenced by light. About half the catalase of a green malt was in the shoots, chiefly in the growing ends. Very wide differences were found in the activity of individual corns during germination. F. E. DAY.

Determination of sucrose in beer. II. J. FIEHE (Z. Unters. Lebensm., 1932, 63, 69—72).—Applications of the author's method (B., 1929, 146, 955; 1932, 43) to beer are described. The factor 3.5 is used to convert the wt. of phloroglucinol compound into sucrose, and errors of 0.06—0.16% are recorded for beers containing 1—5% of sucrose. Omission to decolorise the sample by charcoal gives high results; arabinose, glucose, maltose, lactose, or starch do not interfere. J. GRANT.

Occurrence of lower fatty acids (butyric acid) in sweet wines. P. BERG and G. SCHULZE (Z. Unters. Lebensm., 1932, 63, 62—68).—Qual. applications of the procedure described by Grossfeld, Miermeister, and Battay (B., 1931, 652) indicate that spirit or fermented extracts of carob bean contain relatively large amounts of butyric acid. Less was found in Tokay and fermented currant extracts, still smaller quantities in Malaga, ports, sherries, marsala, muscat, and Russian wines, and little or none in Samos, Palestine, and unfermented currant wines. Since butyric acid appears to be a normal constituent of sweet wines and its amount may be influenced by the method of manufacture, such tests for additions of carob-bean wine must be applied with caution and have only a qual. value. J. GRANT.

Solubility of ferrous and ferric phosphates in solutions of organic acids and its relation to the so-called grey fraction of wines. W. SIEFERT (Oesterr. Chem.-Ztg., 1932, 35, 30—34).—The solubility of Fe^{++} and Fe^{+++} phosphates in tartaric, malic, and lactic acids, at the concns. in which they are present in wines, has been determined. The solubility in wines is actually less than in the acid mixture. The turbidity which forms in wines on keeping is due to gradual oxidation of Fe^{++} to Fe^{+++} compounds, which are eventually pptd. as $Fe_3(PO_4)_2$. Both Fe^{++} and Fe^{+++} phosphates can be removed from wine by means of $K_4Fe(CN)_6$. E. S. HEDGES.

Law of mass action for wine distillates and wine brandies. E. RUPPIN (Z. Unters. Lebensm., 1932, 63, 80—81). A. MIERMEISTER and G. BÜTTNER (*Ibid.*, 81).—Analyses of 43 wines, wine distillates, and wine brandies (30—64 vol.-% EtOH) stored for 1.5 years in open, half-filled, 2-litre flasks show a fall in the ratio ester: acid corresponding with the decrease in EtOH content. They therefore justify the author's contention (B., 1929, 573) that the law of mass action is of value for the detection of adulteration of such samples and rebut the criticisms of Büttner and Miermeister (B., 1930, 527), who also contribute a reply. J. GRANT.

Oenological indices relative to [detection of] added water. DUBAQUIÉ (Ann. Falsif., 1931, 24, 598—605).—The val. of various analytical indices in the detection of excessive watering of wine is discussed.

W. J. BOYD.

Rubber hose in the production of beer, wine, and acetic acid. BODE (Gummi-Ztg., 1932, 46, 733—735, 771—772).—Rubber hose for use in breweries should conform to the following standards. The combined amounts extracted by treatment for 8 hr. with CO_2 and by 0.5% alcoholic KOH should be $\geq 15\%$. The content of ash must be $\geq 30\%$ and of pure rubber (calc. by subtracting the sol. fraction and ash from 100) should be at least 60%, which corresponds to 62—63% of the best plantation rubber, as 2—3% of the latter is sol. and saponifiable. If 30% of ash is present, the sol. fraction cannot exceed 10%. This consists of 2—3% from the rubber, 2% from filling materials, and only 5—10% is allowed for the addition of factice etc. Undesirable flavours acquired by the beer from the hose are due, not to inferior rubber, but to an addition of $> 10\%$ of factice. Rubber hose manufactured according to the above standards does not develop cracks which permit the harbouring of bacteria, but rubber containing over 30% of mineral fillers does so. CaCO_3 and MgCO_3 should not be used as fillers, as they are dissolved by the beverages containing CO_2 , and the hose becomes porous. Rubber tends to swell in contact with AcOH , and no standards can be given for the rubber used in the manufacture of that acid.

C. RANKEN.

Fuel gas from distillery waste.—See II. **Determination of sugars.**—See XVII.

See also A., Mar., 303, **Aldehydease of liver. Pancreatic amylase.** 305, **Pyrophosphatase of malt and yeast.** **Cocarcboxylase.** 305—6, **Acetoacetic acid transformation and β -hydroxybutyric acid formation by yeast.** 306, **Bioactivator in honey.** 307, **Action of thermophilic bacteria on coal.**

PATENTS.

Manufacture of yeast. R. BERTEL and O. SCHÜSSLER (B.P. 365,086, 15.9.30).—Separated yeast is incorporated with readily sol. Ca salts of lactic acid and, if desired, of H_3PO_4 in the solid state, the friable mass being thereafter dried by a current of air at 30—35°.

C. RANKEN.

Manufacture of beer. K. S. FELIX (B.P. 365,348, 5.2.31).—A stock beer of superconcn. is prepared by fermenting a wort of which the concn. and hop rate greatly exceed the normal. The beer, which can be further conc. by freezing the H_2O out of it, is rendered potable by the addition of H_2O and CO_2 . C. RANKEN.

Treatment [colouring] of beer. (SIR) M. A. J. MALCOLM (B.P. 365,208, 22.10.30).—Beer or malt liquor is coloured green by the addition of an innocuous dye such as chlorophyll or aniline-green. The coloured beer remains longer brilliant and deteriorates less on exposure to light.

C. RANKEN.

Manufacture of [vitamin-containing] beer. H. VAN DE SANDT (B.P. 365,256, 1.12.30).—Yeast or other substance containing vitamin is autolysed at approx. 50° in H_2O , wort, or beer, and after purification of the

vitamin-containing liquid by kieselguhr or the like, the clear liquid is de-albuminised by boiling and is then conc. in vac. to a dry powder which is afterwards added to the beer or wort.

C. RANKEN.

XIX.—FOODS.

Examination of samples of wheat and flour in Wood's light. P. BARBADE (Ann. Falsif., 1931, 24, 581—587).—The largest and soundest grains of wheat exhibit a blue fluorescence, whereas grains which have suffered in quality owing to excessive moisture during growth have a yellow fluorescence. Fluorescence is to some extent characteristic of the variety, and uniformity of fluorescence indicates homogeneity of variety and of conditions of growth and storage. Thus mixed consignments may be detected. Blue fluorescence of sound grains is changed to yellow by alkalis and is restored by acids. The substance causing the blue fluorescence is insol. in EtOH , Et_2O , and CCl_4 , sol. in boiling H_2O and in warm dil. acids and alkalis, and appears to be related to the gums. In section the digestive portion of the kernel and especially the aleurone layer appear strongly fluorescent, whereas the pericarp with the exception of the epicarp shows little fluorescence. Other seeds present as impurities have characteristic fluorescences by which they may be recognised. Impurities in flour are more readily detected and determined by the microscope in ultra-violet than in ordinary light.

W. J. BOYD.

Determination of acidity of bread, flour, and macaroni etc. C. SCHWEIZER (Mitt. Lebensm. Hyg., 1931, 22, 117—124; Chem. Zentr., 1931, ii, 1214).—For white bread a titration val. of > 10 indicates excessive acidity, but with wholemeal bread this limit can be exceeded without causing an unpleasantly sour taste. The acidity is better expressed as p_{H} val.; this must not fall below 4.5. Bread may have a rancid odour without this being reflected in the acidity val. Flours gave the same titration and p_{H} vals. as bread. In macaroni etc. in presence of egg the titration acidity may increase with age.

A. A. ELDRIDGE.

Loss of bread substance on baking. J. GERUM (Z. Unters. Lebensm., 1932, 63, 51—62).—The author finds a 15—20% loss for mixed rye, barley, and wheat flours; this is attributed mainly to carbohydrate substances, and occurs to a greater extent in the dough fermentation and to a less extent in the oven process. Determinations of the H_2O , crude fibre, pentosans, and ash on the meal and final bread are given and enable the % loss in wt. on baking to be calc. from the expression $100(\text{change in \% of ash})/\% \text{ of ash in bread}$. J. GRANT.

Mould in bread. W. GREGORY and M. LAW (Food Tech., 1931, 1, 25—26).—Mould growth in unwrapped bread is prevented by free circulation of air around the loaf. Bread to be wrapped should be cooled for 5—7 hr. Sliced bread should be wrapped in ventilated or porous paper.

E. B. HUGHES.

Composition of milk. I. Significance of the chlorine-sugar value for distinguishing between human and cow's milk. II. Colostrum and milk. A. KELLER and H. MAI (Schweiz. med. Woch., 1930, 60, 7 pp., 4 pp.; Chem. Zentr., 1931, ii, 2232).—I. Determinations of Cl by Votocek's method in milk

cleared with H_2WO_4 , and of lactose by the iodometric method, in human and cow's milk are recorded.

II. Determinations of the Cl-sugar val. of human and cow's milk during the first 9 days after parturition are recorded; the lactose content on the first day is smaller (2.56–4.75%) than has been supposed.

A. A. ELDRIDGE.

Distinction between human and cow's milk. H. MAI and A. KELLER (Klin. Woch., 1930, 9, 535–536; Chem. Zentr., 1931, ii, 2232).—Cow's milk contains Cl 0.114, lactose 5.13%; human milk contains Cl 0.0345, lactose 7.48%; the Cl-sugar vals. are 2.23 ± 0.05 and 0.44 ± 0.015 , respectively. The high Cl content of the colostrum with low lactose content falls rapidly after the first stage of lactation, and in human milk becomes normal at the end of the third week.

A. A. ELDRIDGE.

Examination of ewes' milk. FONZES-DIAON (Ann. Falsif., 1931, 24, 594–596).—It is not possible to detect cows' milk in ewes' milk by determination of Cl' as the average vals. for the two milks differ little (cf. Martin, *ibid.*, 1928, 21, 236). Ewes' milk so adulterated has reduced fat and casein contents. Addition of goats' milk may be detected by the high Cl' and low casein and fat contents.

W. J. BOYD.

Molecular constants of milk. Variations of the elements during the cycle. C. STAINIER (J. Pharm. Belg., 1931, 13, 553–562, 573–582, 591–595, 609–616, 629–641, 653–667; Chem. Zentr., 1931, ii, 2232).—Variations are: P 0.607–1.28 (average 0.95), citric acid 1.28–2.73 (1.99), non-protein-N 0.32–0.59 (0.44) g. per litre; the consts. are preferred to vals. of solids-not-fat, ash, and lactose for the detection of added H_2O . The sum of lactose + NaCl + sol. P + citrate + urea, for milk at max. lactation (but not for colostrum), is preferred to Mathieu and Ferré's const. Porcher's modification offers no advantage. Variations do not exceed 20%. The f.p. shows variations of 11% (-0.53° to -0.59°); n is much less const. The quantity of citrate appears to be a function of that of lactose. The view that fat and P originate from phosphatides is supported.

A. A. ELDRIDGE.

Electrical conductivity of milk; its character and application. J. KRENN (Angew. Chem., 1932, 45, 171–173).—No direct relation exists between the electrical conductivity of milk and the ash content or Cl' content, but normal cows' milk always gives a val. below 46×10^{-4} . The temp. coeff. has no const. val.

E. S. HEDGES.

Water content of melted cheese. F. E. NOTTBOHM (Z. Unters. Lebensm., 1932, 63, 37–47).—Data are recorded for the H_2O and fat contents of a number of rindless Emmenthaler and Tilsiter cheeses of various origins. Swiss melted rindless Emmenthaler cheeses (28) were found to contain 42% H_2O , i.e., about 10% more than that of natural full-fat cheese; 8 similar German cheeses contained 48% and 11 Tilsiter cheeses 37.16% (mean vals.). In general, melted cheeses may be divided into two groups having H_2O contents of above or below 50%; the former can be spread.

J. GRANT.

Fish phosphatides. I. German fish meals. O. BÄHR and O. WILLE (Fischwirt., 1931, 7, 113–120;

Chem. Zentr., 1931, ii, 2233).—The lecithin content (% of dry substance; extracted by C_6H_6 80% + EtOH 20% and treatment of the extract with Et_2O etc.) of various species was: whole fish 1.03–2.49, offal 0.9–3.44, head 0.64–2.18, flesh 0.53–2.18. Vals. are also given for protein, fat, Ca phosphate, and NaCl.

A. A. ELDRIDGE.

Preservation of fish. II. J. T. CLARK and J. M. PHILIPSON (Food Tech., 1932, 1, 224–225).—The pressed juice from fresh codfish, the same juice after it had been frozen, and the "drip" from frozen cod all had d 1.028 and n 1.3690, whilst the juice scraped from the freshly cut surface of frozen cod had n 1.3740. Cooling curves for the pressed juice and for 2% and 6% gelatin solution cooled in brine at 10° are given.

E. B. HUGHES.

Cold storage of fish. J. T. CLARK and J. M. PHILIPSON (Food Tech., 1931, 1, 153–154).—Experiments indicate that "drip" and deterioration of fish during cold storage are not caused solely by rupture of the cells, but may be due to enzymic action.

E. B. HUGHES.

Cooling of foodstuffs. D. E. A. JONES (Food Tech., 1932, 1, 214–216).—The principles involved in cooling by H_2O and by air are explained.

E. B. HUGHES.

Packing of hams for export. J. M. PHILIPSON (Food Tech., 1931, 1, 116–118).—After wrapping in paper and cloth, hams are coated by dipping in a 50% gelatin solution at 45° , and, after draining, the packages are treated with dil. aq. $\text{Na}_2\text{Cr}_2\text{O}_7$ or CH_2O and are matured for several weeks. In tropical regions such hams are subject to bacterial deterioration, which commences on the inside of the gelatin covering. Preliminary experiments with numerous preservatives for gelatin, using *B. fluorescens liquefaciens* as the test organism, have shown that at dilutions of 1/1000–1/100,000 HgCl_2 is the most effective and H_3BO_3 the least.

H. J. DOWDEN.

Dried peas. R. S. POTTER (Food Tech., 1931, 1, 51–54).—The principles underlying preservation by drying are outlined. Peas for treatment in this manner are allowed to mature more fully than ordinary peas, and they have lower H_2O and higher protein, extractives, and fibre contents. The culture, harvesting, threshing, and desiccation are described, as well as the processes involved in warehousing and packing. The optimum H_2O content is 14%, and as any reduction below this figure represents loss in val., controlled humidifying installations are recommended. The "soaking tablet" included in the packet is essentially NaHCO_3 with mint flavouring.

H. J. DOWDEN.

Action of heat on tomato conserves. O. CARASCO and E. SARTORI (Ann. Falsif., 1931, 24, 589–594).—On reheating tomato conserves at 100° for several hr., considerable loss of reducing sugars and increase in acidity occur in proportion to the concn. of the product. After removal of the sugars by fermentation and, in a less degree, after neutralisation of the acidity without removal of the sugars, the loss in dry wt. on reheating is greatly reduced.

W. J. BOYD.

Do chlorogenic acid decomposition products play a rôle in [the maturing of] coffee? E. EBINGER

(Pharm. Zentr., 1932, 73, 84—86).—By suitable treatment of raw coffee the chlorogenic acid is decomposed with formation of caffeic and quinic acids, and although the caffeine content is unaltered a coffee so treated has an improved aroma and is much less harmful physiologically. E. H. SHARPLES.

Obtaining trigonelline from raw coffee. F. E. NOTTBOHM and F. MAYER (Z. Unters. Lebensm., 1932, 63, 47—51).—The authors' method (B., 1931, 652) is modified to deal with larger quantities (e.g., 250 g.) of coffee, the liquid after the caffeine determination being freed from CHCl_3 by addition of H_2O and evaporation, and the solution conc. to 150 c.c. and heated with 25 c.c. of HCl in an autoclave at 4.5 atm. to ensure complete destruction of the sugars. The liquid is then neutralised, treated with animal charcoal, evaporated in a vac., and the residue extracted with hot EtOH ; the residue after evaporation, dissolution in H_2O , and treatment with C is used for the iodometric determination of trigonelline (*loc. cit.*). The C treatment is unnecessary if the extract is originally cleared with Pb acetate; Santos coffee yielded 0.43% (cf. *loc. cit.*). A similar digestion process is suggested for the isolation of betaine and choline.

J. GRANT.

Determination of caffeine in maté, coffee, tea, kola nut, and guarana. T. UGARTE (Chemia, 1930, 7, 490—491; Chem. Zentr., 1931, ii, 2234).—The material (0.5 g.) is carbonised cautiously in a 500-c.c. Kjeldahl flask, care being taken that none of the white vapour escapes. The cold mass is extracted four times with 5 c.c. of H_2O ; the united extracts are filtered, and the filtrate is evaporated to dryness at 100° . The residue is dissolved in H_2O (2 c.c.), H^+ 1—2 drops of N-NH_3 are added, together with 5 c.c. of CHCl_3 ; after vigorous stirring the liquid is filtered through a chloroformed filter. The H_2O remaining on the filter is again extracted with 5 c.c. of CHCl_3 . The CHCl_3 is removed by evaporation and the residue is extracted three times with 2 c.c. of H_2O for 2 min. on the water-bath. The extracts are evaporated to dryness in a tared vessel.

A. A. ELDRIDGE.

Preservation of beverages. R. H. MORGAN (Food Tech., 1931, 1, 97—98).—As a preservative for "squashes" SO_2 is superior to BzOH in that it prevents the fermentation which results from dilution of the surface layers by "sweating." The volatility of SO_2 , however, causes rapid and progressive leakage; thus the concn. in lemon juice fell from 576 to 483 p.p.m. in 14 days, and that in orange juice from 562 to 496 p.p.m. in the same interval. SO_2 maintains a good natural colour for a prolonged period, but bleaches most artificial colouring matter. BzOH has the advantage as regards taste and odour, it does not attack artificial colours, and its low volatility is unimportant when used in liquors aerated with CO_2 .

H. J. DOWDEN.

Scientific basis of food preservation by heat. J. W. BLACK (Food Tech., 1931, 1, 60—62).—The difficulties of combining complete bacterial sterility with absence of deterioration through overlong processing are discussed. In large packs the inner temp. may be only 107.8° after holding at 112.8° for 70 min. or 105.5° after holding at 115.5° for 50 min. In such cases effective

inhibition is to be aimed at rather than sterility, and this signifies a very low bacterial content attained by careful pre-processing control coupled with judicious use of preservatives (NaCl , spice, etc.) and rapid cooling of the pack. H. J. DOWDEN.

Pressures developed in cans during processing. An experimental study. R. J. MUNRO (Food Tech., 1931, 1, 57—60, 124).—One end of a can is perforated and a flexible diaphragm soldered internally so as to cover the perforations, whilst a metal cap is affixed externally. The cap is connected to an air pump by means of which the external pressure on the diaphragm may be made equal to that developed within the can during processing, any departure from equilibrium being indicated by electrical means. The method is applicable to cans of all sizes for any type of product, and with any system of closure (e.g., under vac. or packed at atm. pressure). The difference between the pressure in the retorts and in the cans represents the "strain" on the can. This is much greater when cans are filled and sealed cold than when so treated hot. Thus cans filled at 21° and processed at 100° or 118° will develop pressures up to 18 or 30 lb./sq. in., respectively. It is advantageous to trap cold air within the retort, since by its expansion during processing it reduces the strain on the can.

H. J. DOWDEN.

Spoilage in canned foods. F. HIRST (Food Tech., 1931, 1, 26—33).—The cause of spoilage in canned foods is examined. Canned fruits undergo spoilage as the result of leaky seams giving rise to bacterial infection, and of H_2 swells which are met with only where high storage temp. are necessary. Canned vegetables are commonly spoiled by under-sterilisation and not by H_2 swells. A high temp. is essential to prevent "flat sours"—the form of bacterial spoilage often met with. Canned meat and fish require high temp. and prolonged heating to kill the bacterial spores. The type of retort used by the canner must ensure that all cans are equally heated, and all air is expelled before the pressure is allowed to rise.

E. B. HUGHES.

Heat penetration by convection.—See I. Grey mould.—See V. Vitamins in cod-liver oil.—See XII. Opaque gelatin.—See XV. Determination of sugars.—See XVII. Orange water.—See XX. Pathogeny and foodstuffs. Fumigation.—See XXIII.

See also A., Mar., 309, Determination of vitamins in foods. 309—311, Vitamins (various).

PATENTS.

Preparation of cooked meats. H. VICKERS (B.P. 367,294 and Addn. B.P. 367,303, [A] 20.7.31, [B] 25.8.31).

Beer containing vitamins.—See XVIII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Test for purity of veronal. C. G. VAN ARKEL (Pharm. Weekblad, 1932, 69, 86—87).—The non-appearance of a ppt. on addition of NaOH and Br is not a satisfactory test; whilst luminal gives an immediate ppt., veronal also gives a ppt. on keeping, especially if the conditions are varied slightly. The m.p. is sufficient test of purity and identity. S. I. LEVY.

Determination of the sulphur content of ammonium ichthosulphonate (ichthamol). N. L. ALLPORT (Quart. J. Pharm., 1931, 4, 566—569).—Inorg. SO_4 is determined by pptg. org. matter from the aq. solution by CuCl_2 , filtering, and pptg. SO_4 from the filtrate as BaSO_4 ; and org. S by mixing with anhyd. Na_2CO_3 , fusing with cryst. $\text{Cu}(\text{NO}_3)_2$, and treatment with conc. HCl followed by extraction with H_2O , yielding a filtrate from which SO_4 is pptd. as BaSO_4 . F. O. HOWITT.

Fluorescence of orange water. F. GRÉGOIRE and J. RIPERT (Bull. Sci. pharmacol., 1931, 38, 209—216; Chem. Zentr., 1931, ii, 1208—1209).—Fluorescence diminishes as distillation proceeds and also on keeping. The fluorescence of the H_2O from the shoots is weak.

L. S. THEOBALD.

Bulgarian rose oil. A. WAGNER (Pharm. Zentr., 1932, 73, 81—84).—The commercial production of rose oil and the economics of the industry are described.

E. H. SHARPLES.

Determination of aldehydes and ketones in essential oils. H. SCHMALFUSS, H. WERNER, and R. KRAUL (Z. anal. Chem., 1932, 87, 161—164).—10 c.c. of oil are mixed with 50 c.c. of saturated aq. Na_2SO_3 which has been neutralised with a 30% aq. solution of NaHSO_3 after addition of a little phenolphthalein. The mixture is heated, with vigorous shaking, on a boiling water-bath, and aq. NaHSO_3 added from time to time to react with the NaOH formed, reaction being complete when liberation of NaOH ceases. The diminution in vol. of the oil gives the aldehyde and ketone content. This method gives reliable results with lemon-grass, caraway, and cassia oils.

R. CUTHILL.

Value of the vanillin-hydrochloric acid colour reactions with essential oils. W. ZIMMERMANN (Pharm. Zentr., 1932, 73, 113—122).—The use of this reagent in the detection, comparison, and examination of essential oils is illustrated by its application to various commercial samples of 47 oils and some oil-containing preps. and specialties.

E. H. SHARPLES.

Ketones as solvents. Amyl nitrite.—See III. Cod-liver oil emulsions.—See XII. Determining caffeine in maté etc.—See XIX.

See also A., Mar., 251, Cryst. Na α -glycerophosphate. 277, Sesquiterpenes from Japanese cedar oil. New sesquiterpene alcohol. 281, Atophan and its determination. 283, Barbituric acid derivatives. 286, Alkaloids of the *Senecio* series. 289, Determining narcotine in opium preps. etc. *Cinchona* alkaloids. 290, Optical identification of strychnine. Derivatives of *p*-arsanilic acid. 301, Synthetic papaverine derivatives. Detection of strychnine in cases of poisoning. 302, *Pinellia tuberifera* extracts. 308, Hormones of the corpus luteum. 313, Alkaloid of *Lobelia inflata*.

PATENTS.

Manufacture of acridine derivatives. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 363,392, 18.6. and 1.12.30).—A reactive 10-substituent in acridines having in 2-position H, halogen, alkyl, or alkoxy, and in 7-position halogen or alkyl, is replaced by an alkyl- or aryl-amino-group carrying a basic

substituent. The following 7-chloro-2-methoxyacridines are described: 10- ϵ -diethylamino-*n*-amylamino- (B,2HCl, decomp. 258—260°); 10- ϵ -diethylamino- β -amylamino- (B,2HCl, decomp. 248—250°); 10- β - β' -bisdiethylamino-isopropylamino- (B,3HCl, decomp. 225—228°); 10- γ -diethylamino- β -hydroxy-*n*-propylamino- (B,2HCl, decomp. 238—240°); 10- γ -dimethylamino-*n*-propylamino- (B,2HCl, decomp. 255°); 10- δ -diethylamino- β -butylamino- (B,2HCl, decomp. 258—260°); 10- δ -diallylamino- β -butylamino- (B,2HCl, decomp. 208—210°); 10- β -diallylaminoethylamino- (B,2HCl, decomp. 210—212°); 10-(*N*-ethyl-*N*- β -diethylaminoethyl)-*p*-aminoanilino- (B,3HCl, decomp. 255—258°); 10-*p*- β -diethylaminoethoxyanilino- (m.p. 78—80°; B,2HCl, decomp. 236—238°); 10- β -*N*-piperidinoethylamino- (m.p. 139—140°; B,2HCl, decomp. 260—263°); 10- β -ethyl- β -(β' -diethylaminoethyl)aminoethylamino- (B,3HCl, decomp. 225—228°); 10- β -diethylaminoethylamino- (m.p. 117—118°; B,2HCl, decomp. 251—252°); 10-*p*-aminomethylanilino- (B,2HCl, decomp. 258°). 7-Chloro-10- β -diethylaminoethylamino-2-ethoxy- and 7-chloro-10- δ -diethylamino- β -butylamino- (B,2HCl, decomp. 240°), and the following 10- ϵ -diethylamino- β -amylamino-acridines are also described: 7-chloro- (B,2HCl, decomp. 234—236°); 7-chloro-2-methyl- (B,2HCl, decomp. 245—246°); 2:7-dichloro-; 2-methoxy-7-methyl- (B,2HCl, decomp. 242°); 7-methyl- (B,2HCl, decomp. 220—222°); 2:7-dimethyl- (B,2HCl, decomp. 219—221°); 2-chloro-6-methyl- (B,2HCl, decomp. 218—220°); 7-chloro-2-ethyl- (B,2HCl, decomp. 148°).

C. HOLLINS.

[Manufacture of] soluble preparations of cinchona alkaloids. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 363,001, 17.9.30. Addn. to B.P. 327,428; B., 1930, 640).—Mixtures of a cinchona alkaloid salt and sarcosine anhydride are compressed into tablets which readily disintegrate and dissolve in H_2O .

C. HOLLINS.

Manufacture of organic arsenic compounds. E. WALTON (B.P. 362,852, 3.9.30).—A *p*-aminobenzene-arsinic acid is condensed with an aliphatic dicarboxylic acid (1 mol.) or its ester etc., and the product is converted into an amide by interaction with NH_3 or a primary or *sec.* amine. Products from arsanilic acid and succinic anhydride, with NH_2Ph , NH_2Me , NH_2Et , NH_3 , NHMe_2 , piperidine; acid chloride from Et.H malonate, with NH_3 , NH_2Me , NH_2Et , NHMe_2 , NH_3Ph ; acid chloride from Et.H glutarate, with NH_2Me . C. HOLLINS.

Germicidal gas.—See XXIII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

See A., Mar., 238, Action of slow cathode rays [on emulsions]. 245, Photo-electric photometer for X-ray intensities. 282, Cyanine dyes and related compounds.

PATENTS.

Manufacture of light-sensitive layers containing diazo compounds [diazo-types]. KALLE & Co. A.-G. (B.P. 362,735, 19.1.31. Ger., 22.1.30).—Diazo compounds of cyclohexyl derivatives of arylenediamines are used in diazo-type layers for wet or dry development.

Examples are: *p*-diazocyclohexylaniline (brown with resorcinol, blue with phloroglucinol); 5-diazo-*N*-cyclohexyl-*o*-anisidine (red-blue with phloroglucinol); 6-diazo-*N*-cyclohexyl-*m*-toluidine; 4-diazo-*N*-methylcyclohexylaniline (black with resorcinol and phloroglucinol); 4-diazo-*N*-benzylcyclohexyl- or -*N*-cyclohexylethyl-aniline.

C. HOLLINS.

Photographic films. KODAK, LTD., Assees. of J. B. WELLS (B.P. 366,380, 7.5.31. U.S., 17.5.30).—The cellulose acetate film base is coated on the back with cellulose acetate of lower "pptn. val." before the anti-halation backing is applied. The pptn. val. is derived from a prescribed determination of the % of acetate pptd. from COMe_2 solution (5%) when a H_2O - COMe_2 mixture is added to produce a total of 40% of H_2O . The presence of this intermediate layer facilitates the bleaching or washing out of the colour backing during the subsequent processing.

J. LEWKOWITSCH.

Manufacture of coloured photographic pictures. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 365,661, 28.10.30).—The Ag of the image is converted into AgBr [by, e.g., $(\text{NH}_4)_2\text{S}_2\text{O}_8$, CuSO_4 , and KBr] in the presence of a H_2O -sol. leuco-compound of a vat dye (e.g., Indigosols) insol. in H_2O and fast to light. The dye takes the place of the Ag particles. The leuco-compound may be present in the bleaching solution or incorporated in the emulsion when it is made. J. LEWKOWITSCH.

Photographic development. I. G. FARBENIND. A.-G. (B.P. 365,317, 13.1.31. Ger., 13.1.30).—The presence of air bubbles on an emulsion surface during development is entirely avoided by bathing the plate, film, etc., before development, in a bath containing a small quantity of certain org. wetting agents; or the wetting agent may be added directly to the desensitising or developing bath. Suitable wetting agents are sulphonated castor oil, a sulphonated alkylated or aralkylated aromatic compound, or a salt thereof.

J. LEWKOWITSCH.

Developing, tinting, toning, and washing kinematograph films. FILM OZAPHANE (B.P. 365,742, 16.12.30. Fr., 19.12.29).—Films having a support permeable to H_2O are developed by treating with the usual chemicals (e.g., NH_3 , for the diazo process) in solution in H_2O with 35–98% of org. solvent (e.g., MeOH, EtOH, or COMe_2). Such solution may also be employed when toning, fireproofing, or rendering the film pliable. The film is but slightly wetted by such solutions, and deformation is avoided.

J. LEWKOWITSCH.

Making and projection of photographic films for coloured pictures. P. L. BURGER, and PICTORIAL SCREENS, LTD. (B.P. 367,044, 18.11.30).

Kinematograph film. S. KOOL (B.P. 365,243, 13.11.30. Holl., 6.10.30).

[Printing from coloured transparencies in colour photography.] T. T. BAKER, and SPICERS, LTD. (B.P. 366,958, 7.11.30).

Photographic printing [by optical projection]. I. G. FARBENIND. A.-G. (B.P. 367,411, 20.10.30. Ger., 18.10.29).

Projection of lenticular films. I. G. FARBENIND. A.-G. (B.P. 367,414, 12.11.30. Ger., 21.11.29).

XXII.—EXPLOSIVES; MATCHES.

Ketones as solvents.—See III.

PATENTS.

Nitrocellulose products.—See V. Denitration of acids.—See VII.

XXIII.—SANITATION; WATER PURIFICATION.

Chlorination of sewage. C. K. CALVERT (Ind. Eng. Chem., 1932, 24, 92–94).—During the summer a portion of the sewage at Indianapolis is discharged, temporarily, in an incompletely purified condition. Large-scale experiments have been made to determine the effect of Cl_2 as an adjunct to the purification process. Suitable apparatus was evolved to enable liquid Cl_2 to be applied. The results obtained were disappointing, the reduction in the biochemical O_2 demand of the sewage being < 10% with no appreciable advantage to the succeeding treatment in activated sludge tanks. It is considered that Cl_2 cannot be expected materially to improve the condition of the river during summer months if the biochemical O_2 demand load exceeds 25,000 lb. per day.

C. JEPSON.

Indole and skatole in sewage. W. RUDOLFS and N. S. CHAMBERLIN (Ind. Eng. Chem., 1932, 24, 111).—Small amounts of these odour-producing substances are present in crude sewage and are gradually removed during the purification process. The methods used in determining these compounds are described.

C. JEPSON.

Concentrated fumigation. R. H. MORGAN (Food Tech., 1932, 1, 213–214).—The infested articles are subjected to the toxic action of ethylene oxide mixed with CO_2 under reduced pressure after removing air. Fumigation is complete in $1\frac{1}{2}$ –2 hr.; all live insects and also eggs are killed.

E. B. HUGHES.

Pathogeny and foodstuffs. Bacteriological examination of illness complaints in connexion with canned foods. R. J. MUNRO (Food Tech., 1931, 1, 20–21, 33, 35, 157–158, 170).—A review of the methods of isolating and identifying food-poisoning bacteria, dealing particularly with the work of Savage and White on the *Salmonella* group.

E. B. HUGHES.

Lime water-softening. C. P. HOOVER (Proc. VIII Ann. Water Works Sch., Univ. Kansas, 1930, 2, 18).— CO_3 hardness is reduced to approx. the theoretical solubility limit of CaCO_3 and $\text{Mg}(\text{OH})_2$; sufficient CaO or $\text{Ca}(\text{OH})_2$ is added to combine with free or half-bound CO_2 and to ppt. $\text{Mg}(\text{OH})_2$. 25–50 p.p.m. in excess of the amount theoretically required to replace Mg must be added to convert Mg salts into hydroxide; this leaves caustic alkalinity in the water, which is neutralised with CO_2 . CaCO_3 , the pptd. sludge, or other inert material is then mixed with the water, after which it is clarified by settling or filtration.

CHEMICAL ABSTRACTS.

Seasonal manganese in a public water supply. E. S. HOPKINS and G. B. MCCALL (Ind. Eng. Chem., 1932, 24, 106–108).—The seasonal occurrence of Mn in the water supply of Baltimore, Md., is thought to be due to leaching from the underlying soil of the unstripped storage reservoir owing to the presence in the water of

CO₂ produced by fermentation of org. matter. The Mn accumulates in the water at the bottom of the reservoir until the fall in temp. in autumn causes a "turnover" which distributes it throughout the mass. The relative merits of prevention and removal depend largely on the comparative costs of stripping the soil from the reservoir and removal by coagulation etc. until such time as the conditions described cease to exist. C. JEPSON.

Correcting for errors caused by manganese in the residual chlorine test. L. H. ENSLOW (Water Works and Sewerage, 1931, 78, 183—184).—Mn⁺⁺ does not give a colour with *o*-tolidine, but with Cl forms MnCl₂ which gives a colour, the result indicating a higher Cl content than is present. The following method is employed. The residual Cl content is determined with *o*-tolidine in the usual way. The sample is boiled (25 c.c. of 100 c.c. removed), cooled, and diluted with Mn-free water; a correction is then applied for the colour obtained with *o*-tolidine. In the Forman test the unchlorinated sample is made strongly alkaline with NaOH and oxidised by displacing the air in a bottle above the sample with O₂, then stoppering and shaking violently. The oxidised sample is neutralised or slightly acidified and *o*-tolidine is added. This result is subtracted from that obtained with the chlorinated sample.

CHEMICAL ABSTRACTS.

Determination of traces of aluminium hydroxide in water clarified by addition of aluminium sulphate. L. GIZOLME (Ann. Falsif., 1931, 24, 587—589).—In a modification of Auger's method ("Cours de Chim. analyt.") for determination of Al(OH)₃ by means of Na alizarinsulphonate, the disturbing effect of Ca salts is avoided by adding a few drops of 0.1N-HCO₂H [sufficient to give a distinct coloration when the same sample contains 0.0001 g. Al(OH)₃ per litre]. The coloration deepens gradually [up to 1 hr. being necessary for samples containing only traces of Al(OH)₃]. If, however, 3 drops of glycerin (*d* 1.26) are added, the colorimetric comparison may be made after 2 min. The results are accurate to 0.0001 g. Al(OH)₃ per litre in samples containing 0.001 g./litre. W. J. BOYD.

Continuous control of the *p*_H of water. W. KORDATZKI (Chem.-Ztg., 1932, 56, 19—20).—An apparatus is described and illustrated by means of which the *p*_H of waste H₂O is continuously measured. The H₂O is caused to drop over a small tube from which an COMe₂ solution of quinhydrone drops at a regulated rate, and the mixed solution falls into an apparatus carrying the usual electrodes separated from one another by saturated KCl solution. A. R. POWELL.

Gas from distillery wastes.—See II. **Concrete water-pipes.**—See IX. **Preserving samples of H₂O.**—See XVI.

See also A., Mar., 241, Measuring the *p*_H of natural waters. 242, Determining PO₄^{'''} and BO₃^{'''} in waters. 243, Determining silicic acid in mineral waters. Detection of Mn in sea-water. 308, Monoethers of dihydric phenols as bactericides.

PATENTS.

Treatment of sewage or other [water-borne] organic matters. A. T. MALTBY (U.S.P. 1,811,181, 23.6.31. Appl., 20.10.28).—The aëration and biological

purification of sewage matters is facilitated by passing the liquor through a narrow, shallow tank in which is a series of partly submerged wheels. As the wheels revolve with the sewage flow, biologic growths adhering to them are alternately exposed to the air and the liquor and become active agents in the purification process. At the same time, portions of the sewage are carried round by an arrangement of troughs in the wheel and are thus agitated and aërated. The bottom of the tank is shaped to fit closely to the periphery of the wheels and is scraped by chains attached thereto, in order to prevent serious accumulation of septic sludge which might interfere with the aërobic conditions the plant is designed to produce. C. JEPSON.

Production of germicidal gas. J. N. ALSOP, Assr. to AMER. THERAPEUTIC GAS Co. (U.S.P. 1,810,589, 16.6.31. Appl., 7.10.25. Renewed 15.12.28).—Apparatus is described by means of which air heated and ionised by an intermittent electric arc is passed over strips of white or yellow pine in such a way that volatile constituents are extracted without the wood being burned. The impregnated air is then suitable for use in sterilising and preventing inflammation or suppuration of incised wounds. C. JEPSON.

[Manufacture of] insecticides. RÖHM & HAAS Co. (B.P. 361,900, 20.5.30. U.S., 31.5.29).—Aliphatic thiocyanates, containing CO, halogen, NO₂, OH, CN, alkoxyl, ester, or CO₂H groups, or unsaturated linkings, are insecticides without offensive odour or irritant action. Examples are: β -ethoxy- and β -butoxy- β' -thiocyanodiethyl ethers; thiocyanacetone; amyl, cyclohexyl, *sec*-octyl, and β -ethoxyethyl thiocynoacetates and -propionates; Et and Bu β -thiocynoethyl ethers.

C. HOLLINS.

Purification of water. K. P. McELROY, Assr. to PERMUTIT Co. (U.S.P. 1,811,587, 23.6.31. Appl., 1.3.29).—Natural or artificial hydrated SiO₂, after treatment with a limited amount of acid, is capable of absorbing alkali carbonates from water. The process is applied to the further treatment of zeolite-softened water by passing it through beds of this material, which must be regenerated periodically by treatment with cold, very dil. acid, or NaHSO₄. C. JEPSON.

Chemically improving drinking and service waters. G. A. KRAUSE (B.P. 366,429, 31.8.31).—Waters containing excessive amounts of Na₂SO₄ or MgSO₄ may be rendered more serviceable by pptn. with BaCl₂, BaCO₃, or Ba(AlO₂)₂ according to the purpose for which the water is required. Any excess of Ba ions may be removed by treatment with CaSO₄, either in the form of pptd. gypsum or as a porous slab or filter bed, in such quantity or at such a rate that excess SO₄ ions are unlikely to pass into solution again as CaSO₄. C. JEPSON.

Apparatus for treatment of water with [measured quantities of] chemical reagents. H. G. MARIGNY and R. T. PEMBERTON (B.P. 367,453, 22.11.30).

Apparatus for effecting the base-exchange water-softening process automatically. J. DOUGLAS (B.P. 366,915, 31.10.30).

Boiler H₂O. Burning rubbish etc.—See I. **Zeolites.**—See VII.