

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

DEC. 6, 1929.

I.—GENERAL; PLANT; MACHINERY.

Determination of gas temperatures by measurement of pressure differences. H. SCHMICK (*Z. tech. Physik*, 1929, 10, 146—147; *Chem. Zentr.*, 1929, i, 2800).—The method is based on the fact that when a gas is passed through a valve at a certain speed the pressure difference is approximately proportional to the absolute temperature. A. A. ELDRIDGE.

Measurement of absolute viscosity by the use of concentric cylinders. H. R. LILLIE (*J. Amer. Ceram. Soc.*, 1929, 12, 505—515).—A stationary cylindrical spindle is suspended by a torsion member in the centre of a cylinder containing the liquid under test, the cylinder is rotated at a measured rate, and the torque thus exerted on the spindle is measured by means of a mirror, a telescope, and a straight scale. With castor oil as a test fluid, spindles of different lengths but of the same radius were used to give values for apparent viscosities. These values were plotted against reciprocals of the length of the spindles, and the "true" viscosity of the oil was found by averaging the extrapolated values of a number of such curves. By this method the viscosity was found to be 9.67 poises at 20°. Using this value, a correction, to allow for the torque on the ends of the spindle, was determined. For a spindle such as is used in measuring the viscosity of glasses this factor was 0.44 cm. The effect of variations of temperature of the spindle and the fluid was also studied. F. SALT.

New laboratory materials. H. A. J. PIETERS and J. A. MEYLINK (*Chem. Weekblad*, 1929, 26, 495—497).—Nickel and special steel crucibles increase in weight irregularly when heated at 700—1000°, but nickel crucibles may be used for smelting minerals with potassium hydroxide, though not with sodium hydroxide. Small nickel crucibles are suitable for determination of the gas content of coal. Among refractories, "Weta" material and alundum are suitable for igniting precipitates, determining ash in coal, etc.; the former must first be ignited till constant in weight. S. I. LEVY.

Optical measurement of [furnace] temperature. G. AECKERLEIN (*Z. tech. Physik*, 1929, 10, 129—136; *Chem. Zentr.*, 1929, i, 2799).

See also A., Nov., 1233, **Velocity of elutriation and particle size** (ANDREASEN and LUNDBERG). 1234, **Ultracentrifuging** (LAMM). 1261, **Removal of dissolved gases from liquids** (HIBBEN).

PATENTS.

Furnaces or plant for the heating and heat treatment of metals or other materials or goods.

J. SUMMERS & SONS, LTD., and C. BOTTOMLEY (B.P. 319,300, 20.6.28).—Chambers for goods to be heated (*e.g.*, bars to be rolled into plates) are situated on each side of a fire chamber, and behind these are larger chambers (containing, *e.g.*, plates to be rolled into sheets) at a lower temperature. Means for controlling the distribution of heat and admission of secondary air are described. B. M. VENABLES.

Shaft furnaces and reaction chambers for treating solid materials with gases. A./S. NORSK STAAL (ELEKTRISK-GAS-REDUKTION), and E. EDWIN (B.P. 295,999, 18.8.28. Norw., 22.8.27).—The furnace consists of a stack of interchangeable sections each having a perforated bottom to support the material under treatment; the detachable sections are terminated by top and bottom sections for inlet and exhaust of gases. These end sections are not removable, but have sufficient vertical movement (alone or with the whole stack) to permit insertion and withdrawal of the detachable sections one at a time; the latter work downwards (or upwards) through the whole height of the tower. Other similar towers for preheating and cooling may be arranged adjacent the reaction tower.

B. M. VENABLES.

Heat interchanger. F. C. REED and F. A. ERNST (U.S.P. 1,730,293, 1.10.29. Appl., 1.8.27).—An inner cylindrical casing is clamped between two headers of larger diameter, the internal space being idle. This unit is inserted into a larger cylindrical container having a fixed flange on the lower end to afford support for the unit and inlet and outlet connexions for the outer fluid. Spiral tube coils extending from header to header in parallel are situated in the annular space and convey the inner fluid. B. M. VENABLES.

Heat-exchanging apparatus. J. M. HARRISON (U.S.P. 1,730,139, 1.10.29. Appl., 16.5.28).—A number of elements, each comprising a pair of side plates secured together along all four edges, are assembled with distance pieces between the elements. Inlet and outlet connexions are formed from transverse conduits welded to the edges of the units, with suitable openings into the interiors of the units. B. M. VENABLES.

Boilers for evaporating or heating liquids. SPENCER-HOPWOOD, LTD., and A. L. HITCHCOCK-SPENCER (B.P. 319,380, 23.3 and 7.12.28).—In a vertical boiler of circular section provided with cross-tubes, the segmental dead spaces at each side of the bundle of tubes are filled by hollow members which may be either of solid refractory material or of metal; the latter may serve as heaters for air or vapour to be used internally or externally for any useful purpose. B. M. VENABLES.

Drying of steam or vapours under pressure. A. VALDER (B.P. 319,567, 30.1.29).—A priming trap for use inside steam boilers is described. B. M. VENABLES.

Carrying out chemical reactions. H. T. BUCHERER (B.P. 296,376, 30.8.28. Ger., 30.8.27).—A gaseous substance is caused to pass at high velocity at right angles to an orifice which delivers a liquid substance; the speed of the gas current produces a reduction of pressure which assists in promoting the flow of liquid and causes the latter to be finely sprayed. Both conduits are calibrated to maintain the stoichiometric relation according to the pressures used. Inert gases may be added to promote desired effects such as evaporation, and the apparatus may be used for purely mechanical purposes such as spray-painting.

B. M. VENABLES.

Extinguishing fire. J. Y. JOHNSON. From I. G. FARBEIND. A.-G. (B.P. 319,083, 27.6.28).—Burning material, especially that in a finely-divided state, *e.g.*, coal dust, straw, cotton, is sprayed with a dilute aqueous solution of a wetting agent, *e.g.*, soap, saponin, Turkey-red oil, a sulphuric ester of or a sulphonated organic compound. Alternatively, the wetting agent is sprayed on to inflammable material liable to ignite and water is subsequently played on to it in case of ignition.

L. A. COLES.

Disintegrating machines. MAGNET-WERK G.M.B.H. EISENACH SPEZIALFABR. F. ELEKTROMAGNET-APPARATE (B.P. 308,347, 1.3.29. Ger., 22.3.28).—The preliminary disintegration is effected in an annular hopper-like space provided with fixed and rotating knives, but the final disintegration takes place in a zone that is not very narrow, the necessary retardation of the downward flow of material being brought about by a change of direction in the passage, the fine-grinding zone being bounded above by a renewable ring of fixed knives or serrations and below by a flat cone attached to the disintegrator shaft. The width of the fine-grinding passage remains about the same throughout.

B. M. VENABLES.

Apparatus for separating minerals or other materials. R. E. TROTTIER (U.S.P. 1,729,913, 1.10.29. Appl., 2.5.25. Fr., 12.5.24).—A conical drum with horizontal axis is provided on the interior with a continuous helix which decreases in depth and pitch towards the narrower end. The drum is rotated in such a direction that the helix tends to work the heavier material up the slope, whilst water delivered to the interior of the drum washes the lighter material downwards.

B. M. VENABLES.

Separation of materials of different sp. gr. H. M. CHANCE (U.S.P. 1,730,123 and 1,730,189, 1.10.29. Appl., [A] 5.12.25, [B] 15.4.29).—(A) A mass of materials is passed through a reciprocating conduit, and a positive longitudinal movement is given to the material by means of a slope and by forming the bed in steps; stratification is thereby produced, the upper layer consisting of the larger lighter particles. A high-velocity gas current is provided in the same direction as the travel of material. In (B) a particular form of (A) is described, the bottom of the conduit being formed of trays in step-like formation with spaces between.

B. M. VENABLES.

Obtaining granular solids [from viscous liquids].

A. J. COLLIER, F. HEYWOOD, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 319,893, 27.8.28).—Droplets of a viscous liquid, such as solutions of calcium nitrate or mixtures of concentrated ammonium nitrate and calcium carbonate, are picked up by the spikes of a rotary, brush-like member and flicked off into a chamber in which they are solidified by contact with a gas before they reach the walls or bottom of the chamber.

B. M. VENABLES.

Apparatus for uniformly evaporating liquids, especially for uniformly charging gases with vapours. R. MEZGER (B.P. 305,089, 12.10.28. Ger., 30.1.28).—The apparatus for purposes such as delivering xylene into a gas main comprises an electrically-heated vaporising chamber with warning thermometer and thermo-elements to cut off the current in the event of overheating. The vaporising chamber being well lagged, after the initial heating, the amount of liquid evaporated per unit of time will be proportional to the watts of electricity supplied. The level of the liquid in the vaporiser is kept constant by a separate bird-fountain device. Should this leak, an emergency overflow (with tank) is provided to prevent flooding of the vaporiser.

B. M. VENABLES.

Electrically heated apparatus for evaporating, distilling, etc. J. A. REAVELL (B.P. 319,849, 6.7.28).—The vessel is surrounded by more than one concentric jacket containing oil or other suitable fluid, which is heated electrically and circulated by an internal pump or propeller.

B. M. VENABLES.

Device for interconnecting the evaporation elements of evaporation plants. B. BOULOGNE (B.P. 292,915, 18.6.28. Holl., 25.6.27).—The liquor spaces of a number of evaporating elements are connected by U-shaped conduits. A similar U-shaped conduit connects at both ends with the later of the evaporators concerned, and the rising branch is common to both U-shaped conduits. Modifications, some including non-return valves, are described. The object is mainly to prevent, by cooling, too sudden ebullition of incoming weak liquor.

B. M. VENABLES.

Distillation. E. H. LESLIE (U.S.P. 1,730,892, 8.10.29. Appl., 19.4.23).—Liquid to be distilled is vaporised and the vapours are led through a fractionator to a reflux cooler in which heat control is effected by a liquid cooling medium that boils under the conditions of the operation, thereby enabling the return of an exactly predetermined weight of the partial condensate to the fractionating system.

H. S. GARLICK.

Acid-concentrating and like towers. P. H. EVANS and R. C. BOWDEN (B.P. 319,839, 3.7.28).—The baffles, shelves, or partitions are constructed from acid- and heat-resisting bricks in such a manner to be individually supported against collapse, one form of construction consisting of alternate arches and pairs of half-arches. A cement consisting of glass, sodium silicate, and pumice powder may be used.

B. M. VENABLES.

Apparatus for [comparing the rate of] separation of particles suspended in a liquid. K. T. R. LUNDGREN (B.P. 319,629, 19.6.28).—The samples, *e.g.*,

blood for medicinal tests, are contained in a number of tubes which are supported in a framework so that they are in one vertical plane but may be all inclined equally to the horizontal.

B. M. VENABLES.

Gas mixer. L. J. O'NEIL and L. B. BECKER (U.S.P. 1,730,288, 1.10.29. Appl., 26.3.28).—A device for insertion in a pipe-line comprises a spiral baffle (twisted flat strip) supported at its ends by discs of perforated material of different mesh; the discs are forced into grooves formed on the interior of a tube, which is provided with an atomising nozzle at one end.

B. M. VENABLES.

Gas analyser. W. KEMP (U.S.P. 1,727,544, 10.9.29. Appl., 15.9.28).—A sample of the gas is supplied under a steady head by means of a water-operated injector terminating in a water-seal which permits escape of excess gas. The gas is led to one side of a diffusion plate, on the other side of which is an absorbent (e.g., caustic potash for flue gases) for one constituent. The pressure in the absorption chamber is less than that of the gas supplied, by an amount depending on the proportion of absorbable constituent, and is measured by a known type of gauge.

B. M. VENABLES.

Viscosimeter. I. G. FARBERIND, A.-G. (B.P. 303,853, 28.12.28. Ger., 11.1.28).—A viscosimeter of the type in which a body is rotated in the liquid is constructed so that the pull of the thread by which the rotating force is applied comes directly opposite one of the bearings of the rotating body, that bearing being of the needle-point and cup type. Any parts subjected to friction may be constructed of stainless steel.

B. M. VENABLES.

Heating and/or chemical treatment of liquids and molten materials by direct contact with combustion products. S. C. SMITH (U.S.P. 1,730,440, 8.10.29. Appl., 4.5.25. U.K., 12.5.24).—See B.P. 242,680; B., 1926, 32.

Apparatus for evaporation of liquids. E. MORTERUD (U.S.P. 1,731,146, 8.10.29. Appl., 13.12.26. Norw., 19.12.25).—See B.P. 263,132; B., 1927, 800.

[Centrifugal] apparatus for precipitation of particles suspended in liquids. K. T. R. LUNDGREN (U.S.P. 1,730,776, 8.10.29. Appl., 16.12.27. Swed., 22.12.26).—See B.P. 282,681; B., 1928, 507.

Furnaces with mechanical stokers. M. RATEL (B.P. 293,468, 6.7.28. Fr., 8.7.27).

Machines for grinding ores, minerals, stones, etc. J. R. BROADLEY (B.P. 319,897, 29.8.28).

Rectification of gas and/or vapour mixtures in absorption refrigerating apparatus. ELECTROLUX, LTD., ASSEES. OF PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (B.P. 298,574, 11.10.28. Ger., 11.10.27).

II.—FUEL; GAS; TAR; MINERAL OILS.

Chemical composition of peat. V. Rôle of micro-organisms in peat formation and decomposition. S. A. WAKSMAN and K. R. STEVENS (Soil Sci., 1929, 28, 315—340; cf. B., 1929, 545).—Micro-organisms are most important factors in the production of peat from plant residues. The nature and numbers of organisms

occurring at various depths in different peat bogs were determined. In low-moor peats aerobic bacteria, fungi, nitrifying and cellulose-decomposing bacteria occur mainly in surface layers, being steadily displaced by anaerobic organisms as the depth from the surface increases. Acid sphagnum peat has an abundant bacterial flora capable of growing in media of p_H 4.0. The decomposition of peat is slower than that of fresh plant residues, and the ratio of carbon, eliminated as carbon dioxide, to nitrogen, liberated as ammonia and nitrate, increases with the depth from the surface. The decomposition of peat is accelerated by the removal of waxes by suitable solvents.

A. G. POLLARD.

X-Ray study of vitrain and durain and of their constituents. C. MAHADEVAN (Indian J. Physics, 1929, 4, 79—98).—Vitrain shows the two most prominent graphite-carbon rings when examined by the X-ray diffraction method. Durain behaves as a colloid with vitrain as the dispersion medium and ash and vegetable detritus as the disperse phases. The α - and β -compounds of vitrain appear to be identical and similar to untreated vitrain. The pyridine extract, the benzene-soluble and the benzene-insoluble fractions gave similar patterns for vitrain and durain, respectively.

W. E. DOWNEY.

Moisture content of petrographic varieties of Polish coal. J. PFANHAUSER (Przemysl Chem., 1929, 13, 449—455).—The highest values for moisture content of coal are given by Schläpfer's xylene distillation method. Drying at 105° in nitrogen gives somewhat lower results, whilst in the presence of oxygen the values obtained are lower still. In the former case the drying curve has a halt after 30—45 min., after which it again ascends, the apparent moisture content eventually exceeding that obtained by Schläpfer's method; this is due to loss of volatile constituents. In the presence of air the drying curve similarly reaches a maximum after 30—45 min., but thereafter the apparent moisture content declines in the cases of vitrain and durain, as a result of absorption of oxygen; in the case of fusain the apparent moisture content attained after 30 min. thereafter varies very little. The most reliable method of determining the moisture content is that of Schläpfer; if ordinary drying methods are used, the coal should be kept at 105° for 45—60 min. in a stream of nitrogen, or for 30—45 min. in air.

R. TRUSZKOWSKI.

Determination of water in lignite with calcium carbide. R. VON WALTHER and G. BENTHIN (Braunkohlenarch., 1929, No. 23, 110—122; Chem. Zentr., 1929, i, 2260).—Piatscheck's method is modified in detail to give more concordant results.

A. A. ELDRIDGE.

Classification of North American coals. A. C. FIELDNER (Fuel, 1929, 8, 473—481; cf. B., 1929, 155).—The first year's work of the three technical committees organised by the American Society for Testing Materials for dealing with the standardisation of coal classification is summarised. The committees deal respectively with (a) scientific classification, (b) use classification, and (c) marketing practice. Their work up to the present has consisted in the collection and correlation of data concerning existing systems of classification.

A. B. MANNING.

Errors due to the substitution of "ash" for "mineral constituents" in coal analyses. K. MAYER (*Brennstoff-Chem.*, 1929, **10**, 377—382).—For coals of low ash content the calorific values as calculated from the ultimate analyses by Vondracek's formula (B., 1927, 179) agree closely with the experimental values. The deviations exhibited by coals of greater ash content are due to the assumption that the "ash" may be taken as equivalent to the "mineral constituents" when calculating the "pure coal" content. A simple procedure for determining more accurately the mineral constituents of coals, except those containing hydro-silicates, consists in extracting the coal with hydrochloric acid, ashing the extracted coal at a dull red heat, and determining the ferric oxide in the ash. The mineral constituents are then given by the sum of the acid-soluble constituents, the pyrites, calculated from the ferric oxide, and the remainder of the ash.

A. B. MANNING.

Tests of bituminous caking coal in a large low-pressure heating boiler. P. NICHOLLS, C. E. AUGUSTINE, and B. A. LANDRY (*Fuel*, 1929, **8**, 482—486).—The design of the boiler used in earlier tests (cf. Blizard and Houghton, *Bur. Mines Tech. Paper* 303, 1922) has been modified by the provision of tuyères for admitting secondary air at the rear of the bridge wall. The boiler and furnace efficiency averaged only 1% higher in tests with the new arrangement than when the secondary air was admitted through slots in the fire doors. Less carbon monoxide was present in the flue gases in the tests with tuyères, and less smoke was measured by the Ringelmann chart, but the smoke was not materially reduced. Owing to the increased resistance to the flow of gases through the boiler with tuyères for supplying secondary air, about 15% additional draught was required to obtain the same steam output as before.

A. B. MANNING.

Various methods of calculating the calorific value of solid fuels. P. JARRIER (*Chaleur et Ind.*, 1929, 107; *Fuel*, 1929, **8**, 486—491).—The methods that have been used for calculating the calorific value of a solid fuel from (a) the ultimate analysis, (b) the proximate analysis, and (c) the oxygen used for combustion are summarised and compared. Whilst none of the formulæ is strictly satisfactory, some of them permit the evaluation of the calorific value with an accuracy that is often sufficient.

A. B. MANNING.

Phases of the organic sulphur problem in the manufacture and utilisation of gas. W. J. HUFF (*Proc. 2nd Int. Conf. Bit. Coal*, 1928, **2**, 814—825).—The amount of carbon disulphide produced on distillation of coal is larger when the coal is heated rapidly. Carbon-sulphur complexes may be important intermediates in the production of sulphur compounds found in gas; their elimination as hydrogen sulphide is desirable.

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Low-temperature carbonisation of a coal in the presence and absence of tetrahydronaphthalene. D. J. W. KREULEN (*Brennstoff-Chem.*, 1929, **10**, 382—383).—A 20-g. sample of coal was saturated with tetrahydronaphthalene, heated at 175—200° until the bitumen had passed into solution, and the whole then car-

bonised in the Fischer aluminium assay apparatus. The yields of coke, tar, liquor, and gas, and the quality of the coke, were the same as obtained by carbonising the coal directly.

A. B. MANNING.

"Water-gas" equilibrium in higher-limit methane-oxygen-nitrogen flames. H. F. COWARD (*Fuel*, 1929, **8**, 470—471).—An analysis of the results of Burgess and Wheeler (B., 1914, 1194), giving the composition of the gaseous mixture "snatched" from the centre of "higher-limit" flames of methane, oxygen, and nitrogen, shows that the water-gas equilibrium was attained either in the flame or closely behind it.

A. B. MANNING.

Determination of phenols in effluent from the carbonisation of lignite, and their extraction. P. ROSIN and H. JUST (*Z. angew. Chem.*, 1929, **42**, 965—968, 984—987, 1002—1007).—Ulrich and Kather's bromination method of determining phenols (B., 1926, 306) when applied to lignite effluents must be performed with 1.6 pts. of 20% quinoline-benzene mixture, the treatment must last 2 hrs., and the liquor sample must be fresh. The bromine number so obtained, however, does not permit the phenol content to be calculated accurately, as dibasic phenols are present and their bromination proceeds irregularly, especially in the case of quinol. The error involved is not, however, great. Much lower results are obtained by extraction of phenols with ether, distillation of the latter, and bromination. Apparently the extraction is incomplete. The authors' gravimetric method is to extract with quinoline and benzene, treat with alkali, acidify the phenoxide solution, and then extract with ether. The crude phenols (containing fatty acids) are dissolved in alkali and brominated to determine the percentage of pure phenols. For extraction on an industrial scale quinoline is too expensive, but tests show that benzene alone has only inferior extracting power. The most satisfactory medium for large-scale work is a 20% aniline-benzene mixture. The determinations carried out in this connexion were performed by Ulrich and Kather's method, blank tests being run to correct for the bromination of aniline etc. By working on the countercurrent principle, 1 pt. of aniline + benzene will extract 75% of the phenols from 4 pts. of liquor. It is impossible to separate the extracted phenols by distillation owing to the presence of aniline, but alkali treatment is suitable. The entrained solvent must be recovered from the effluent by distillation. Lignite carbonisation effluents usually contain too little ammonia for its recovery by distillation to be economical, but this could be attained, and one distillation might serve both purposes, if the lignite were thoroughly dried before carbonisation.

C. IRWIN.

Formation of liquid hydrocarbons from acetylene. II. Catalytic hydrogenation and condensation of acetylene. F. FISCHER, K. PETERS, and H. KOCH (*Brennstoff-Chem.*, 1929, **10**, 383—385; cf. B., 1929, 703).—By passing a mixture of acetylene and hydrogen over an iron-copper-alkali catalyst at 250°, 40—70% of the acetylene has been converted into oil. The catalyst was not readily poisoned, and a high degree of purity in the gas mixture was unnecessary. If the copper:iron ratio exceeded 1:10 the tube became

stopped up by a deposit of cuprene. The addition of nickel appeared to diminish the production of cuprene. An iron-nickel catalyst (10 Fe:1 Ni) containing no copper brought about a 60% conversion of acetylene into oil. With iron alone it was necessary to raise the reaction temperature to 300–340°, and the oil production was then accompanied by carbon deposition. Considerable fluctuations in the temperature and rate of passage of the gas were without effect on the yield and quality of the oils produced. The product consisted of a heavy oil which collected in the receiver and a light oil, of boiling range approx. 50–150°, which was absorbed by activated charcoal. The heavy oil contained no paraffin wax. From 1 cub. m. of coke-oven gas, which was first subjected to an electric discharge and then to the above process, 85 g. of total oil were produced, of which 75% was light oil.

A. B. MANNING.

Testing of bitumen. H. BÖSENBERG (Petroleum, 1929, 25, 1275–1279).—The determination of the dropping point, solidification point, and stability value of a bitumen is described in detail, together with diagrams of suitable apparatus. The physical properties of pitches of the Central Institution of Asphalt and Tar Research and of the American Asphalt Association are given, also of mixtures of these. It has been found possible, by mixing given grades of bitumens, to obtain any desired degree of penetration value and m.p., numerical data for several mixtures of which are appended.

W. S. E. CLARKE.

Cracked residues and cracked oil distillates. A. SACHANEN and M. BESTUSHEV (Petroleum, 1929, 25, 307–309).—The sp. gr., viscosity, and flash point of cracked oil residues are recorded. Balachany mazout having d_{4}^{15} 0.908, viscosity (E_{50}) 6.17, setting point –20°, flash point (open) 161°, was cracked at 425° under 15 atm. pressure for 32 min., 1 hr. 32 min., 3 hrs. 2 min., and 6 hrs. 2 min., respectively. The cracked residue, viz., that remaining after removing benzene and kerosene fractions to 300°, was distilled at 6–15 mm. It is shown that the difference between the cracked oil distillates and oil distillates of the original substance increases with longer cracking. Determinations of mol. wt. and elementary analyses show that the hydrocarbons present are chiefly aromatic and hydroaromatic, and that cracking brings about dehydrogenation and decomposition.

W. S. E. CLARKE.

Analysis of motor fuels. O. SMETANA (Petroleum, 1929, 25, 1061–1067).—The b.p. curve of a liquid fuel reveals, in some cases, its method of preparation, but does not measure its volatility; the latter can only be accurately determined by passing an inert gas over the liquid. A shorter method is described in which a filter paper is soaked with the fuel and the rate at which it loses weight is measured, under conditions which may be varied to suit the type of liquid. The action of bromine is considered to give more information as to the tendency of a fuel to polymerise than treatment with sulphuric acid, but the test must be carried out in the dark, and with only slight excess of halogen. The mutual solubility of aniline, benzene, and non-aromatic light petroleum has been examined, and the results are shown in a diagram. The volume change which occurs

on shaking a fuel with aniline can be used to determine its aromatic content. A special vessel is employed, consisting of two bulbs connected by a graduated neck; 48.3 c.c. of aniline and 25 c.c. of the fuel are shaken and warmed slightly, and then allowed to cool to 20°. The contraction is directly related to the aromatic content in a way which is shown graphically, and varies slightly with the b.p. of the liquid. Better results are obtained if the aniline be previously saturated with non-aromatic hydrocarbons of the same type. Practical recommendations for the application of the method to various cases are made, and the accuracy of measurement is considered.

R. H. GRIFFITH.

“Formolite” analysis of mineral oil. J. HOŠEK (Chem. Obzor, 1929, 4, 67–70; Chem. Zentr., 1929, i, 2606).

See also A., Nov., 1237, **Equilibrium** $\text{CO}_2 + \text{C} = 2\text{CO}$ (DENT and COBB). 1275, **Solubility of humic acids in phenol** (SOM and PODBREZNIK). **Humic acids in coal and lignite** (PODBREZNIK). **Optical activity of hydrocarbons derived from resin acids** (ZELINSKI and SEMIGANOWSKI).

PATENTS.

Coke ovens. C. A. BAGLIN (B.P. 318,448, 17.12.28).—In a coke oven composed of U-shaped elements in which combustion takes place in two stages (cf. B.P. 259,078; B., 1926, 1004), the two adjacent flues composing each element are provided at their lowest part, and below the point at which combustion commences in the ascending flue, with a number of canals allowing the passage of a controllable volume of products of combustion from the descending to the ascending flue. The flame is thereby increased in length and the heating made more uniform.

A. B. MANNING.

Coke ovens. F. TOTZEK, Assee. of H. KOPPERS A.-G. (B.P. 300,278, 8.11.28. Ger., 10.11.27).—Regenerators are provided extending longitudinally under the oven chambers, and each is divided into two portions by a partition wall transverse to the length of the chambers. A horizontal extension channel leading from each regenerator portion passes above the companion regenerator portion. Each portion and its corresponding extension channel are directly connected with the heating wall above, so that each heating wall is supplied over the whole of its length with heated gases rising from one of the regenerator portions.

A. B. MANNING.

Coking retort ovens. KOPPERS Co., Assees. of J. VAN ACKEREN (B.P. 304,743, 26.3.28. U.S., 26.1.28).—A coking retort-oven battery with alternate coking chambers and heating walls has two or more separate heating systems, each with its own intake and offtake regenerators. Each heating wall comprises a group of flame flues of one system superposed on a group of flues of another system, each group being connected in series with a corresponding group in another heating wall. The intake regenerators for all the heating systems are disposed on one side of the battery and the offtake regenerators on the other side. The regenerators extend to about half the height of the battery and are connected to the heating walls at about their middle

point. Provision is made for heating with a rich gas if desired.

A. B. MANNING.

Carbonising apparatus. G. W. WALLACE, ASST. to S.E. Co. (U.S.P. 1,728,582, 17.9.29. Appl., 15.3.27).—A vertical shaft kiln has an inclined bottom. An opening in the lower part of the side wall adjoining the lower edge of the bottom is provided with a sliding door which comprises a grate presented to the interior of the kiln, and a vapour-collecting compartment outside the grate. Means, operable when the door is in position, are provided for covering the opening through which liquids and vapours from the collecting compartment pass to a point outside the kiln.

A. B. MANNING.

Rotary retorts for the distillation or heat treatment of carbonaceous materials. H. NIELSEN and B. LAING (B.P. 319,223, 18.5.28).—Surrounding the lower end of a rotary retort is an annular drum. A discharge door in the retort communicates with the interior of the drum and a second door leads from the drum to the atmosphere. The doors are slidably mounted in suitable frameworks and are operated by two motors supplied with current in such a manner that they intermittently and alternately open and close each door.

A. B. MANNING.

Regulation of furnaces working with different fuels. C. LÖBBECKE (B.P. 300,204, 1.11.28).—A simple mechanical device, comprising two fixed scales, a moving scale, and a pulley system which transmits the motion of the pointer of one fixed scale to the moving scale with a suitable ratio of transmission, is used to indicate the volume of air which must be supplied to a furnace working with two different fuels, corresponding with any given rates of supply of the respective fuels.

A. B. MANNING.

Operation of internal-combustion engines with pulverulent fuel. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,853, 14.7.28).—Engines of the Diesel type are run with pulverulent fuel and with oxygen or with air enriched with oxygen.

A. B. MANNING.

Dryer and carboniser for fuel agglomerates. F. M. CROSSMAN (B.P. 318,506, 24.5.28).—A central driving shaft supports a number of flat, circular trays within a vertical cylindrical chamber. Each tray is divided into compartments the perforated floors of which are hinged radially. The floors are normally supported by a horizontal circular rail, in which, however, a gap is so arranged that after an almost complete revolution the floors fall open and discharge the contents of the corresponding compartments on to the tray below. A current of hot gas or superheated steam is passed up through the trays and the material contained therein.

A. B. MANNING.

[Low-temperature] carbonisation of coal. A. SMALLWOOD and J. FALLON (B.P. 319,464, 14.8.28).—The apparatus consists of a long horizontal retort or heating chamber constructed of heat-resisting steel surrounded by brickwork, a horizontal cooling chamber in line with the retort, and a continuous conveyer which carries the coal through the two chambers in succession. A feed hopper is situated at one end of the apparatus and a discharge outlet at the other end. The conveyer

returns through a long narrow conduit below the retort and is so arranged as to be completely enclosed. The retort, the underside of which is arched, is heated externally from below.

A. B. MANNING.

Treatment of carbonaceous material for fuel. TRENT PROCESS CORP., ASSEES. of W. E. TRENT (B.P. 293,454, 25.6.28. U.S., 7.7.27).—The size of the coal-oil agglomerates formed as described in B.P. 183,430 (B., 1923, 392 A) is controlled by varying the water dilution and the temperature of the materials. In the first stage of the process these conditions are adjusted to give agglomerates of a size, e.g., $\frac{1}{4}$ in., capable of being carried by the moving liquid. These agglomerates are then further treated by agitation in clean cold water in a second apparatus, whereby they coalesce into larger masses which may be baked directly to form a solid fuel.

A. B. MANNING.

Distillation of solid carbonaceous materials and manufacture of briquettes. H. NIELSEN and B. LAING (B.P. 319,895, 28.8.28).—Caking coal is mixed with a non-caking carbonaceous material and heated to a temperature, e.g., 350–400°, at which the former becomes plastic. The mixture is then briquetted and the briquettes are subjected to a further heat-treatment at a higher temperature, e.g., 850–1000°. The non-caking material may be a non-caking coal, a caking coal which has undergone a preliminary heat-treatment in an oxidising atmosphere, high- or low-temperature coke breeze, etc.

A. B. MANNING.

Distillation of fine granular bituminous material. TROCKNUNGS-, VERSCHWELUNGS-, u. VERGASUNGS-GES. M.B.H. (B.P. 301,907, 27.11.28. Ger., 9.12.27).—Coal etc. is distilled in layers of less than 2 mm. thickness and at temperatures only slightly above the dew point of the tar, e.g., 380°, for pit coal and lignite. The process is advantageously carried out on a revolving, annular, horizontal hearth as described in B.P. 289,137 (B., 1928, 436).

A. B. MANNING.

Manufacture of carbon. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,140, 17.9.28. Addn. to B.P. 286,845; B., 1928, 357).—The yield and quality of the carbon produced by heating carbon monoxide in the presence of small amounts of iron carbonyl etc., as described in the main patent, are improved by the addition of small quantities (0.5–5%) of water vapour to the gas.

A. B. MANNING.

Production of light hydrocarbons from carbonaceous materials and similar bodies containing complex organic compounds. J. M. F. D. FLORENTIN and A. J. KLING (B.P. 302,354, 30.11.28. Fr., 15.11.27).—Low-temperature tars, lignites, or coals are heated with hydrogen under high pressures in the presence of dehydrating catalysts (cf. B.P. 263,082 and 276,007; B., 1927, 836), non-hydrogenating substitutive catalysts (cf. B.P. 253,507; B., 1927, 696), and hydrogenating catalysts such as reduced iron, nickel, or cobalt, or unstable compounds, e.g., suboxides, sulphides, or nitrides, of tungsten, vanadium, molybdenum, uranium, iron, manganese, etc. The mixture may be heated successively at different temperatures, each corresponding with the optimum conditions for the action of one of the catalysts.

A. B. MANNING.

Manufacture of fertilisers and hydrocarbons from coal and other carbonaceous materials. W. W. HARRIS (B.P. 318,404, 26.9.28).—Coal, or similar carbonaceous material, is mixed with quicklime and common salt and is subjected to the action of steam under a pressure of at least 800 lb./in.²

A. B. MANNING.

Gas apparatus. F. D. MOSES (U.S.P. 1,727,892, 10.9.29. Appl., 22.11.24).—A vertical reaction chamber comprises an upper tapered portion which can be heated externally and constitutes the carbonising zone, and a lower cylindrical portion which is supplied with an air-blast and forms the gasification zone. The upper part of the carbonising zone is more sharply tapered than the lower part.

A. B. MANNING.

Apparatus for making oil gas. A. E. DICKERMAN, Assr. to GASGO POWER CORP. (U.S.P. 1,728,400, 17.9.29. Appl., 25.8.22).—An oil-gas retort comprises a chamber which can be heated at one end, an oil-vaporising tube extending within the chamber, and gasifying tubes leading from the chamber, outwardly spaced from the vaporising tube and exposed to further heat. The vaporising tube is adapted to receive oil and water and to deliver the vapours near to the heated end of the chamber, on which, however, they are prevented from impinging directly by a baffle. The gasifying tubes lead to an exit conduit for the gases.

A. B. MANNING.

Regenerative water-gas producers. GAS U. TEER GES.M.B.H. (B.P. 296,374, 30.8.28. Ger., 30.8.27).—The total chamber space of a regenerative water-gas producer is divided into as large a number of smaller chambers as possible; these are connected in pairs, and the phases at which change-over is effected are so arranged that the individual pairs of chambers are changed over consecutively, preferably at regular intervals. The gas, air, and exhaust valves of each chamber communicate with the corresponding valves of the remaining chambers by means of common pipings.

A. B. MANNING.

Utilisation of the heat of the waste gases of alternately-working gas generators and that of the produced gas. A. BREISIG (U.S.P. 1,728,720, 17.9.29. Appl., 11.6.26. Austr., 13.6.25).—In the operation of a plant comprising a gas generator, a heat accumulator serving as a vaporiser, a recuperator for superheating the steam, and a waste-heat boiler, a step is included which consists of simultaneously passing part of the waste gases leaving the recuperator into the vaporising accumulator and another part into the boiler.

A. B. MANNING.

Gas-purification process. C. J. RAMSBURG, Assr. to KOPPERS Co. (U.S.P. 1,727,559, 10.9.29. Appl., 8.9.23).—The gas is passed through a mass of inert solid material which is drenched with a solution reactive to the impurities in the gas. The solution discharged from the inert material is regenerated by heating and aeration, and the material is drenched intermittently with the regenerated solution.

A. B. MANNING.

Purification of coal gas. MANCHESTER OXIDE Co., LTD., and R. H. CLAYTON (B.P. 319,382, 23.5.28).—The hot gas drawn from the hydraulic main is passed up through a tower filled with a loose packing material,

e.g., Raschig rings, the whole being maintained at a temperature above the dew point of the gas for water. "Tar fog" is thereby eliminated, and in particular the higher tar acids are removed. A considerable portion of other oxidisable materials are removed, and a further reduction in the contamination of the ammonia-still effluent liquor is effected, if dephenolated tar is passed down the tower countercurrent to the gas. The ammonia in the gas after passing through the tower may be recovered by the "direct" process.

Recovery of sulphur from gases. C. STILL (B.P. 297,062, 13.9.28. Ger., 13.9.27).—Gases containing hydrogen sulphide are washed with a suspension of a metal oxide in a dilute alkaline solution containing a soluble foam-producing agent, *e.g.*, soap, saponin. On regeneration of the spent liquor by oxidation the sulphur separates in a particularly pure form.

A. B. MANNING.

Purification of gas containing sulphuretted hydrogen. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,396, 20.6.28).—Gases containing hydrogen sulphide, and preferably also ammonia, are purified by catalytic oxidation of the hydrogen sulphide, the catalyst consisting of a heavy metal, preferably one capable of combining with sulphur, to which has been added up to 10% of an alkali or alkaline-earth salt, or of lead, bismuth, copper, or their compounds. One or more oxygen-transferring metals, group IV, V, or VI (*e.g.*, chromium, vanadium), may also be added. The sulphur dioxide is recovered in the form of a sulphite-bisulphite mixture by treatment with a suitable alkaline agent.

A. B. MANNING.

Separation of by-products and of other secondary constituents from coke-oven gases and from other gas mixtures. CONCORDIA BERGBAU-A.-G., J. I. BRONN, and G. FISCHER (B.P. 318,319, 9.6.28).—Gases, the principal constituents of which are to be separated by compression and cooling to a very low temperature, are pretreated at an intermediate temperature, *e.g.*, -60° , and at a comparatively low stage of compression, by washing successively with concentrated ammonia of low f.p. or with liquefied ammonia gas, and an organic solvent for acetylene, *e.g.*, acetone. The washing may be followed by cooling to about -90° in order to bring about complete condensation of the vapours of the washing liquids, or these vapours may be absorbed in acid, alkali, and/or solid adsorbents.

A. B. MANNING.

Apparatus for detecting the presence of explosive or combustible gases. C. MCLUCKIE (B.P. 319,231, 16.6.28).—A metallic vessel is divided into two chambers; in one the gas to be tested can be subjected to the action of a hot platinum wire, whilst the other serves as a compensator for variations in the temperature and pressure of the atmosphere. By means of a multiple-way cock the chambers may be connected, respectively, to the source of gas and to the air, both chambers may be closed, or they may be connected, respectively, to the two limbs of a U-tube manometer. The diminution in pressure after combustion gives a measure of the combustible gas, *e.g.*, methane, present in the gas tested.

A. B. MANNING.

Apparatus for indicating the presence of inflammable vapours or gases. H. T. RINGROSE (B.P. 319,530, 30.10.28).—The diminution in pressure produced within a porous vessel by the combustion of the inflammable constituents of a gas which has passed into the vessel is used to break the circuit of a lamp when the percentage of the inflammable constituents reaches a predetermined quantity. The lamp circuit and the heating filament of the vessel are connected in series. The circuit is broken automatically by the action of the diminished pressure on a collapsible diaphragm.

A. B. MANNING.

Volumetric determination of explosive gases or gaseous mixtures, e.g., eudiometric measurement of firedamp. J. G. DALOZ (B.P. 300,281, 10.11.28. Belg., 10.11.27).—The apparatus includes two chambers of identical volume and a small hand-pump by means of which they may be filled with the gaseous mixture. The chambers are connected by a U-tube manometer which serves to measure the contraction resulting from the combustion of the mixture in one chamber, brought about by passing a current through a small heating resistance therein. From the contraction the percentage of combustible gas in the mixture may be deduced. The reading may be confirmed by subsequently burning the gas in the other chamber.

A. B. MANNING.

Distillation of tar. BARRETT Co., Assees. of S. P. MILLER (B.P. 286,278, 315,368, 315,373—4, 2.3.28. U.S., 2.3.27).—(A) The tar is introduced into a still, through the vapour space of which are passed the hot gases from a number of coke ovens, the temperature of the gases being sufficiently high to effect rapid distillation of the tar. A small proportion of the tar is circulated continuously, in the form of spray, through the hot gas current. The still may be run intermittently or continuously. The gases and vapours leaving the still may be used to preheat the entering tar, and are then subjected to fractional condensation. (B) The gases and vapours leaving the still are passed through an electrical precipitator in order to remove suspended material therefrom before condensing the oils. The material so removed may be drawn off as a separate pitch product or may be returned to the still. (C) The gases and vapours leaving the still are scrubbed with tar before passing to the condensing system. They are thereby cleaned, whilst the tar used for scrubbing undergoes a partial distillation in the process. The tar leaving the scrubber is preferably passed into the still. (D) The hot gases for carrying out the distillation are formed by combining the gases from a number of ovens or retorts in order to equalise the fluctuations in the temperature, volume, and composition of the gases from individual ovens. The gases from the remaining ovens, comprising the greater part of the battery, are combined and cooled for the recovery of tar therefrom, which is subsequently distilled as above described.

A. B. MANNING.

Dehydration of tar. BARRETT Co., Assees. of S. P. MILLER (B.P. 287,084, 5.3.28. U.S., 14.3.27).—Tar is dehydrated, or dehydrated and distilled, by passing hot gases from the carbonisation of coal through a body of tar contained in a still, which is not otherwise heated.

A. B. MANNING.

Manufacture of liquid or pasty emulsions from natural or artificial bitumen or tar. H. PLAUSON (B.P. 319,101, 25.7.28).—Bituminous materials are emulsified in water in the presence of animal or vegetable fats or oils, an alkali carbonate, calcium hydroxide, and, if desired, a water-soluble organic compound such as aniline, furfural, etc. The oil or fat is first emulsified in water containing the alkali carbonate, and the heated bitumen, to which the aniline etc. has been added, is then emulsified therein, before or after the addition of the calcium hydroxide.

A. B. MANNING.

Treatment of liquids containing tar acids. KOPPERS Co., Assees. of J. A. SHAW (B.P. 299,837, 12.4.28. U.S., 2.11.27).—The heated liquid is passed down a tower filled with suitable contact material, and is exposed therein to a rising current of inert gas which volatilises and carries away the tar acids. These are recovered from the gas by treatment with alkali, and the purified gas is recirculated for the treatment of further quantities of liquid. The gas becomes saturated with the vapours of the volatile constituents of the liquid other than tar acids, and the temperature and other conditions are so adjusted that no undesirable condensation of these vapours will occur. A gas liquor may be subjected to this treatment between the free and fixed ammonia distillation stages, or the tar acids may be driven off with the free ammonia and recovered from a first condensate obtained by cooling to a temperature which will effect the condensation of the tar acids with as little as possible of the ammonia.

A. B. MANNING.

Distillation of petroleum. E. H. LESLIE and E. M. BAKER (U.S.P. 1,730,891, 8.10.29. Appl., 20.3.23).—Petroleum is heated and passed to a flash vaporiser, from which the vapours are led to the bottom of a fractionator, consisting of a number of sections placed one above the other, up which the vapours pass counter-current to condensate from a reflux. Either liquid products or vapours can be withdrawn as desired from any of the sections.

H. S. GARLICK.

Catalytic cracking of petroleum oils, tar, and the like. COMP. INTERNAT. POUR LA FABR. DES ESSENCES ET PÉTROLES (B.P. 319,341 and Addn. B.P. 320,286, [A] 19.12.28, [B] 20.12.28. Fr., [A] 21.9.28, [B] 2.10.28).—(A) In a process for cracking the oils etc. at atmospheric pressures, they are vaporised as completely as possible, and the vapours are led first to a catalyser, and thence to a dephlegmator. The light products are removed, and the residual liquors led to a second vaporiser-catalyser-dephlegmator group followed, in series, by other similar groups. These are arranged to be used in parallel or in a closed circuit of any number of cycles. (B) Between the catalyser and dephlegmator is placed a purifier containing divided oxides or metals on a suitable carrier, this being maintained at a temperature sufficient to avoid condensation.

W. S. E. CLARKE.

Manufacture of light hydrocarbons by catalytic cracking of petroleum oils, tars, or other similar starting materials. COMP. INTERNAT. POUR LA FABR. DES ESSENCES ET PÉTROLES (B.P. 320,287, 21.12.28, Fr., 24.10.28).—In a further elaboration of the apparatus described in B.P. 319,341 and 320,286 (cf. preceding abstract) a connexion is made to the

dephlegmators of groups of purifiers for the refining of light products issuing from the dephlegmators. These groups consist of a heater for the light products, followed by one or more purifying chambers for retaining sulphur compounds, and one or more catalytic reaction chambers, and finally a condensing apparatus. Non-condensed products are collected in absorbers before the evacuation of the permanent gases. The vaporiser of each main group receives oil heated in successive heaters at a progressively increasing temperature, additional moisture being supplied as steam. W. S. E. CLARKE.

Distilling and cracking or decomposing bodies such as oils and the like by contact with salt or metal melts. T. SEIFER (B.P. 320,126, 28.6.28).—The melt is circulated under thermodynamic action through a heating chamber disposed in a furnace to a vertical treating chamber, to the bottom of which the liquid to be treated is supplied and from the top of which the products are withdrawn, the melt returning to the heating chamber by means of a downwardly-directed pipe outside the furnace. H. S. GARLICK.

Converting solid carbon into liquid hydrocarbons. P. DANCKWARDT (U.S.P. 1,730,997, 8.10.29. Appl., 13.1.28).—Carbon or carbonaceous material is forced together with hydrogen under high pressure through a quantity of molten metal hydroxide which is being electrolysed, using finely-divided nickel as the cathode and an anode consisting of an electrical conductor through or near which fixed hydrocarbon gas is injected. The carbonaceous material is allowed to escape into another vessel where the light hydrocarbons are separated from the heavier ones, the latter being returned with fixed carbonaceous material to the electrolyser for re-treatment. H. S. GARLICK.

Purifying and cooling the gaseous cloudy substance obtained by heat-transformation of heavy oils. C. CHILOWSKI (B.P. 288,305, 4.4.28. Fr., 8.4.27).—The gas produced by cracking heavy oils as described in B.P. 255,423, 271,899, and 271,907 (B., 1927, 805, 867) is maintained at a high temperature (above 500°) until it issues from the gas producer, and is then suddenly cooled by sprays of water or heavy oil to below 100°. This brings about the condensation of the suspended particles of tar and carbon in the gas, which would otherwise form a deposit on the walls and in the pipes of the intermediate apparatus leading to the engine. [Stat. ref.] A. B. MANNING.

Dehydrator [for crude oil etc.]. V. L. GIBSON (U.S.P. 1,727,504, 10.9.29. Appl., 16.2.27).—The separation of water from a liquid of differing sp. gr. is effected by gravity while the mixture is flowing slowly in thin layers. The mixture passes generally upwards with a number of horizontal passes through passages enclosed on all sides and heated on all sides by thermostatically controlled steam passing upwards through a containing tower. The horizontal pans are provided with riffles into which the water (or liquid of higher sp. gr.) settles, and from which it is drained by automatic valves. Subsequent to the separation, the oil (or liquid of lower sp. gr.) is cooled in similar towers provided with an air draught instead of with steam, and in which the zig-zag passages are not provided with riffles. B. M. VENABLES.

[Fuel for] airship. J. I. BRONN (U.S.P. 1,731,840, 15.10.29. Appl., 6.3.28. Ger., 14.3.27).—In an airship of the type in which the heat energy for operating the engines is obtained by burning buoyant fuel gas and liquid fuel in such proportions that the buoyancy is practically independent of the fuel consumption, the fuel gas consists of a mixture of hydrocarbons free from components liquefiable at atmospheric temperatures, and comprises methane mixed with a smaller proportion of hydrocarbons of higher b.p. F. G. CROSSE.

Treatment of carbonaceous materials in electric furnaces or the like. J. J. NAUGLE (U.S.P. 1,731,473—4, 15.10.29. Appl., [A, B] 21.4.23).—See B.P. 267,240—1; B., 1927, 694.

Distillation of carbonaceous material. O. H. HERTEL (U.S.P. 1,731,165, 8.10.29. Appl., 15.3.24).—See B.P. 247,639; B., 1926, 350.

Making infusible asphalt masses of high elasticity. R. LICHTENSTERN (B.P. 320,579, 16.1.29).—See U.S.P. 1,720,487; B., 1929, 769.

Feeding frames and lids for retort-bench producers, furnaces, and the like. C. D. DRURY and F. P. FALL (B.P. 319,872, 28.7.28).

Machines for crushing coke, coal, and other materials in the form of lumps. I. H. PILOT (B.P. 319,864—5, 21.7.28).

[Coke-extractor gear for] coke chambers of vertical retorts for carbonisation of coal and the like. E. WEST, and WEST'S GAS IMPROVEMENT CO., LTD. (B.P. 320,232—3, 11.10.28).

Gas burners. J. MILES (B.P. 320,083, 2.7.28). BASTIAN-MORLEY Co. (B.P. 312,981, 6.7.28. U.S., 5.4.28). F. KING, and F. KING & Co. (BATH), LTD. (B.P. 320,453, 15.8.28).

[Head for upright] incandescent mantles. ALADDIN INDUSTRIES, LTD., and C. W. DAVIS (B.P. 294,536, 10.7.28. U.S., 25.7.27).

Extinguishing fire (B.P. 319,083). Charging gases with vapours (B.P. 305,089). Distillation (U.S.P. 1,730,892). Gas analysis (U.S.P. 1,727,544).—See I. **Treatment of partial oxidation products (U.S.P. 1,721,959). Dibasic acid salts (U.S.P. 1,721,958).**—See III. **Revivification of potassium ferrocyanide (B.P. 319,147).**—See VII. **Bituminous coatings (B.P. 320,123).**—See IX. **Cultivation of micro-organisms (B.P. 318,649).**—See XVIII.

III.—ORGANIC INTERMEDIATES.

Synthesis of carbamide from ammonia and carbon dioxide. G. JAKOVKIN (Trans. Sci. Inst. Sci.-Tech. Dep. U.S.S.R. [Russia], Papers Chem., 1928, No. 2, 207—224).—Carbon dioxide and ammonia are preferably caused to react continuously under pressure without cooling. The conversion of the ammonium carbamate into carbamide and water by heating in an autoclave is effected at temperatures not above 160—170° during 6 hrs. The yield of carbamide is then 40% of the theoretical at 75—80 atm. Catalysts are not advantageous. Nickel and non-corroding chromium-nickel steel (Krupp V4A) are the best available materials. A. A. ELDRIDGE.

Chlorination of benzene in the presence of iron and ferric chloride. P. W. KARLASCH (Ukraine Chem. J., 1929, 4, [Tech.], 145—151).—Results obtained by this method were compared with those obtained by former investigators (cf. Bourion, B., 1920, 480 A). The results obtained with anhydrous ferric chloride (1% by wt. of benzene) and iron were substantially the same, and agreed with the former data, yielding 65—75% of monochlorobenzene, and 10—15% of polychlorobenzenes (of which about 30—40% was *p*-dichlorobenzene). In commercial practice, therefore, the method of chlorination in the presence of metallic iron is expedient, since it is considerably cheaper than that in which ferric chloride is used; the latter method necessitates a preliminary drying of the benzene and purification of the catalyst by sublimation. M. ZVEGINTZOV.

Electrochemical oxidation of toluene. R. W. MITCHELL (Amer. Electrochem. Soc., Sept., 1929. Advance copy. 17 pp.).—An indirect method, in which toluene was sulphonated and a solution of the product electrolysed, was investigated, as well as the direct method of electrolysing an aqueous solution of an electrolyte containing toluene in suspension. In the former method the highest current efficiency in the production of *p*-sulphobenzoic acid was 21·8%, using a 40% aqueous solution of *p*-toluenesulphonic acid at 100° as electrolyte and an anode constructed of lead-wool. Further anodic oxidation of *p*-sulphobenzoic acid keeps the current efficiency low. In the direct method, using an emulsion of toluene with 2*N*-sulphuric acid or sodium hydroxide, hardly any oxidation occurred; increasing the degree of dispersion of the toluene by means of various emulsifying agents caused no improvement, nor did this procedure increase the yield or velocity of the purely chemical reaction between toluene emulsions and oxidising agents such as ammonium persulphate solution. In the electrolytic process increasing the surface of contact between the anode and the toluene by using a lead-wool anode in a well-stirred emulsion yielded only traces of desirable oxidation products, although the low current densities employed must have kept the oxygen overvoltage low. Experiments in which a catalyst was added to the toluene emulsion were then conducted under various conditions, using a sheet lead cathode. With a rich toluene emulsion in 55% sulphuric acid containing manganous sulphate at 50°, benzaldehyde was produced at a current efficiency of 61% when the toluene phase was frequently or continuously removed from the cell, and the oxidation products were extracted. With chromic instead of manganous sulphate benzoic acid was produced with an efficiency as high as 54% under similar conditions. In these processes the oxidation of the toluene is brought about by manganic sulphate and chromic acid, which are the respective primary anode products, but a certain amount of cresol is produced by direct anodic oxidation of the toluene. H. J. T. ELLINGHAM.

1-Chloronitronaphthalenes. R. ASAOKA (Bull. Tokyo Ind. Res. Inst., 1928, 23, 1—26).—The following eutectics were observed for the 1-chloro-mono- and -di-nitronaphthalenes: 1:4 (57%)—1:5, 74—75°; 1:4 (57%)—1:8, 52—53°; 1:5 (45%)—1:8, 66—

67°; 1:4:5 (34%)—1:4:8, 117—118°. Methods of preparation of the pure materials are described.

CHEMICAL ABSTRACTS.

Phenols from carbonisation of lignite. ROSIN and JUST.—See II. **Perfumes etc. from furfuraldehyde and its derivatives.** GILMAN and WRIGHT.—See XX.

See also A., Nov., 1247, **Electrochemical preparation of phenylhydrazine** (McCLURE). 1261, **Apparatus for distillation at very low pressures** (WATERMAN and ELSBACH). 1276, **Electrolytic reduction of acetone** (HAGGERTY). 1288, **1-Methylnaphthalene derivatives** (VESELY and others). 1289, **Synthesis of aniline** (SMIALOWSKI). 1291, **Electrolytic preparation of 2:4-diaminophenol** (BRADT and BROWN). 1302, **Derivatives of naphthaquinones** (LANTZ and WAHL). 1303, **Partly hydrogenated naphtha- and anthra-quinones** (DIELS and others). 1304, **Benzanthrone** (LÜTTINGHAUS and others). 1310, **Aldehydofluorescein** (SEN and BANERJEA). **Condensation of esters with resorcinol, dimethylaniline, and *m*-diethylaminophenol** (SEN and MUKHERJI). 1341, **Bacterial oxidation of phenanthrene** (TAUSSON).

PATENTS.

Treatment of partial oxidation products [of hydrocarbon oils]. J. H. JAMES (U.S.P. 1,721,959, 23.7.29. Appl., 18.5.23).—Aldehydic partial oxidation products obtained by catalytic vapour-phase oxidation of hydrocarbon oils are further oxidised to mono- or di-basic fatty acids, e.g., with chromic acid, chlorine, 22% nitric acid below 50° in presence of an air current, or further catalytic oxidation. E.g., a catalytic oxidation mixture from Pennsylvania kerosene, containing 81% of aliphatic aldehydes, 10% of aldehydic fatty acids, and 9% of hydrocarbons, is converted at 300—330°, with uranyl molybdate catalyst screen, into a mixture containing 65% of aldehyde fatty acids, 31·5% of aliphatic aldehydes, and 3·5% of hydrocarbons.

R. BRIGHTMAN.

Manufacture of highly polymerised products of unsaturated hydrocarbons. H. STAUDINGER and H. A. BRUSON (U.S.P. 1,720,929, 16.7.29. Appl., 15.3.27).—Unsaturated diolefines containing at least four carbon atoms are treated with stannic chloride in chloroform or other inert solvent. R. BRIGHTMAN.

Manufacture of emulsions of diolefines. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 318,296, 1.6.28. Cf. B.P. 312,201; B., 1929, 612).—Emulsifying agents are produced *in situ*, e.g., by dissolving oleic acid in the diolefine and ammonia in water and mixing the two solutions. Polymerising agents, oxidants, vulcanisation accelerators, driers, proteins, pectins, resins, plasticisers, and stabilisers may be added to one or other of the two solutions. An artificial latex is obtained, for example, by agitation of a solution of benzoyl peroxide (5 pts.), cobalt oleate (0·5 pt.), olein (12·6 pts.), an accelerator, and linseed oil (10 pts.) in β -methylbutadiene (400 pts.) with a solution of trisodium phosphate (10 pts.), 5% glue solution (25 pts.), and 10% hydrogen peroxide (5 pts.) in 0·5% aqueous ammonia (500 pts.). C. HOLLINS.

Manufacture of ketones [from glycols]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 318,124,

15.5.28).—Glycols are passed in vapour form at 210—220° over a catalyst comprising a heavy metal of group I or VIII (copper) together with an alkaline promoter and, if desired, a difficultly reducible metal oxide. Examples are : methyl ethyl ketone from γ -butylene glycol, methyl *n*-propyl ketone from $\beta\delta$ -amylene glycol, methyl *isopropyl* ketone from trimethylethylene glycol, phenylacetone from γ -phenyl- $\alpha\beta$ -propylene glycol.

C. HOLLINS.

Manufacture of homologues of dioxan. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 318,758, 24.9.28).—Homologous glycols, *e.g.*, the mixture from cracked gases, or $\alpha\beta$ -propylene glycol, are boiled with a little concentrated sulphuric acid or sodium hydrogen sulphate.

C. HOLLINS.

Extracting [fatty] acids from solutions. H. E. MARTIN, Assr. to CELANESE CORP. OF AMERICA (U.S.P. 1,717,719, 18.6.29. Appl., 3.12.27).—Aqueous solutions of acetic acid or other fatty acids of low mol. wt. are concentrated by extraction with methylene chloride or mixtures containing at least 80% of methylene chloride and less than 20% of ether, *e.g.*, by counter-current processes with methylene chloride in liquid or vapour phase.

R. BRIGHTMAN.

Manufacture of dibasic acid salts. J. H. JAMES (U.S.P. 1,721,958, 23.7.29. Appl., 4.4.22. Renewed 5.12.28).—Organic acids obtained, *e.g.*, by the partial oxidation of mineral oil are oxidised to dibasic acids, preferably with chlorine or hypochlorite in alkaline solution, and the dibasic salts or soaps are salted out. The dibasic acids may be liberated from the salts and converted into a mixture of the sodium ammonium or potassium ammonium salts.

R. BRIGHTMAN.

Manufacture of pure *m*- and *p*-cresols. SCHERING-KAHLBAUM A.-G. (B.P. 297,083, 29.8.28. Ger., 14.9.27).—The compound of *m*-cresol and carbamide separates readily (especially on seeding) in a pure state when carbamide is added to crude *m*-cresol or to a mixture of *m*- and *p*-cresols. A solvent (carbon tetrachloride or a small amount of water) may be used. The carbamide-cresol compound may be decomposed by distillation in a vacuum or by treatment with acid.

C. HOLLINS.

Purification of phthalic anhydride. P. C. BOWERS, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,728,225, 17.9.29. Appl., 27.10.22).—Phthalic anhydride obtained by the oxidation of naphthalene vapour is heated with a condensing agent capable of rendering the impurities less volatile than the anhydride, *e.g.*, an alkali hydroxide, a metal chloride, or an alkali hydrogen salt of a polybasic mineral acid.

L. A. COLES.

Separation of α -naphthylamine from a mixture of α - and β -naphthylamines. H. J. WEILAND and I. GUBELMANN, Assrs. to NEWPORT Co. (U.S.P. 1,722,026, 23.7.29. Appl., 28.6.26).—The β -naphthylamine is dissolved out with dilute acid from mixtures containing less than 15% of β -naphthylamine, *e.g.*, by heating at 50° with 3—4 mols. of hydrochloric acid per mol. of β -naphthylamine. The latter is recovered quantitatively from the cold filtrate by addition of sulphuric acid.

R. BRIGHTMAN.

Manufacture of 5:7-dialkoxy-3-[hydr]oxythionaphthens [thioindoxyls] and of dyes therefrom. I. G. FARBENIND. A.-G. (B.P. 291,361, 30.5.28. Ger., 30.5.27).—5:7-Dialkoxythioindoxyls are converted into thioindigos by oxidation or are condensed with isatins etc. 2-Nitro-3:5-dimethoxybenzoic acid, m.p. 232°, is reduced to the amine, m.p. 189—190°, and converted into 3:5-dimethoxy-1-carboxyphenyl-2-thioglycollic acid, m.p. 105—107° (or 128—130°, anhydrous), which on alkaline fusion gives 5:7-dimethoxythioindoxyl, m.p. 143°. This is oxidised to the thioindigo (bluish-grey), or is condensed with the *p*-dimethylaminoanil of 6-chloro-4-methylthioisatin (violet), or with 5:7-dichloroisatin α -chloride (bluish-grey).

C. HOLLINS.

Production of butyric aldehyde. M. MUGDAN and J. WIMMER, Assrs. to CONSORT. F. ELEKTROCHEM. IND. (U.S.P. 1,730,587, 8.10.29. Appl., 30.3.27. Ger., 15.5.26).—See B.P. 271,103; B., 1928, 151.

Manufacture of chlorinated aldehydes of the aromatic series. G. KALISCHER, H. SCHEYER, and K. KELLER, Assrs. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,717,567, 18.6.29. Appl., 30.1.28. Ger., 2.2.27).—See B.P. 311,208; B., 1929, 747.

Manufacture of chlorine-substituted product of 1-amino-2:4-dimethylbenzene [*m*-4-xylydine]. E. HOFFA, E. RUNNE, and E. THOMA, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,730,729, 8.10.29. Appl., 21.9.27. Ger., 6.10.26).—See B.P. 278,729; B., 1928, 440.

Manufacture of nuclear-substitution product of 1-aminonaphthalene-8-carboxylic acid in the open or anhydride form. R. HERZ and F. SCHULTE, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,728,995, 24.9.29. Appl., 29.11.26. Ger., 4.12.25).—See B.P. 296,010; B., 1928, 780.

**Concentration of nitric acid (B.P. 320,125).
Sodium glutamate (B.P. 290,657).—See VII.
Butyl alcohol and acetone by fermentation (B.P. 319,642).—See XVIII.**

IV.—DYESTUFFS.

New derivatives of *p*-phenylenediamine and their application for hair-dyeing. H. MEYER (Chem.-Ztg., 1929, 53, 765—766).—The injurious action of diamines on the skin is related to their basicity and diminishes, *e.g.*, in the order: *p*-phenylenediamine, 2:5-tolylenediamine, *p*-aminodiphenylamine. If both amino-groups are neutralised with acid, the salts are unsuitable for dye production. With carboxylic acids these bases form only mono-acid salts, which are crystalline substances, oxidised readily to dyes, and free from harmful action on the skin; they do not, like the diamines, combine with butyric acid to give powdery salts which close the skin-pores. The use of these compounds in hair-dyeing is protected by patent application. Examples are: *p*-phenylenediamine salicylate, m.p. 137° (decomp.), gallate, m.p. 180° (decomp.), benzoate, *o*-nitrobenzoate, acetate, and lactate; 2:5-tolylenediamine salicylate; *p*-aminodiphenylamine salicylate.

C. HOLLINS.

See also A., Nov., 1231, Absorption of dyes by growing crystals (MILLIGAN). 1248, Colour selectivity in dye systems (WEIGERT and NAKASHIMA).

1251, Ultramarine (HOFFMANN). 1262, Scopometer (EXTON). 1310, Aldehydofluorescein (SEN and BANERJEA). Condensation of esters with resorcinol, dimethylaniline, and *m*-diethylaminophenol (SEN and MUKHERJI). 1313, Reaction products from indigotin (POSNER and others).

PATENTS.

Azo dyes from rubber derivatives. H. L. FISHER, Assr. to B. F. GOODRICH Co. (U.S.P. 1,724,270, 13.8.29. Appl., 28.12.26).—The product from caoutchouc dibromide and phenol (2 mols.) is coupled with a diazotised arylamine, *e.g.*, sulphanilic acid, aniline, or benzidine. The dyes are maroon or purple in acid and yellow in alkali. C. HOLLINS.

[Manufacture of] disazo dyes. H. JORDAN, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,724,663, 13.8.29. Appl., 25.8.27).—Disazo dyes of the type, A → B → C, containing at least two sulphonic or carboxylic groups but no free hydroxyl, and carrying, in the end-component only, a free amino-group, are condensed with *p*-nitrobenzoyl chloride and the reduced product is further condensed with an aliphatic or aromatic acid chloride or anhydride. The *p*-benzamidobenzoyl derivative of the dye amido-G-acid → *m*-toluidine → *m*-toluidine (yellow on cotton, wool, silk, or viscose) is specially claimed. Other examples are the *p*-benzamidobenzoyl derivatives of: 2:4:8-naphthylaminedisulphonic acid → cresidine → *o*-anisidine (orange); met-anilic acid → Cleve acid → *m*-toluidine (yellow-brown); sulphanilic acid → Cleve acid → α -naphthylamine (red-brown). C. HOLLINS.

Orange to brown [direct] disazo dyes and their manufacture. H. JORDAN, Assr. to E. I. DU PONT DE NEMOURS & Co. (U.S.P. 1,724,660, 13.8.29. Appl., 13.11.25).—Aminobenzamidobenzoyl-J-acids are used as middle-components, the end-components being a sulphonated pyrazolone or methylindole. The dye, aniline → 4-*p*-aminobenzamidobenzoyl-J-acid → 1-*p*-sulphophenyl-3-methylpyrazolone (yellow-orange) is specially claimed. C. HOLLINS.

Triarylmethane dye. H. POLIKIER and O. BOEGER, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,731,637, 15.10.29. Appl., 8.7.27. Ger., 9.8.26).—See B.P. 275,609; B., 1928, 46.

Manufacture of salt-like compounds derived from dyestuff bases of the triarylmethane series. O. MEYER, Assr. to GEN. ANILINE WORKS, INC. (U.S.P. 1,729,003, 24.9.29. Appl., 30.6.27. Ger., 5.7.26).—See B.P. 298,101; B., 1928, 888.

[Manufacture of] vat dyes. P. NAWIASKY and E. KRAUCH, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,729,006, 24.9.29. Appl., 18.6.27. Ger., 22.6.26).—See B.P. 273,247; B., 1928, 517.

Manufacture of azo dyes. H. WAGNER and E. FISCHER, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,731,643, 15.10.29. Appl., 19.7.27. Ger., 29.7.26).—See B.P. 275,258; B., 1929, 239.

[Manufacture of acid] monoazo dyes. E. REBER and J. SPIELER, Assrs. to SOC. CHEM. IND. IN BASLE (U.S.P. 1,731,150, 8.10.29. Appl., 22.11.27. Switz., 4.12.26).—See B.P. 281,713; B., 1929, 351.

[Manufacture of water-insoluble] azo dyes. H. GRIMMEL and H. CLINGESTEIN, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,731,623, 15.10.29. Appl., 28.7.27. Ger., 19.8.26).—See B.P. 298,697; B., 1929, 48.

Dyes from thioindoxyls (B.P. 291,361).—See III. **Concentration of nitric acid** (B.P. 320,125).—See VII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Decomposition of rye straw and maize stalks by different fermentation processes. E. HORVÁTH (Papier-Fabr., 1929, 27, 664—670).—Samples of rye straw, of maize stalks, and of the rind, knots, and medullary substance of maize stalks, sterilised in different ways, were suspended in water and inoculated with pectin-dissolving cultures from hemp and flax, and with *Botrytis cinerea*. Unsterilised samples were also self-fermented. The extent of fermentation and the changes in chemical properties of the products (ash, nitrogen, protein, pentosan, lignin, etc. contents) were examined. The fermentative power of the cultures used is not evident from the results obtained, but the presence of 10% of lime in suspensions inoculated with pectin-dissolving organisms has a considerable effect on the yield and disappearance of lignin and cellulose. With rye straw in the presence of lime there is a greater loss of lignin and cellulose, but with maize stalks under the same conditions the effects are roughly reversed. In many cases there is not only considerable loss of lignin etc. (up to 50%), but also of cellulose (12—30%). Losses of ash constituents, silica, etc. are greater from the softer and more easily attacked parts of maize stalks than from the hard knots. Although further investigation is necessary to explain the results of such fermentation processes, it may be stated that the possibility of decomposition of a material with micro-organisms is to a great extent dependent on the structure or chemical composition and physical properties of the raw material.

B. P. RIDGE.

Purification of wood pulp: Japanese pulp as rayon material. H. OKADA, T. MATSUDA, and E. HAYAKAWA (J. Cellulose Inst., Tokyo, 1929, 5, 225—233).—By first bleaching sulphite wood pulp and then digesting it with alkaline liquors a perfectly white pulp of low copper number is obtained, but the α -cellulose content and the viscosity are not satisfactory. If the order of treatment be reversed, however, the α -cellulose content of the product is excellent, but the copper number and whiteness are inferior and the viscosity may be low; moreover, the bleaching operation is difficult. The following procedure, which combines the advantages of both methods, is recommended on account of ease of bleaching, economy of materials, and superiority of all the physical and chemical properties of the product. The raw, unbleached pulp is treated with 40% of the amount of chlorine necessary to give the ordinary complete bleach, then digested in the usual manner, and finally treated with the minimum amount of chlorine necessary to give a good white. Digestion of the pulp after chlorination with chlorine water is found to give the best results. Properties of viscoses prepared from cotton tissue-paper pulp, imported pulp, and Japanese pulp purified in the manner described

have been investigated, and it is found that threads produced from the purified pulp have a higher wet tenacity than those from the imported pulp.

B. P. RIDGE.

Some constituents of artificial silk. Y. KAMI (J. Cellulose Inst., Tokyo, 1929, 5, 233—237).—The moisture, ash, and fat and oil contents of 48 kinds of viscose, 7 of cuprammonium, and 1 of acetate silk have been determined. The ash content varies from 0.05 to 2.07% (average 0.25%), but higher values are given by dyed material. It also varies according to the country of origin of the artificial silk; for German material it is about 0.15%, and for French about 0.40%. This variation is due to differences in the cellulose used and in the methods of coagulation, washing, and after-treatment. The fat and oil content is 0.09—0.84%, and also varies according to the country of origin; German and Italian yarns have low, and French and Swiss very high, values. For Japanese varieties the solubility in water has a mean value of about 2% for bleached, and about 5% for unbleached, material, whilst the mean value for the sulphur content of viscoses is 0.02%. In no case is there complete absence of sulphur in viscose.

B. P. RIDGE.

Polysaccharides. XLI. Behaviour of "Lilienfeld silk" towards cellulase. P. KARRER and P. O. MANGELLI (Helv. Chim. Acta, 1929, 12, 989—990).—"Lilienfeld silk," which has the characteristics of a silk spun in a strongly acid bath, is, as expected, more readily attacked by snail cellulase than are other viscose silks (A., 1928, 276), but less readily than cuprammonium silks.

R. K. CALLOW.

Solubility of cellulose derivatives. I, II. E. W. MARDLES (Kolloid-Z., 1929, 49, 4—11, 11—16).—I. The solubility of cellulose acetate and nitrate in a number of solvents at 20° was determined by adding light petroleum (in which the cellulose derivatives are insoluble) from a burette to 5% solutions and observing when opalescence was produced. Solutions of cellulose derivatives in many solvents deposit a gelatinous mass on cooling, and the precipitation temperature has been determined for 5% solutions of cellulose acetate in a number of solvents, and the effect of altering the concentration of the solution has been examined. *cyclo*-Hexane is a useful solvent as the solution does not gelatinise until cooled to -17°. The course of the gelatinisation of a benzyl alcohol solution of cellulose acetate was followed by taking measurements of the viscosity after various time intervals, and can be expressed by the empirical formula $\eta - \eta_0 = ae^{kt}$, where k is a measure of the gelatinisation, t the time, and a is a constant. The maximum gelatinisation temperature, or the temperature at which k becomes zero, varies with the concentration. Below 12° benzyl alcohol practically ceases to be a solvent for cellulose acetate. Measurements were made of the variation of the solubility with temperature for cellulose acetate in acetone and in benzyl alcohol and for cellulose nitrate in acetone.

II. Measurements have been made of the swelling and solvent power of benzyl alcohol-anisole mixtures for some cellulose derivatives. For cellulose acetate

both the swelling and the solubility are at a maximum in a mixture containing 30% of anisole. The solubility of cellulose derivatives in mixtures of two or more liquids which are non-solvents when taken singly is discussed and a theory is advanced. The viscosity, surface tension, and density of the solutions are related to their solvent power. The degree of dispersion, the amount of swelling, and the resistance to gelatinisation on cooling are all greatest in the best solvents.

E. S. HEDGES.

Waste heat in paper mills. SMITH.—See IX.

See also A., Nov., 1234, **Swelling of cellulose acetate in binary mixtures** (SAKURADA). 1235, **Silicic acid gels** (PRASAD and HATTIANGADI).

PATENTS.

Production of artificial silk by the copper oxide-ammonia stretch-spinning process. J. P. BEMBERG A.-G. (B.P. 300,572, 29.8.28. Ger., 15.11.27).—Where a single, circulating precipitating liquid is employed, the copper and ammonia content of the used liquor may be reduced sufficiently for re-use by removing a portion, and replacing it either with fresh precipitating liquid or with used liquor which has been worked up by distilling off ammonia so that the copper is precipitated.

F. R. ENNOS.

Manufacture of viscose. L. LILIENFELD (B.P. 319,378, 22.3.28).—By carrying out at least part of the preparation of the alkali-cellulose at above 80° or even above 100°, the time required for maturing is shortened and a final product of enhanced strength is obtained.

F. R. ENNOS.

Spinning of artificial silk from viscose. J. C. HARTOGS (B.P. 319,887, 20.8.28).—Not more than 0.8% (0.3—0.5%) of finely-divided sulphur, preferably a mixture of colloidal sulphur with a protective colloid, is added at any stage in the manufacture of the xanthate solution prior to spinning.

F. R. ENNOS.

Production of artificial formations from viscose. BORVISK SYND., LTD., ASSEES. OF B. BORZKOWSKI (B.P. 292,627, 23.6.28. Ger., 24.6.27. Addn. to B.P. 273,647; B., 1927, 963).—A dull matte appearance is produced by the addition of organic compounds containing nitrogen, *e.g.*, casein, or of inorganic compounds, *e.g.*, barium hydroxide, to the viscose before spinning. [Stat. ref.]

F. R. ENNOS.

Preparation or treatment of liquids for use in the manufacture of artificial silk. BRYSLKA, LTD., and F. W. SCHUBERT (B.P. 319,841, 4.7.28).—In the cuprammonium stretch-spinning process, the coagulant liquor at ordinary temperature is flashed through a high vacuum to remove free oxygen, and a definite amount of oxygen is then re-introduced in accordance with the denier and number of the filaments being spun.

F. R. ENNOS.

Production of composite cooking liquor. L. BRADLEY and E. P. MCKEEFE, ASSTS. TO BRADLEY-MCKEEFE CORP. (U.S.P. 1,702,587, 19.2.29. Appl., 2.3.25).—Residual liquor from the cooking of wood with a liquor containing sodium sulphite is calcined under such conditions that neither oxidation nor reduction can take place.

F. G. CROSSE.

Manufacture of substances resembling cork. I. G. FARBENIND. A.-G. (B.P. 300,207, 6.11.28. Ger., 8.11.27).—Cellulose is esterified with "estolidic acids" (inner condensation products of hydroxylated higher fatty acids, *e.g.*, triricinoleic acid) or mixtures of these with higher fatty acids. The products contain 1.5—6% of cellulose residue and are substitutes for cork. An example is the ester from linters (10 pts.), lauryl chloride (35 pts.), and triricinoleyl chloride (10 pts.) heated in chlorobenzene and pyridine at 125—135°.

C. HOLLINS.

Manufacture of wrapping material. F. K. WICKEL (B.P. 294,463, 18.4.28. Ger., 23.7.27).—Transparent films of cellulose derivatives may be rendered iridescent on one or both sides with metallic mirror-forming materials, *e.g.*, oxychlorides of antimony or bismuth; by further coating the metallic mirrors with solutions of suitable resins or other film formers, iris effects are produced.

F. R. ENNOS.

Manufacture of artificial light filters. C. HOLUB (U.S.P. 1,730,574, 8.10.29. Appl., 13.7.26. Austral., 24.7.25).—See B.P. 265,455; B., 1927, 295.

Production of cellulose from highly-lignified plants. R. RUNKEL, Assr. to VER. F. CHEM. IND. A.-G. (U.S.P. 1,731,112, 8.10.29. Appl., 11.5.27. Ger., 20.5.26).—See B.P. 296,547; B., 1928, 810.

Non-deliquescent product from sulphite[*-*cellulose] waste liquor. P. ONNERTZ, H. WESCHE, and K. BRODERSEN, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,731,433, 15.10.29. Appl., 12.11.26. Ger., 24.1.24).—See F.P. 592,119; B., 1926, 188.

Manufacture of artificial silk and like threads. C. W. PALMER and W. WHITEHEAD, Assrs. to CELANESE CORP. OF AMERICA (U.S.P. 1,731,317, 15.10.29. Appl., 29.1.23. U.K., 18.2.22).—See B.P. 198,023; B., 1923, 765 A.

Treatment of cellulose prior to esterification. H. DREYFUS (U.S.P. 1,731,299, 15.10.29. Appl., 16.1.26. U.K., 24.5.22).—See B.P. 207,562; B., 1924, 129.

Manufacture of mixed esters of cellulose. KODAK, LTD., Asses. of H. T. CLARKE and C. J. MALM (B.P. 290,570, 4.5.28. U.K., 14.5.27).—See U.S.P. 1,690,621; B., 1929, 554.

Softening of paper. K. H. MEYER, J. MÜLLER, and U. HOFFMANN, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,731,679, 15.10.29. Appl., 7.1.28. Ger., 7.1.27).—See B.P. 292,430; B., 1928, 638.

Process and apparatus for degumming, washing, and drying of fibres. R. L. PRITCHARD (B.P. 319,594, 14.6.28).

Machines for spinning artificial silk. J. P. BEMBERG A.-G. (B.P. 297,417, 25.8.28. Ger., 21.9.27).

[Spinning] apparatus for manufacture of artificial silk. H. WADE. From SYNTHETA A.-G. (B.P. 320,417, 14.7.28).

Bobbins for use in preparation of artificial silk from viscose. J. C. HARTOGS (B.P. 319,888, 20.8.28).

Manufacture of resin-coated pulp-board. G. M. CLARK. From AGASOTE MILLBOARD CO. (B.P. 319,901, 31.8.28).

Chemicals from wood-pulp waste-liquor (U.S.P. 1,728,252). Mineral fibres (U.S.P. 1,730,609).—See VII. Cellulosic filament (U.S.P. 1,730,417).—See XI.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Mercerisation of cellulose. F. I. BOGOYAVLENSKI (J. Appl. Chem. Moscow, 1929, 2, 167—178).—The quantity of sodium hydroxide absorbed by cellulose at 20—22° increases with concentration up to 4—5*N*; for 5—8*N* the quantity absorbed corresponds with the formula $(C_6H_{10}O_5)_4 \cdot 2NaOH$, and for 9—10*N* with $(C_6H_{10}O_5)_8 \cdot 5NaOH$. The rate of reaction is maximal at 5*N*. Absorption of potassium hydroxide increases rapidly up to 5*N*, and thereafter slowly. With 10*N*, the compound $(C_6H_{10}O_5)_4 \cdot 2KOH$ is probably formed.

CHEMICAL ABSTRACTS.

Hair-dyeing. MEYER.—See IV.

See also A., Nov., 1254, **Photographic determination of coloured solutions** (LYTHGOE and TANSLEY), 1262, **Scopometer** (EXTON), 1298, **Colour and constitution** (HODGSON).

PATENTS.

Preparation of effect threads. E. F. EHRHARDT. From CHEM. WORKS, FORMERLY SANDOZ (B.P. 318,366, 7.8.28).—The resistance of cellulose mono- and diacetates to direct cotton colours is increased by steaming under pressure and even an incompletely monoacetylated yarn can thus be rendered completely resistant. When coloured cotton is acetylated, the dye may be fixed by steaming.

C. HOLLINS.

Treatment of fabrics. [Effects on mixtures of cellulose esters and animal fibres.] BRIT. CELANESE, LTD., and G. RIVAT (B.P. 302,592, 17.12.28. U.S., 16.12.27).—Mixed fabrics such as velvets having a cellulose acetate pile on a silk or wool back are printed with mineral acids or their acid salts (sulphuric acid, sodium hydrogen sulphate); the pile is locally destroyed and may be removed by subsequent neutralisation and brushing. A solvent, softener, or swelling agent for the cellulose ester may advantageously be added to the printing paste.

C. HOLLINS.

Treatment of fibrous material. SPICERS, LTD., Asses. of H. FRIEDLAENDER (B.P. 290,625, 24.4.28. Ger., 18.5.27).—The pulp of fibrous material is impregnated with a quantity of emulsified montan wax, previously heated at 230—250° while air is blown through, which is equivalent to 1—10% or considerably less than 30% of the dry weight of the fibre; a wax solvent (carbon tetrachloride) and sizing materials (casein, resins, fats, oils, or soaps) may also be added, the whole being precipitated on the fibre by the addition of alum or aluminium sulphate.

F. R. ENNOS.

Colour printing pastes and their manufacture. E. I. DU PONT DE NEMOURS & Co. (B.P. 285,041, 9.2.28. U.S., 9.2.27).—See U.S.P. 1,705,818; B., 1929, 716.

Treatment of vegetable fibrous materials [to give wool-like effects]. G. HEBERLEIN, Assr. to HEBERLEIN PATENT CORP. (U.S.P. 1,731,245, 15.10.29. Appl., 28.1.28. Ger., 4.2.27).—See B.P. 284,686; B., 1928, 332.

Weighting fibres of cellulose derivatives. C. DREYFUS and H. PLATT, Assrs. to CELANESE CORP. OF

AMERICA (U.S.P. 1,731,298, 15.10.29. Appl., 24.10.25).—See B.P. 260,290; B., 1928, 477.

Machines for dyeing of textile fabrics. C. CALLEBAUT and J. DE BLICQUY (B.P. 320,544, 5.11.28).

Washing, bleaching, and like machines. BRIT. LAUNDERERS' RES. ASSOC., R. G. PARKER, D. N. JACKMAN, and R. E. V. HAMPSON (B.P. 320,102, 3.7.28 and 23.4.29).

Treatment of artificial silk threads and filaments. J. BRANDWOOD (B.P. 320,025, 22.3.28).

Fluid treatment of artificial silk threads and filaments. J. BRANDWOOD (B.P. 319,848, 6.7.28).

Treatment with liquid of fibres wound on permeable spools. I. G. FARBENIND. A.-G. (B.P. 294,548, 24.7.28. Ger., 25.7.27).

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

Desulphurisation of burnt pyrites. C. FICAI and P. PIACENTINI (Giorn. Chim. Ind. Appl., 1929, 11, 349—353).—Desulphurisation of burnt pyrites (cf. B., 1929, 21) takes place wholly in the combustion chamber, especially where the temperatures are higher. At the time of its elimination the sulphur is present entirely as sulphates, the dissociation of which is greatly retarded by their low concentration. The large excess of air maintained in the furnace helps neither the desulphurisation nor the agglomeration of the pyrites, since these are enhanced by a low concentration of the oxygen. Originally tunnel furnaces were furnished with a pipe which drew off a part of the gases before they passed to the chimney for the purpose of blowing the flame in the combustion chamber, but such arrangement appears to have been discarded in Cokerill furnaces owing to the difficulty of working the furnaces under these conditions; in view of diminished chimney losses, the authors suggest that it might be of interest to give further consideration to its use. T. H. POPE.

Determination of calcium oxide in quicklime. H. A. J. PIETERS and J. H. VAN DER HEIJDEN (Chem. Weekblad, 1929, 26, 511—512).—Direct titration gives very low results, owing to the slowness with which the oxide dissolves. The phenol and ammonia methods also give low results, though the error is less; the ammonia distillation method is more accurate still, but again gives low results. Boiling with excess of standard acid and back-titration, combined with a carbonate determination, gives quite accurate results. S. I. LEVY.

Alumina from volcanic ash as a source of aluminium. I. SEKI (Rep. Imp. Ind. Res. Inst. Osaka, 1929, 10, No. 2, 22 pp.).—Volcanic ash is dried at 130°, powdered, heated for 2 hrs. at 400—700°, and treated with sulphuric acid (*d* 1.26) for 30 min. Aluminium sulphate is best separated from calcium sulphate when the solution has *d* 1.47. Iron may be removed with ferrocyanide. The product contains Al₂O₃ 99.08, H₂SiO₃ 0.86, Fe(OH)₃ 0.06%. CHEMICAL ABSTRACTS.

Grain growth in silver halide precipitates. S. E. SHEPPARD and R. H. LAMBERT (Coll. Symp. Mon., 1928, 6, 265—282).—In the first stage of digestion certain

grains grow by accretion from solution and others dissolve; growth due to recrystallisation within the aggregates produced by collision and coalescence then occurs. CHEMICAL ABSTRACTS.

Determination of water-soluble phosphate. SUCHIER.—See XVI.

See also A., Nov., 1929, Absorption of carbon dioxide by sodium hydroxide (HATTA). 1247, Production of nitric oxide in the electric arc (BRINER and RIVIER). 1250, Preparation of pure cupric sulphide (FISCHBECK and DORNER). 1251, Ultramarine (HOFFMANN). 1253, Preparation of hydrogen sulphide (GFELLER and SCHAEFER). 1255, Potentiometric titration of acids and bases (KAHLENBERG and KRUEGER). Microanalysis of acids (FEIGL and KRUMHOLZ). Determination of perchlorate (FEDOROVA). 1256, Micro-determination of sulphur dioxide in air (RÖTTINGER). 1336, Colloidal lead (GANASSINI).

PATENTS.

Manufacture of sulphuric acid. H. F. MERRIAM, ASST. to GEN. CHEM. CO. (U.S.P. 1,728,213, 17.9.29. Appl., 29.4.26).—In the contact process, compressed air is used for the oxidation to sulphur dioxide of material containing sulphur. L. A. COLES.

Production of concentrated nitric acid from dilute solutions. J. Y. JOHNSON. FROM I. G. FARBENIND. A.-G. (B.P. 320,125, 7.7.28).—Dilute nitric acid of not less than 50% concentration, or residual liquor from the nitration of carbohydrates, dyes, intermediates, etc., is treated in a closed vessel with liquid nitrogen peroxide at 30—60° (preferably above 40°); after the mixture has separated into layers, the nitrogen peroxide layer, which contains nitric acid in solution, is withdrawn and the nitric acid is recovered by fractional distillation or by cooling to about 5°, when the solution again settles into layers the lower of which yields almost pure nitric acid on evaporation of the dissolved peroxide. L. A. COLES.

Recovery of nitric acid [from solutions containing other volatile acids]. I. G. FARBENIND. A.-G. (B.P. 303,351, 10.12.28. Ger., 21.12.27).—Solutions containing nitric acid and, e.g., hydrochloric acid are treated with gaseous reducing agents, e.g., sulphur dioxide, preferably in quantity sufficient to reduce the nitric acid to nitric oxide which, after scrubbing with water and, e.g., milk of lime to remove hydrochloric acid etc., is oxidised to nitric acid or to nitrates and nitrites. Hydrochloric and sulphuric acids are recovered from the residual liquor. L. A. COLES.

Manufacture of alkali nitrates. I. G. FARBENIND. A.-G. (B.P. 303,355, 18.12.28. Ger., 31.12.27. Addn. to B.P. 303,351; preceding).—Alkali (potassium) sulphate or chloride either separately or in admixture is treated at 35° with nitric acid (*d* 1.20). By cooling to —5° and filtering or centrifuging, a product containing 95% of potassium nitrate is obtained, which may be further purified by purging with a saturated solution of potassium nitrate. The mother-liquor may be freed from the remaining nitric acid by the process of the prior patent, and then distilled to separate hydrochloric acid (as 20% acid). The residue, on cooling, yields

potassium bisulphate, which, suitably mixed with alkali chloride, may be re-treated with nitric acid as above.

P. E. L. FARINA.

Manufacture of ammonium salts. "MONTECATINI," SOC. GEN. PER L'IND. MINERARIA ED AGRICOLA, Asses. of G. FAUSER (B.P. 292,129, 13.6.28. It., 14.6.27).—Sulphuric acid is sprayed into a chamber containing ammonia, and ammonium sulphate is removed from the lower end of the chamber. Automatic means operated by the pressure in the chamber regulate the supply of acid, which is of such concentration that the water is evaporated completely by the heat of reaction, and the steam is removed subsequently from the chamber by circulation through an external cooler and rectifier, which serves also for generating the ammonia when an aqueous solution of it is used as the source of supply.

L. A. COLES.

Recovery of chemicals [sodium carbonate free from sulphide from wood-pulping waste liquor]. F. G. RAWLING (U.S.P. 1,728,252, 17.9.29. Appl., 4.2.27).—The ash obtained by concentrating and then incinerating the liquor is treated with air and steam under conditions such that a portion of the free carbon burns and thereby converts sodium sulphide into the carbonate with the liberation of hydrogen sulphide. Sodium carbonate is extracted from the product.

L. A. COLES.

Manufacture of synthetic mineral fibres. M. M. GROSSMAN (U.S.P. 1,730,609, 8.10.29. Appl., 17.10.27).—Sodium silicate is boiled for several hours under pressure with a solution of caustic soda, the resulting solution is concentrated and spun into fibres, and these are hardened by passing through a bath containing calcium chloride solution.

H. ROYAL-DAWSON.

Electrolytic revivification of potassium ferrocyanide formed in the purification of gases by oxidation of hydrogen sulphide with potassium ferricyanide. R. BRANDT (B.P. 319,147, 4.10.28).—The spent liquor, after removal of the coarser particles of sulphur by sedimentation, is subjected to anodic oxidation by being passed upwards through a cell containing upright iron electrodes with interjacent ribs to increase the surface, the potassium hydroxide formed during electrolysis being converted into the carbonate by the addition of potassium bicarbonate.

L. A. COLES.

Purification of sodium glutamate. K. OKA (B.P. 290,657, 2.4.28).—Iron compounds are precipitated by concentrating sodium glutamate solutions in the presence of sodium sulphide.

L. A. COLES.

Technically pure CrO₃ [chromium trioxide]. METALS PROTECTION CORP. (B.P. 307,061, 18.2.29. U.S., 3.3.28).—Chromium trioxide prepared by the usual method, washed, if desired, with sulphuric acid to remove sodium hydrogen sulphate, and heated after filtration to remove the greater part of the adhering mother-liquor, is mixed with the quantity of barium hydroxide, carbonate, or chromate necessary to precipitate residual sulphuric acid as barium sulphate on dissolution of the product in water.

L. A. COLES.

Manufacture of phosphorus pentasulphide. P. DUTOIT (B.P. 301,500, 22.11.28. Switz., 1.12.27).—

Sulphur vapour is made to react with ferrophosphorus (Fe₂P) at a temperature below that of fusion by heating a mixture of pyrites and ferrophosphorus (22% P) at 700–800°; the phosphorus pentasulphide evolved is then condensed.

P. E. L. FARINA.

Recovery of selenium. D. L. OGDEN and R. E. VALENTINE, Asses. to UNITED STATES METALS REFINING Co. (U.S.P. 1,730,681, 8.10.29. Appl., 9.5.28).—Sulphur dioxide, free from hydrochloric acid, is introduced into the hot solution containing selenium to precipitate the selenium as a black amorphous powder, which is collected, ground in a wet state, washed, and dried.

H. ROYAL-DAWSON.

Purification of gases. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOIT. DES PROC. G. CLAUDE, Asses. of SOC. CHIM. DE LA GRANDE PAROISSE, AZOTE & PROD. CHIM. (B.P. 307,039, 6.6.28. Fr., 2.3.28).—The catalyst chamber for the pretreatment of gases for use in synthetic reactions, e.g., for the reduction of oxygen and carbon monoxide in nitrogen-hydrogen mixtures for use in the synthesis of ammonia, surrounds the main reaction chamber so that the purifying process is facilitated by the heat generated in the main reaction. Means may be provided between the two chambers for removing the water etc. formed in the first chamber.

L. A. COLES.

Oxidation of potassium ferrocyanide to potassium ferricyanide. R. BRANDT (U.S.P. 1,732,117, 15.10.29. Appl., 16.10.28. Ger., 18.11.27).—See B.P. 319,147; preceding.

Decomposition of complex hydrofluoric salts. M. BUCHNER, Assr. to A. F. MEYERHOFER (U.S.P. 1,730,915, 8.10.29. Appl., 23.3.26. Ger., 24.3.25).—See B.P. 249,860; B., 1927, 748.

Molybdenum phosphotungstate compounds. P. RABE, B. WENK, and E. HARTMANN, Asses. to GEN. ANILINE WORKS, INC. (U.S.P. 1,731,081, 8.10.29. Appl., 9.5.27. Ger., 14.7.26).—See B.P. 292,253; B., 1928, 603.

Extraction of hydrogen from gaseous mixtures. G. CLAUDE, Assr. to L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOIT. DES PROC. G. CLAUDE (U.S.P. 1,730,805, 8.10.29. Appl., 5.3.25. Fr., 8.3.24).—See B.P. 230,413; B., 1925, 356.

Granular solids from viscous liquids (B.P. 319,893). Acid-concentrating towers (B.P. 319,839).—See I. Sulphur from gas (B.P. 297,062).—See II. Treatment of gypsum (B.P. 298,607).—See IX. Fertilisers (B.P. 305,132, 318,842, and 318,909).—See XVI.

VIII.—GLASS; CERAMICS.

Soda-zinc glasses. K. FUWA, S. SAKAI, M. SATO, and F. SUZUKI (J. Japan. Ceram. Assoc., 1928, 36, 135–153, 243–264).—The influence of chemical composition of glasses 0.5–2.0Na₂O, 0–6ZnO, 6SiO₂ on melting, weathering, devitrification, workability, effect of reheating, coefficient of expansion, elongation, thermal endurance, and resistance to chemicals was examined. In the pull test the rate of elongation of *y*Na₂O, *x*ZnO, 6SiO₂ increases as *y* increases, the increase being diminished as *x* increases. The thermal endurance is not greatly influenced by variation in *x* if *y* is small,

whilst it is reduced by increase in x when y is large. The glasses are very resistant to water so long as x is large; the resistance is not much influenced by the proportion of x and y . The glasses $0.75\text{Na}_2\text{O}, 1.0-2.0\text{ZnO}, \text{SiO}_2$ are most resistant. The resistance to hydrochloric acid is greatly influenced by variation in x and y . The glass $1.0\text{Na}_2\text{O}, 1.25\text{ZnO}, 6\text{SiO}_2$ was the least soluble. The glasses are not highly resistant to sodium hydroxide solution; the solubility in sodium carbonate solution is not small.

CHEMICAL ABSTRACTS.

Coating and welding of glass. S. MURAKAMI (J. Japan. Ceram. Assoc., 1928, 36, 303—311).—For coating, the difference in coefficient of expansion should not be greater than 60×10^{-8} , the glass with the larger coefficient being used on the outside.

CHEMICAL ABSTRACTS.

Progress report on investigation of fireclay bricks and the clays used in their preparation. R. A. HEINDL and W. L. PENDERGAST (J. Amer. Ceram. Soc., 1929, 12, 640—675).—The investigation was carried out on 17 makes of fireclay bricks, 14 raw mixtures, 26 fireclays, and 3 samples of crushed quartz and silica sand. Chemical analyses and the results of a number of physical tests on clays and the bricks made therefrom are given. The thermal expansions of the fireclays at 1400° and of the firebricks after reheating them at 1400° , 1500° , and 1600° were determined, and the materials were classified according to the type of expansion. The modulus of elasticity and the transverse breaking strength were determined on the bricks at several temperatures, and also after the bricks had been subjected to different heat treatments. The thermal expansions of most bricks decreased as the firing temperature increased. The thermal expansion of a finished brick was not necessarily the average of the expansions of the clays of which it was composed. The modulus of elasticity was generally greater at 550° than at 20° , and at 1000° it was less than at either of these temperatures. The resistance to spalling decreased with increase in modulus of elasticity and increase of thermal expansion. Large variations in the number of quenches required to cause spalling in bricks of the same brand were observed, indicating considerable differences in the physical properties. No relation was observed between the method of making the brick and its thermal expansion, but there was a direct relation between expansion and resistance to spalling. Spalling-resistance is expressed as an empirical relation, varying directly as the modulus of rupture and grog content and inversely as the modulus of elasticity and coefficient of expansion.

F. SALT.

Effect of various addition agents and treatments on the green strength of Missouri refractory clays. A. J. PAUL and M. E. HOLMES (J. Amer. Ceram. Soc., 1929, 12, 676—686).—The effects of ageing, varying the colloidal content, and developing bacterial growth on plastic and semi-flint clays and diaspore were investigated. Small additions of bentonites produced a substantial increase in the strength of bodies. The strength of a material of low plasticity was greatly increased by small additions of a highly colloidal clay. Little effect was produced by treating plastic fireclay

with steam under pressure or by adding sodium silicate. The deflocculating action of sodium carbonate and of tannic acid was moderately effective. Organic growth, induced by grape juice, had a marked effect on the strength, but many months were required to produce the same effect as bentonite. Negative results were obtained with salt and aluminium chloride. Additions of 0.5% of dextrin had a considerable effect. The "P.C.E. value" was reduced by about 1 cone per 3% addition of a bentonite.

F. SALT.

Jointing cements. EDWARDS.—See IX.

See also A., Nov., 1257, **Detection of alkali metal salts in silicates** (TANANAEV).

PATENTS.

Manufacture of glass. H. GEORGE (B.P. 299,393, 23.10.28. Fr., 25.10.27).—In a development of an electrical method of melting (cf. B.P. 279,818; B., 1928, 823) glass is placed directly in contact with, and is heated by, an electrically heated mass of molten tin. Additional tin may be added from an auxiliary chamber when melting is complete in order to facilitate fining or regulate the surface height of the glass.

A. COUSEN.

Manufacture of composite or non-splintering glass. J. E. ALCOCK (B.P. 319,873, 31.7.28).—Resinous products obtained by the reactions between phthalic anhydride and glycerol, phthalic anhydride, glycerol, and succinic acid, or formaldehyde and phenols, dissolved in suitable solvents, are employed for uniting glass to celluloid etc. Nitrocellulose, dissolved in a solution of the mixed resins, assists cohesion.

A. COUSEN.

[Tunnel] kilns and the like. CARBORUNDUM Co., LTD. From CARBORUNDUM Co. (B.P. 319,840, 3.7.28).—A form of kiln is described in which the heating is performed by laterally placed combustion-chamber units, constructed from highly-conductive refractory material such as silicon carbide bricks, the products of combustion then being discharged into the tunnel. Cooling is performed beyond the firing zone by passing the ware between walls of similar material, behind which are located passages for the circulation of air.

A. COUSEN.

Clouding of enamels. I. KREIDL (B.P. 297,724—5, 23. and 24.1.28. Austr., 26.9.27).—Clouding of enamels is effected by the production of finely-distributed gas bubbles which are evolved during the firing of the enamel from (A) organic substances or substances containing volatile organic compounds, or from (B) inorganic substances which are added in the enamel mill. The clouding action may be varied by altering the permeability of the enamel batch, e.g., by varying the addition of fluorides to the enamel. The clouding medium may contain a small portion of non-volatile matter which cannot of itself produce the clouding effect in the absence of gas bubbles. The clouding medium may produce its effect either directly or by interaction with other substances.

F. SALT.

Furnace [for refractories etc.]. R. MALVOS and M. CROZEMARIE (U.S.P. 1,731,901, 15.10.29. Appl., 14.11.24. Fr., 11.11.23).—See B.P. 248,036; B., 1926, 408.

Manufacture of glass-melting crucibles and similar refractory objects of clay. J. HOCHHUT (U.S.P. 1,732,088, 15.10.29. Appl., 22.12.27. Ger., 6.11.25).—See B.P. 291,305; B., 1928, 524.

Forehearth of glass-melting furnaces. BRIT. HARTFORD-FAIRMONT SYND., LTD., and T. WARDLEY (B.P. 320,334, 8.5.28).

IX.—BUILDING MATERIALS.

Waste heat in cement mills and paper mills. H. B. SMITH (Proc. Eng. Soc. W. Penn., 1929, 45, 269—296).—The use of wash-heat boilers in connexion with cement kilns in America dates from about 1910; in 1928 25% of the country's kilns were so equipped. A test in 1923 with entering gases at 660° showed a heat recovery of 68%. The steam produced may average 3.5 lb. per lb. of coal fired, and should suffice for the power requirements of the plant. The life of fans varies from 3 weeks to 3 years. Wear is promoted by inward air leakage on the train, which causes excessive dust. The draught loss through friction in the boiler must be minimised by special designing. A newer use of the waste-heat boiler is in connexion with the combustion of dehydrated black liquor from the sulphate-pulp process. This combustion is carried out primarily to recover the chemical content of the liquor. The gases deposit a clinker consisting largely of sodium salts for which provision must be made. Discussion on this paper deals principally with fan design, the risks attached to direct firing to supplement a waste-heat installation, and the possibility of sale of surplus power to a power company to be bought back when required.

C. IRWIN.

Distribution of particles of cements. K. FUJII (J. Jap. Ceram. Assoc., 1928, 36, 46—57).—Fractions of different fineness were determined. The whole cement and the fraction consisting of particles of diameter less than 18 μ contained, respectively: SiO₂ 21.10, 20.42; Al₂O₃ 6.01, 6.21; Fe₂O₃ 2.29, 2.17; CaO 63.90, 61.60; MgO 1.03, 0.91; SO₃ 1.53, 1.85; loss on ignition 3.01, 6.50%.

CHEMICAL ABSTRACTS.

Japanese cement. V.—VIII. S. NAGAI (J. Jap. Ceram. Assoc., 1928, 36, 104—113, 265—275, 440—448, 475—483).—A comparative study of recent products.

CHEMICAL ABSTRACTS.

Action of acid on cement mortar. S. NAGAI (J. Jap. Ceram. Assoc., 1928, 36, 382—394).—The effect of sulphuric and hydrochloric acids on the tensile strength of cements has been studied. CHEMICAL ABSTRACTS.

Ferruginous cements. O. REBUFFAT (Giorn. Chim. Ind. Appl., 1929, 11, 353—355).—The characters of Portland ferro-cement are described. T. H. POPE.

Jointing [refractory] cements. C. EDWARDS (Trans. Ceram. Soc., 1929, 28, 405—413).—The properties of refractory cements for use with silica bricks and firebricks are outlined. The chief raw materials used in making these cements are silica rock, silica brick, raw fireclay, and fireclay grog, and the usual bonding materials are ball-clay, lime, Portland cement, sodium silicate, and ground glass. For certain purposes carborundum is a useful constituent. To establish the

quality of a cement it should be tested for the following properties: texture and working qualities, grain size, tensile strength, refractoriness, shrinkage, adherence, and spalling. The effect of long usage on cements is discussed. F. SALT.

PATENTS.

Treatment of gypsum. C. GAMARRA (B.P. 298,607, 29.9.28. U.S., 12.10.27).—An alkaline-earth (calcium) chloride and an organic acid yielding an insoluble calcium salt, *e.g.*, tartaric acid, are added to gypsum containing carbonates so that on mixing the product with water carbon dioxide is evolved slowly and a hard, porous mass is obtained on setting. L. A. COLES.

Manufacture of cement from slag. J. G. BERGQUIST (U.S.P. 1,731,189, 8.10.29. Appl., 18.5.25).—Molten slag is transferred to a furnace and to it is added sufficient lime to form dicalcium silicate. After cooling and allowing it to disintegrate to a powder, it is mixed with powdered limestone, wetted, ground, and burned to form a clinker, which is subsequently ground.

F. G. CROSSE.

Manufacture of constructional materials. MUSAG GES. F. DEN BAU VON MÜLL- & SCHLACKEN-VERWERTUNGSANLAGEN, A.-G., and A. GROTE (B.P. 298,159, 2.10.28. Ger., 4.10.27).—Mixtures of hard-sintered refuse slags with bituminous binders are compressed into blocks.

L. A. COLES.

Heat non-conducting composition [in paste form]. R. BOWMAN & Co., LTD., and J. W. CRAGGS (B.P. 319,648, 22.8.28).—The product, which dries and hardens after application, is prepared by adding hot sodium oleate solution to hot bitumen with continued stirring and, after coagulation of the emulsion, incorporating powdered talc, Italian powder, and colouring constituents.

L. A. COLES.

Production of porous building materials from mineral binding media. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 319,103, 26.7.28).—Portland cement etc. is beaten up to a frothy pulp with hot or cold, dilute, aqueous solutions containing wetting agents comprising sulphonated organic compounds containing at least six carbon atoms in the molecule, *e.g.*, Turkey-red oil, or sulphonated tall oil, higher fatty acids, mineral or tar oils, alkylated aromatic hydrocarbons, and the products are cast in moulds.

L. A. COLES.

[Bituminous] lining or coating of pipes, tubes, etc. CLAYTON, SON & Co., LTD., and W. SOWDEN (B.P. 320,123, 7.7.28).—The pipes etc. are coated at 220—230° with a mixture of bituminous material, *e.g.*, "B₁ mexphalte," and about 10% of medium wool-fat pitch or fatty acid pitch blended at about 170° and subsequently incorporated with finely-divided carbonaceous material.

L. A. COLES.

Protective coatings for metal, wood, or other surfaces. J. DE B. W. GARDNER (B.P. 320,160, 23.7.28).—The surfaces are coated with an asphalt emulsion prepared with the use of clay as emulsifying agent; the emulsion, before it has set, is dusted over with a dry, powdered cement, *e.g.*, Portland cement.

L. A. COLES.

Apparatus for treating wet raw materials in the manufacture of cement. J. S. FASTING (U.S.P. 1,731,457, 15.10.29. Appl., 30.11.23. Denm., 22.12.22).—See B.P. 227,977; B., 1925, 232.

Bituminous emulsions (B.P. 319,101).—See II.

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

Cleaning of blast-furnace gas. The stream-line dry gas filter. R. M. COLLES (Iron & Steel Inst., Carnegie Schol. Mem., 1929, 18, 53—59).—Some experiments on the removal of dust from air by a small stream-line filter are recorded, and suggestions are made for the construction of a larger experimental filter for cleaning blast-furnace gases. Based on the results of the laboratory tests, such a filter plant covering the same ground space as a Halberg-Beth plant but being 4 ft. less in height should handle 29% more gas at 100° or the same volume of gas at 210° that the bag-plant will handle at 100°. A 6-ft. pack stream-line filter with a pressure difference between the outside and inside of 3 in. should handle 390 cub. ft./hr. or with a pressure difference of 7 in. 910 cub. ft./hr. Provided the dust is kept dry by operating the filter above 100° no clogging should occur once equilibrium has been established, and the dust should fall off the outside from time to time in the form of a cake, provided that the coarser particles were not removed as in present-day practice. A. R. POWELL.

Economics of modern dry-cleaning processes for blast-furnaces gas. M. ZILGEN (Stahl u. Eisen, 1929, 49, 1441—1444).—Detailed cost data are given for a Halberg-Beth filter plant and an electrical gas-purification plant working on the same type of blast-furnace gas. The power consumption averages 2.712 kw.-hrs./1000 m.³ of gas in the first case and 3.065 kw.-hrs. in the second case; the total cost, including overhead charges, is about 12% greater in the second than in the first-named plant. From theoretical considerations it is shown that it is not only advantageous but also economical to cool the purified gases before using them for heating purposes. A. R. POWELL.

Cast iron. IV. Influence of melting temperature on low-carbon cast iron. K. TANIMURA (Bull. Tech. Coll. Kyushu, 1928, 3, 266—276).—Iron containing 3% C and 1.19—2.5% Si was melted and slowly solidified. For high temperatures the degree of graphitisation is relatively small. The matrix of specimens melted at a high temperature was relatively heterogeneous. CHEMICAL ABSTRACTS.

Influence of structure of cast iron on changes due to high temperature. A. LE THOMAS (Compt. rend., 1929, 189, 639—641).—The differences in behaviour of a series of 10 bars of cast iron (C 3.34, Si 1.51, Mn 0.57, S 0.07, P 0.27%) of diameters varying from 13.0 to 100.5 mm., but otherwise similar, due to heat treatment have been examined. The Brinell hardness, expansion due to a cycle reaching 850°, and amplitude and temperature (this last but slightly) of the Ar transformation all steadily diminish as the thickness of the bars increases, whilst the effect of the fusion of the phosphorus eutectic is perceptible at a lower tem-

perature (960°) for a thin bar than (1020°) for a thick one. The Ac point remains unchanged throughout, and the temperature of graphitisation after rising steadily to that of the Ac point for a bar of 30 mm. diam. thereafter remains constant. Thus a more slowly cooling thick bar is more stable than a quicker cooling thin one. C. A. SILBERRAD.

Sulphur in cast iron. K. HASEGAWA (Iron and Steel, Japan, 1928, 14, 1072—1083).—In white cast iron sulphur exists chiefly as ferrous and manganous sulphides; in grey cast iron most of the sulphur is present as manganous sulphide, the remainder existing as ferrous sulphide when the manganese content exceeds 0.5%. When the iron contains less than 0.5% Mn, and the silicon content is high, part of the sulphide is insoluble in acid; the insoluble compound is probably an unstable compound formed by interaction between iron, sulphur, iron carbide, and iron silicide. CHEMICAL ABSTRACTS.

Effects of nickel and chromium on cast iron. I, II. D. HANSON (Metallurgist [Supp. Engineer], 1929, 147, 38—40, 56—60).—With increasing amounts of nickel (up to 20%) the Brinell hardness is maximal at 2% Ni, minimal at 3% Ni, subsequently rises slightly, and then declines. With silicon one maximum is observed. The joint effect is essentially the sum of the individual effects. Silicon and nickel decompose, but chromium stabilises, free carbide in grey iron. CHEMICAL ABSTRACTS.

Effect of service on endurance properties of rail steels. J. R. FREEMAN, JUN., and H. N. SOLAKIAN (Bur. Stand. J. Res., 1929, 3, 205—246).—Tests have been carried out to compare the endurance properties of steel rails before and after service. In one case after being subjected to 20,000,000 tons of traffic no change in the endurance properties was found, and it is concluded that the rails were not subjected in service to stresses exceeding the endurance limit. In another case an appreciable reduction in endurance limit was found with rails subjected to 12,000,000 tons of traffic. In this case a greater spread in the values for the endurance limit of different specimens, both before and after service, was found, and fatigue is attributed to the presence of impurities acting as fatigue nuclei. The necessity for improving the soundness of rail steels is emphasised, rather than reducing wheel loads which are below the endurance limit for sound rail steels. C. J. SMITHHELLS.

Low-expansion nickel steel. T. F. RUSSELL (Engineering, 1929, 128, 400—402).—The uses of a steel containing 36% Ni, known commercially as "Nilex" and generally used for clock pendulums, standard tapes, etc., have been extended to engineering parts. Although this alloy is used chiefly on account of its low coefficient of expansion ($[2-0.3] \times 10^{-6}$), the mechanical properties are comparable with those of a 0.3% carbon steel, though previous heat treatment influences both the mechanical properties and the expansion coefficient, which remains low only throughout a comparatively small range of temperature. The harder the alloy the lower is the temperature range during which there is a constant coefficient of expansion, and the lower this coefficient the more easily is it increased by heating the alloy. Alloys having a very low coefficient cannot be

heated to 100° without increasing the coefficient, though this is not liable to alter in an indefinite period if the alloys are maintained within the range of probable constancy of coefficient.

C. A. KING.

Influence of the use of sponge iron on the properties of steel. W. ROHLAND (Stahl u. Eisen, 1929, 49, 1477—1485).—The mechanical and working properties of soft iron and steel made from sponge iron have been determined, using charges of 150—250 kg. melted in arc, induction, and crucible furnaces, and the results are shown in numerous tables and graphs. Direct melting of sponge iron yields a product equal to Lancashire soft iron, and mild steel made from it is free from ageing faults even when only 0.03% Mn is present. Tool steels can be made directly from sponge iron without addition of a deoxidising agent, and with only 0.02% Mn or Si they have a good surface hardness and a tough core. Owing to the high purity of the steel made in this way the pearlite can be readily transformed into granular cementite, the rate of diffusion of carbon in pure steel being very high. Alloy tool steels from sponge iron are much tougher than those made from pig iron, and less liable to develop faults during heat treatment. Steels for clock springs and cutting tools made from sponge iron are superior to those made of Swedish iron. For steel wires alloys with 0.85—0.9% C may be used in place of the usual steels with 0.7% C as they have a tensile strength 20—30% higher with an equal ductility and bending strength. Microscopically and analytically little difference can be found between steel made from pig iron and the same steel made from sponge iron.

A. R. POWELL.

Improving the toughness of high-speed tool steel by carbide annealing. R. HOHAGE and R. ROLLETT (Arch. Eisenhüttenw., 1929—30, 3, 233—239; Stahl u. Eisen, 1929, 49, 1519—1520).—The effect of hot-rolling and subsequent annealing on the toughness of a high-speed tool steel with 0.72% C, 0.15% Si, 0.30% Mn, 4.49% Cr, 19.6% W, 0.37% Mo, and 1.58% V has been investigated. In the hard-rolled state the Brinell hardness was 652 when the temperature at the end of the rolling was 400° or 900°, and 600 when the final temperature was 700°. Annealing at 850° produced the minimum hardness in all cases, but only in the case of metal rolled at 700° was the maximum bending angle obtained at this temperature; in all cases, however, this angle was small. Maximum toughness was produced by quenching the alloy at 650—750° after annealing at 800°. Micrographic examination showed this behaviour to be due to refining of the primary carbide and to the secondary carbide, originally precipitated in a disperse form, subsequently coalescing with the primary carbide and leaving a purely pearlitic ground-mass.

A. R. POWELL.

Application of spectrographic analysis in steel-works' laboratories. K. KELLERMANN (Arch. Eisenhüttenw., 1929—30, 3, 205—211; Stahl u. Eisen, 1929, 49, 1520—1521).—A review of recent work. The determination of the minor constituents of steels by the comparison of the intensities of "homologous pairs" is briefly described.

A. R. POWELL.

Rapid analysis in the metal foundry. C. TAMA (Z. Metallk., 1929, 21, 342—343).—A review. Rapid electrolytic methods with rotating electrode and spectral-colorimetric analysis save considerable time in the foundry laboratory so that copper, nickel, or iron determinations may be made while the metal is held ready for casting. A table is given showing the extinction values obtained with the Herzfeld-Hoffmann spectral-colorimeter with copper nitrate solutions of concentrations between 2.4 and 7.9 g./litre of copper.

A. R. POWELL.

Converting low-grade [copper] matte at Rio Tinto. H. R. PORRS (Bull. Inst. Min. Met., 1929, Oct., 10 pp.).—A typical Rio Tinto matte contains 44.95% Fe, 21.94% Cu, 23.96% S, 2.1% Zn, and small quantities of lead, bismuth, antimony, nickel, and slag constituents. About 3% of the iron is in the free state; about 75% of the remainder is present as ferrous sulphide, and the remainder as magnetite. The converters used are of the Great Falls type, 12 ft. in diam. with 22 tuyères of 1¼ in. diam. made of solid drawn-steel tubing. The magnesite lining is 19 in. thick on the tuyère half and 15 in. on the opposite half, the bricks being set with a plain magnesite and water cement. On starting a new lining the converter is washed out with slag having a high magnetite content so as to form a protective layer for the magnesite lining. The slag produced during blowing has the following average composition: 12.64% SiO₂, 60.77% FeO, 18.61% Fe₂O₃, 3.42% Cu₂S, and 0.51% Cu₂O. In order to keep the temperature to an average of 1400° briquettes of a low-grade precipitate copper (65% Cu) are added from time to time during the blowing. The average production of a converter between one complete lining and another is 15,000—20,000 tons, but the tuyère belt is repaired after every 1200 tons. The average amount (tons) of matte used per blow is 21.4, of flux 4, of copper precipitate 3.16, and of air 3.2; the slag produced is 22 tons and the blister copper 5.04 tons.

A. R. POWELL.

Inverse segregation [in alloys]. W. FRAENKEL and W. GÖDECKE (Z. Metallk., 1929, 21, 322—324).—To study the origin of inverse segregation tests were made on copper-aluminium and copper-zinc alloys by casting in a chill mould, withdrawing the molten central portion through a hole in the bottom of the mould when a crust had formed round the sides, and analysing the crust and determining its sp. gr. In all cases the crust contained more copper than the average composition of the molten metal, hence segregation had taken place in the normal way. On the other hand the sp. gr. of the crust was about 3% less than that of the cast ingot, indicating porosity. These results substantiate the theory that inverse segregation is caused by contraction of the primary crystal skeleton causing voids between the outside of these crystals and the sides of the mould; the low pressure in these voids then sucks part of the inner molten metal through the porous crystal skeleton on the outside of which it solidifies. Thus the outside of the ingot has a lower, and the succeeding layers a higher, content of the constituent of higher m.p. than the interior.

A. R. POWELL.

X-Ray study of castings. I. Perkin's metal. G. SHINODA (Suiyokaishi, 1928, 5, 687—694).—The solubility of tin in the α -solid solution of copper and tin is 14%. The small thermal effect at 577° is caused by transformations of the β -phase. The transformation at 578° for the alloy containing 30—38.4% Sn is a peritectoid reaction, $\beta + \text{Cu}_3\text{Sn} \rightarrow \delta$; another eutectoid reaction, $\gamma \rightarrow \beta + \text{Cu}_3\text{Sn}$, occurs at 637°. The compound Cu_4Sn has no solubility on the copper side. Changes in electrical resistance with temperature were followed.

CHEMICAL ABSTRACTS.

Influence of iron, silicon, and manganese on the ageing of duralumin. K. L. MEISSNER (Z. Metallk., 1929, 21, 328—332).—Tests on duralumin made from the purest aluminium containing less than 0.03% each of silicon and iron have confirmed that silicon is not essential to ageing at the ordinary temperature, magnesium alone imparting these ageing properties to the alloy. Other than that of increasing slightly the tensile strength, addition of silicon to form Mg_2Si has no effect whatever. Iron also is without effect on the ageing of duralumin, except that it increases the absolute tensile strength to a greater extent than silicon. Addition of 0.6% Mn results in a large increase in the tensile strength, and this beneficial action is enhanced by the presence of 0.3% Si, but decreased by 0.3% Fe; the simultaneous presence of 0.3% Si and 0.3% Fe yields an alloy with the same properties as that free from these constituents. The deleterious effect of more than 2% Mg on the ageing of duralumin is ascribed to its action in depressing the solid solubility of copper in aluminium, and it is suggested that the actual function of the small magnesium content of duralumin is to accelerate the separation of CuAl_2 from the supersaturated solution, and to cause this separation to take place at lower temperatures. This theory postulates that the true age-hardening constituent in duralumin is CuAl_2 , the addition of magnesium simply intensifying its action.

A. R. POWELL.

Corrosion of aluminium alloys in superheated steam. L. GUILLET and BALLAY (Compt. rend., 1929, 189, 551—553; cf. B., 1928, 862).—The deterioration of aluminium alloys in superheated steam at 300—350° is due to formation of alumina, and occurs at the junction of the grains. It is influenced by the presence of other metals, though these do not necessarily enter into reaction, and is greatest for the purest samples of aluminium in both still and circulating steam, and least for alpac (13% Si). The rate of corrosion also appears to depend on the thermal and mechanical history of the alloy.

J. GRANT.

Solution potentials of aluminium alloys in relation to corrosion. J. D. EDWARDS and C. S. TAYLOR (Amer. Electrochem. Soc., Sept., 1929. Advance copy. 8 pp.).—In connexion with the development of materials known as "Alclad," consisting of an aluminium alloy coated homogeneously with nearly pure aluminium, measurements have been made of the *P.D.* between pure aluminium and certain of its alloys in salt solutions. The alloys are practically always nobler than the pure metal, and are therefore protected by it from corrosion. This is particularly true for the alloy 17ST, which is a

heat-treated and naturally-aged alloy of the duralumin type. Measurements of the *P.D.* between aluminium or its alloys and brass, copper, iron, steel, zinc, and galvanised iron under similar conditions indicate that aluminium and its alloys are always baser than the other metals except zinc, galvanised iron, and, in some cases, steel. Under the conditions of experiment zinc is definitely baser than aluminium or the alloy 17ST, but there is no definite tendency for either metal to corrode at the expense of the other when in contact.

H. J. T. ELLINGHAM.

Aluminium and its alloys in aircraft. T. W. BOSSERT (Amer. Electrochem. Soc., Sept., 1929. Advance copy. 7 pp.).—The properties of some special alloys are outlined and their particular applications in aircraft construction reviewed.

H. J. T. ELLINGHAM.

Magnesium and its alloys in aircraft. W. G. HARVEY (Amer. Electrochem. Soc., Sept., 1929. Advance copy. 11 pp.).—The properties and applications of magnesium and its alloys are reviewed. Special reference is made to the alloy containing 7% Al and 0.4% Mn, which has a tensile strength of 25,000 lb./in.² as cast, and 33,000 lb./in.² after heat treatment. The presence of the manganese increases resistance to corrosion. Castings are now commercial products and forgings are coming into use. The lightness of magnesium alloys commends them for many aeroplane parts.

H. J. T. ELLINGHAM.

X-Ray differentiation between mechanically and electrolytically produced gold coatings. U. DEHLINGER and R. GLOCKER (Z. Metallk., 1929, 21, 325—326).—X-Ray examination by the Laue-Debye method of the coatings removed from the articles by treatment with hydrochloric acid affords an indication as to whether the article is rolled gold or annealed electro-gilt. The former gives a röntgenogram which shows a characteristic rolling structure, the (112) direction being in the direction of rolling, and the (011) plane in the plane of rolling. Annealed gilt coatings have an irregularly oriented crystal structure. If rolled-gold articles are annealed after rolling, 22-carat coatings lose the rolled structure at 500°, 14-carat at 600°, and 12-carat above 650°; hence the method cannot be applied to finished articles in all cases.

A. R. POWELL.

Desulphurisation of burnt pyrites. FICAI and PIACENTINI. **Source of aluminium.** SEKI.—See VII. **Electrolytic corrosion.** ANGEL and BECK-FRIIS.—See XI.

See also A., Nov., 1220, **Producing long single crystals of metal** (GOETZ and HASLER). 1229, **Austenite \rightarrow martensite in hardened steel** (SCHEIL). 1231, **Adsorption of phosphoric acid by stannic sulphide [in bronze analysis]** (CHANDELLE). 1247, **Electrodeposition of chromium** (ROUDNICK). 1253, **Tantalum** (SPITZIN and KASHTANOV). **Preparation of pure uranium** (BOTOLFSSEN). 1259, **Electrometric determination of copper** (PRING and SPENCER). **Determination of aluminium** (BENEDETTI-PICHLER). 1261, **Continuous purification of mercury** (BOTOLFSSEN).

PATENTS.

Treatment of materials for the concentration of iron contained therein. S. G. S. DICKER. From

BRADLEY-FITCH Co. (B.P. 319,309, 19.6.28).—The ore is heated at 400–450° in an atmosphere of reducing gas containing hydrogen and steam, the heat required being generated by partial combustion of the gases. The product, which contains ferrosferric oxide, is subjected to magnetic separation for the recovery of the iron. (Cf. B.P. 319,392; *infra*.) A. R. POWELL.

Briquettes for use in refining or treating molten metals [iron]. G. C. CASTLE, C. WOOD, and BEECROFT & PARTNERS, LTD. (B.P. 319,603, 22.6.28).—The briquettes are composed of a ferro-alloy, e.g., ferro-silicon, -manganese, -phosphorus, -chromium, -vanadium, or -titanium, bonded with lime cement and sodium carbonate. A. R. POWELL.

Direct production of iron or steel. H. D. PIERSON and others (HELDING & PIERSON), and A. E. M. LEDEBOER and others (STAALSYND. DR. LEDEBOER) (B.P. 287,925, 21.3.28. Holl., 30.3.27).—Sponge iron is melted in a furnace by means of a current of hot gases produced by a surface-combustion burner, the gases being almost or completely burnt before coming into contact with the charge. A. R. POWELL.

Production of iron or steel of a low degree of cold-brittleness, blue fracture, etc. VEREIN STAHLWERKE A.-G. (B.P. 294,246, 16.7.28. Ger., 21.7.27).—The molten metal prior to casting is treated with at least 0.1% Al, Ti, Mg, Zr, or other metal having a similar deoxidising action, and the resulting castings are rolled at temperatures between 700° and the Ar₃ point, and are then subjected to a normalising anneal. A. R. POWELL.

Heat-treatment of iron. A. F. MEEHAN, ASSR. to MEEHANTE METAL CORP. (U.S.P. 1,731,346, 15.10.29. Appl., 22.7.29).—In the manufacture of cast iron a casting, resulting from molten metal to which has been added an amount of an alkaline-earth metal in excess of that which would be neutralised by any element of the molten mixture, is heat-treated. F. G. CROSSE.

Die-casting of cast iron. C. MEIER (U.S.P. 1,731,676, 15.10.29. Appl., 20.6.25).—To produce a free-flowing, non-scaling iron suitable for use under pressure in steel moulds, about 2% of an alloy containing not less than 50% Al, 25% Ni, and 25% Si is mixed with pig iron. F. G. CROSSE.

Cast-iron alloys. CLIMAX MOLYBDENUM Co., ASSEES. of J. K. SMITH (B.P. 308,751, 19.6.28. U.S., 28.3.28).—The alloy consists of iron with 2.7–3.7% C of which 0.2–0.8% is combined, 1.5–3% Si, 0.05–0.2% S, 0.1–1.25% P, 0.25–1.25% Mn, and 0.2–2.5% Mo. The preferred composition is 3.3% C (0.6% combined), 2.16% Si, 0.09% S, 0.54% P, 0.43% Mn, and 0.35–2% Mo. The last-named is added as a high molybdenum-silicon-iron alloy free from carbide. A. R. POWELL.

[Copper-iron] alloys [containing chromium]. W. P. DIGBY (B.P. 319,899, 30.8.28).—Alloys of iron with 10–25% Cu, 0–9.5% Cr, 0.2–0.8% Mn, and 0.8% C are claimed. The materials are melted in an electric furnace the electrodes of which supply the carbon, and the manganese is added about 5 min. before casting. A. R. POWELL.

Production of molybdenum-bearing iron. CLIMAX MOLYBDENUM Co., ASSEES. of A. KISSOCK (B.P. 299,800, 19.6.28. U.S., 1.11.27).—Pig iron containing a predetermined quantity of molybdenum is obtained by adding the requisite quantity of molybdenum oxide, calcium molybdate, or molybdenum sulphide to the usual blast-furnace charge. A. R. POWELL.

Air-toughened alloy [manganese] steel. J. H. HALL and J. S. COMERFORD, ASSRS. to TAYLOR-WHARTON IRON & STEEL Co. (U.S.P. 1,732,202, 15.10.29. Appl., 16.5.27).—A steel containing less than 1% C, an effective amount up to 5% Ni, less than 0.5% Si, and 10–15% Mn. F. G. CROSSE.

Electrodeposition of metal [iron]. F. K. BEZZENBERGER, ASSR. to ALUMINUM Co. OF AMERICA (U.S.P. 1,729,607, 1.10.29. Appl., 14.7.21. Renewed 7.6.24).—As electrolyte a solution of ferrous sulphate containing precipitated iron hydroxide in suspension and having a mud-like consistency is claimed. F. G. CROSSE.

Froth-flotation processes. F. KRUPP GRUSONWERK A.-G. (B.P. 310,834, 4.8.28. Ger., 1.5.28).—Pulp for flotation treatment is fed centrally into a conditioning vessel through which it passes alternately towards and away from the periphery along a series of superimposed transverse surfaces in a tortuous path to a central discharge outlet in such a way that settling and thickening are avoided. A. R. POWELL.

Roasting of fines ore. C. L. LEVERMORE, ASSR. to GEN. CHEM. Co. (U.S.P. 1,730,738, 8.10.29. Appl., 23.2.28).—In the desulphurisation of finely-divided sulphide ores having a moisture content of less than 0.3%, the ores are roasted while in gaseous suspension. F. G. CROSSE.

Extraction of mercury from its ores and from residues of their roasting. I. CAVALLI (U.S.P. 1,731,669, 15.10.29. Appl., 22.9.27. It., 24.9.26).—The ore or waste material is concentrated hydraulically, and subjected to the action of an alkali hypochlorite. F. G. CROSSE.

Working-up of materials containing lead, tin, copper, and antimony. HÜTTENWERK NEDERSCHÖNEWEIDE A.-G. (B.P. 294,487, 23.7.28. Ger., 21.7.27).—Scrap bearing metal etc. is heated in a shaft furnace by means of oil burners operating at the top so that the heat travels downwards by conduction. The lead-tin alloy which melts out of the mass gradually flows downwards, alternately solidifying and re-melting, and is finally tapped from the bottom of the shaft. A. R. POWELL.

Production of [non-corrosive] aluminium alloy. D. R. TULLIS (B.P. 319,967, 31.10.28).—Aluminium is alloyed with 0.5–5% Mg, 0.2–3% Cr, 0.1–2% Ca, and, if desired, up to 0.2% Si. The alloy is refined by the process described in B.P. 272,326 (B., 1927, 606). F. G. CROSSE.

Production of pliable tungsten. M. N. RICH, ASSR. to WESTINGHOUSE LAMP Co. (U.S.P. 1,731,269, 15.10.29. Appl., 23.1.25).—Tungsten which has become brittle by the absorption of hydrogen is rendered pliable by arranging it as the anode in an electrolyte, so that when a current is passed through it nascent oxygen is evolved at the surface of the metal and is isolated from the action of cathodic hydrogen. F. G. CROSSE.

Resistance alloy. M. N. RICH, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,731,267, 15.10.29. Appl., 1.3.27).—An alloy containing at least 60% Cr and at least 40% W.
F. G. CROSSE.

[Tungsten-tantalum] alloy. J. W. MARDEN, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,731,255, 15.10.29. Appl., 22.10.26).—A mixture of powdered tungsten with tantalum oxide is compressed, sintered *in vacuo* to consolidate it and reduce the oxide, and heat-treated at about 2000° to cause diffusion of the metals.
F. G. CROSSE.

Recovery of manganese values from solutions containing manganese. S. G. S. DICKER. From BRADLEY-FITCH Co. (B.P. 319,392, 19.6.28).—In the extraction of manganese from ores by the process described in B.P. 284,098 (B., 1928, 235) the solution of manganese sulphate obtained by leaching the reduced ore with ammonium sulphate solution is heated first with a small quantity of ammonia and agitated with air to remove iron, then with a larger quantity of ammonia and air to precipitate the manganese, the ammonia being derived from the previous leaching process. The insoluble residues from this process are magnetically separated and the non-magnetic product is returned to the reduction furnace, preferably after treatment on concentrating tables for the removal of silica.
A. R. POWELL.

Treatment of ores and the like containing manganese. S. G. S. DICKER. From BRADLEY-FITCH Co. (B.P. 319,605, 19.6.28).—Manganese ore reduced in coal gas at 400–450° (cf. B.P. 284,098; B., 1928, 235) is leached in two stages with hot ammonium sulphate solution under reduced pressure, the ammonia being removed as rapidly as it forms and more than 2 mols. of ammonium sulphate being present for every mol. of manganous oxide. (Cf. B.P. 319,392, preceding.)
A. R. POWELL.

Gold alloys. V. D. DAVIGNON, Assr. to GEN. PLATE Co. (U.S.P. 1,731,210–3, 8.10.29. Appl., [A, B] 10.6.26, [C, D] 23.6.28).—Homogeneous, malleable, and ductile alloys are claimed containing (A) Au 58, Cu 8, Mg 3, Zn 5, Ag (by diff.) 26%; (B) Au 50, Si 1–3, Mn 1%, and the remainder copper; (C) Au 25–85%, substantial amounts up to 3% of metal of the group consisting of silicon and titanium, small but substantial amounts of manganese, and the remainder chiefly silver; and (D) Au 25–85%, Ti up to 3%, and the remainder chiefly copper.
F. G. CROSSE.

Case-hardening of metals. P. W. and E. B. SHIMER (B.P. 292,557, 21.6.28. U.S., 22.6.27).—A case-hardening bath comprises a fused mixture of calcium and sodium chlorides to which is added at hourly intervals 0.25–1% of calcium cyanide and/or cyanamide.
A. R. POWELL.

Treatment of iron pyrites. S. I. LEVY (U.S.P. 1,730,514, 8.10.29. Appl., 25.2.28. U.K., 10.2.28).—See B.P. 307,188; B., 1929, 399.

Purifying pig iron. F. WÜST (U.S.P. 1,730,960, 8.10.29. Appl., 30.6.27. Ger., 17.7.26).—See B.P. 274,438; B., 1928, 862.

Hardening of high-speed steel. W. STAUFFER, Assr. to A.-G. DER MASCHINENFABR. ESCHER WYSS & CIE. (U.S.P. 1,731,549, 15.10.29. Appl., 7.4.28. Switz., 23.4.27).—See B.P. 289,082; B., 1929, 250.

Bearing-metal alloy. K. MÜLLER and W. SANDER (U.S.P. 1,731,021, 8.10.29. Appl., 21.7.28. Ger., 1.10.20).—See B.P. 174,610; B., 1923, 316 A.

[Cast-steel] annealing cases. ACIÉRIES RÉUNIES DE BURBACH-EICH-DUDELANGE SOC. ANON. (B.P. 310,489, 25.6.28. Luxembourg, 27.4.28).

Casting and rolling copper. UNITED STATES METALS REFINING Co., Assees. of W. F. EPPENSTEINER and H. M. GREEN (B.P. 305,998, 12.2.29. U.S., 13.2.28).

Furnaces for heat-treating metals etc. (B.P. 319,300).—See I. Electric furnace for metals (B.P. 297,826).—See XI.

XI.—ELECTROTECHNICS.

Electrolytic corrosion due to current leakages and its prevention. G. ANGEL and C. BECK-FRIS (Chem.-Ztg., 1929, 53, 553–554, 574–575).—Some examples of electrolytic corrosion due to leakage of current in a generating station and in the neighbourhood of underground conductors are briefly described, together with methods for measuring the resistance of the local cells set up and the loss of energy due to leakage. Several methods of preventing corrosion of electric tramway rails are mentioned.
A. R. POWELL.

Oxidation of toluene. MITCHELL.—See III.

See also A., Nov., 1247, **Electrodeposition of chromium** (ROUDNICK). **Production of nitric oxide** (BRINER and RIVIER). **Preparation of phenylhydrazine** (MCCLEURE). 1251, **Behaviour of alkali fluoroborates in tungsten-filament lamps** (DE BOER). 1259, **Determination of copper** (PRING and SPENCER). **Cæsium-magnesium photo-cell** (ZWORYKIN and WILSON). 1276, **Electrolytic reduction of acetone** (HAGGERTY). 1291, **Electrolytic preparation of 2:4-diaminophenol** (BRADT and BROWN).

PATENTS.

Electric resistance furnace for the thermal treatment of metals etc. "INFRA," Assees. of V. SORREL and L. A. LAFONT (B.P. 297,826, 17.9.28. Fr., 29.9.27).—The temperature of an electric furnace is automatically regulated by a balance, the equilibrium of which is controlled by the variations with temperature of the state of magnetisation of a magnetic body.
J. S. G. THOMAS.

Electron-discharge device. F. ROTHER (B.P. 300,547, 24.10.28. Ger., 14.11.27).—A cathode in an evacuated vessel is bombarded with α - or β -particles or with γ -rays emitted from a radioactive anode freed from gas, the active area of the cathode being smaller than the area of the anode.
J. S. G. THOMAS.

Electron-discharge device. H. C. RENTSCHLER and J. W. MARDEN, Assrs. to WESTINGHOUSE LAMP Co. (U.S.P. 1,731,268, 15.10.29. Appl., 28.3.25).—The envelope contains a cathode of the thoriated type and an anode composed of copper containing occluded hydrogen.
F. G. CROSSE.

Insulating [cellulosic] filament. H. A. GARDNER (U.S.P. 1,730,417, 8.10.29. Appl., 10.1.28).—A cellulosic filament contains an electrically non-conducting resin and finely-divided, non-conducting, micaceous material.
J. S. G. THOMAS.

Electrolytic preparation of antiseptic and cicatrising solutions. F. CHEVRIE and M. L. GRILLE (B.P. 320,096, 4.4.28).—An antiseptic solution is electrolysed between substantially horizontal electrodes, the anodic current density being so high that considerable ozone is produced.
J. S. G. THOMAS.

Photo-electric cell. R. HART (U.S.P. 1,730,505, 8.10.29. Appl., 30.1.28).—A selenium cell containing iodine is claimed.
H. ROYAL-DAWSON.

Manufacture of nickel flakes for use as admixture in the active material of alkaline accumulators. E. BREUNING and O. SCHNEIDER, Asss. to ELECTRIC STORAGE BATTERY Co. (U.S.P. 1,732,179, 15.10.29. Appl., 6.7.27. Ger., 27.7.26).—See B.P. 275,221; B., 1928, 198.

[Liquid replenisher for] electrical accumulators and storage batteries. D. E. WASHINGTON (B.P. 320,026, 31.3.28).

[Vulcanite frames for electrodes of] electric accumulators. C. J. WARD and S. E. HILLMAN (B.P. 319,634, 21.6.28).

Manufacturing [spraying of emissive substances on to] cathodes of thermionic valves. S. LOEWE (B.P. 293,694, 9.7.28. Ger., 9.7.27).

[Medical] apparatus for X-ray investigation. SIEMENS-REINIGER-VEIFA GES. F. MEDIZ. TECHN. M.B.H. (B.P. 301,377, 11.10.28. Ger., 28.11.27).

Charging gases with vapours (B.P. 305,089). Apparatus for evaporating, distilling, etc. (B.P. 319,849).—See I. **Indicator for inflammable gases (B.P. 319,530). Converting carbon into liquid hydrocarbons (U.S.P. 1,730,997).**—See II. **Revivification of potassium ferrocyanide (B.P. 319,147).**—See VII. **Electrodeposition of iron (U.S.P. 1,729,607). Pliable tungsten (U.S.P. 1,731,269). Resistance alloy (U.S.P. 1,731,267).**—See X. **Dehydration of rubber (B.P. 299,713).**—See XIV. **Preservation of liquids (B.P. 294,903).**—See XIX.

XII.—FATS; OILS; WAXES.

Fats. A. VAN RAALTE (Rec. trav. chim., 1929, 48, 1058—1060).—Fats are separated into solid and liquid phases by extraction with a mixture of alcohol and acetone at ordinary temperature. The proportion of liquid varies with the source (*e.g.*, lard > beef fat). The refractive indices, iodine and Crismer values of the original fat and solid and liquid phases all vary considerably. The different solid (or liquid) fractions of the fats examined also show varying differences.
H. BURTON.

Fat of the seed of the murumuru (*Astrocaryum murumuru*). M. SARAIVA (Mem. Inst. Chim. Rio de Janeiro, 1929, No. 2, 5—19).—A botanical description of the murumuru is given. The dried seed contains 39.7% of fatty material extractable by ether, m.p. 32°, iodine value (Hübl) 11.0, acid value 14.5, saponif.

value 242.0, Reichert-Meissl value 2.8, n_D^{20} 1.4540 (cf. André and Guichard, A., 1925, i, 1124; B., 1925, 728). The composition, determined by separating the lead salts of the fatty acids, bromination of the unsaturated fraction, and distillation of the methyl esters of the saturated fraction, is as follows: glyceryl radical 5.89%; acid radicals: octoyle 1.03%, decoyle 1.47%, lauryl 39.92%, myristyl 34.55%, palmityl 4.26%, stearyl 2.01%, linoleyl 0.38%, oleyl 10.13%, unsaponifiable matter 0.26%. The fat is edible and tasteless and suitable for the manufacture of margarine or pomades.
R. K. CALLOW.

Microdetermination of glycerol in fats by Zeisel and Fanto's method. B. FLASCHENTRÄGER (Mikrochem., 1929, Pregl Fest., 89—90).—The glycerol in 20 mg. of fat can be satisfactorily determined by Willstätter's method, using concentrated hydriodic acid. The isopropyl iodide formed is decomposed and the silver iodide weighed.
H. F. HARWOOD.

Injurious action of heavy metals on soaps during the washing process. E. L. LEDERER (Deut. Parfümerieztg., 1928, 14, 487—488; Chem. Zentr., 1929, i, 2714).—A discussion.
A. A. ELDRIDGE.

Chemical and physical characteristics of cod oil [industrial cod-liver oil]. A. D. HOLMES, W. Z. CLOUGH, and R. J. OWEN (Oil and Fat Ind., 1929, 6, [10], 15—18).—The characteristics of a number of industrial cod-liver oils of various qualities (pure to tannery cod oils) were determined; these show wide variations and the need for standards of these oils is emphasised.
E. LEWKOWITSCH.

Oil seeds. ANON. (Bull. Imp. Inst., 1929, 27, 277—289).—The oils prepared from two varieties of perilla (*P. ocymoides*) seed from Assam and one (*P. nankinensis*) from Manchuria had, respectively, d_{15}^{15} 0.9350, 0.9344, 0.9348; n_D^{20} 1.475, 1.475, 1.474; acid value 1.2, 2.3, 2.6; saponif. value 192.6, 192.6, 192.9; iodine value (Hübl, 17 hrs.) 198, 196.8, 192.6; unsaponif. matter 0.9, 1.1, 0.9%. The characteristics are thus similar to those recorded for *P. ocymoides* and commercial perilla oil, and meet the requirements of the U.S. specifications for this oil.

Oiticica nuts (*Lacania rigida*, Benth) from Rio Grande and Brazil yielded 74% of kernels which contained 4.7% of moisture and 61% of oil. The extracted oil was partly liquid and partly solid; a commercially expressed oil was a soft fat. The extracted (2 samples) and expressed fats had, respectively, d_{15}^{15} 0.9674, 0.9679; n_D^{20} 1.507, 1.504; acid value 1.8—5.6, 4.4; saponif. value 189.5—186.1, 190.8; iodine value (Wijs, 3 hrs.) 140.5—144.8, 139; unsaponif. matter 0.5—0.9, 0.9%; solidifying point of fatty acids 47.4—45.4, 44.8°. On heating the oil to 190° and above gas bubbles are formed; on heating at 250—270° (30 min.) the oil does not polymerise, but on slowly raising the temperature to 300° the oil forms a transparent jelly.

Mlenda seed (*Sesamum angustifolium*, Engl.) from Tanganyika contained 7.5% of moisture and by extraction yielded 28.9% of a pale green limpid oil which gave a very slight deposit on keeping. The oil had d_{15}^{15} 0.9365, acid value 16.8, saponif. value 181.6, iodine value (Hübl, 17 hrs.) 117.7, n_D^{20} 1.4708, and gave a positive Baudouin

reaction. The meal contained (corresponding figures for sesamé cake in parentheses): moisture 8 (8.12)%, crude proteins 23.8 (39.6)%, fat 0.3 (13.01)%, carbohydrates etc. (by diff.) 18.5 (22.0)%, crude fibre 42.8 (4.36)%, ash 6.6 (12.9)%, nutrient ratio 1:0.8 (1:1.31), food units 79 (154). The seeds thus resemble sesamé, but are of lower value on account of the low yield of oil and the poor cake containing a very large amount of fibre.

The kernels (64.2%) from kullan nuts (*Balanites orbicularis*, Sprague) from British Somaliland contained 6.3% of moisture and 37.2% of a clear yellow oil (extracted) which had: d_{15}^{25} 0.9184, n_D^{20} 1.4623, acid value 0.3, saponif. value 192.7, iodine value (Hübl, 17 hrs.) 75.9, unsaponif. matter 0.5%, solidifying point of fatty acids 38.6°. The residual meal contained saponin but no cyanogenetic glucosides, gave positive reactions when tested for alkaloids, and had moisture 9.6%, crude proteins 30.5%, oil 1.4%, carbohydrates etc. (by diff.) 50.4%, crude fibre 3.7%, ash 4.4%, nutrient ratio 1:1.8, food units 130. The oil is non-drying and suitable for soap-making, and possibly for edible purposes.

Babassu (*Orbignia martiana*, Barb. Rodr.) fruits and kernels, from the States of Para and Amazonas, on extraction with light petroleum yielded solid fats and buff-coloured tasteless meals. The characteristics of the oils agreed closely with those already recorded for babassu fat (cf. Bray and Elliott, B., 1916, 1121). The kernels contained, respectively, 5.1 (4.9)% of moisture, and 67.3 (67)% of oil, which had d_{15}^{20} 0.8672, 0.8672; m.p. 24.1°, 25.4°; n_D^{20} 1.450, 1.450; acid value 3.5, 1.8; saponif. value 251.0, 254.7; iodine value (Wijs, 3 hrs.) 13.4, 9.7; unsaponif. matter 0.7, 0.8%; solidifying point of fatty acids 21.4°, 21.1°; volatile acids (sol.) 6.0, 6.4%; (insol.) 13.3, 13.0%. The composition (%) of the meals (expressed on meal containing 7% of fat) was: moisture 10.8 (10.5), crude proteins 22.7 (20.5), fat 7.0 (7.0), carbohydrates etc. (by diff.) 42.3 (47.8), crude fibre 12.7 (8.7), ash 4.5 (5.5); their nutrient ratio was 1:2.6 (1:3.1), food units 117 (117).

E. LEWKOWITSCH.

Oil from seeds of the anda-assú (*Johanesia princeps*, Vell). L. GURGEL and F. RAMOS (Mem. Inst. Chim. Rio de Janeiro, 1929, No. 2, 21—29).—A botanical description of the anda-assú is given. The seed contains 51.8% of oil extractable by ether, acid value 24.8, saponif. value 207.3, iodine value (Hübl) 122.5, n_D^{25} 1.4742. The composition, determined by separating the lead salts of the fatty acids, bromination of the unsaturated fraction, and distillation of the methyl esters of the saturated fraction, is as follows: glyceryl radical 4.23%; acid radicals: oleyl 42.5%, linoleyl 43.10%, myristyl 2.20%, palmityl 5.03%; unsaponifiable matter 0.97% (a substance, m.p. 131°). The oil is used as purgative, particularly in veterinary medicine. It is suitable for use in soap-making.

R. K. CALLOW.

Oil from [seeds of] the páo marfim (ivory wood) (*Agonandra brasiliensis*, Miers). L. GURGEL and T. F. DE AMORIM (Mem. Inst. Chim. Rio de Janeiro, 1929, No. 2, 31—38).—A botanical description of the plant is given. Extraction of the seeds with ether yields

35% of brown, viscous oil, d_{15}^{25} 0.9602, n_D^{25} 1.4925, acid value 66.8, saponif. value 207.3, iodine value (Hübl) 112.3, completely soluble in cold alcohol, soluble in 11 pts. of light petroleum. The composition, determined by separating the lead salts of the fatty acids, bromination of the unsaturated fraction, and distillation of the methyl esters of the saturated fraction, is as follows: glyceryl radical 4.90%; acid radicals: ricinoleyl 44.85%, linoleyl 34.65%, oleyl 11.45%, myristyl 2.21%, palmityl 1.32%, unsaponifiable matter 0.60%. The oil is easily oxidised, and may be sulphonated to yield a product resembling Turkey-red oil. Prolonged action of sulphuric acid and partial hydration yields a spongy substance which might be used in the preparation of rubber substitutes.

R. K. CALLOW.

Oil from seeds of *Sapindus trifoliatus*, Linn. [soapnut tree]. D. R. PARANJPE and P. R. AYYAR (J. Indian Inst. Sci., 1929, 12A, 179—184).—The soapnut fruits gave 65.7% of pericarp and 34.3% of seeds (one third kernels). The kernels yielded on extraction 44.7% of a dark yellow oil which deposited a small amount of stearine on keeping and had d_{15}^{20} 0.8540, n_D^{25} 1.4764, saponif. value 194.1, iodine value 58.5, Reichert-Meissl value 1.5, acetyl value 0.0, unsaponif. matter 1.2%, Hehner value 93.5 (cf. Menon, J.S.C.I., 1910, 29, 1431). The mixed fatty acids had saponif. value 195.4, iodine value 61.3, equiv. wt. 287, titre 47°; saturated acids 38.5%, n_D^{20} 1.4400, equiv. wt. 292.5; unsaturated acids 61.5%, iodine value 86.2, equiv. wt. 283, n_D^{20} 1.4450. From bromination experiments and fractionation of the methyl esters of the saturated acids it is deduced that the oil consists of the glycerides of palmitic (5.6%), stearic (8.5%), *n*-eicosic (21.9%), lignoceric (2.5%), and oleic (61.5%) acids. The unsaponifiable matter yielded 30% of (mixed) sterol, m.p. 115—120°. The oil is thus a rich source of *n*-eicosic acid.

E. LEWKOWITSCH.

Pecan [*Hicoria pecan*] oil. G. S. JAMESON and S. I. GERTLER (Oil and Fat Ind., 1929, 6, [10], 23—24).—The nut fragments from the preparation of the edible pecan nuts or "meats" can be utilised for the production of an excellent salad oil of a mild agreeable flavour. The (expressed) oil had: d_{25}^{25} 0.9141, n_D^{25} 1.4692, saponif. value 190, iodine value (Hanus) 100, unsaponif. matter 0.35%, acid value 7.0, Reichert-Meissl value 0.05, Polenske value 0.30, acetyl value 7.4, saturated acids 5.09% (corr.), unsaturated acids 89.54% (corr.; iodine value 105.5). The saturated acids were separated by the lead salt-ether method, esterified (methyl alcohol), and fractionally distilled; the composition of the unsaturated acids was calculated from the iodine value. The oil contained the glycerides of oleic 77.8, linoleic 15.8, myristic trace, palmitic 3.3, stearic 1.9, and arachidic acids 0.1%, and unsaponif. matter 0.35%.

E. LEWKOWITSCH.

Vegetable oils of the Union of S.S.R. III. Nature of fatty oils of *Anacardiaceæ*, in connexion with the climate of district of origin. S. IVANOV and A. J. MAGNITOVA (Chem. Umschau, 1929, 36, 322—324; cf. B., 1929, 923).—Characteristics of the oils from various members of the *Anacardiaceæ* (pistacia, sumach, etc.) are collated: the preponderating unsaturated acid of the oils of these tropical and sub-tropical

plants is oleic acid. In passing from sub-tropical to tropical plants, the linoleic acid content of the oils decreases progressively and the amount of saturated acids increases; the iodine value changes correspondingly within the limits 120 (*e.g.*, *Pistacia nutica*) and 25—30 (*e.g.*, *Mangifera indica*). E. LEWKOWITSCH.

Formula for calculating the organically combined sulphur trioxide in sulphonated oils. R. HART (Chem. Umschau, 1929, 36, 321—322).—It is shown that the second formula, $\% \text{SO}_3 = 8(F - B)/56 \cdot 1$, given by Nishizawa and Winokuti (*cf.* B., 1929, 402) is a special case of the general formula, $\% \text{SO}_3 = 8(F + A)/56 \cdot 1$, given by Bauer and the American Leather Chemists' Association (*cf.* B., 1919, 871A), which is applicable to all cases if *A* (mg. KOH/g. of oil) is taken as positive when it indicates the amount of acid needed to neutralise the soap, and as negative when it indicates the alkali required to neutralise an acid oil. E. LEWKOWITSCH.

Reclamation of tung oil. STEINHOFF.—See XIII.

See also A., Nov., **Determination of organic peroxides** (MARKS and MORRELL). 1270, **Preparation of fatty acids from their higher homologues** (ROCHUSSEN). 1271, **Mechanism of degradation of fatty acids by mould fungi** (STENT and others). **Separation of glycerides** (SUZUKI and others). 1292, **Irradiated sterols** (MONTIGNIE). 1306, ***Embelia Ribes*** (KAUL and others). 1330, **Halibut tumour oil** (KAMM).

PATENTS.

Rendering and/or digesting subjects containing fats and separating the products. M. GEARIN & SONS, LTD., and J. R. CULLEN (B.P. 297,728, 2.7.28. Austral., 26.9.27).—The material is treated in a steam-jacketed digester with open steam introduced at a temperature and pressure lower than those employed for the jacket steam (*e.g.*, 5—20, and 30—50 lb./in.², respectively) to ensure the dryness of the former; the digester is designed to facilitate the collection of the oil from the charge. E. LEWKOWITSCH.

Detergents. H. and J. COPLAND (B.P. 320,088, 4.7.28).—A jellified detergent for carpets etc., containing soap, sodium carbonate, colloidal clay, and a large proportion of water, with, if desired, sodium borate, is claimed. E. LEWKOWITSCH.

Manufacture of toilet soaps, and of medicated or disinfectant soaps. P. VILLAIN (B.P. 319,804 and 319,832, 26.4.28).—The rosin in soap is replaced by an aromatic resinous composition produced by emulsifying as required terpenes (or sesqui- or poly-terpenes), synthetic or natural resins, and residues from the solvent-extraction of flowers ("floral wax") with glycerin, a suitable solvent (*e.g.*, methyl alcohol, diacetone), and an emulsifier (*e.g.*, 5% ammonium sulphoricinoleate). Medicinal and disinfectant substances (*e.g.*, iodine, formalin, birch tar) are added as required. E. LEWKOWITSCH.

[Medicated] soap. P. H. TODD (U.S.P. 1,731,551, 15.10.29. Appl. 25.5.27).—A soap composition contains 1—15% of cresol and 0.25—3% of mercuric iodide.

F. G. CROSSE.

Production of [non-caking] soap threads. A. WELTER (B.P. 319,807, 26.5.28).—An alkali salt, or

mixture of such salts, excepting sodium carbonate, *e.g.*, bicarbonates, sulphates, borates, per-salts, β -naphthalenesulphonates, up to the amount producing salting-out, is added to the soap paste or curd soap (preferably in the liquid state), with or without the addition of fat solvents; the solid mixture is pressed through fine nozzles (max. diam. 1.5 mm.).

E. LEWKOWITSCH.

Apparatus for spraying and applying viscous oils or fats. C. RICHTER (B.P. 295,362, 10.8.28. Ger., 10.8.27).

Substances resembling cork (B.P. 300,207).—See V.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Oxidation and weathering of linseed oil paints.

II. J. D'ANS (Z. angew. Chem., 1929, 42, 997—999; *cf.* B., 1928, 935).—It has been noted that the oxidation products of linseed oil include a large number of fatty acids. To test the effect of these on the durability of paint, films of linseed varnish either alone or with different pigments were prepared and drops of the acids in question allowed to fall upon them. With the varnish alone the effect varied inversely with the volatility of the acid, that of formic and acetic acid being negligible. If basic pigments, *e.g.*, white lead, are present, the lower acids dissolve the pigment without affecting the film, producing transparent spots. The higher acids, however, render the film brittle and cause blisters, particularly with zinc white. Hexoic acid in a moist atmosphere at 34° renders all films soft and pasty in a short time, and the effect persists after removal of the acid. In this case the linoxyn molecule has apparently suffered hydrolysis; the products of this hydrolysis are known to be very complicated. In appearance the various films closely resembled films naturally damaged by weather. The steps in the weathering of paint are therefore (1) oxidation, (2) hydrolysis of the oxidation products and interaction of the compounds so formed with the pigment.

C. IRWIN.

Testing and evaluation of the durability of paints. H. WOLFF (Farben-Ztg., 1929, 35, 182—185).—A dissertation on weathering tests, normal and accelerated, and the conclusions to be drawn therefrom. Stress is laid on common fallacies in the interpretation of such tests, *e.g.*, a "chalking" paint may be more durable than one that develops porosity without chalking. Two types of rusting are considered: (a) the "classic" type, in which the combined action of water and air causes disintegration of the iron surface under the paint; and (b) the type in which dissolved iron permeates the paint film and is oxidised as a surface layer, leaving the iron surface in good condition under the paint, as can be demonstrated by removing the film. Forecasts of the durability of paints can but be guesses in view of variations in conditions of application, drying, etc., and guarantees of a definite life for a paint are considered to be unreliable and misleading.

S. S. WOOLF.

Action of pigments on tung oil. H. WAGNER (Farben-Ztg., 1929, 35, 179—182).—The consistency of

pigment-tung oil pastes stored in tubes for one year showed a general tendency towards thickening, leading in some cases to the production of hard, crumbly masses, attributable to the separation of β -elæostearin. Freshly ground pastes examined microscopically at ages of from 1 to 14 days show differences as to the extent and crystalline form of glyceride separated. Iron oxide pigments, chromium hydroxide-green, cadmium-orange, some types of ultramarine-blue, barytes, china clay, calcium carbonate, etc. ground in tung oil show little divergence from the behaviour of a tung oil film in regard to separation of β -elæostearin, such variations as may occur being attributable to mechanical influence on crystallisation. Catalytic influence on the $\alpha \rightarrow \beta$ rearrangement is, however, considered to be evinced by the relatively great divergence from tung oil of pastes containing zinc sulphide, lithopone, and most ultramarine-blues (positive catalysis), and zinc oxide, calcium carbonate (negative catalysis). Photomicrographs of the various pastes are given. It is suggested that the phenomenon is capable of being linked with the drying and polymerisation of tung oil. S. S. WOOLF.

Pigment and oil. E. KLUMPP and H. MEIER (*Farben-Ztg.*, 1929, 35, 127—128).—The view that oil absorption corresponds to pore-volume only, virtually regardless of the size and nature of the pigmentary particles, is discussed (cf. B., 1929, 862). The relations between primary and secondary particles account for all possible changes in oil absorption on grinding pigments. Baldwin's experiments (cf. B., 1929, 443) are criticised on the grounds that he worked with indefinite secondary particles. By the use of peas, glass beads, seeds, etc. it is demonstrated that the oil absorption-composition curve for binary mixtures of primary pigments of different sizes should show a minimum. This is confirmed, using mixtures of barytes (diam. of particle 10—15 μ) with white lead (2 μ), "high-dispersion" red lead (1.5—2 μ), and zinc yellow (1.5 μ), respectively. As the difference in particle size diminishes, so does the curve flatten, and at equal particle size the minimum is absent, the mixture of two primary pigments behaving as a single one. S. S. WOOLF.

Glycerin used to reclaim china-wood [tung] oil [varnishes]. E. STEINHOFF (*Oil and Fat Ind.*, 1929, 6, [10], 25, 43).—Glycerin may be used for the purpose, whether the batch is cold and solid or has just begun to congeal. *E.g.*, a long-oil varnish containing 60 gals. of tung oil is heated with 1 gal. of glycerin, 5 lb. of litharge being sprinkled on to reduce the froth; the mixture is cooled and thinned as usual. The glycerin, forming an ester with the rosin and tung oil, hardens the product and makes it more waterproof, whilst the litharge serves to accelerate the drying. E. LEWKOWITSCHE.

Oxidation of turpentine in the open air. K. N. KOROTKOV (*Zapiski Belarus. Dzyarzh. Akad. Selsk. Gasp.*, 1928, 7, 142—153).—In the absorption of oxygen by turpentine carbon dioxide is formed; 30% of the oxygen absorbed is "active" and available. The turpentine from *Pinus sylvestris* can absorb 34 litres of oxygen per litre. CHEMICAL ABSTRACTS.

See also A., Nov., 1251, **Ultramarine** (HOFFMANN). 1306, **Resin of *Euphorbia palustris*** (MÜLLER).

PATENTS.

Manufacture of paint [from celluloid etc.]. R. J. CARRUTHERS (B.P. 319,978, 7.11.28).—Zinc oxide is ground in a mixture of a methyl-alcoholic solution of shellac and a suitable cellulose acetate solution, and added to a solution of preferably non-inflammable celluloid cuttings in a mixture of acetone, benzol, and absolute alcohol. S. S. WOOLF.

Preparation of synthetic resin varnishes. G. E. LANDT and W. H. ADAMS, JUN., ASSTS. to CONTINENTAL-DIAMOND FIBRE Co. (U.S.P. 1,731,071—2, 8.10.29. Appl., 31.8.27).—(A) The initial condensation product of a synthetic resin is dissolved in a solution prepared by causing ammonia and formaldehyde to interact to produce hexamethylenetetramine in an organic solvent. (B) The hexamethylenetetramine is produced in the solution of the synthetic resin in the organic solvent. S. S. WOOLF.

Liquid coating composition. G. H. MAINS, ASSR. to WESTINGHOUSE ELECTRIC & MANUF. Co. (U.S.P. 1,730,857, 8.10.29. Appl., 6.8.27).—The condensation products of formaldehyde, a drying oil, and a coal-tar acid containing a substantial amount of xylenol are claimed. S. S. WOOLF.

Coating of articles. E. I. DU PONT DE NEMOURS & Co. (B.P. 287,940, 30.3.28. U.S., 30.3.27).—An "anchoring" [priming] coat comprising a mixed ester of a polyhydric alcohol with a polybasic acid and a drying oil or the acids derived therefrom, a solvent for the ester, a drier, and pigment is applied to a metal or other surface, allowed to dry, and a coating of different composition is applied. The latter may be a "binding" coat of the drying-oil type, to be followed after drying by a "top coat" of a cellulose ester lacquer. S. S. WOOLF.

Synthetic resins and compositions prepared therefrom. E. C. R. MARKS. From E. I. DU PONT DE NEMOURS & Co. (B.P. 320,041, 27.3.28).—A polyhydric alcohol other than pentaerythritol is heated in a non-reactive atmosphere to 180—265° with substantially the theoretically required amounts of a polybasic acid and a drying-oil acid, with or without other acidic materials, *e.g.*, natural resins having an acid value of at least 50. Combinations of the synthetic resins thus obtained with cellulose esters or ethers are also claimed. S. S. WOOLF.

Manufacture of artificial [furfuraldehyde-amine condensation] products. H. KAPPELER (B.P. 293,872, 13.7.28. Switz., 14.7.27).—Furfuraldehyde, alone or mixed with other aldehydes, is condensed with urea and/or other amino-compounds, part of the reaction at least being conducted in the presence of an acid or a salt having an acid reaction. Solid, black, artificial resins, insoluble in the usual resin solvents, stable towards alkali lyes and dilute acids, and having the appearance of ebonite are obtained. S. S. WOOLF.

Cutting plates and sheets from blocks of artificial resins. K. W. and K. W. RASCHIG (F. RASCHIG) (B.P. 319,806, 30.4.28).

Non-splintering glass (B.P. 319,873).—See VIII.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Natural coagulation of *Hevea* latex. A. S. CORBET (Rubber Res. Inst. Malaya, Bull. No. 1, 1929, 17 pp.).—Latex in process of spontaneous coagulation is swarming with bacteria; isolation of the predominating organism has now been effected. This organism, designated *Bacillus pandora*, is a facultative anaerobe, able to decompose latex substances with formation of acid, and consequently to cause separation of the rubber. It subsequently attacks the proteins with production of ammonia and so is responsible for the acid serum and alkaline surface layer observed during the natural coagulation of latex. The effect of sodium sulphite or ammonia as anticoagulants is attributed to their removal of free lactic acid; assuming that a molecule of methylinositol can yield five carboxyl groups, the proportion of this substance in latex calls for 0.35 g. of ammonia per 100 g. of latex to prevent development of acidity.

D. F. TWISS.

Oil of pao marfim. GURGEL and DE AMORIM.—See XII.

See also A., Nov., 1307, **Isoprene and caoutchouc** (STAUDINGER and BONDY).

PATENTS.

Concentration of natural [rubber] latices. K.D.P., LTD., Assees. of METALLBANK U. METALLURGISCHE GES. A.-G. (B.P. 293,771, 11.7.28. Ger., 11.7.27).—In the production of reversible concentration products from natural latices, the addition of protective colloids such as soap can be dispensed with if alkali fluorides and/or salicylates are introduced prior to concentration.

D. F. TWISS.

Preparation of concentrated india-rubber latex. DUNLOP RUBBER Co., LTD., H. J. ALCOCK, ANODE RUBBER Co. (ENGLAND), LTD., KOOPMAN & Co., and ARTIEBOLAGET SEPARATOR (B.P. 319,410, 26.4.28).—Fresh latex is treated with 0.1–0.3% of ammonia and is then concentrated by centrifuging, *e.g.*, in an Alfa Laval machine (cf. B.P. 219,635; B., 1925, 139). The ammonia content of the concentrate is then adjusted to approx. 0.3–0.4%. The rubber in the "skim" is recovered by coagulation with acid.

D. F. TWISS.

Manufacture of rubber or rubber-like material. GOODYEAR TIRE & RUBBER Co., Assees. of A. M. CLIFFORD (B.P. 302,147, 4.9.28. U.S., 10.12.27).—Substituted aryl hydroxy-compounds, without substantial accelerating effect on vulcanisation, *e.g.*, α -amino- or α -chloronaphthol, are applied as anti-oxidants or age-retarders for rubber or rubber-like materials. D. F. TWISS.

Manufacture of rubber-like materials. J. C. WICHMANN, Assr. to CACTUS RUBBER Co. OF AMERICA (U.S.P. 1,703,702, 8.10.29. Appl., 20.9.27).—The concentrated juice from the fleshy parts of the cactus family is boiled with sodium tungstate, sodium molybdate, boiled linseed oil, and rubber dissolved in turpentine, and the resulting mass is dried and oxidised.

H. ROYAL-DAWSON.

Apparatus for filtering rubber dispersions and the like. ANODE RUBBER Co., LTD., Assees. of A. SZEGVARI and C. M. SPENCER (B.P. 294,215, 20.7.28.

U.S., 20.7.27).—A filtering device for latex, with a minimum of coagulant effect, permits continuous uniform flow or circulation of the liquid, such as is desirable, *e.g.*, in the manufacture of articles by electrodeposition. A continuous strip of filtering material, maintained in a moist condition, passes round a drum or cage into the interior of which flows the liquid to be filtered; the filtered liquid passes into the vessel in which the drum is contained and leaves by an aperture provided.

D. F. TWISS.

Production of deposits or coatings from aqueous suspensions of rubber. ANODE RUBBER Co. (ENGLAND), LTD., Assees. of COMP. GÉN. D'ELECTRICITÉ (B.P. 291,339, 29.5.28. Ger., 27.5.27).—Gel-forming substances (gelatin, agar-agar, white of egg) are added to aqueous suspensions of rubber which are then subjected to temperature changes through the surface of moulds brought into contact with the latter so that congealed layers incorporating rubber globuloids are formed at the mould surfaces. The formation of deposits may be aided by the addition of favourable substances (*e.g.*, sulphates, acetates, in the case of gelatin) and of preservatives, and also by the diffusive action of coagulants from the moulds. Substances which retard gelation or which tend to hydrolyse certain gel-forming substances, *e.g.*, alkalis, should be removed from the suspensions by known means, *e.g.*, dialysis. If the presence of the gel-forming substances as such in the deposits is undesirable they may be removed or rendered insoluble by treatment with suitable agents. D. F. TWISS.

Treatment of aqueous dispersions of organic materials such as rubber or the like. ANODE RUBBER Co. (ENGLAND), LTD. From F. GABOR (B.P. 319,801, 29.3.28).—Coagulation or gelling of latex is effected by heating, *e.g.*, for a short time at 80–90°, after the incorporation of a substance such as white of egg which normally has a neutral or stabilising action on the latex, but is coagulable by heat. This method of coagulation or gelling is applicable to latex in various forms, *e.g.*, in bulk, in layers (in or on moulds), or as filaments or tubing issuing from nozzles.

D. F. TWISS.

Dehydrating rubber deposited from aqueous dispersions. ANODE RUBBER Co., LTD., Assees. of C. L. DARBY (B.P. 299,713, 29.10.28. U.S., 28.10.27).—Layers or articles of rubber or similar substances formed from aqueous dispersions can be dried efficiently and rapidly by electroendosmosis, as much as 90% of the water in the deposit being removable in a few minutes with a sufficiently high voltage; *e.g.*, the deposit formed on an electrically conductive material is immersed in a conducting fluid such as mercury or an electrolyte, or is brought into contact with metal plates, the conducting fluid or metal plates being connected with the negative pole and the electrically conductive material which supports the rubber, with the positive pole of a source of electric current. D. F. TWISS.

Manufacture of rubber compositions. M. C. TEAGUE, Assr. to NAUGATUCK CHEM. Co. (U.S.P. 1,730,485, 8.10.29. Appl., 31.3.25).—The union between rubber and pulverulent materials is improved by evacuating the latter, treating with ammonia gas in the presence of

moisture, and then introducing them into the rubber, whereby fine dispersion is effected. D. F. TWISS.

Curing [vulcanising] of sheet rubber and the like. C. MACINTOSH & Co., LTD., and H. C. YOUNG (B.P. 319,448, 27.7.28).—In vulcanising lengths of sheet rubber by passing the sheet between an endless band and a heated rotatable drum, the weight of the drum is sustained by the endless band; the pressure thus exerted may be augmented or stabilised by other means, e.g., by the application of hydraulic pressure.

D. F. TWISS.

Manufacture of synthetic rubber. I. G. FARBEIND. A.-G. (B.P. 308,755, 6.7.28. Ger., 31.3.28. Addn. to B.P. 283,841; B., 1929, 485).—In the synthesis of rubber by polymerisation of an appropriate hydrocarbon in an atmosphere of hydrogen, nitrogen, or carbon dioxide, under the influence of an alkali metal, the presence of ethyl or phenyl ether or an olefine oxide or peroxide is especially valuable.

D. F. TWISS.

Production of [hollow] rubber articles. W. W. TRIGGS. FROM VEREIN. GUMMIWAREN-FABR. WIMPASSING VORM. MENIER-J. N. REITHOFFER (B.P. 320,451, 10.8.28).

Emulsions of diolefines (B.P. 318,296).—See III. **Dyes from rubber derivatives** (U.S.P. 1,724,270).—See IV.

XV.—LEATHER; GLUE.

(A) **Appearance and (B) bacteriology of red stains on salted raw hides.** F. STATHER and E. LIEBSCHER (Collegium, 1929, 427—437, 437—450).—(A) The flesh side of salted calfskins is sometimes covered with pink, orange-red, or red stains. In the last case the flesh side is slimy, the hair is easily removed after soaking, the fatty tissue in the adipose tissue is much decomposed, the surrounding fibres are attacked, and some damage is done to the grain. There are bacterial colonies in the epidermis, which is often destroyed. The extent of the bacterial growth and the damage to the hair roots vary directly as the extent of bright red stains on the flesh side. Increased loss of hide substance was observed in the soak liquors and lime liquors. (B) *Sarcina lutea* and *auriantica*, *Micrococcus tetragenus* and *roseus*, *Bacillus subtilis*, *Proteus*, and *Actinomyces* have been isolated from stained skins. These include bacteria which form red and yellow dyestuffs, respectively. *Actinomyces* which split up fats are known, and there is evidence that the *M. tetragenus* possess fat-splitting properties. The growth of these microorganisms was stimulated by the presence of sodium chloride in the case of *S. lutea* and *M. roseus*. As much as 16% of sodium chloride was required to prevent the growth of *S. lutea* and *auriantica* and *M. roseus*, and only 8% for *Proteus*, *Actinomyces*, and *B. subtilis*; 16% of sodium chloride considerably repressed the growth of *M. tetragenus*. The growth of these organisms was prevented at p_H 11.0, which requires an addition of 3% of calcined sodium carbonate to the sodium chloride used in salting.

D. WOODROFFE.

Sedimentation method of determining the insoluble matter in tannin analysis. V. KUBELKA and

V. NĚMEC (Collegium, 1929, 421—427).—The tan liquor of analytical strength is placed in a glass cylinder (diam. 10 cm.) through the upper part of the wall of which passes a tube fitted with a stopcock. The inside end of the tube bends down and terminates at a point called the zero mark. The liquor fills the cylinder to a mark 15 mm. above this. After keeping for 24 hrs. at 18—20°, particles larger than 1 μ have settled out of the tan liquor above the zero mark; the liquor can be withdrawn through the tube and used for the determination of the total soluble matter. Determinations of insoluble matter should be made on tan liquors of different strengths by this method. The results obtained at analytical strength are much less than those given by the filter-paper or filter-candle methods. A chestnut extract showed a maximum amount of sediment at a concentration of 22.5 g./litre, whilst the sediment from a quebracho extract increased continuously with increased concentration.

D. WOODROFFE.

Glue and gelatin. O. GERNGROSS (Z. angew. Chem., 1929, 42, 968—972).—The properties desired in both these substances are due to the gluten content. This can be judged by the definition of interference rings in the X-ray spectrum, but the method is too tedious for practical use. The water content is best determined by dissolving in a small quantity of water and evaporating so that a thin, easily dried film is obtained. The p_H value of gelatin can be determined potentiometrically, but glue must be titrated with nitrophenol indicators by Michaelis' method. The gluten content of gelatin can be roughly judged by measuring the bulk of precipitate formed by adding 2*N*-sulphosalicylic acid to its aqueous solution. A recent method has also been developed by which the gluten content is determined from the rate of gelatinisation under given conditions. Methods for the determination of viscosity, m.p., bending strength, etc. are described.

C. IRWIN.

See also A., Nov., 1235, **Behaviour of swollen gelatin in water vapour** (SCHREINEMAKERS). 1335, **Swelling of cod-fish skins** (KERNOT and KNAGGS).

XVI.—AGRICULTURE.

Determination of the maximum molecular moisture-holding capacity of soils by centrifuging, and the characterisation of the mechanical properties of soils by this determination. A. F. LEBEDEV (Pochvovedenie, 1928, 23, No. 1—2, 49—69).—The force necessary to remove gravitational water from various types of soil has been determined. A classification of soils based on the molecular moisture-holding capacity checks well with the classification based on mechanical analyses.

CHEMICAL ABSTRACTS.

Field trials and Neubauer experiments [for determining fertiliser requirements of soils]. F. SCHEFFER (Z. Pflanz. Düng., 1929, 8B, 501—515).—Relative practical values of the results of field trials and those of Neubauer's seedling method are compared and discussed. The work of Gerlach (B., 1929, 143) is considered in the light of the requisite limiting values. The differences in the nature of the factors measured by the two methods are discussed. A. G. POLLARD.

Fixation of phosphates in soils. C. O. WILLIAMS (Proc. Dept. Conf. Div. Chem., S. Africa, Series No. 100, 1929, 426—438).—The literature concerning soil acidity and phosphate fixation is reviewed and the general inference is drawn that the superiority of water-soluble phosphates over mineral phosphate fertilisers is largely discounted in the acid soils of Natal.

A. G. POLLARD.

[Simplification of] the citrate test [for the determination of water-soluble phosphate in superphosphate]. A. SUCHIER (Z. angew. Chem., 1929, 42, 990—992).—The precipitate of magnesium ammonium phosphate in as crystalline a form as possible is prepared as usual, rapidly collected and washed on a glass filter, decomposed with a known excess of 0.5*N*-hydrochloric acid, and the excess titrated with methyl-orange and standard alkali. If the prescribed quantities are strictly adhered to the results do not vary more than 0.2% from those given by the gravimetric method.

C. IRWIN.

Decomposition of citric acid by soil. L. A. and A. L. DEAN (Soil Sci., 1929, 28, 281—287).—Certain Hawaiian soils are able to decompose citric acid with the production of acetone and carbon dioxide. The determination of citric-soluble phosphates is seriously affected thereby.

A. G. POLLARD.

Relation between the adsorbed and the exchangeable calcium and magnesium content of a soil four years after additions. W. H. MACINTYRE and K. B. SANDERS (Soil Sci., 1929, 28, 289—304).—Soils and subsoils were treated with lime, limestone, and dolomite and examined by means of lysimeters for their "fixation" of calcium and magnesium, and by Hissink's method for exchangeable bases. The amounts of calcium and magnesium "fixed" were consistently greater than those accounted for as exchangeable bases, the difference being more pronounced in surface soils than in subsoils. The ratio of exchangeable calcium to exchangeable magnesium was greater than the ratio of these bases in the rain-water percolates. It is suggested that a portion of the added lime etc. is combined with soil components other than the absorbing complex.

A. G. POLLARD.

Micro-organisms of and reactions occurring in farmyard manure made in different ways, with special reference to H. Krantz' method of preparing synthetic farmyard manure. W. GOETERS (Landw. Versuchsstat., 1929, 108, 1—60; Bied. Zentr., 1929, 58, 456—458).—The total number of micro-organisms in farmyard manure is greatly diminished both at high and at low temperatures, *i.e.*, 60—80° or 0°, whilst the greatest activity takes place at 20—40°. Higher temperatures kill most of the vegetative forms, only spores surviving. At 60° thermophilic organisms are active. Properly handled "synthetic" farmyard manure is poor in vegetative organisms, and mesophilic organisms are much reduced in numbers by heat in the first day after composting. Urea-decomposing bacteria develop heat-resisting forms and play an important part in dung ripening. The development of cellulose-decomposing organisms varies according as the conditions are anaerobic or aerobic, the anaerobic ones being less able to

withstand high temperatures. The number of heat-resistant cellulose-decomposing bacteria in synthetic farmyard manure is very low. The aerobic bacteria thrive best at 38—40°. The high bacterial content of the usual stall manure is reflected in its high loss of dry matter and plant foods, which is not the case with the synthetic material. The degree of nitrification of the nitrogen compounds in soil containing 1% of organic manure is 3 times as great in the internal layers as in the surface, and in the inside layers of synthetic manure 2—3 times as high as in the outside layers of farmyard manure. Plant yield increases in pots manured with hot-fermented manure (the Krantz method) were 2—4 times as large as when ordinary farmyard manure was used. In further pot experiments the "nitrogen efficiency" of the hot-fermented straw manure was 2—3 times, and of the hot-fermented peat manure 4 times, that of the ordinary material. E. HOLMES.

Manurial trials with town sewage in 1928. W. ZIELSTORFF, A. KELLER, and W. BRUTLER (Z. Pflanz. Düng., 1929, 8B, 481—501).—Treatment of field soils with sewage effluent resulted in increased crops of wheat, oats, potatoes, and pasture grasses. The fertiliser value of the effluent lies mainly in its nitrogen content. Considerable amounts of phosphate are also present, but the potash content is small. The digestibility of pastures was not greatly affected by treatment with sewage effluent, but the total crop per unit area was more than doubled. In pot experiments, clarification of the effluent before use had but little influence on the results.

A. G. POLLARD.

Oily plants. N. M. TULAIKOV (Zhur. Opit. Agron. Yugo Vostoka, 1928, 6, No. 2, 105—138).—Seasonal variations in the dry matter content of sunflower and flax were determined. The ash is highest in the leaves. The nitrogen content is high in the early period of growth, thereafter diminishing. The accumulation of ash and nitrogen in flax continues up to harvesting.

CHEMICAL ABSTRACTS.

Relation of calcium to the nodulation of soya beans on acid and neutral soils. W. A. ALBRECHT and F. L. DAVIS (Soil Sci., 1929, 28, 261—279).—The improved inoculation of soya-bean roots with *B. radicola*, brought about by the liming of acid soils, is due to the addition of calcium salts as well as the reduction of soil acidity. The natural fertility and previous cultural history of the soil are also important factors. No apparent relationship exists between the increased nodulation and the hydrogen-ion concentration or the amount of electro-dialysable calcium of the soil. Soya-bean organisms in clay suspensions are carried down with the coagulum during flocculation with calcium chloride solution, but only to an insignificant extent when potassium chloride is used. A. G. POLLARD.

Müntz nitrification process. A. P. FORJAZ (Compt. rend., 1929, 189, 585—586).—The roots of *Cytisus proliferus* (var. *palmensis*) were separated from the nodules accompanying them, each portion was incinerated separately, and the flame spectra of the hydrochloric acid extracts were examined. Lines not common to both preparations were due to molybdenum, nickel, and

cobalt (?), and these are considered specific elements in the biocatalytic fixation of atmospheric nitrogen.

J. GRANT.

Sulphur dioxide content of air and its influence on the plant. G. KÖCK, P. RECKENDORFER, and F. BERAN (Forts. Landw., 1929, 4, [6], 170; Bied. Zentr., 1929, 58, 467—470).—Systematic experiments were carried out in 1928 to test the effects of sulphur dioxide-air mixtures, varying from 1 pt. in 200,000 to 1 pt. in 20,000 pts. of air, on the growth and composition of red clover. In all, 32 plots, of approx. 2 m. \times 1.5 m., and covered with glass, were employed, 16 as controls, and 16 under different treatments. Sulphur dioxide in concentrations of 1 pt. per 200,000 and per 100,000 kept in contact with the plants for 1—4 hrs. had no significant effect on the amount of SO_2 in the dry matter of the plants when examined either 1 hr. or 2 days after fumigation, nor on the total digestible or indigestible protein of the clover. A significant increase in SO_2 in the plants was found when the concentration of sulphur dioxide was increased to 1 pt. per 50,000 and per 20,000 of air, but there was no variation in the protein content. Under the conditions of the experiment no deleterious effect on the fodder value of the clover was observable.

E. HOLMES.

Mechanism of plant nutrient intake. W. W. BUKWITSCH (Landw. Jahrb., 1929, 69, 521—541; Bied. Zentr., 1929, 58, 460—462).—A general discussion of the mechanism of the diffusion of nutrient salts through colloidal membranes and the bearing of the results on plant nutrient intake problems. From experiments with oats and buckwheat, it is found that increase in the acidity of the nutrient medium increases the nitrogen-hunger of the plant when the source of nitrogen is ammoniacal. With deficiency of phosphoric acid the plant shows minimal development in alkaline solutions. In the case of potash deficiency yield of oats is higher when the nutrient solution is alkaline. E. HOLMES.

Potash manuring of sugar beet. E. OHLY and T. REMY (Landw. Jahrb., 1929, 69, 401—427; Bied. Zentr., 1929, 58, 452—454).—It has been shown at Poppelsdorf that 1 kg. of nitrogen gives a 170-kg., and 1 kg. of potash a 70-kg., increase in yield of sugar beet. The increase due to nitrogen is obtained at the expense of quality, whilst with potash quality is maintained. Potash bound in soil complexes is more available to old than to young beet plants. After June either kainit or potash manurial salts gave quicker growth and brighter foliage of beet than potassium sulphate, and no soil acidification was apparent from the sulphate dressings. The proportion of leaf to root is increased more by kainit than by 40% potash salts; a tentative explanation is advanced. The original paper evidently discusses the potash requirements of the young plant at length.

E. HOLMES.

Effect of manuring on the quality of potatoes. E. GLASER and KLEBERGER (Landw. Jahrb., 1929, 69, 543—554; Bied. Zentr., 1929, 58, 454—456).—From experiments carried out during three years on a light, sandy loess-loam rich in humus, and on a heavy, sticky loam, both with average amounts of lime, under varying weather conditions, it is concluded that lack of phosphoric

acid and potash has important effects on total yield, and particularly on the yield of tubers, and the addition of these materials is often more important than soil type in potato cultivation. Increase in the application of phosphoric acid and potash gave as great increases in yield as increase in the complete dressings, including nitrogen. Heavy dressings of farmyard manure had neither as good an effect on the total yield nor on the yield of tubers as the complete mineral fertiliser, but additional dressings of phosphoric acid as superphosphate increased yields, and gave tubers of better quality. It is concluded that for potatoes cultivated for industrial and fodder purposes, increased amounts of phosphoric acid and potash must be used, whilst for potatoes for ordinary consumption increased amounts of a complete fertiliser are advisable. The normal dressing used contained 15 kg. N, 10 kg. P_2O_5 , and 20 kg. K_2O per hectare.

E. HOLMES.

See also A., Nov., 1256, **Determination of traces of iodine in organic substances** (SCHWAIBOLD). **Colorimetric determination of phosphorus** (VÁSÁRHELYI). **Determination of arsenic by the Gutzeit method** (NELLER).

PATENTS.

Manufacture of fertilisers. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOIT. DES PROC. G. CLAUDE, and E. URBAIN (B.P. 305,132, 18.1.29. Fr., 31.1.28).—A mixture of potassium and ammonium chlorides obtained as described in B.P. 210,399 (B., 1924, 530) is heated at 220—260° with phosphoric acid (d 1.6) sufficient to form the compounds $\text{M}'\text{H}_5\text{P}_2\text{O}_8$. When all the hydrochloric acid has been expelled, water is added until the temperature falls to 150° and gaseous ammonia is then passed into the vessel with vigorous stirring until a dry powdery mass of crystals of ammonium and potassium dihydrogen phosphates is obtained. Further quantities of ammonia may be added, after cooling to 50°, to form the monohydrogen phosphates.

A. R. POWELL.

Manufacture of fertilisers. J. Y. JOHNSON. FROM I. G. FARBEININD. A.-G. (B.P. 318,842 and 318,909, 10.3.28).—The products claimed in B.P. 236,494 (B., 1925, 732) are modified by replacing, completely or partly in every case, (A) the urea by ammonium sulphate or mixtures of it with sodium nitrate, and, if desired, the potassium nitrate and/or potassium sulphate by potassium chloride to yield a product with $\text{N} : \text{P}_2\text{O}_5 : \text{K}_2\text{O} :: 1 : 0.9 : 1.2$, or (B) the urea by sodium nitrate, and, if desired, the potassium nitrate and/or potassium sulphate by potassium chloride to yield a product with $\text{N} : \text{P}_2\text{O}_5 : \text{K}_2\text{O} :: 1 : 0.6 : 1.5$.

L. A. COLES.

Fertilisers (B.P. 318,404).—See II.

XVII.—SUGARS; STARCHES; GUMS.

Manuring of sugar beet. OHLY and REMY.—See XVI.

See also A., Nov., 1248, **Effect of X-rays on crystalline and dissolved sucrose** (REINHARD and TUCKER). 1273, **Acids from pectin of sugar beet** (EHRlich and SCHUBERT). 1281, **Solubility of starch**

in water below the swelling temperature (SAMEC and TOMAZO). 1337, Invertase from honey (PAPADAKIS).

PATENTS.

Treatment of molasses for yeast growth. DISTILLERS Co., LTD., W. G. BENNETT, and A. M. PEAKE (B.P. 319,641, 25.6.28).—For the removal of substances inhibiting yeast growth and of colouring matters, an adsorbent which is either ground-nut cake or calcium carbonate is added to neutral or slightly acid molasses. At the same time, or subsequently, a protein precipitant, such as tannin, is added together with a protein, *e.g.*, horse-blood serum, if the molasses is deficient in these.

C. RANKEN.

Cultivation of micro-organisms (B.P. 318,649).—See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Electrometric titration [of worts]. F. EMSLANDER (Woch. Brau., 1929, 46, 407—409).—The titration vessel consists of a U-tube, of which the two arms are connected by a wide tube immediately above the curved part. Just above this, one arm is widened to allow of the addition of the titration reagent without marked increase in depth of liquid. The wide arm carries the bridge and a spiral rotating stirrer, by which the contents of the vessel are caused to mix by circulating through the bend and connecting tube. The narrow arm is closed by a rubber stopper fitted with an inlet tube for hydrogen, and with a gold electrode plated with iridium and coated with platinum-black. This just dips into the liquid. The excess of hydrogen escapes through the connecting tube to the wide, open arm, to which the titration reagent is added. Equilibrium is very rapidly attained. The author titrates to p_H 4.5, 6.8, 8.3, and 9.18.

F. E. DAY.

Titration [of worts and beers] by stages. L. HEINTZ (Woch. Brau., 1929, 46, 393—396).—Since many beers have a reaction below p_H 4.27, the limit proposed by Kolbach (B., 1929, 373) for the acid titration, it is considered that the acid titration should be carried to p_H 4.00, especially as buffering is strong at this reaction. For the next stage p_H 5.50 is preferred to p_H 5.67 as being more nearly intermediate between p_H 4.00 and 7.07, and sufficiently removed from the original p_H of most worts (about 5.7—5.8) to give a check on the buffering. In the formol titration the additional alkali needed to reattain the final end-point at p_H 9.18 is independent of treatment or otherwise of the wort or beer with baryta and of the reaction at which the formalin is added. With 12.5% worts about 55% of the original titration value between p_H 7.07 and 9.18 remains after treatment with baryta, and as this is certainly not due to amino-acids capable of reacting with formalin, the inclusion of this with the formol titration as total amino-nitrogen is incorrect. The increased alkali used after addition of formalin is quite well-defined, and is best expressed as "formol nitrogen." The titration value after precipitation with baryta may be employed to give a further insight into the nature of the buffering substances. Details of

procedure are given, and the permanent standards of Kolthoff (B., 1922, 235 A) are found satisfactory and convenient, a single standard sufficing for methyl-orange at p_H 4.00 and for methyl-red at p_H 5.62.

F. E. DAY.

Decomposition of rye straw and maize stalks. HORVÁTH.—See V.

See also A., Nov., 1261, **Apparatus for distillation of sensitive solutions in a vacuum** (KRAUT and others). 1262, **Scopometer** (EXTON). 1266, **Determination of ethyl alcohol by chromic oxidation** (SEMICHON and FLANZY). 1339, **Physiological selection of enzymes by alcohol** (SEMICHON). **Determination of gas in fermentations** (RAYMOND). **Relation of acetyl group to fermentation** (HIGASHI). **Effect of various preparations on baker's and brewer's yeasts** (WILLIAMS and others). **Separation of nitrogen during yeast fermentations** (IVANOV and KRUPKINA). **Sulphite fermentation** (POLAK). 1340, **Behaviour of sodium glucosesulphite with yeast** (NEUBERG).

PATENTS.

Influencing the speed of enzymic reactions. F. F. NORD (B.P. 291,443, 18.5.28. Ger., 3.6.27).—Enzymes in the form of colloidal solutions or contained in cells are activated and rendered more resistant by exposure to an unsaturated hydrocarbon such as acetylene, ethylene, etc. An adsorption layer is formed on the surface of the enzyme and, in the case of enzymes contained in cells, the permeability of the cells is increased.

C. RANKEN.

[Solutions for the] cultivation of micro-organisms. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 318,649, 8.3., 23.6., and 10.9.28).—Peat is hydrolysed by heating with dilute acids, and the liquor, after filtration, is purified by the addition of, *e.g.*, calcium, barium, or zinc oxide in quantity sufficient to neutralise the acid and to precipitate humus substances, but not to react with the sugars present, yielding a solution which, after filtration and preferably after the addition of potassium and magnesium salts etc., is suitable for the cultivation of yeast etc. Removal of the humus substances is facilitated by aeration of the solution and by the precipitation of phosphates in it, *e.g.*, by adding phosphoric acid or soluble phosphates before the addition of calcium oxide etc. Stronger solutions are obtained by using the same acid liquor for the successive extraction of two or more batches of peat.

L. A. COLES.

Production of butyl alcohol and acetone by fermentation. DISTILLERS Co., LTD., and H. B. HUTCHINSON (B.P. 319,642, 25.6.28).—Starchy material, such as manioc, is fermented with added ammonium acetate to increase the yield of acetone, and with added ammonium lactate to increase the yield of butyl alcohol. The addition of such nitrogenous nutrients decreases the yield of ethyl alcohol.

C. RANKEN.

Manufacture of yeast. W. H. F. BÜHRIG, Assr. to FLEISCHMANN Co. (U.S.P. 1,730,876, 8.10.29. Appl., 14.5.25).—See B.P. 252,193; B., 1927, 857.

Molasses for yeast growth (B.P. 319,641).—See XVII.

XIX.—FOODS.

Detection of milk pasteurised by the holding method. R. HOCK (Milch. Zentr., 1929, 58, 309—311).—Milk which has been pasteurised by heating at 60—65° for $\frac{1}{2}$ hr. can be detected by the volume of serum which separates when the milk is treated with rennet. A 50-c.c. sample is brought to a Soxhlet-Henkel acidity of 5 by addition of 0.25*N*-caustic soda. To the milk warmed to 35—40° is added $\frac{1}{2}$ c.c. of dilute rennet essence (1:10), and, after shaking, the mixture is incubated in Petri dishes at 37° for 14 hrs. With unpasteurised milk the volume of serum is more than 40 c.c., but if the milk has been heated to 60—65° the volume is less than 40 c.c. The maximum found for pasteurised milk was 36 c.c., and the minimum for fresh milk 41 c.c. The nature of the precipitated casein affords further evidence of the heat-treatment the milk has undergone. Milk which has been heated to 70° or over gives a voluminous white curd with slight bubble formation due to aerogenic bacteria, whereas fresh milk or milk which has not been heated above 65° gives a thin, dense, fissured coagulum which adheres firmly to the bottom of the dish. The curds from milk heated to 65° or over can be readily poured off with the serum.

H. J. DOWDEN.

Baking quality of wheat varieties. F. SCHNELLE (Wiss. Arch. Landw., Abt. A, Pflanz. I, 1929, 471—555; Bied. Zentr., 1929, 58, 462—464).—The baking quality of various American, English, and European varieties of wheats is discussed. Differences in baking quality due to season are best reflected in the 1000-corn weight and litre weight, differences between varieties by the sp. gr. In general, rising power of a dough and the nitrogen content of the grain can be correlated with baking quality, but seasonal variations may alter the latter conclusion.

E. HOLMES.

Determination of vitamins-A, -B, and -C in collards and turnip greens. G. W. BURTON (J. Home Econ., 1928, 20, 35—42).—Cooking turnip greens or collards in water caused a loss of 10% or 40—50%, respectively, in the vitamin-B content; the vitamin-A was unaffected. Biological determinations of vitamins-A, -B, and -C are recorded.

CHEMICAL ABSTRACTS.

Vitamin-A content of avocados. L. S. WEATHERBY, J. E. YONTZ, and R. V. WATSON (J. Home Econ., 1929, 21, 360—364).—The avocado is rich in vitamin-A; biological tests are recorded. CHEMICAL ABSTRACTS.

Determination of free ammonia in decomposing meat. MUCHLINSKY (Z. Fleisch Milch-Hyg., 1929, 39, 189—190; Chem. Zentr., 1929, i, 2712).—The minced material (10 g.) is distilled for 1.5—2 hrs. with 20 pts. of carbon tetrachloride, in a flask provided with a ground-in adapter, delivery tube, and pipette-condenser, into 0.01*N*-hydrochloric acid. A. A. ELDRIDGE.

Packaging and quick-freezing perishable flesh products. III. Sanitary measures in fish-dressing plant. C. BIRDSEYE (Ind. Eng. Chem., 1929, 21,

854—857; cf. B., 1929, 697, 621).—When caught the fish is immediately gutted and boxed in ice for placing in cold store on reaching land. In the processing of haddock fillets, the fish is scaled under sea water, washed, filleted, skinned if not already scaled, brined, wrapped, and frozen very rapidly. To mitigate bacterial infection, which is high and increases during the processing, the plant is supplied with chlorinated sea water containing originally 7 p.p.m. and 1—3 p.p.m. by the time the wash-tank is reached. Sea water is preferable to fresh water since the former increases the salt content of the fish and, by partially coagulating the surface protein, lessens the absorption of protein by the water. The free chlorine content of the brine is maintained at 1—3 p.p.m. by hourly additions of sodium hypochlorite, and by this treatment the bacterial count of the fillets is reduced by 50%. Monel metal and nickel-chromium or chromium-plated equipment is used extensively, and the plant and buildings are cleansed with chlorinated sea water or hypochlorite solution.

H. J. DOWDEN.

Fats. VAN RAALTE. **Murumurú fat.** SARAIVA. **Pecan oil.** JAMIESON and GERTLER.—See XII.

PATENTS.

Preserving liquid nutriment such as milk and the like. F. SEIDAL and A. GIAN (B.P. 294,903, 30.7.28. Austr., 28.7.27).—The milk is sterilised, without affecting the flavour etc., by preheating to 63° and then passing through an evacuated vessel wherein it is subjected to a magnetic field and also to an electric current at 440 volts passing through the milk and thence from its surface through the rarified air to another electrode. Flow is continuous, the milk remaining in the vessel for about 15 min. Increased vitamin content is claimed.

E. B. HUGHES.

Preservation of the yolk and white of eggs, and of a mixture of the two. M. D. C. MICHAUD, and COMP. OLIVIER (B.P. 293,794, 2.7.28. Fr., 12.7.27).—Egg yolk or white or whole egg is mixed with sucrose (15—50%) or sodium chloride (4—17%), or mixtures of the two, with or without lactic acid (0.2—1%), and the product is dehydrated *in vacuo* to 70—90% of total solids and then packed in cans in an atmosphere of carbon dioxide and/or nitrogen.

E. B. HUGHES.

Sterilising and drying of fish materials and fish waste. C. DOWNS and R. A. BELLWOOD (B.P. 320,107, 5.7.28).—The vapours from the fish-drying plant are passed through a heat exchanger whereby the air used for drying is preheated.

E. B. HUGHES.

Production of egg products. A. K. EPSTEIN, Assr. to EMULSOL CORP. (U.S.P. 1,730,879, 8.10.29. Appl., 24.12.26).—See B.P. 305,844; B., 1929, 301.

Treatment [separation of leaf and stalk] of tea. C. S. BATEMAN (B.P. 319,843, 4.7.28).

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Preserving chloroform. N. SCHOORL (Pharm. Weekblad., 1929, 66, 880).—The addition of anhydrous citric or oxalic acid proposed by Oberhard (B., 1929, 338) is

found not to prevent oxidation of chloroform on keeping, even in sealed tubes.

S. I. LEVY.

Evaluation of vitamin-D preparations. A. SCHEUNERT and M. SCHIEBLICH (Klin. Woch., 1929, 8, 699; Chem. Zentr., 1929, i, 2800—2801).—A biological method is described, and comparative values for commercial preparations are recorded. A. A. ELDRIDGE.

Degree of hygroscopicity of tobacco. G. O. GABEL and G. KIPRIANOV (Ukraine Chem. J., 1929, 4, [Tech.], 117—134).—The degree of hygroscopicity of various grades of tobacco was determined at temperatures of 20°, 25°, and 30°, and humidities of 60, 70, 80, and 90%. With a humidity of 60% and temperatures of 25° and 30°, most tobaccos gradually lose moisture, the degree of hygroscopicity falling from 8.35—14.11% to 6.5—7.5%. Temperature changes of 5° and variations in humidity of 5% had no appreciable effect. At 20° and 25° and with 70% humidity most tobaccos with an initial degree of hygroscopicity of 7—8% tend to absorb moisture very slowly. With 80% humidity moisture is absorbed markedly at 20°, 25°, and 30°. Variations in temperature of 10° influence the rate of absorption, but not its final value. The rate is very high during the first day, but decreases rapidly, the lower grades of tobacco reaching their final values earlier than the higher ones. The experimental results were much less accurate than with the other sets of conditions. The hygroscopicity with a humidity of 90% was very high (20—33.2%), the lower grades having the lower value. As in the case of 80% humidity, the experimental results did not agree closely, and experiments showed that no apparent biochemical change was taking place in the leaves, the discrepancies being probably due to variations in the physical condition of individual leaves.

M. ZVEGINTZOV.

Extraction of nicotine from tobacco dust by kerosene. G. O. GABEL and G. I. KIPRIANOV (Ukraine Chem. J., 1929, 4, [Tech.], 109—116).—The tobacco dust was treated with calcium hydroxide solution, and the aqueous suspension shaken with kerosene. It was found that by using 700 c.c. of kerosene per 100 g. of tobacco (nicotine content 0.38—1.38%), and extracting at 80°, about 96% of the nicotine could be removed. The efficiency of the extraction decreased when the concentration of nicotine in the kerosene layer reached 2.83 g. On shaking the kerosene solution with sulphuric acid in equimolecular proportions 85% only of the nicotine could be extracted, the remainder requiring acid of 50% concentration. As nicotine sulphate is insoluble in kerosene, it was suspected that another basic substance was present. On treating the first acid extract with alkali a colourless liquid showing feebly basic properties and giving a picrate, m.p. 207—209°, was obtained. Its nature, however, could not be identified.

M. ZVEGINTZOV.

Use of kerosene for determination of the nicotine content in tobacco. V. D. KUTZENOS (Ukraine Chem. J., 1929, 4, [Tech.], 135—139; cf. preceding abstract).—A résumé of the existing methods of determining nicotine in tobacco, with a description of an experimental comparison of Tote's and Keller's methods. It was found

that extraction with light petroleum could in both methods be successfully replaced by extraction with kerosene.

M. ZVEGINTZOV.

Examination of samples of opium of varying composition. E. W. ANSINGH (Pharm. Weekblad, 1929, 66, 865—872).—The difficulties introduced into the analysis by the presence of considerable quantities of various gums may be overcome by a new method involving extraction of the morphine with 96% alcohol containing tartaric acid. An examination of results obtained by using varying quantities of quicklime showed that very low results may be recorded if insufficient lime is used, e.g., if the lime is partly slaked or contains magnesia.

S. I. LEVY.

Analysis of Peruvian bark, and the liquid extracts prepared therefrom. J. A. C. VAN PINXTEREN (Pharm. Weekblad, 1929, 66, 929—961).—The method of Commelin (Med. Kinaproefstat., 1912) for determinations of total alkaloids in the bark, and of quinine and cinchonidine, is discussed, and the objections raised by various authors are considered. In the crystallisation of quinine and cinchonidine tartrates, a double tartrate containing 1 mol. of quinine to 2 mols. of cinchonidine may be formed; this loses all its water of crystallisation in 3—4 hrs. at 110°. In the preparation of the liquid extract changes occur in the composition of the alkaloid mixture, though no specific action on any alkaloid group by hydrochloric acid could be detected. In the method of preparing the extract laid down by the Dutch pharmacopœia, the hydrogen-ion concentration changes irregularly, on account of the strong buffer action of constituents of the bark, and effective decomposition of the tannates occurs only after these have been removed in the early stages of the percolation. A good extraction can be obtained with the use of only 70% of the quantity of hydrochloric acid specified by the pharmacopœia.

S. I. LEVY.

Essential oils of the huahuan (*Laurelia serrata*). G. FESTER and J. SALGADO (Z. angew. Chem., 1929, 42, 987—988).—The bark of this tree, which is a native of Southern Chile, yielded on distillation 2.7% and the leaves 3.8% of essential oil calculated on dry weight. The bark oil has d^{15} 1.0426, n_D^{20} 1.52182, acid value 0, ester value 6.9, and consists chiefly of safrole. The leaf oil has d^{15} 0.9469, n_D^{20} 1.49632, α —12.5°, acid value 1.4, ester value 9.3, and contains a small quantity of sulphur. The commercial extraction of the oil in competition with camphor and sassafras oil is considered possible.

C. IRWIN.

Pyrethrum flowers. I. Determination of active principles. C. B. GNADINGER and C. S. CORL (J. Amer. Chem. Soc., 1929, 51, 3054—3064).—Using a modification of the method described by Staudinger and Ruzicka (A., 1924, i, 700), pyrethrins I and II have been isolated from the flowers of *Chrysanthemum cinerariifolium*, Bocc., and the toxicity of these towards cockroaches has been determined; the results agree with those of Staudinger and Ruzicka. Alcoholic solutions of pyrethrins I and II, like pyrethrolone (*loc. cit.*), reduce alkaline copper solutions; the reducing powers are considerably less than those of dextrose.

A modified Folin method (A., 1926, 648) is described which is applicable to the determination of the pyrethrins in the flowers. This involves extraction of the active principles with light petroleum, treatment of the alcoholic solution of the residue from the extract with lead acetate, and subsequent reduction of an alkaline copper sulphate solution with the filtrate. The reduced solution is compared colorimetrically with a similar solution using dextrose. For 16 samples of flowers examined the amount of pyrethrins I and II varied between 0.4 and 1.21%; the stems contain 0—0.04%. Daisy flowers (*Chrysanthemum leucanthemum*) contain no pyrethrins. Japanese and Dalmatian pyrethrum flowers contain the same active principles.

H. BURTON.

Preparation of some perfumes and flavouring extracts from furfuraldehyde and its derivatives. Esters of β -furylacrylic acid. H. GILMAN and G. F. WRIGHT (Iowa State Coll. J. Sci., 1929, 3, 109—112).—A study of the odour and taste of methyl, ethyl, propyl, isopropyl, butyl, amyl, benzyl, and furfuryl β -furylacrylate, the preparation of which is described.

CHEMICAL ABSTRACTS.

Anda-assú oil. GURGEL and RAMOS.—See XII.
Vitamins in collards and turnip greens. BURTON.
Vitamin-A in avocados. WEATHERBY and others.—See XIX.

See also A., Nov., 1213, **Spectrographic studies of hormones** (GRAUBNER). **Adsorption spectra of hormones and allied substances** (MARCHLEWSKI and SKARIZYŃSKI). 1255, **Limits of applicability of indicators in p_H determinations** (EISENBRAND). 1295, **Phthalide derivatives** (MAYER and others). 1306, **Cyclamin** (BUREŠ and BERGAUER). 1308, **Crystalline compounds from essential oils** (WIENHAUS and SCHOLZ). 1318, **Lupin alkaloids** (CLEMO and RAPER). **Identification of atropine** (FULTON). 1319, **Microchemical reactions of sparteine** (WAGENAAR). **Identity of pectinin with carnegin** (SPÄTH and KUFFNER). **Angostura alkaloids** (SPÄTH and PIKL). 1320, **Potentiometric determination of morphine** (MARIQ). **Strychnos alkaloids** (LEUCHS and others). 1321, **Benzthiazole arsenicals** (BOGERT and HESS). 1323, **Simultaneous determination of nitrogen and mercury in organic mercury compounds** (HERNLER).

PATENTS.

Manufacture of physiologically active substances [from internal secretive organs]. SCHERING-KAHLBAUM A.-G. (B.P. 291,006, Addn. B.P. 294,651, and 320,278, [A] 16.5.28, [B] 25.7.28, [C] 10.12.28. Ger., [A] 23.5.27, [B] 29.7.27).—(A) Extracts from, e.g., placenta or testicles are stirred with an alkaline-earth hydroxide and, if desired, a non-reacting adsorbent, e.g., kaolin, silica gel, in the presence of a mixture of water with not more than 50% of an organic solvent, e.g., methyl alcohol, acetone, and at a temperature not above 80°. After filtration, the solution is concentrated to expel the organic solvent and the residue is extracted with ether to recover the desired product. (B) The finely-divided organs are themselves treated, instead of

the extracts, as described in (A). In (c) the dried, finely-divided internal organs are treated as in (B).

L. A. COLES.

Manufacture of germ-gland hormones from vegetable organisms. SCHERING-KAHLBAUM A.-G. (B.P. 294,650, 25.7.28. Ger., 29.7.27).—Vegetable organisms, e.g., yeast or finely-ground wheat, or hormones previously extracted from them, are treated in suspension in water or in a mixture of an organic solvent and water with an alkaline-earth hydroxide and, if desired, a non-reacting adsorbent, e.g., kaolin or silica gel. After filtration, the solution is, e.g., evaporated to dryness or extracted with ether to recover the hormone (cf. B.P. 271,492; B., 1928, 769).

L. A. COLES.

Preparation of therapeutic substances from tubercle bacilli. I. SAISHO (B.P. 320,048, 2.5.28).—Tubercle bacillus preparations, after drying by suction on a filter, are ground for 5—10 min. with 20—37% hydrochloric acid or with 60—94% sulphuric acid and the acid, diluted if desired with physiological salt solution, is removed by centrifuging followed by repeated washing with physiological salt solution. The product, which is free from waxes, is diluted with physiological salt solution containing 0.5% of phenol to the strength required for injection.

L. A. COLES.

Manufacture of *o*-hydroxybenzylaminearsinic acids and their aroyl derivatives. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 318,315, 5.6.28).—*N*-Hydroxymethyl derivatives of aromatic amides (benzamide, phthalimide) are condensed with a *p*-nitrophenol, which may contain an *o*-substituent, to give the corresponding acylated nitrohydroxybenzylamine, which is reduced and converted by Bart's reaction into the hydroxybenzylaminearsinic acid, the acyl group being subsequently removed by hydrolysis if desired. Instead of a *p*-nitrophenol a *p*-hydroxyphenylarsinic acid may be used. The products are therapeutically valuable and have no neurotoxic properties. Examples are: *2-hydroxybenzylamine-5-arsinic acid*, m.p. 290° (benzoyl derivative, m.p. 220—221°; phthaloyl derivative, m.p. 276°); *3-aminomethyl-*o*-cresol-5-arsinic acid*, m.p. above 290° (phthaloyl derivative, m.p. 273°); phthaloyl derivative, m.p. 263—264°, of *6-chloro-2-aminomethylphenol-4-arsinic acid*. The phthaloyl derivatives, m.p. 225—226° and 95—97°, respectively, of 5-nitro- and 5-amino-2-hydroxybenzylamines are described.

C. HOLLINS.

Manufacture of ointments, particularly water ointments. F. MERZ (U.S.P. 1,732,105, 15.10.29. Appl., 28.9.26. Ger., 30.3.26).—See B.P. 268,719; B., 1928, 769.

Separation of particles suspended in liquids (B.P. 319,629).—See I. **Antiseptic solutions** (B.P. 320,096).—See XI. **Medicated soaps** (B.P. 319,832 and U.S.P. 1,731,551).—See XII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES

Grain growth in silver halide precipitates. SHEPPARD and LAMBERT.—See VII.

See also A., Nov., 1248, **Colour selectivity of photo-chloride** (WEIGERT and ELVEGARD). **Colour selectivity in dye systems** (WEIGERT and NAKASHIMA). 1249, **Daylight photometry** (ATKINS and POOLE).

PATENTS.

Films for colour photography and kinematography. SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS (B.P. 293,306, 29.6.28. Fr., 2.7.27).—Halation is eliminated on lenticular films, *e.g.*, those described in B.P. 10,611 (B., 1910, 720), by introducing into the sensitive emulsion insoluble or soluble coloured material capable of rendering non-actinic the rays reflected by the surface of the emulsion in contact with the support, *e.g.*, silver chromate, indulines, tartrazine.

L. A. COLES.

Production of gelatin relief plates or films for production of dye imbibition prints. W. C. FAIRWEATHER. From JOS-PE FARBENPHOTO-GES.M.B.H. (B.P. 319,077, 20.6.28).—Unripe gelatin-silver bromide emulsions of 5–8° Scheiner are used for the production of relief by tanning and subsequent removal of the untanned gelatin, the emulsions containing also a hardening agent, *e.g.*, alum, substances to ensure dissolution of the untanned gelatin, *e.g.*, ammonium carbonate, material to break up the homogeneity of the layer, *e.g.*, resin, casein, salicylic acid, and, preferably, potassium iodide.

L. A. COLES.

Selector screens for colour photography and kinematography. SOC. FRANC. CINÉCHROMATIQUE (PROC. R. BERTHON), Assees. of SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET CINÉMATOGRAPHIE EN COULEURS (B.P. 294,493, 23.7.28. Fr., 22.7.27).

XXII.—EXPLOSIVES; MATCHES.

Pentaerythritol tetranitrate and its mixtures with nitroglycerin ("Penthrinite") as filling materials for projectiles. A. STETTACHER (Chem.-Ztg., 1929, 53, 533–534, 554–556).—Pentaerythritol tetranitrate ("Penthrite") is soluble in nitroglycerin to the extent of 2% at 20° and 7–8% at 75–80°, and is therefore thoroughly wetted by the ester even in a finely-powdered form. The mixture of 80% of "Penthrite" and 20% of nitroglycerin ("Penthrinite") has a detonating velocity of 8600 m./sec. compared with 6700 for trinitrotoluene (T.N.T.) and 7800 for glycol dinitrate, and forms a plastic mass of maximum sp. gr. under 500–600 kg./cm.² compared with a pressure of 3000 kg./cm.² for T.N.T. The respective heats of explosion are 1449.5 and 950 kg.-cal./kg. and the volumes of gas formed at N.T.P. 762 and 690 litres/kg. Hence "Penthrinite" has a much greater shattering power and a higher safety factor than any of the nitroaromatic compounds usually employed in high explosives. (Cf. B., 1928, 626.)

A. R. POWELL.

PATENTS.

Explosive. G. A. RUPP, Assr. to TROJAN POWDER Co. (U.S.P. 1,728,307, 17.9.29. Appl., 29.2.28).—An

aqueous suspension of a carbohydrate nitrate is stirred with a liquid immiscible with water until this liquid is absorbed by the ester.

L. A. COLES.

Flash-reducing agent for smokeless powders. W. T. INGRAHAM (U.S.P. 1,731,378, 15.10.29. Appl., 8.11.23).—A nitroglycerin-free propellant includes nitrocellulose and rosin.

F. G. CROSSE.

Blasting cartridges. D. HODGE (B.P. 320,226, 5.10.28 and 1.1.29).

Manufacture of matches. H. A. GILL. From S. E. RAHE (B.P. 320,249, 22.10.28).

Acid-concentrating towers (B.P. 319,839).—See I. **Detection of explosive gases** (B.P. 319,231). **Eudiometry of explosive gases** (B.P. 300,281).—See II. **Concentration of nitric acid** (B.P. 320,125).—See VII.

XXIII.—SANITATION; WATER PURIFICATION.

Methods of chemical analysis as applied to sewage and sewage effluents (Rep. Comm. Min. Health, 1929, 71 pp.).—In order to secure uniformity in the methods employed in obtaining the data by which the character of a sewage or sewage effluent is judged, the methods in use have been reviewed. The methods now recommended for general use are largely based on those included in the Fourth Report (pt. V) of the Royal Commission on Sewage Disposal. The Committee recommend *inter alia* the substitution of 0.0125*N*- for 0.125*N*-potassium permanganate in the "oxygen-absorption" test at 26.7° and the use of the Gooch crucible method for "suspended solids," and emphasise the importance of ammonia-free distilled water as a diluent when determining "free and saline ammonia."

C. JEPSON.

Phenols in effluent from lignite carbonisation. ROSIN and JUST.—See II. **Manurial trials with sewage.** ZIELSTORFF and others.—See XVI.

PATENTS.

Disposal of sewage or other waste organic matter. C. G. WIGLEY, Assr. to C. POTTS (U.S.P. 1,730,489, 8.10.29. Appl., 7.4.27).—The sewage matter, after being freed from excess moisture, is spread on the floor of a closed but aerated chamber where it is converted into a dry, granular, innocuous material by means of a fungoid growth, which may be propagated therein if the material is maintained at a suitable temperature, under aerobic conditions, and in the absence of sunlight.

C. JEPSON.

Refuse destructor installations. WOODALL-DUCKHAM (1920), LTD., and A. SCOTT (B.P. 320,140, 11.7.28).—The water-jacket surrounding the shaft of the furnace is kept at a temperature corresponding with the steam pressure in the boiler, either by causing the water from the boiler to flow into the jacket and back into the water-space of the boiler, or by connecting the upper part of the jacket with one end, and the lower part with the other end, of a closed duct which extends through a water-space of the boiler.

C. JEPSON.