BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

APRIL 1, 1927.

I.-GENERAL; PLANT; MACHINERY.

PATENTS.

Heat exchange apparatus. G. U. MORGAN (E.P. 264,377, 17.5.26).—A heat exchanger for two liquids which is specially suitable (as one of a pair) for heating oil fuel, as it can be easily and completely taken apart for cleaning, is claimed. B. M. VENABLES.

Heat exchanger. J. PRICE, Assr. to GRISCOM-RUSSELL Co. (U.S.P. 1,617,083, 8.2.27. Appl., 29.9.25). —Separate heat-transferring units are assembled one above the other, each comprising a pair of headers connected by tubes which are slightly bent. The headers are so held that the tubes bend when heated and remove scale. B. M. VENABLES.

Grinding, crushing, pulverising, mixing, and separating machines. D. J. REES (E.P. 264,324, 20.1.26).—In a grinding mill in which a number of roll heads, balls, or like grinding members are rotated by a spider and pressed centrifugally against a fixed ring, the driving spider is formed with resilient arms.

B. M. VENABLES.

Atomisation and desiccation of liquids or solutions. NESTLÉ AND ANGLO-SWISS CONDENSED MILK Co. (E.P. 257,893, 15.6.26. Conv., 5.9.25).—Liquids issuing from one jet are subjected to a stream of hot, atomised air from another jet, at right angles to it. The jets are under suitable pressure or control, and are contained in a chamber, one side of which has an opening in direct alinement with the atomising jet, through which the atomised liquid is carried into the evaporating and collecting chamber. F. R. ENNOS.

Method of concentrating fluids. W. B. MCLAUGHLIN (U.S.P. 1,615,287, 25.1.27. Appl., 17.1.23). —The concentration is effected at low temperatures by heat interchange with a hotter fluid, the heat passing from a small surface in contact with the heating fluid to a large surface in contact with the fluid to be heated.

H. HOLMES.

Method and apparatus for distilling liquids. W. F. DOWNS (U.S.P. 1,616,079, 1.2.27. Appl., 24.12.21). —The liquid is contained in a chamber provided with a partition near one wall to form a passage opening into the chamber at its upper and lower ends. Heat is applied to this wall to induce an upward circulation of the liquid through the passage, and means are provided for maintaining the upper end of the passage and liquid level in the chamber at predetermined relative heights. H. HOLMES.

Vacuum evaporator. E. HELLER (G.P. 432,903, 4.3.24).—The apparatus is provided with an external heating unit connected with the evaporator by an ascension pipe. The upper part of the heating unit is at the same height as the floor of the container of the evaporator, and the length of the ascension pipe corresponds to the temperature difference between the heating unit and the evaporator. By this arrangement a constant circulation of the liquid is obtained.

R. A. A. TAYLOR.

Columnar hollow shapes for filling absorption towers etc. A. LETSCHERT (G.P. 433,055, 18.4.23).— These shapes have in their outside surfaces openings which, in cross-section to their major axes, form approximately equilateral triangles with rounded corners. They have openings like narrow slits, parallel to or laterally placed to the sides, and slits which become narrower towards the inside. R. A. A. TAYLOR.

Method for low-temperature cooling, liquefaction, and separation of gases. A. SELIGMANN (U.S.P. 1,615,597, 25.1.27. Appl., 3.3.24. Conv., 26.5.22).— The gases are passed through a countercurrent heatexchanger at a speed which is greater upon starting the process than during its normal continuance.

H. HOLMES.

Air-cleaning machine. J. C. HOSCH (U.S.P. 1,616,802, 8.2.27. Appl., 27.7.25).—The air is passed through a primary set of zig-zag parallel vanes which terminate in hook-shaped collecting pockets. Two similar sets of vanes are provided for continuing the zig-zag motion. B. M. VENABLES.

Manufacture of colloidal or the like materials. W. H. BENTLEY, W. M. COATES, and J. RILEY & SONS, LTD. (E.P. 263,670, 7.6.26).—Stable solutions of colloidal substances for horticultural sprays and other purposes where the presence of electrolytes is a disadvantage, are prepared by the interaction, in the presence of a protective colloid in aqueous solution, of substances of such a nature and in such quantity that the solution contains the desired colloid, while the reaction product other than water contains little or no electrolyte, or is insoluble, or sparingly soluble, or is little dissociated. The quantity of water also may be limited, so that a soluble jelly is produced. W. G. CAREY.

Non-corrosive liquid for fluid systems. M. R. SHERBINO, ASST. to HYDRAULIC BRAKE CO. (U.S.P. 1,616,670, 8.2.27. Appl., 19.3.26).—Castor oil is dissolved in alcohol and saponified. H. ROYAL-DAWSON.

Means for effecting the chemical analysis of liquids. H. S. HATFIELD (E.P. 264,237, 14.10.25).— The apparatus comprises means for mixing known volumes of two or more liquids and recording the attainment or non-attainment of the end-point. In the case of testing the hardness of water, a measured volume of water is transferred to a tilting reacting vessel, and to it is added, drop by drop, standard soap solution. Each 208

CL. II,-FUEL; GAS; DESTRUCTIVE DISTILLATION; MINERAL OILS.

drop of soap solution actuates an electrical contact which controls a pawl in a mechanical recorder. The solution is kept in agitation by a stream of air bubbles, and when the frothing point is reached the reaction vessel will overturn and start a fresh cycle. Another method of operation is to take fixed quantities of both reacting liquids and to record the attainment or non-attainment of the end-point by means such as a hydrogen electrode or a beam of light passing through the liquid and impinging on a photo-electric cell, the light being cut off if the liquid is coloured by an indicator. B. M. VENABLES.

[Illumination] photometer. H. WADE. From N. V. PHILIPS' GLOEILAMPENFABE. (E.P. 264,039, 24.3.26).— In an illumination photometer of the kind in which a semi-transparent screen is illuminated on one side by a standard source of light of definite candle power, a resistance body of positive temperature coefficient is connected in series with the standard lamp in order to maintain the current through the lamp approximately constant for values of the voltage of the battery in its fresh and exhausted conditions. J. S. G. THOMAS.

Preserving physiological and like specimens. J. BRUNNER and E. SCHEELE (E.P. 263,674, 17.6.26).— Insects, plants, amphibia, reptiles, fishes, crustacea, etc. are preserved by embedding them in a soft or fluid-like condensation or polymerisation product, which permeates them, and which is then hardened by heating. All artificial resins may be used, the condensation products of formaldehyde and phenol or carbamide being especially suitable for animal and vegetable bodies.

B. FULLMAN.

[Bridge for] furnaces. E. CROWTHER (E.P. 264,560, 9.7.26).

[Adjustable frame for portable] mixing apparatus. C. S. SIMMONDS (E.P. 265,073, 6.8.26).

Distillation and like columns. C. STILL and A. KUHN (E.P. 264,735, 20.7.26).

Nozzles for filters. JEWELL EXPORT FILTER CO., Assees. of J. E. WILLIAMSON (E.P. 256,228, 26.7.26. Conv., 28.7.25).

Apparatus for classifying [air-borne] materials. HARDINGE Co., INC., Assees. of H. HARDINGE (E.P. 257,568, 26.1.26. Conv., 28.8.25).

II.—FUEL; GAS; DESTRUCTIVE DISTILLATION; MINERAL OILS.

Freeman multiple retort of the British Oil and Fuel Conservation, Ltd. (Dept. Sci. Ind. Res. Rept., 1926, 35 pp.).—The retort is of the vertical continuous type, externally heated, and consists of six cast-iron chambers, 18 in. deep, placed vertically above one another. The temperature in each chamber is about 100° higher than in the one immediately above. The coal passes down through the chambers in succession, and is continually turned over during carbonisation (cf. B., 1919, 317 A). As a result of a preliminary run some minor alterations of the system were found necessary—in particular the feed and discharge valves were modified, the gas offtakes altered so that they could be readily cleared if they became choked, and improvements made in the arrangement of the ploughs for conveying the coal across the revolving trays. Four tests were carried out with a non-caking slack ("Kirkby Top Hard"), one with a feebly caking coal (" Brynna "), and one was commenced with a moderately caking coal ("Washed Waterloo Slack "), but had to be abandoned because the retort choked. The maximum temperature in the first test was 566°, but in the others did not exceed 500°. The weight of coal treated in each run varied from 7.5tons to 15.7 tons, and the duration of the tests from 2 to 3 days. Losses on the weight and thermal balances varied between $1 \cdot 29$ and $3 \cdot 2\%$ on the former and between 3.8 and 8.4% on the latter. The yields from the "Kirkby Top Hard " (at 500°) were 13.4 cwt. of coke, 1610 cub ft. of gas of about 900 B.Th.U. per cub. ft., and $20 \cdot 2$ gals. of tar per ton of coal as charged. The corresponding yields from "Brynna" coal were 14.7 cwt. of coke, 1720 cub. ft. of gas of 978 B.Th.U. per cub. ft., and 18.6 gals. of tar. The coke was in the form of breeze, but was readily combustible; it could either be further ground and used as pulverised fuel or briquetted. The yield of tar was high, representing 80% of that obtained in the Gray-King apparatus (B., 1921, 205 A). The gas was a typical low-temperature gas, and yielded on scrubbing about 1 gal. of spirit per ton of dry coal. The yield of ammonia was low. The following are the yields in gals. per ton of dry coal of refined products from the tar of Test 3, and may be taken as representative-motor spirit (to 170°) 0.99; naphtha $(170-220^{\circ})$ 0.65; burning oil $(220-280^{\circ})$ 1.69; gas oil (280-320°) 1.15; lubricating oil (320- 360°) 1.46; crude tar acids, 5.17; bases 0.23; the pitch amounted to 39.3% by weight of the tar. Estimates are made of the labour and power required to operate the plant. A. B. MANNING.

Influence of the ash content of a coal on the calculated calorific value of the ash-free coal. R. STUMPER (Brennstoff-Chem., 1927, 8, 33—36).—The calorific value of ash-free coal, calculated from the observed calorific value of the raw coal, varies with the ash content of the coal, the variation being particularly marked when the ash content exceeds about 18%. Possible explanations are discussed, but the variations appear to be principally caused by heat effects due to chemical changes occurring in the ash. The calculated calorific value of the ash-free coal is appreciably lowered by adding above 18% of silica to the coal, and slightly (but not regularly) raised by adding to the coal further quantities of its own ash.

W. T. K. BRAUNHOLTZ.

Reactivity of coke. L. NETTLENBUSCH (Brennstoff-Chem., 1927, 8, 37—41).—When semi-coke, produced at 550°, is subjected to higher temperatures, its reactivity, as determined by Bähr's method (cf. B., 1924, 160), decreases, the decrease being particularly marked for superheat temperatures exceeding 800°. This is due to deposition of graphitic carbon on the coke surface, owing to decomposition of methane. On the other hand, the reactivity is practically unaffected by subjecting coke for a prolonged period to the same temperature as that at which it was produced. The degree of decomposition of coal gas by heat depends on the temperature, gas velocity and concentration, surface area of the reaction chamber, and nature (particularly content and composition of ash) of the coal carbonised. The physical form in which the carbon is deposited depends largely on the nature of the hot decomposing surface. The reactivity of coke is enhanced by the presence of manganese dioxide and iron, but depressed by alumina and, slightly, by silica. The introduction of steam during carbonisation is advisable, in that it greatly reduces the deposition of carbon on the coke, thus rendering the latter easily combustible, and also protects the gas from the catalytic action of the ash. W. T. K. BRAUNHOLTZ.

Experiences with American and other coals during the miners' strike, 1926. G. WEYMAN (Gas J., 1927, 177, 191-193).-The large stocks of coal held by gas works at the commencement of the strike had suffered variable amounts of deterioration during storage, resulting in a poorer quality of gas and coke, and slower rates of carbonisation. The Landsale, drift, outcrop, and heap coals which were utilised showed a very great variation in quality. Few of the European coals used were suitable as gas coals. The Silesian coals were practically non-coking, and the quality of the gas was poor. The Westphalian and Czecho-Slovakian coals gave fine-grained hard cokes, but again the gas was poor in quality, and difficulties were encountered in handling the small wet coal supplied. The American coals were uniformly good for gas-making, high yields of good quality being obtained; the tar yields were also good. Results of tests (on a 1/1000-ton scale coaltesting plant) are tabulated for all the types of coal discussed. A. B. MANNING.

Basic calculations and processes, together with the economics, of the conversion of ethylene in coke-oven gas into alcohol. W. GLUUD and G. SCHNEIDER (Gas- u. Wasserfach, 1927, 70, 97-102).-The raw gas must be subjected to a preliminary purification and concentration, including removal of tar, cyanogen, hydrogen sulphide, ammonia, and benzol, followed by compression, removal of carbon dioxide, and intensive cooling by the Linde process or the like. In this way a gas containing 70% of ethylene, 20% of methane, and about 10% of other hydrocarbons may be obtained. This is passed through a preliminary scrubber containing concentrated sulphuric acid, in which undesirable hydrocarbons (e.g., acetylene, butadiene, propylene, etc.) are absorbed, then over quicklime (to remove sulphur dioxide), and finally through the main scrubber in which the ethylene is absorbed in concentrated sulphuric acid containing 1% of silver sulphate. The acid from the preliminary scrubber is diluted to precipitate resins, and may be concentrated or used for ammonium sulphate manufacture. The acid from the main scrubber, in which about 80% is combined with ethylene, is freed from catalyst, diluted with water, and from this solution alcohol (of about 40% strength) is distilled. The residual sulphuric acid is treated in the same way as that from the preliminary scrubber, and the alcohol is concentrated up to about 90% strength. Details are given for carrying out the process in the laboratory and on the large scale, and a detailed balance sheet is appended.

W. T. K. BRAUNHOLTZ.

Extended formolite analysis of crude petroleum oils. A. M. NASTUKOFF (Petroleum, 1926, 22, 1349— 1350).—The great absorptive capacity of the formolite for saturated hydrocarbons is utilised in the further analysis of crude oils. From the first formolite number, F_1 , obtained in the usual manner, a second, F_2 , is obtained by treatment with light petroleum, and a third, F_3 , by subsequent treatment with chloroform; this last is the true formolite number. Further calculated values up to F_7 are employed. Differences between these values indicate the yield of solar and lubricating oils, the resin content, cyclic unsaturated hydrocarbons, etc. A table gives the respective values for eight Russian and one Pennsylvanian crude oil. H. MOORE.

Anti-knock materials. G. GROTE (Petroleum, 1926, 22, 1344-1347).-The results of Charch, Mack, and Boord are discussed (cf. B., 1926, 570). The efficiency of lead tetraethyl being taken at 100, a table of comparative efficiencies is given. Whilst compounds of quadrivalent lead show anti-detonating properties, those of bivalent lead, with some exceptions, have no action. Lead benzaldehyde, lead diphenyl dinitrate, tin bromide, ferric chloride, aluminium triethyl and chloride, and bismuth triphenyl dichloride have no anti-detonating action. The anti-detonating action of substances on an acetylene mixture in an explosion tube varied greatly from results obtained on the motor. A direct relation was shown between intensity of detonation and electric conductivity of cylinder gases. The most powerful anti-knock materials deposit finely-divided particles of the metallic constituent on heating, and such compounds as undergo complete oxidation on heating are inefficient. Detonation is a consequence of the electric charge, rather than of the H. MOORE. conductivity of the gases.

Determination of the sand content of machine grease. C. BUNGE (Chem.-Ztg., 1927, 51, 64).—10 g. of the grease are extracted with benzyl alcohol and finally with hot water, and the residue is dried and weighed. The presence of sand grains being established by touching the residue, heated to glowing point, with a glass rod, the residue is treated with hydrochloric acid, filtered, and the remaining residue, after identification as sand under the microscope, is weighed. Amounts of sand, varying from 0.009-0.057%, have been found in samples of grease examined. There was no direct relationship between the percentage of sand and the number of grains present, as determined by the microscope method. H. M. LANGTON.

PATENTS.

Coal-washing apparatus. FLOW COAL WASHERY Co., LTD., A. RUSSELL, and S. AUSTIN (E.P. 262,890, 16.10.25).—The suspended material in the coal to be cleaned is carried in a stream of water along a trough in which, at intervals, there are slots communicating with shale-evacuating boxes. These consist of vertical conduits, tapering from top to bottom, but uniform in width throughout, with the slots extending across the troughs. A stream of water enters these boxes through rectangular openings in one side. Above the water inlet and immediately below the coal-inlet slot is an inverted V-shaped bridge which spreads the coal and facilitates the cleaning action of the ascending stream of water. Shale falls through the water stream, and the partially washed coal is returned to the trough for further treatment. S. PEXTON.

Compressed fuel for heating and cooking purposes. A. WENIGER (Swiss P. 114,655, 17.2.25).— Carbonaceous material is finely ground and treated with alkali carbonates; it is then sprinkled with dilute mineral acid, mixed with binding material, heated, and compressed. Any type of brown coal can thus be converted into a fuel resembling anthracite, and of high combustibility. A. B. MANNING.

Pre-treatment of a binding material for solid fuels. E. B. G. BASCOU (G.P. 433,734, 26.3.24. Conv., 10.4.23).—A mixture of dehydrated pitch and crude petroleum pitch is granulated by pouring the molten material in fine streams into water. Briquettes made using this material as binder are resistant to moisture and hold well together in the fire. A. B. MANNING.

Centrifugal gas washer. HAGER & Co. G.M.B.H. (G.P. 433,181, 25.6.20).—The washer is horizontal, and the wash liquid is driven by the gas pressure in a thin layer along the wall of the vessel. The liquid is collected by a gutter and used again after being returned to a holder and spray diffuser. The condition of the wash liquid is regulated by control of the quantity in circulation. R. A. A. TAYLOR.

Removal of solid substances from gases. G. J. PRAT (F.P. 606,783, 23.11.25. Conv., 24.11.24).—The gas to be purified is caused to flow through a rotating cylinder with perforated walls through which the solid substances pass, when they are given a helical motion about the axis of the cylinder. R. A. A. TAYLOR.

Rich gases from fuels. KOHLENVEREDLUNG G.M.B.H. (F.P. 606,886, 26.11.25. Conv., 23.1.25).—The gases laden with tar vapours pass directly from the retort through a cracking plant, avoiding introduction of foreign gases. A. B. MANNING.

Determination of the substances causing luminosity in gases, vapours, or mixtures of gaseous substances. I. G. FARBENIND. A.-G., Assees. of R. ENGEL-HARDT and W. LOMMEL (G.P. 432,237, 24.8.24).—The gases, before and after removal of the luminous constituents, are consumed in a burner to which air or oxygen is led, the amount of oxygen necessary to render the flame non-luminous being determinable by means of a flow-meter. R. A. A. TAYLOR.

Saturation and recovery of gases and vapours by solid absorbents. Soc. DE RECHERCHES ET D'EX-PLOITATIONS PÉTROLIFÈRES (F.P. 607,683, 23.3.25).— The absorbent (activated carbon), charged with the gases and vapours, is treated with superheated steam to drive off the absorbed substance.

R. A. A. TAYLOR.

Improvement in the Edeleanu process. ALLGEM. GES. FÜR CHEM. IND. M.B.H. (G.P. 432,580, 27.9.25).— Loss of liquid sulphur dioxide is minimised by saturating the charge with gaseous sulphur dioxide before introducing it into the reaction apparatus.

A. B. MANNIN G. Extraction of petroleum from oil-sands, bitumen from oil-chalks, oil-shales, coals, etc. H. PRELLER (G.P. 433,978, 30.8.22. Addn. to 400,122).—The raw material is first washed by being passed counter-current to a stream of hot water, the coarser oil and mineral particles being thus separated. The finer particles still containing oil pass into a second washing vessel of considerably greater cross-section, where the more slowly moving stream permits separation of the fine oil particles. Loss of oil is thereby avoided.

A. B. MANNING.

Continuous distillation of crude petroleum oils. F. M. ROGERS and R. E. WILSON, ASSTS. to STANDARD OIL CO. (U.S.P. 1,615,407, 25.1.27. Appl., 11.10.24).— The oil is reduced in conventional stills to a very heavy residue; this is then passed with steam through a pipe still in which it is heated at 370—425°, thence to a separating chamber in which a vacuum of about 4 in. of mercury is maintained. The vapours are condensed. W. N. HOYTE.

Petroleum distillation. W. D. MASON, Assr. to STANDARD OIL CO. OF CALIFORNIA (U.S.P. 1,615,991, 1.2.27. Appl., 11.12.22).—The vapours from the continuously-operated still pass to a tower where they are sprayed with the feed oil; the latter, together with the condensed portion of the vapours, pass to the still. Water is sprayed into the uncondensed vapours in such proportions that it is completely converted into steam. These vapours and steam are then condensed.

W. N. HOYTE.

[Fractionating column] for distillation of hydrocarbon oils. M. G. PAULUS and O. C. BREWSTER, Assrs. to STANDARD OIL CO. (U.S.P. 1,615,400, 25.1.27. Appl., 27.2.24).—The column is divided by transverse partitions on which a quantity of liquid is retained; vapours pass up through the partition, and are deflected down through the liquid by means of a cap which rotates; baffles are fitted to prevent vortices forming in the liquid on the partition. W. N. HOYTE.

Oil-cracking still. E. C. HERTHEL, ASST. to SINCLAIR REFINING CO. (U.S.P. 1,615,583, 25.1.27. Appl., 28.11.21).—The still consists of a series of pipes exposed to a current of hot flue gases, the oil flowing through counter-current to the gas stream. The tubes nearest the firebox are smooth externally, those farthest away are ribbed. W. N. HOVTE.

Manufacture of highly active charcoal. ALGEM. NORIT MAATSCHAPPIJ (F.P. 608,730, 15.12.25. CONV., 11.5.25).—Residual carbon compounds are removed as completely as possible from charcoal prepared from them, and activation of the charcoal is carried on to such an extent that the product is nearly pure carbon.

L. A. Coles.

Production of active charcoal. E. BERL (G. P. 433,524, 15.6.23).—Lignite or coal is extracted with hydrogenated naphthalene derivatives, and, after removal of the solvent, the residue is heated to about 1000°, potassium compounds being added if necessary.

L. A. COLES. Manufacture of lampblack. Decomposition of carbonaceous gases. CANADA CARBIDE Co., LTD., Assees. of S. A. WISDOM (Can. P. 260,226-7, 13.8.23).----(A) Mixtures of acetylene with oxidising gases in quantity insufficient for its complete combustion are heated to the dissociation temperature of acetylene. (B) Mixtures of carbonaceous gases, of which one is endothermal, are heated to dissociation temperature, so that the heat of dissociation of the endothermal gas causes decomposition of at least a portion of the other constituents of the mixture. L. A. COLES.

Process and apparatus for the manufacture of oil gas. Anc. ETABL. BARBIER, BÉNARD, ET TURENNE (Soc. ANON.) (E.P. 260,215, 26.7.26. Conv., 22.10.25).— See F.P. 605,407; B., 1926, 813.

Cracking liquid hydrocarbons. H. O. SWOBODA and E. M. RICHARDS, Assrs. to H. O. SWOBODA, INC. (U.S.P. 1,616,515, 8.2.27. Appl., 6.7.22).—See G.P. 362,461; B., 1923, 260 A.

Gas burners. FRANKFURTER GAS-GES., and E. SCHUMACHER (E.P. 265,041, 13.4.26).

Furnaces burning pulverised fuel. J. BRASS (E.P. 262,977, 27.1.26).

Apparatus for combustion of liquid fuel. E. BECKER (E.P. 262,948, 19.12.25).

Production of acetylene (F.P. 607,059).—See VII.

Bleaching mineral oils (E.P. 245,745).—See XII.

III.—TAR AND TAR PRODUCTS.

Calcium salts of low-temperature tar phenols. F. R. GREENBAUM (Amer. J. Pharm., 1927, 99, 10-12).--Calcium phenoxides were obtained in maximum yield by heating a mixture of 450 g. of distilled low-temperature tar phenols, 170 g. of calcium chloride, and 115 g. of calcium hydroxide with 300 c.c. of water, with constant stirring for 6 hrs. under a reflux condenser. The product was filtered off, and washed with water and benzene to remove free phenols; the residue (269 g.) contained 55% of calcium phenoxides and 45% of calcium hydroxide. The product might be of use as an insecticide. L. A. COLES.

PATENTS.

Production of low-temperature tar from bituminous shale. J. FABIAN (Austr. P. 103,714, 10.3.23). —Shale residues are rendered suitable for building purposes, and low-temperature tar is obtained in good yield, by burning away the fixed carbon in the distillation residues, and using the combustion gases, without admixture with steam or other gases, for the distillation of fresh shale. L. A. COLES.

Cracking tar etc. COMP. DES MINES DE VICOIGNE, NOEUX, ET DROCOURT (F.P. 607,279, 13.3.25).—Raw mineral oils, their fractions, tars, or their neutral oil fractions are introduced in a finely-divided state into a melt maintained at the cracking temperature.

A. B. MANNING.

Treatment of light tar-oils, naphtha, or oil distillates, containing unsaturated hydrocarbons such as coumarone and indone. COMP. DES MINES DE VICOIGNE, NOEUX, ET DROCOURT (F.P. 607,672, 21.3.25).— The oils are subjected to a polymerisation process in the presence of oil-soluble metal chlorides, such as titanous chloride, and the purified oil is separated by distillation from resins formed during the process. L. A. COLES.

IV.—DYESTUFFS AND INTERMEDIATES.

Detection and determination of foreign substances in dyes. A. BOHANES (Chem. Listy, 1927, 21, 56—58).—Material insoluble in ether is determined by extraction, and ash by calcination. Soluble salts are separated by dialysis, and determined in the solution. Chlorides are best determined by Votoček's method of titration with mercuric nitrate (cf. B., 1918, 444 A; 1922, 1001 A). S. I. LEVY.

PATENTS.

[Dyes for] dyeing acetyl [cellulose acetate] silk. BRITISH ALIZARINE CO., LTD., W. H. DAWSON, and C. W. SOUTAR (E.P. 263,946, 8.10.25).—Anthrapyridone compounds of the type

$$C_{6}H_{4} \underbrace{\begin{array}{c} C = CH - CO \\ C_{6}H_{3} \cdot \dot{N}H \end{array}}_{CO} \underbrace{\begin{array}{c} C = CH - CO \\ C_{6}H_{3} \cdot \dot{N}H \end{array}}_{CO}$$

prepared by cyclisation of an α -acetamidoanthraquinone, are satisfactory dyes for cellulose acetate silk, being applied in aqueous suspension or colloidal solution. The cyclisation is effected by boiling the acetyl compound with a large excess of dilute caustic soda, or, in some instances, with water alone. *E.g.*, a bright red *dye* is obtained by boiling 300 pts. of 1:4-bisacetamidoanthraquinone for about 6 hrs. Reddish-yellow, bright orange, and blue *dyes* are obtained by cyclisation of diacetylamino-, 1:5-bisacetamido-, and 1:5-diamino-4:8-bisacetamidoanthraquinone, respectively.

A. J. HALL.

Anthraquinone vat dyes. I. G. FARBENIND. A.-G., Assees. of F. FUNCKE (G.P. 430,901, 28.9.24).—o-Diamines are condensed with suitable dichloroketodihydrothiazines of the type (I) or (II)



to give vat dyes, the diamine or the thiazine, or both, being anthraquinone derivatives; the products may afterwards be alkylated or arylated. 2:2-Dichloro-3 - keto - 7 : 8 - phthalylbenzo - 2 : 3 - dihydro - p - thiazine[dichloroketoanthraquinone-2:1-dihydrothiazine] condenses in dichlorobenzene at 125-130° with o-phenylenediamine to give a brown vat dye, m.p. above 300°, with 4:5-diamino-m-xylene a dark brown vat dye, and with 1:2-diaminoanthraquinone a yellow vat dye. 1-Amino-2-p-tolylaminoanthraquinone, from 2-bromo-1-aminoanthraquinone and p-toluidine, condenses with the same thiazine in nitrobenzene at 150° to give a greenish-yellow vat dye. Dichloroketo-p-tolyldihydro-p-thiazine (1, $Ar = C_7H_7$ with 1:2-diaminoanthraquinone yields a yellow vat dye, and a yellow vat dye is also obtained by ethylation with ethyl p-toluenesulphonate of the condensation product from dichloroketoanthraquinone-1:2-dihydrothiazine and 1:2-diaminoanthraquinone. C. HOLLINS.

Anthraquinone vat dyes. I. G. FARBENIND. A.-G., Assees. of K. H. MEYER and H. HOPFF (G.P. 432,579, 29.8.24).— β -Naphthoyl derivatives (containing no substituent hydroxyl group) of aminoanthraquinones containing at least one α -amino-group are prepared by the action of the acid chloride on the base in nitrobenzene, and are used as vat dyes. β -Naphthoyl chloride with α -aminoanthraquinone gives a greenish-yellow vat dye; with 1:5-, 1:6-, or 1:7-diaminoanthraquinone, yellow; with 1:4-diaminoanthraquinone, bluish-red. 2:3-Methoxynaphthoyl chloride with 1:4-diaminoanthraquinone gives an orange vat dye; 1:2-chloronaphthoyl chloride and 1:4-diaminoanthraquinone a red. C. HOLLINS.

Vat dyes of the anthraquinone series. BADISCHE ANILIN U. SODA-FABR. (F.P. 604,347, 7.10.25. Conv., 16.2 and 27.8.25).—Aminoanthraquinones are acylated with *m*-substituted benzoic acids, especially *m*-alkoxybenzoic acids, the dyes obtained being distinguished by good fastness to light. Acylation with *m*-methoxybenzoyl chloride of 1:4-diaminoanthraquinone yields a bluish-red dye, of 1:5-diaminoanthraquinone a yellow, of 1:5-diamino-4-hydroxyanthraquinone a red, of 1:5diamino-4-methoxyanthraquinone an orange, of 4:8diaminoanthrarufin a violet-blue, and of 1-amino-4methoxyanthraquinone a scarlet. Examples are also given of the use of *m*-toluic, *iso*phthalic, *m*-benzamidobenzoic, 3-methylthiolbenzoic, 5-methoxy*iso*phthalic, and *mm*'-diphenyldicarboxylic acids as acylating agents.

A. DAVIDSON.

Manufacture of vat dyes. L. CASSELLA & Co. G.M.B.H. (F.P. 604,450, 12.10.25).—2-Methylanthraquinone is heated with diamines (other than *p*-diamines) and sulphur. *E.g.*, by heating 2-methylanthraquinone with 1:5-naphthylenediamine and sulphur at 240—250° a *dye* is formed which, after extraction with sodium sulphide and purification with sodium hypochlorite, dyes cotton from the vat in reddish-yellow shades. By heating 2-methylanthraquinone with diaminobenzanthrone and sulphur an orange-brown vat *dye* is formed. A. DAVIDSON.

Vat dyes [of the thioindigo series]. H. WAGNER, R. BRUNE, M. HESSENLAND, E. HOFFA, and F. MÜLLER, Assrs. to GRASSELLI DYESTUFF CORP. (U.S.P. 1,610,539, 14.12.26. Appl., 3.5.26. Conv., 6.5.25).-2: 3-Dihalogenotolyl-5-thioglycollic acids, in which position 6 may, or may not, be substituted by CO.H. CN, or $CO \cdot NH_{2}$, are converted into the corresponding oxythionaphthens, which are oxidised to the corresponding thioindigo dyes. These compounds give on cotton in the vat shades which are fast to light and kiering. E.g., 6-chloro-o-toluidine is converted by the methods described in E.P. 17,417/14 and G.P. 364,822 (B., 1921, 619 A; 1923, 598 A) into 2:3-dichloro-6aminotolyl-5-thioglycollic acid, the amino-group is eliminated, and the product is treated with chlorosulphonic acid, and oxidised to the corresponding 5:6:5':6'-tetrachloro-4:4'-dimethylthioindigo, which dyes cotton in the vat bright, bluish-red shades. The dye is also obtained from 2:3-dichloro-6-cyanotolyl-5thioglycollic acid, which is transformed by treatment with aqueous alkali and sodium sulphide into 5:6-dichloro-3-amino-4-methylthionaphthen-2-carboxylic acid; this on heating at 100°, gives 5: 6-dichloro-3-oxy-4-methylthionaphthen, m.p. 157°, which is oxidised by air in alkaline solution in presence of copper.

T. S. WHEELER. Azo dyes. I. G. FARBENIND. A.-G., Assees. of H. KRZIKALLA (G.P. 431,773, 11.12.24).—Sulphonated diazo compounds are coupled with bisacylacetyl derivatives of aromatic diamines to give acid wool dyes fast to washing and milling, or lake dyes, or ice-colours on the fibre. Bisacetoacetyl-o-tolidine gives with diazotised sulphanilic acid a greenish-yellow wool dye; with diazotised 6-chloro-*m*-toluidine-4-sulphonic acid a yellow on wool, or as an ice-colour on cotton the dye has good fastness properties. C. HOLLINS.

Dyes from perylene. KALLE & Co. A.-G., Assees. of M. P. SCHMIDT and J. Voss (G.P. 432,178, 4.12.23).— Sulphonation of perylene with concentrated sulphuric acid gives at 60° perylenedisulphonic acid, a greenishyellow acid wool dye; at 190° a dark brown vat dye for cotton. By the action of sulphuric acid and manganese dioxide at room temperature perylene is converted into a vat dye, which gives a yellow-brown on wool. A brown vat dye for wool is obtained by the action of chlorosulphonic acid. Treatment of perylene derivatives with these reagents is also covered.

C. HOLLINS.

Production of 2:5-diaminobenzene-1:4dicarboxylic acid (p-diaminoterephthalic acid). G. SCHROETER (G.P. 433,277, 20.7.24).—Benzene-1:2:4:5-tetracarboxylic acid di-imide (pyromellitic acid di-imide) is shaken with dilute alkaline hypochlorite solution at temperatures below 50° until dissolved; addition of acid reducing agents yields 2:5-diaminobenzene-1:4-dicarboxylic acid in quantitative yield as a light yellow, microcrystalline powder (diethyl ester, m.p. 168°). E. H. SHARPLES.

Preparing [3-]nitro[-4-]aminobenzoyl-o-benzoic acid and derivatives. R. ADAMS, J. M. DAVIDSON, and I. GUBELMANN, ASSTS. to NEWPORT CO. (U.S.P. 1,614,584, 18.1.27. Appl., 8.2.26).—4-Chloro-3-nitrobenzoyl-o-benzoic acid on heating with aqueous ammonia at 100° for several hours yields 3-nitro-4-aminobenzoyl-obenzoic acid, m.p. 224°. In place of ammonia, alkyl- or aryl-amines can be employed. T. S. WHEELER.

Manufacture of water-insoluble azo dyes. CHEM. FABR. GRIESHEIM-ELEKTRON (F.P. 601,687, 5.8.25. Conv., 16.8.24).-Diazo, tetrazo, or diazoazo compounds containing no sulpho- or carboxyl groups are coupled with diarylides of 2-naphthol-3: 6-dicarboxylic acid. The following diarylides of 2-naphthol-3 : 6-dicarboxylic acid, prepared in the usual way, are described :-- dianilide, m.p. 282°; di-o-toluidide, m.p. 255°; di-m-chloroanilide, m.p. 243-244°; di-o-anisidide, m.p. 150-152°; di-anaphthylamide, m.p. 218-220°. A bluish-red lake is obtained by coupling diazotised p-nitro-o-aminotoluene with the dianilide of 2-naphthol-3:6: dicarboxylic acid. Cotton padded with the dianilide and developed with diazotised 4-nitro-2-aminoanisole gives fast bluish-red A. DAVIDSON. shades.

Non-alkaline solutions or pastes of sulphide dyes. I. G. FARBENIND. A.-G., Assees. of H. KESSELER and E. DÖRING (G.P. 432,112, 15.3.24).—Solutions or pastes of sulphide dyes suitable for dyeing animal fibres and acetate silks or for printing on account of their non-alkaline reaction, are made by treatment with magnesium hydroxide and a reducing agent, such as sodium hyposulphite. C. HOLLINS.

Azo dyes. I. G. FARBENIND. A.-G., Assees. of L. LASKA and A. ZITSCHER (G.P. 430,579, 21.9.24).-Azo dyes, suitable especially as ice-colours, are made by coupling diazotised aminodiphenyls (2- and 4-aminodiphenyl, aminoditolyls, and their chloro- and dichloroderivatives) with 2:3-hydroxynaphthoic arylamides. 4: 4'-Dichloro-3 (?)-aminodiphenyl, m.p. 95-96°, and 4:4'-dichloro-6-amino-3:3'-dimethyldiphenyl, m.p. 88°, are prepared by reduction of nitrated 4 : 4'-dichlorodiphenyl and 4 : 4'-dichloro-3 : 3'-dimethyldiphenyl, respectively; 4-amino-4'-hydroxydiphenyl, m.p. 273°, from benzidine by diazotising one amino-group and boiling the diazo-solution. 2 : 3-Hydroxynaphthoic m-chloroanilide, coupled on the fibre with diazotised 4-chloro-4'-aminodiphenyl, gives a garnet shade. All the dyeings are fast to bowking. C. HOLLINS.

Brown dyes for wool and leather. I. G. FAR-BENIND. A.-G., Assees. of R. SCHMIDLIN (G.P. 431,776, 29.5.24. Addn. to 414,390).—A diaminodiphenyl or diaminodiphenylmethane derivative is condensed first with 1 mol. proportion of a halogenonitroaryl-sulphonic or -carboxylic acid, and then with a quinone of the benzene series. Thus, from equimolecular proportions of benzidine, 1-chloro-4-nitrobenzene-6-sulphonic acid, and toluquinone a tobacco-brown dye for leather is obtained. C. HOLLINS.

Fuel-testing composition (U.S.P. 1,615,143).— See II.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Degradation of the cellulose and lignin of wood, two distinct processes of decomposition by mycelium present in wood. R. FALCK and W. HAAG (Ber., 1927, 60 [B], 225-232).-The decay of wood is due to corrosion generally caused by parasitic agents and destruction brought about by species of merulius, coniophora, poria, lenzites, etc. During corrosion the lignin is first affected, followed by the cellulose, a considerable proportion of which remains after the lignin has disappeared completely. During destruction, the difference is more pronounced, since the cellulose disappears completely, whereas the lignin is unaffected. These differences also find expression in the carbon content of the products at various stages. In both series the pentosan content decreases uniformly. The copper numbers in the series are quite distinct, and show that the enzyme does not cause accumulation of oxycellulose or similar degraded products. The increased copper number of merulius cellulose proves that insoluble compounds with reducing properties are initially produced ; acidic substances are also formed, quantitatively, similar to those obtained by the action of Aspergillus niger on starch. The aqueous extracts of corroded wood (at any rate until decomposition is very profound) resemble those of sound wood, whereas those from "destroyed" wood are dark brown, acidic, and reducing in the early stages of the process. During corrosion there is a decrease in the proportion of substance soluble in alcohol-benzene, whereas the reverse is the case during destruction. The possibility of isolating lignin from wood by the aid of merulius species under milder conditions than those employed by Willstätter and Zechmeister is indicated. H. WREN.

Gelatinisation of lignocellulose. III. Viscose reaction. A. W. SCHORGER (Ind. Eng. Chem., 1927, 19, 226—227; cf. B., 1923, 923 A; 1924, 250).—Owing partially to filtration difficulties, attempts to obtain lignin in an unchanged state from wood by means of the viscose reaction proved unsuccessful. A large part of the lignin passed into solution with the carbohydrate, and of the 82% of aspen wood and 70% of white pine dissolved, a considerable proportion was not precipitated on acidification. The lignin of white pine was more soluble than that of aspen. Cellulose is more easily removed from hydrolysed than from the original wood.

C. O. HARVEY.

Chemistry of the sulphite process. V. Digestion of spruce wood with sodium bisulphite. E. Hägg-LUND (Papier-Fabr., 1926, 24, 775-780).-Digestion with sodium bisulphite takes place with somewhat more difficulty than with the calcium liquor. A 12% solution of sodium bisulphite at 130° or at 140° gives practical products. There is exceptional liability to "black cooks" with concentrated liquors, e.g., with 18% solution of sodium bisulphite at 140°. This tendency is attributed to the low hydrogen-ion concentration of the sodium bisulphite liquor, since high initial hydrogen-ion concentration protects against this decomposition. On the other hand, the yield of cellulose is extremely high. The first stage of the process consisting in the combination of the bisulphite with the lignin-carbohydrate constituent takes place very rapidly at a low temperature. The second stage, during which this solid lignosulphonic acid is hydrolysed, proceeds slowly under normal conditions, so long as decomposition of the bisulphite liquor and formation of sulphuric acid are negligible. At this stage the ratio of carbohydrates to lignin in the liquor remains normal and constant. In cooks carried out without blackening, the cellulose is characterised by a high content of insoluble lignosulphonic acid, equivalent to 3.5-7.0% of lignin, or 13-25% of the original lignin of the wood. The ratio of reducing sugars after inversion, to direct reducing sugars in the liquor, remains at about $4 \cdot 0$. Notable destruction of pentosans occurs even in the early stages of digestion, but the lignin of wood contains 1.24% of substance yielding furfuraldehyde expressed as pentosan which is not a pentosan. The pulps from the sodium bisulphite digestion are easily resolved into fibres, but on account of their high content of insoluble lignosulphonic acid, they belong rather to the class of "half celluloses," and yield papers of very high strength and folding qualities. J. F. BRIGGS.

Determination of water in sulphite pulp. E. SCHLUMBERGER (Papier-Fabr., 1926, 24, 783-785).— In the determination of moisture in cellulose by the distillation method, tetrachloroethane is used instead of an inflammable hydrocarbon. The apparatus consists of a boiling flask of 700 c.c. capacity, with ground-in stopper carrying a wide, vertical, distillation column, bent round into a vertical condenser. The distillate is delivered into a U-shaped receiver consisting of two bulbs acting as a Florentine separator and extending at its inlet into a vertical measuring tube or burette 20 cm. long and 3 mm. wide, graduated in 0.02 c.c. The cellulose is boiled with tetrachloroethane, and distillation is continued until the drops of distillate previously cloudy again come over clear; this takes about $\frac{1}{2}$ hr. at a distillation rate of 80—100 c.c. in 10 min. The volume of water is read off in the measuring tube with a maximum error of $\pm 0.17\%$. J. F. BRIGGS.

PATENTS.

Production of fibres capable of being spun. OBERRHEINISCHE HANDELS GES.M.B.H., and L. UBBEL-OHDE (E.P. 264,233 and 264,428, 14.10.25. [A] Addn. to 254,357; B., 1926, 782).-(A) The roughening and curling of smooth fibres in order to increase their spinning qualities are produced by precipitating inorganic or organic roughening agents on or within the fibres by chemical decomposition or physical means in the wet, semi-dry, or dry state as in mordanting or waterproofing, or by causing the adherence of an organic colloid. (B) The fibres are rendered more sensitive to the roughening material by treatment with alkalis, acids, salts, solvents, or swelling agents at some or all stages of the manufacturing process. The fibres are mixed with a suspension of the roughening agent (infusorial earth, kaolin, silica gel, sand, lime, etc.) in the sensitising solution, agitated, and dried after removal of part of the liquid. Agitation alone after sensitising also produces B. P. RIDGE. roughening.

Production of pattern effects on fabrics. TOOTAL BROADHURST LEE Co., LTD., and R. P. FOULDS (E.P. 264,559, 9.10.25).—The material (artificial silk, cotton, or mixtures of both) is treated in selected areas with a concentrated solution of antimony or bismuth trichloride, and subsequently washed with water, more concentrated solutions being required for cotton than for artificial silks. The chloride is dissolved in glycerin, lactic acid, or any other medium from which the oxide is not thrown out until the fabric is treated with water, and a thickening agent suitable for use in an acid medium, *e.g.*, china clay and gum, is added if required. Antimony trichloride with feculose and lactic acid gives the best results. B. P. RIDGE.

Treatment [sizing] of yarns or threads. BRITISH CELANESE, LTD., C. W. ADDY, J. BILLING, and H. HALKYARD (E.P. 264,382, 4.6.26).—Yarns in packages or on bobbins etc. are impregnated in an airtight chamber with a solution of a sizing or dressing agent in a volatile solvent, penetration being assisted by evacuation or pressure or both used alternately. After removal from the solution they are unwound while still wet, dried by evaporation of the solvent, and re-wound on to bobbins or hanking frames. Suitable sizing compositions are described in E.P. 244,947 and 244,979 (B., 1926, 189). B. P. RIDGE.

Treatment of wool for the purpose of diminishing its affinity for acid and neutral-dyeing wool dyes. I. G. FARBENIND. A.-G., Assees. of A. GÜNTHER, W. SCHLEGEL, and A. THAUSS (G.P. 432,111, 20.6.23).— Clear two-colour effects are obtained on half-wool materials by pre-treating the wool with sulphurised phenol products with or without the addition of tin salts (cf. G.P. 409,782; B., 1925, 627), so that it has less affinity for acid and neutral-dyeing wool dyes, or by the addition of sulphurised phenols to the dye bath.

A. J. HALL.

Production of wool-like effects on cotton fabrics. H. I. HUEY, ASST. to SAYLES FINISHING PLANTS, INC. (U.S.P. 1,616,749, 8.2.27. Appl., 5.5.22. Renewed 30.9.24).—The unmercerised material is first treated with sulphuric acid of $d \cdot 547 - 1 \cdot 580$, washed, dried, and afterwards treated with sodium hydroxide solution of $d \cdot 116 - 1 \cdot 180$ at 30-35°, with subsequent washing. B. P. RIDGE.

Substitutes for catgut and similar animal products. DUNLOP RUBBER CO., LTD., and R. TRUESDALE (E.P. 264,640, 11.12.25).—Threads formed from any textile fibres are impregnated with a viscous cellulose solution, such as cellulose xanthate, drawn through die boxes, and twisted together, a further coating of solution being given if desired. The solution is coagulated and the cords are dried by passing through a heated chamber. Composite cords are produced by twisting the impregnated threads round a suitable core, *e.g.*, catgut or wire, and flexibility is obtained by the addition of a softener such as glycerin to the cellulose solution.

B. P. RIDGE.

Manufacture of textile fabrics [resembling crêpe]. H. DREYFUS (U.S.P. 1,614,832, 18.1.27. Appl., 9.4.24. Conv., 4.9.23. Cf. E.P. 224,642).—The process of E.P. 226,256 (B., 1925, 201) is applied to fabrics containing reconstituted cellulose, *e.g.*, denitrated nitrocellulose or cellulose recovered from cuprammonium solutions. T. S. WHEELER.

Washing and cleaning fabrics. H. SPINDLER (U.S.P. 1,615,146, 18.1.27. Appl., 1.6.23. Conv., 1.6.22).—Materials can be satisfactorily washed in hard water, using a soap containing a finely-divided oxide or hydroxide of magnesium, calcium, barium, aluminium, zinc, or similar weakly-basic, water-insoluble, metal compound, capable of precipitating calcium and magnesium compounds from the water, and thus softening it in the washing process. The soap can be prepared by adding a soluble salt of the metal to the fatty acids before saponification. T. S. WHEELER.

Process and apparatus for bleaching cellulose pulp and similar fibrous materials. C. B. THORNE (E.P. 264,596, 21.10.25).—Concentrated pulp is treated uniformly with a bleaching agent and water in a mixer, and then, while still comparatively stiff, is conveyed continuously downwards through a series of aerating towers, through which air or gas is passed from a slowlyrotating hollow shaft carrying a perforated distributing arm, agitation of the pulp being avoided as much as possible. Removal from each tower is facilitated by the use of a jet of water, the material being again concentrated before entering the next tower. Bleaching of highly-concentrated pulp may be combined with the treatment of diluted material. B. P. RIDGE.

Cellulose ester composition. J. G. DAVIDSON, Assr. to CARBIDE AND CARBON CHEMICALS CORP. (U.S.P. 1,617,237, 8.2.27. Appl., 10.5.26).—In a pyroxylin plastic, dibenzyl is used as a plasticiser. Nitrocellulose (100 pts.), esters of the higher alcohols (10—20 pts.), and dibenzyl (10—30 pts.) are mixed with sufficient acetone to give the desired plasticity. B. P. RIDGE.

[Non-inflammable] cellulose composition. W. G. LINDSAY, Assr. to CELLULOID Co. (U.S.P. 1,616,910,

8.2.27. Appl., 25.4.22).—Lithium phosphate containing water of crystallisation is mixed with a homogeneous, non-fibrous, cellulosic derivative in such proportion as to render the composition non-inflammable.

B. P. RIDGE.

Viscose-treating apparatus. S. A. NEIDICH (U.S.P. 1,616,918, 8.2.27. Appl., 10.5.26).—A circular series of trays, capable of rotation in a horizontal plane about a common axis, is arranged above a corresponding series of tanks, means being provided for the intermittent discharge of liquid from the trays into the tanks and vice versa, discharge of the liquid and rotation of the trays taking place alternately. B. P. RIDGE.

Utilisation of black liquor. E. Hägglund (Can. P. 260,376, 20.7.25).—After subjection to heat and pressure, the liquor is mixed with fresh sodium carbonate solution, and used for treating fibrous material. L. A. COLES.

Cooling and utilisation of the heat content of relief gas from sulphite digesters. G. A. RICHTER, Assr. to BROWN CO. (U.S.P. 1,616,703, 8.2.27. Appl., 28.4.25).—The hot relief gas from the digesters is washed with an opposing flow of cold water acidified with sulphur dioxide from an independent source, thereby causing cooling, condensation of steam, and liberation of sulphur dioxide from the water, and yielding a cool gas rich in free sulphur dioxide. B. P. RIDGE.

Drying of fabrics in the open width. S. F. Bar-CLAY, and MATHER & PLATT, LTD. (E.P. 265,026, 18.3.26).

Cellulose ester compositions (U.S.P. 1,611,169 and 1,612,669).—See XIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Recent developments in the dyeing of Celanese [cellulose acetate silk] mixtures. C. G. CANDLISH (J. Soc. Dyers and Col., 1927, 43, 37-42).-Grey Celanese contains little impurity beyond traces of lubricating oil, and requires only a mild scour before dyeing. Bleaching is carried out by the usual methods, or may be effected simultaneously with scouring at 60°. Celanese materials are transparent to ultra-violet light, even after being de-lustred by treatment with boiling water. When Celanese is immersed in boiling water it loses its lustre; use is made of this fact to produce artificial silk materials having a subdued lustre. De-lustreing is assisted by the presence of soap, Turkey-red oil, or other substances capable of reducing the surface tension of the boiling liquor. The use of Celanese in worsted goods is limited because of the loss of lustre during such processes as crabbing and steaming, but the presence of inorganic salts such as magnesium chloride, ammonium sulphate, or sodium chloride assists preservation of the lustre (cf. E.P. 246,879; B., 1926, 317). Vat dyes may be applied to cotton materials containing Celanese without hydrolysis of the latter, provided that phenol is added to the dye bath sufficient to combine with excess of caustic alkali. A. J. HALL.

PATENTS.

Dyeing or colouring of yarns and fabrics or other materials. BRITISH CELANESE, LTD., and G. H. ELLIS (E.P. 263,473, 7.9.25).—In dyeing textile materials, containing animal or other fibres deleteriously affected by caustic alkalis, with vat or sulphur dyes, the caustic alkali usually employed in the dye liquor is replaced wholly or partly by the alkali metal or ammonium salts of hydroxy-, polyhydroxy-, or simple-ring-substituted derivatives of polyhydroxy- or hydroxy-compounds of the homocyclic or heterocyclic organic series, e.g., sodium phenoxide, potassium tolyloxide, sodium quinoxide, sodium β -naphthoxide, and sodium pchlorophenoxide (cf., E.P. 262,506; B., 1927, 105).

A. J. HALL.

Fixing basic dyes on [textile] fibres and other substrata. I. G. FARBENIND. A.-G., Assees. of H. BER-NARD (G.P. 432,113, 30.8.24).—Oxidation products (of higher mol. wt.) of phenols or their homologues or substituted derivatives are satisfactory substitutes for tannic acid in fixing basic dyes (cf. G.P. 406,675; B., 1925, 413). E.g., fabric (unmordanted) is impregnated with a basic dye and the latter fixed by passage through a solution of an oxidised phenol, or colour lakes are formed by bringing together solutions of basic dyes and of an oxidised phenol in the presence of a suitable substratum. A. J. HALL.

Dyeing animal fibres in acid baths. L. CASSELLA & Co., G.M.B.H., Assees. of R. HAVNN (G.P. 433,145, 28.9.24).—Aldehydes, *e.g.*, formaldehyde, or substances which liberate aldehydes, are added to acid dye-baths used for animal fibres for the purpose of preserving the structural qualities of the fibres. A. J. HALL.

Cellulose derivatives. I. G. FARBENIND A.-G., Assees of F. GÜNTHER (G.P. 433,147, 29.6.24).-Cellulose or a related substance is treated with isatoic anhydride or compounds containing the characteristic group of isatoic anhydride, and gives a material which may be diazotised and coupled with the usual components. An isatoic anhydride which already contains an azo grouping may be used. Cotton treated with isatoic anhydride becomes orange when diazotised and coupled with β-naphthol. Treatment of cotton with p-sulphobenzeneazoisatoic anhydride (prepared by phosgenation of p-sulphobenzeneazoanthranilic acid), followed by diazotisation and coupling with β -naphthol, gives a red. A yellow results when cotton is treated with the isatoic anhydride obtained by phosgenation of the azo dye from 2-chloroaniline-5-sulphonic acid diazotised and coupled with anthranilic acid; the cotton so treated may further be diazotised and coupled with the usual components. C. HOLLINS.

Dyeing cellulose esters. I. G. FARBENIND. A.-G., Assees. of F. GÜNTHER (G.P. 432,110, 26.4.22).—Cellulose esters are dyed by means of formaldehyde-bisulphite compounds of azo dyes containing a primary aminogroup. If the dye contains a diazotisable aminogroup, the dyed material may be further diazotised and coupled with suitable components. A. J. HALL.

Dyeing of cellulose esters or ethers. I. G. FARBENIND. A.-G., Assees. of W. DUISBERG, W. HENTRICH, C. WEINAND, and L. ZEH (G.P. 433,236, 27.6.24).—1-Aminoanthraquinone-2-sulphonic acids, excepting those containing in the 4-position a free or substituted aminoor hydroxyl group, are claimed as dyes for artificial silks made from cellulose esters or ethers; e.g., 1-aminoanthraquinone-2-sulphonic acid (orange), its 4-bromo-(yellowish-red), 4-tolylthiol- (reddish-violet), and 5-*p*tolylamino- (bordeaux) derivatives. C. HOLLINS.

Dyeing of leather. V. CASABURI (Swiss P. 114,271, 11.10.24).-Leather is mordanted with organic complex metallic salts of aromatic sulphonic acids containing amino- and hydroxyl groups in the nucleus and then dyed, or the dyeing and mordanting can be carried out simultaneously. The mordant is prepared, e.g., by mixing 10 pts. of 1-amino-8-naphthol-3:6-disulphonic acid with 2.26 pts. of chromium hydroxide, 3 pts. of anhydrous sodium carbonate, 4 pts. of sodium acetate, and 6 pts. of potassium hydrogen sulphate. Chrome leather which has been treated with a solution of this mordant can be dyed with basic and substantive dyes. Vegetable mordanted leather and glove leather can also, after mordanting, be dyed with substantive dyes. In dyeing with substantive dyes, the dye and mordant solutions can be used together. In place of chromium hydroxide, the hydroxides of iron, aluminium, copper, etc. can be used. A. DAVIDSON.

Production of multicoloured and black discharges on leather and artificial leather. I. G. FARBENIND. A.-G., Assees. of R. KLEIN (G.P. 433,154, 28.4.25).— Dressed leather is dyed with suitable dyes, then dried, printed with a paste containing a discharging agent such as formaldehyde-sulphoxylate or sodium hyposulphite compounds (zinc may be present) and suitable natural or synthetic dyes, then dried and steamed for $1\frac{1}{2}$ min.

Dyeing, printing, and stencilling of cellulose acetate or products made therewith. BRITISH CELANESE, LTD., and G. H. ELLIS (E.P. 263, 260, 23.10.25). -Cellulose acetate silk materials are dyed with acidyl derivatives of aminoanthraquinones or their methylamino-, hydroxy-, chloro-, or methyl derivatives, applied in a solubilised form (cf. E.P. 219,349; B., 1924, 906), or by vatting methods such as are ordinarily used for vat dyes or by special vatting methods (cf. E.P. 262,506; B., 1927, 105) in which minimum quantities of caustic alkali are used. Suitable acylaminoanthraquinone dyes include 1-acetamidoanthraquinone (lemon-yellow), 1-propionamidoanthraquinone (greenishyellow), 1-acetamido-4-methoxyanthraquinone (goldenyellow), 1-acetamido-4-hydroxyanthraquinone (orange), 1-acetmethylamido-4-methoxyanthraquinone (orange), 1: 4-bisacetamidoanthraquinone (orange), 1: 4-bispropionmethylamidoanthraquinone (bright red), and 1-acetamido-4-methylaminoanthraquinone (reddish-violet). These acidyl dyes have a smaller affinity for vegetable and animal fibres. A. J. HALL.

Producing fast printings [on textile materials]. A. G. BLOXAM. From I. G. FARBENIND. A.-G. (E.P. 262,987, 11.2.26).—Coloured effects particularly fast to washing are obtained by printing textile materials with a mixture containing an alkali salt of a suitable azo compound and the salt of an aromatic sulphonitrosoaminic acid containing one or more of the grouping $\cdot N(NO) \cdot SO_3M$ (M = a metal), and then developing (with simultaneous elimination of the sulpho-group) the shade by aftertreatment with acid vapours or an aqueous solution of a weak acid such as acetic or formic acid. Alternatively, the sulphonitrosoaminic acid may be formed in situ by substituting for it in the printing paste a mixture of sodium nitrite and an alkali salt of an aromatic sulphamic acid. Sulphonitrosoaminic acids derived from amino- or diamino-compounds of diaryls or of the aromatic series, which contain azo, azoxy, carbamide, thiazole, iminazole, 4-azoimido-, or similar groups, are suitable, and particularly suitable are the salts of sulphonitrosoaminic acids of aminoazo compounds having the general formula, $R \cdot N : N \cdot R' \cdot N(NO) \cdot SO_3M$ (R and R' = aromatic residues). Suitable azo compounds include naphthols and their derivatives, e.g., the arylides of 2 : 3-hydroxynaphthoic acid, derivatives of α -naphthol-4-carboxylic acid, and, further, such substances as contain a reactive methylene group, e.g., pyrazolone derivatives or derivatives of $\alpha\beta$ -keto-aldehydes.

A. J. HALL.

Printing fast shades [on textile materials]. I. G. FARBENIND. A.-G., Assees. of A. ZITSCHER and F. MURIS (G.P. 433,276, 25.12.24).-Fabric is printed with a mixture containing an alkali salt of a suitable azo component and a sulphonitrosoamine derivative of an aminoazo compound having the general formula $\mathbf{R} \cdot \mathbf{N} : \mathbf{N} \cdot \mathbf{R'} \cdot \mathbf{N(NO)} \cdot \mathbf{SO_3M}$ (\mathbf{R} and $\mathbf{R'}$ are aromatic residues), then steamed, and successively passed through acid and alkaline liquors for the development of the pigment dye within the fibre. Alternatively, the sulphonitrosoamine compound is replaced by a mixture containing an alkali salt of a sulphoaminoazo compound and sodium nitrite. E.g., a deep black shade is obtained by printing cotton fabric with a paste containing the sodium salt of o-phenetoleazonaphthylsulphonitrosoamine, 2:3-hydroxynaphthoyl-m-nitroaniline, Turkeyred oil, caustic soda, and starch thickening, then steaming and passing successively through dilute hydrochloric acid and caustic soda, afterwards washing and soaping. Such printing mixtures may be used simultaneously with other well-known nitrosoamine printing pastes.

A. J. HALL.

Printing processes [for textile materials]. I. G. FARBENIND. A.-G., Assees. of K.H. MEYER, H. KRZIKALLA, and A. SCHNEEVOIGT (G.P. 433,153, 18.11.24).—Methylolformamide is a good solvent for basic and other dyes, and is miscible with the thickening agents usually employed in printing pastes. Coloured effects obtainable in deep shades, and having a fastness to washing superior to that of similar effects obtained with the assistance of tannic acid, are produced by printing fabric with a paste containing methylolformamide, basic or other dyes, and one or more aromatic hydroxy-compounds, and then steaming or drying on drying cylinders, aftertreatment in a fixing bath of tartar emetic being unnecessary. A. J. HALL.

Dyeing acetyl cellulose or fabrics containing the same and new products for use therein. J. BADDILEY, A. SHEPHERDSON, H. SWANN, J. HILL, and L. G. LAWRIE, ASSIS. to BRITISH DYESTUFFS CORP., LTD. (U.S.P. 1,616,103, 1.2.27. Appl., 19.10.25. Conv., 7.1.25).—See E.P. 246,984; B., 1926, 317.

Dyeing cellulose acetate (E.P. 263,946).-See IV.

Solutions or pastes of sulphide dyes (G.P. 432,112).—See IV.

Bleaching cellulose pulp (E.P. 264,596).-See V.

A. J. HALL.

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

Catalytic oxidation of ammonia. III. L. ANDRUSsov (Z. angew. Chem., 1927, 40, 166-174; cf. A., 1926, 582; B., 1926, 318).-The behaviour of mixtures of ammonia and oxygen at a platinum contact has been examined at temperatures up to 1300°, velocities of 570 cm./sec., and periods of contact as short as millionths of a second. At and above 1200° the yield of nitric oxide may exceed 90% if three successive contacts are used. The course of the change is represented by the equations $NH_3 + O_2 = NH_3O_2 = HNO + H_2O$; $HNO + O_2 \rightarrow NO + H_2O$; $HNO + NH_3 = NH_3HNO$ $= N_2H_2 + H_2O$ and $N_2H_2 + O_2 \rightarrow N_2 + H_2O$. The most important factor influencing the change is the ratio, O_2 : NH₃. If this falls below 0.75, nitrogen is almost the sole product under all conditions examined. Only if the ratio exceeds 1.25 is nitric oxide almost quantitatively produced. Between these ratios there is a proportional division of the yield between nitric oxide and ammonia. Particularly when the velocity of the gas current is low, complications ensue owing to the diffusion backwards of the products of the reaction and formation of nitrogen from ammonia and nitroxyl (v.s.). H. WREN.

Theory of the catalytic combustion of ammonia. M. BODENSTEIN (Z. angew. Chem., 1927, 40, 174—177; cf. Andrussov, preceding abstract).—It is assumed that the primary change is expressed by the equation, $NH_3 + O_2 = HNO + H_2O$, and that the nitroxyl is converted either into nitric acid (which ultimately yields nitric oxide, water, and oxygen), or, by ammonia, into nitrogen, water, and hydrogen. In the absence of sufficient ammonia or oxygen nitroxyl may decompose into (a) nitrous oxide and water, (b) nitrogen, oxygen, and water, or (c) hydrogen and nitric oxide.

H. WREN.

Schlagdenhaufen's reaction [for magnesium]. A. HAMY (Ann. Falsif., 1927, 20, 19—20).—The reaction of Schlagdenhaufen for detection of magnesium occurs under the most favourable conditions in the presence of excess of sodium or potassium, of iodine, and of potassium iodide. 50 c.c. of the sample to be tested are mixed with 6—7 c.c. of N-iodine solution dissolved in 20% potassium iodide solution, then 5 c.c. of N-potassium hydroxide solution are added and shaken violently for 1 min. The red-brown precipitate formed in the presence of magnesium is filtered through asbestos, and can be decolorised by alcohol. D. G. HEWER.

Thermal and material efficiency of modern calcium carbide and ferrosilicon [electric] furnaces. E. SCHLUMBERGER (Z. angew. Chem., 1927, 40, 141— 146).—The data given are derived from a modern 4500-kw. unit in Germany, and represent average good working. In the manufacture of calcium carbide, 78% of the calcium used is present in the finished pure carbide, 10% is found as calcium oxide, and 6% lost as dust and vapour. Of 100 pts. of carbon used together with 7 pts. of electrode carbon consumed, 51 pts. are recovered as carbide or graphite, 25 pts. as carbon monoxide, and 31 pts. lost. The loss is increased by increasing ash content in the coke. Of the power used, 64% is employed in the reaction and 3% in evaporation ; 8% represents electrical transformation losses, and 25% radiation and convection losses of heat. In the manufacture of ferrosilicon (45% Si), 98% of the iron is recovered and 88%of the silicon. Of the carbon used in the form of anthracite, wood, charcoal, and coke, 67% is usefully employed in the reduction of silica, 5% being lost in the reduction of ferric oxide in the ash, and the remainder burnt or lost in the form of vapour. The energy efficiency is 63%, the losses being somewhat similar to those in the carbide process. C. IRWIN.

Determination of small quantities of hydrogen in nitrogen as hydrogen chloride. G. HEYNE (Z. anal. Chem., 1927, 70, 179-183).-A combustion tube is packed with a column of anhydrous nickel chloride, 20 cm. long; the tube is heated at 600° for several hours while a slow current of anhydrous hydrogen chloride is passed through it, and finally this is displaced with a current of pure nitrogen, so as to effect the complete removal of any traces of water in the nickel chloride. The gas to be tested for hydrogen is then passed slowly through the tube heated at 600°, thence through an absorption tube containing dilute sodium hydroxide solution to collect the hydrogen chloride formed by the reduction of the nickel chloride by the hydrogen in the gas sample. The chloride is determined volumetrically by Volhard's method. Less than 0.001% of hydrogen in nitrogen may be accurately determined in this way.

A. R. POWELL.

PATENTS.

Making sulphuric acid. W. F. LAMOREAUX (U.S.P. 1,617,212, 8.2.27. Appl., 13.6.25.)—Sulphur dioxide gas brought into contact with a regulated supply of nitrated acid completely denitrates the sulphuric acid produced, the latter being then brought into contact with a current of gas to remove the residual sulphur dioxide, after which the purified acid is collected.

H. ROYAL-DAWSON.

Evolution of hydrocyanic acid from cyanides. H. LEHRECKE, ASST. to ROESSLER & HASSLACHER CHEM. Co. (U.S.P. 1,615,637, 25.1.27. Appl., 21.11.25. Conv., 27.11.24).—A mixture of sodium cyanide, anhydrous magnesium sulphate, magnesium hypochlorite, and potassium bisulphate is treated with water.

H. ROYAL-DAWSON.

Making arsenic acid. W. C. PIVER (U.S.P. 1,615,193, 18.1.27. Appl., 21.2.23).—An arsenic ore is heated in a current of air, and the volatilised arsenious oxide is passed with air into a tower containing nitric acid and water vapour. Arsenic acid is produced, and the nitrogen oxides formed are reoxidised by the air present. T. S. WHEELER.

Manufacture of phosphoric acid. I. G. FARBENIND. A.-G. (F.P. 609,100, 11.1.26. Conv., 17.1.25).—In the manufacture of phosphoric acid by the combustion of phosphorus or gas mixtures containing it, phosphoric acid solution trickles down the walls of the combustion chamber. L. A. Colles.

Manufacture of effervescent alkali compounds. W. F. LITTLE, Assr. to UPJOHN Co. (U.S.P. 1,616,587, 8.2.27. Appl., 25.8.26).—Sodium carbonate (5 pts.) and calcium lactate (1 pt.) are mixed with powdered tartaric and citric acids and sufficient additional sodium bicarbonate to react with the acids, the mixture being sprayed with 90% alcohol to prevent dust rising from the powder. The mass is then passed to a fusion drier in which the temperature and moisture are controlled to give 93° on the dry bulb and 54° on the wet bulb. After fusion, the mass is broken into granules and dried at 75°.

H. ROYAL-DAWSON.

Manufacture of ammonia. Soc. D'ÉTUDES MINIÈRES & INDUSTRIELLES (E.P. 253,540, 31.12.25. Conv., 8.1.25). —A hot mixture of nitrogen and hydrogen is passed over iron, nickel, cobalt, tungsten, or mixtures of these metals, with the addition of 40% of lithium nitride or amide (cf. B., 1926, 1013), and 5—10% of alumina, magnesia, or lime. Ammonia is formed at 550—600° and under atmospheric pressure. W. G. CAREY.

Production of ammonia and acetylene. L. Tocco and M. LANDI (F.P. 607,059, 18.11.25. Conv., 17.7.25).— Barium oxide is used instead of the carbonate in Margueritte and Sourdeval's process for the production of barium cyanide, and the cyanide is converted into barium oxide, acetylene mixed with small quantities of other hydrocarbons, and ammonia, by treatment with hydrogen and steam in one or more revolving furnaces.

L. A. Coles.

Manufacture of sodium monoxide. ROESSLER & HASSLACHER CHEMICAL CO. (E.P. 264,724, 7.6.26. Conv., 29.1.26. Addn. to 253,520; B., 1927, 187).—Sodium is mixed with finely-divided sodium monoxide in such proportion as not to produce a pasty mass, the mixture containing not over 10% of uncombined sodium, and the mass is oxidised with atmospheric oxygen, the air being regulated so that the oxygen concentration in the reaction vessel is well below 10%. Heating is necessary only to start the reaction, after which the reaction temperature is prevented from rising above 250° by restricting the supply of air. W. G. CAREY.

Dehydration of fused mixtures of alkaline-earth chlorides and magnesium chloride. I. G. FARBENIND. A.-G., Assees. of P. SIEDLER and W. MOSCHEL (G.P. 433,666, 17.2.25).—Granulated calcium carbide is added to the fused material. L. A. COLES.

Preparation of alkali cyanide solutions. K. ANDRICH, ASST. to ROESSLER & HASSLACHER CHEM. CO. (U.S.P. 1,615,208, 25.1.27. Appl., 22.12.25. Conv., 23.12.24).—Hydrocyanic acid is caused to react with an aqueous mixture of alkali sulphate and calcium hydroxide at about 15°. H. ROYAL-DAWSON.

Manufacture of bisulphites. J. B. BEVERIDGE (Can. P. 259,884, 9.4.25).—Solutions containing sodium and magnesium bisulphites are obtained by treating mixtures of lime and magnesia with sulphur dioxide in the presence of water, adding a quantity of sodium sulphate equivalent to the calcium, and filtering off the precipitated calcium sulphate. L. A. COLES.

Production of metal [lead] phosphate. H. BLUMEN-BERG, JUN., ASST. to STOCKHOLDERS SYNDICATE (U.S.P. 1,617,098, 8.2.27. Appl., 8.5.25).—A mixture of litharge and ammonium dihydrogen phosphate is heated to dispel the ammonia and water formed. H. ROYAL-DAWSON.

Production of bismuth silicate. J. ZELTNER (G.P. 433,526, 16.9.24).—Aqueous solutions containing bismuth salts are treated with soluble alkali silicates. L. A. COLES.

Conversion of material other than glue into small particles. A.-G. FÜR CHEM. PROD. VORM. H. SCHEIDE-MANDEL, D. SAKOM, and P. ASKENASY (G.P. 434,278, 14.5.24).-The material, or a concentrated solution of it, is allowed to fall successively through two immiscible liquids in which it is not soluble. The lower liquid layer, which serves to remove the upper liquid from the particles, may consist of a solution of the material under treatment of such concentration that the material does not dissolve. For example, fused sodium sulphide, or a hot saturated solution of it, is dropped into dichloroethylene containing sufficient tetralin to bring it to $d \ 1.150$, and the solidified particles sink into saturated sodium sulphide solution ($d \ 1.175$), whence they are removed. L. A. COLES.

Production of highly-concentrated active hydrogen.—A. THIEL and G. STAMPE (G.P. 433,520, 28.11.25).—A wall of a reaction vessel is constructed of a sheet of metal penetrable by hydrogen, the outer side of the wall serving as the cathode for the electrolysis of water. Tubes having the outer surface constructed of metal penetrable by hydrogen and the inner surface serving as cathode for the electrolysis of water, are used as unpolarisable hydrogen electrodes. L. A. COLES.

Active-chlorine preparation. E. B. PUTT (U.S.P. 1,612,742, 28.12.26. Appl., 22.3.26).—Cineole is employed to mask the odour of preparations containing active chlorine; e.g., 0.5% is added to solutions of sodium hypochlorite. T. S. WHEELER.

Recovery of chlorine. J. A. GUYER and M. C. TAYLOR, ASSTS. to MATHIESON ALKALI WORKS, INC. (U.S.P. 1,617,305, 8.2.27. Appl., 19.4.26).—Gaseous mixtures containing chlorine are subjected to treatment with silica gel at an initial temperature not higher than 10°. H. ROYAL-DAWSON.

Purification of sulphur. T. GOLDSCHMIDT A.-G. (F.P. 608,930, 4.1.26. Conv., 17.1.25).—Crude sulphur is heated at a temperature sufficiently high to carbonise organic impurities, and is then filtered. L. A. COLES.

Manufacture of nitric acid and its salts. G. KASSNER (U.S.P. 1,616,900, 8.2.27. Appl., 24.3.24. Conv., 29.3.23).—See E.P. 213,571; B., 1925, 9.

Catalytic reactions [ammonia]. H. A. HUM-PHREY, ASST. to ATMOSPHERIC NITROGEN CORP. (U.S.P. 1,617,522, 15.2.27. Appl., 1.5.26. Conv., 4.5.25).— See E.P. 255,963; B., 1926, 821.

Manufacture of hydrogen. J. ROCHET, ASST. to COMP. DE PROD. CHIM. ET ELECTROMÉTALLURGIQUES ALAIS, FROGES, ET CAMARGUE (U.S.P. 1,617,965, 15.2.27. Appl., 17.2.25. Conv., 11.4.24).—See E.P. 232,184; B., 1925, 919.

VIII.-GLASS; CERAMICS.

Glass-melting experiments with batch materials containing chemically combined water. E. M. FIRTH, F. W. HODKIN, M. PARKIN, and W. E. S. TURNER (J. Soc. Glass Tech., 1926, 10, 364—373).—When, in batches for soda-alumina-silica glasses with 4-5% Al_2O_3 , the alumina was supplied in the anhydrous form, melting was slightly quicker, working sweeter, and the glass less brittle than when hydrated alumina was used. With soda-lime-alumina-silica glasses the hydrated alumina gave slightly better melting results, but the glass set more quickly and required a higher working temperature than glass from calcined alumina. When, for a soda-lime glass, crystallised sodium carbonate was used, melting was abnormal; a crust formed on the surface of the molten glass, which itself was very seedy, wavy, and cordy, and distinctly more viscous than the corresponding glass made from soda-ash. For glasses of the lamp-glass type, fused borax caused more rapid melting than either boric acid or crystallised borax, although the last-named caused the most rapid fining. None of the three forms possessed outstanding advantages as a source of boric oxide, but all were rather better than calcined borax. A. COUSEN.

Some glasshouse tests to determine differences in the general characteristics and in the working properties of molten glass. W. E. S. TURNER (J. Soc. Glass Tech., 1926, 10, 374–384).—A series of detailed tests proved that an experienced glass-worker formed reliable views on the various working properties of the glasses handled, and deductions made by him were of distinct value in studying complex phenomena of melting and working. The tests confirmed the influence of moisture, arsenious oxide, and chlorides on the working properties of glass. A. COUSEN.

X-Ray patterns of mullite and sillimanite. J. F. HYSLOP and H. P. ROOKSBY (J. Soc. Glass Tech., 1926, 10, 412—415).—X-Ray photographs of natural sillimanite, mullite, kaolin (fired for 5 hrs. at 1050°), and a synthetic silicate obtained by heating alumina and silica in the proportions giving $3Al_2O_3,2SiO_2$ with 15% of sodium tungstate at 1350° for 100 hrs., revealed differences between the patterns of the sillimanite and the other samples examined. Since the differences depended on the relative spacing of the lines, they were sufficient for identification purposes. A. COUSEN.

Commercial sillimanite in glass works. A. COUSEN and W. E. S. TURNER (J. Soc. Glass Tech., 1926, 10, 416-423).—The successful commercial use of sillimanite-clay refractories is cited in the case of a pot for opal glass, potettes, pot rings, port-hearth blocks, pot-furnace sieges, and coatings for flues.

A. COUSEN.

Viscous properties of glass. V. H. STOTT (J. Soc. Glass Tech., 1926, 10, 424-433).-The viscositytemperature curve of a certain soda-lime-silica glass was perfectly definite and reproducible in the range 1200-1350°, if the glass had been rendered homogeneous by stirring at 1470°. On cooling below 1200° and reheating, the viscosity was not necessarily the same function of the temperature as before, and the glass could thus exist in more than one state at temperatures below 1200°. In the metastable range values of viscosity fluctuating by \pm 30% from the mean were obtained. When the glass was not cooled below 1140°, the normal state was regained at temperatures slightly exceeding 1200°, but on slow cooling to the room temperature a persistent viscosity increase of 10% at temperatures above 1200° was obtained. Two different methods had shown that a change in sign of the curvature of the logarithmic viscosity-temperature occurred at about the same temperature as the discontinuity in the thermal

expansion curve. The author's results did not confirm the formula given by Michelson (J. Geol., 1917, 25, 405) for the return flow of glass after the removal of a load. A. COUSEN.

Causes of the surface devitrification of glasses. K. TABATA (J. Amer. Ceram. Soc., 1927, 10, 6-22).-Tammann's explanation of the devitrification of glasses (cf. B., 1925, 920) is deemed inadequate, and the effects of sharp edges, cicatrices, and bubbles on crystal production at the surface layers of glasses are observed. Samples, the constitutions of which are reported and which had been carefully heated at a pre-determined temperature for a prescribed time, were subjected to microscopical examination. Surface devitrification not only depends upon constitution, but is remarkably stimulated by the presence of cicatrices and sharp edges. The explanation of the phenomena lies in the application of the conception of surface energy, there being a greater chance of chemical combination at the surface owing to the greater energy. Curvature of surface also influences the quantity of energy sustained in unit area, hence the effects of sharp edges and cicatrices. The action of surface energy is the most important factor in deciding the degree of devitrification on a glass surface. The paper contains many photomicrographs of the investi-A. T. GREEN. gated effects.

Heat transfer in [glass] furnaces. D. J. McSwiney (J. Amer. Ceram. Soc., 1927, 10, 1-5).-The factors influencing heat transfer in glass-furnace practice are discussed. Flame temperature depends not only on the character of the fuel, but also on its rate of combustion. The maximum temperature possible with a fuel is never attained in practice because intimate pre-mixing of the fuel with air never obtains in commercial furnaces. Flame temperature affects the rate but not the efficiency of heat transference. The completeness of heat transfer from flames does not appear to be affected by variations in luminosity. Convective heating and the circulation of gases are discussed. Rapid changes in the volume of the gases during and following combustion are important factors in promoting the circulation of gases. A. T. GREEN.

X-Ray analysis of clays. L. B. STRUTINSKI (J. Russ. Phys. Chem. Soc., 1926, 58, 314-325).-The X-ray examination of clays affords an accurate means of determining the relation between the size of the particles and the cohesive properties of the clay. The X-ray K_a (line of copper) photographs of a variety of Russian clays, both plastic and rigid, including pure kaolin, were investigated. The presence of comparatively large crystals of quartz was detected. The kaolin, which was coarse-grained even when ground, gave a characteristic diagram, some lines of which persisted in all the clays, which was due to its space-lattice. The constants of this were calculated, and several possible structures discussed. A symmetrical molecule, suggested by Samoilov, is adopted. The broadening of the lines in the X-ray photographs are measured, and the size of the particles calculated from these data. Most of the clay consists of particles larger than 10^{-5} mm., *i.e.*, the proportion of colloid is comparatively small, and the change in the X-ray diagram must be due to the deformation of the space-lattice. M. ZVEGINTZOV.

Substitution of calcined ball clay for non-plastic [materials] in porcelain and talc bodies. A. S. WATTS, R. M. KING, and H. G. FISK (J. Amer. Ceram. Soc., 1927, 10, 53–58).—The effects of the substitution of properly-ground, calcined ball clay for (1) flint in a normal porcelain body, (2) talc in a normal talc body, (3) calcined kaolin in a normal chemical porcelain body, upon the modulus of rupture, resistance to impact and heat shock, and electrical resistivity, are reported. Recipes for the various bodies are given. The results obtained are variable and erratic. The only justification for the use of ordinary plastic ball clay in porcelain bodies is that this material imparts the necessary workable properties to the bodies; the quantity used should be reduced to a minimum.

A. T. GREEN.

Determination of the drying characteristics of clays. E. J. CASSELMAN (J. Amer. Ceram. Soc., 1927, 10, 59-61).—Directions for laboratory tests for controlling the drying properties when new clays are substituted, and which can be used in conjunction with works' data, are reported. Three such tests are formulated, viz., (1) the measurement of the drying shrinkage; (2) the computation of the radius of curvature which results when the clay is dried in contact with a flat plaster mould; (3) the determination of the amount of cracking when a slip of definite consistency is dried in a flat plaster mould. As a guide, limiting values for these data are given. A. T. GREEN.

Free quartz in felspar. A. MALINOVSZKY (J. Amer. Ceram. Soc., 1927, 10, 23—29).—Felspars, which vary in composition, when used in the manufacture of ceramic wares, introduce variations in the coefficient of expansion of the products, due to the amount and nature of the quartz content. Petrographic examination not only shows the presence of this quartz, but also gives quantitative data agreeing with those obtained by the accurate calculation of a rational analysis from the proximate analysis. This shows that the calculated rational analysis can be of great service in controlling felspar additions. Photomicrographs of unfused and fused samples of felspar are given. A. T. GREEN.

Determination of mullite in porcelain. T. N. MCVAY (J. Amer. Ceram. Soc., 1927, 10, 62-63).—A fired porcelain body in which mullite had developed, and a quantity of very pure, artificial crystals of mullite were subjected to treatment by (a) hydrofluoric, (b) sulphuric, (c) phosphoric acids in order to obtain quantitative data concerning the constitution of porcelain. The results obtained show that the use of hydrofluoric acid gives no indication of the amount of mullite present in porcelain, since the residues always contain quartz. Sulphuric and phosphoric acids are also unsuitable.

A. T. GREEN.

Effect of calcined cyanite in porcelain bodies. S. J. McDowell and E. J. VACHUSKA (J. Amer. Ceram. Soc., 1927, 10, 64-72).—The porcelain bodies compounded from clay, flint, felspar, and mullite, the lastmentioned being added as dissociated cyanite, were examined. The triaxial diagram is used to describe the composition of the bodies. The cyanite used consisted of 95% of cyanite, 2% of free quartz, and the remainder

rutile and accessory minerals. This material was calcined at cone 18 for 2 hrs. to obtain complete dissociation. Screen analyses showed that over 85% of the flint, felspar, and calcined cyanite passed through a 260mesh. The total clay content of the body, which was made up of 20% of Kentucky ball clay, 20% of Tennessee ball clay, 20% of Florida plastic kaolin, and 40% English china clay, was kept constant at 50% throughout the investigation. The clay slip was screened through 150-mesh, and the body de-watered on muslin in plaster absorption bowls to the proper working consistency. Firings of the experimental bodies were made in a gas-fired test kiln to cones 8, 10, 12, 14, 16, 18, and 20. The temperature was brought up to within three cones of that desired, and the bodies were soaked until the required cones bent over. Bodies containing the higher percentage of cyanite have the lower shrinkages and coefficients of expansion. The modulus of rupture tends to increase as the amount of cyanite increases at the expense of the felspar and flint, although 30% or more of cyanite must be present before the effect is marked. The colour of the bodies varied from good whites for the felspar-flint mixtures to greys for the cyanite mixtures. Microscopical examination showed that the dissociated cvanite particles are embedded in a ground-mass which has developed mullite from the clay, but that there is little if any secondary development of mullite. Those bodies high in cyanite had a protracted "maturing" range. A. T. GREEN.

Thermal conductivity of refractories. F. H. NORTON (J. Amer. Ceram. Soc., 1927, 10, 30-52).-The main sources of error in previous investigations of the thermal conductivity of refractories are discussed. With a view of obtaining a perfectly linear flow of heat and an accurate measurement of temperature, the author details the design of an apparatus for determining the values of the " constant " up to 1600°, using a gas-fired furnace as the source of heat. The values of the thermal conductivity of a number of refractory materials, including fireclay, silica, magnesite, chrome, and carborundum products, are reported. It is believed that these values may have an error of \pm 25%. The size and shape of the pores are important factors in influencing the value of the thermal conductivity. In most cases the conductivity increases rapidly at low temperatures and more slowly at high temperatures. Magnesite and silicon carbide, however, show the anomalous property of decreasing conductivity with increasing temperature. A rapid increase in conductivity at high temperatures is not indicated by the experimental results, probably because heat transfer by radiation does not become important at temperatures up to 1500°. A. T. GREEN.

Some corrosion and erosion phenomena and their bearing on the macrostructure of refractories. J. F. HYSLOP, R. GUMM, and H. BIGGS (J. Soc. Glass Tech., 1926, 10, 405-410).—The corrosive and erosive attack of glass on refractory materials was simulated by exposing blocks of sealing-wax containing grog to the action of benzene. Corrosion depended on (1) the density of the solute-rich layer relative to the solvent and (2) the size of the grog particles. With a light, upward-flowing layer, material with large particles was more rapidly broken up than that containing small particles, whilst the reverse held with a dense layer. The results were confirmed by immersions of clay rods in glass, clay with larger grog being more corroded than that with finer material in a lead glass, the reverse holding in soda-lime glass. When attack was due to erosion, maximum resistance coincided with the presence of the maximum amount of fine particles. A. COUSEN.

Determination of the attack of slag and flue dust on refractories. F. HARTMANN (Stahl u. Eisen, 1927, 47, 182-186).-A cylinder of the refractory is heated in an electric carbon-granule furnace, and a definite quantity of solid slag is sprinkled on to it over a period of 30 min. The slag has time to react chemically and to run over the surface of the cylinder. The specimen is kept at the required temperature for a further period in order to give the slagged portion of the brick time to flow away. From the initial and final weight and volume of the refractory, the attack of the slag can be expressed as a percentage of the original weight or volume. A reducing or oxidising action can be employed. As the temperature rises above the m.p. of the slag, the rate of attack remains constant within a certain range, above which it increases. The effects of porosity, packing pressure, and surface sintering are considered. Comparison of the slagging action of iron oxide and manganese oxide shows that in the Siemens-Martin furnace slag the manganese oxide is the more active material. L. M. CLARK.

PATENTS.

Colouring glassware. M. L. BURGESS, ASST. to MARIETTA MANUF. Co. (U.S.P. 1,615,973, 1.2.27. Appl., 17.11.23).—To the batch in the furnace is added a suitable colouring medium to give a glass coloured throughout. The molten glass is rolled to the desired thickness and the hot surface sprayed with an aqueous copper sulphate-sulphuric acid solution, after which the glass is annealed, thereby baking-in the surface colour.

A. COUSEN.

Siliceous composition of matter. H. A. ENDRES and L. CALDWELL, Assrs. to CELITE Co. (U.S.P. 1,613,448, 4.1.27. Appl., 19.12.25).—Finely-divided silica, *e.g.*, kieselguhr, is mixed to a paste with an excess of lime and water, and when reaction is complete, is dried and calcined at 450—950°. The mixture of calcium oxide and calcium silicate thus obtained, on treatment with moist chlorine, yields a product which contains calcium hypochlorite dispersed through calcium silicate, and is of value as an ingredient of cement, or as a decolorising material for fats and oils. In an alternative process the calcination at high temperature is omitted.

T. S. WHEELER.

Device for coating articles with glass, enamel, quartz, and metals. M. U. SCHOOP (U.S.P. 1,617,166, 13.1.22. Conv., 8.2.21).—The coating material in powder form is conveyed by a stream of combustible gas through a baffle plate, to attain a uniform suspension, to a nozzle supplied with oxygen and two combustible gases, forming a blowpipe flame. The coating material is projected from the nozzle on to the article to be coated, the particles being heated at a high temperature by the combustion of the conveying agent. B. W. CLARKE. Treatment of glass used in motor-car lamps etc. R. HERTOG (F.P. 608,026, 16.12.25).—Glass is sprayed with a mixture of powdered rock having a high silica content, *e.g.*, quartz, with a binding agent, such as fluorspar, and heated to about 600° in a muffle furnace. L. A. COLES.

Annealing of glassware. HARTFORD-EMPIRE Co., Assees. of V. MULHOLLAND (E.P. 250,201, 13.3.26. Conv., 31.3.25).

Lehrs for annealing glassware. W. J. MELLERSH-JACKSON. From HARTFORD-EMPIRE Co. (E.P. 264,446, 22.7.25).

Methods of and apparatus for forming sheet glass. L. Mellersh-Jackson, From Hartford-Empire Co. (E.P. 264,720, 31.5.26).

Manufacture of aluminium chloride (U.S.P. 1,617,693).—See VII.

IX.—BUILDING MATERIALS.

Apparatus for the thermal analysis of plaster. P. JOLIBOIS and L. CHASSEVENT (Compt. rend., 1927, 184, 202-204).-As an adjunct to the chemical analysis of plasters an apparatus for thermal analysis is described in which a thermometer dips into a truncated, conical, brass vessel containing the paste, surrounded by a calorimeter-jacket containing water, the temperature of which is adjusted electrically. Curves relating the temperature-rise during setting and the time are given for a number of types of plaster. The apparatus enables control and classification of industrial plasters, according to their rates of hydration, to be obtained, by measuring the beginning of setting, the rate of transformation into gypsum, and the composition and resist-J. GRANT. ance.

PATENTS.

Manufacture of cement. P. CADRE (E.P. 264,711, 7.5.26).—Gypsum, anhydrite, karstenite, or other materials containing a high proportion of calcium sulphate are dried to a moisture content of less than 5%, finely-pulverised, cooled, and mixed with dried and finely-pulverised, blast-furnace slags, clinkers, and the like, preferably in the proportion 80% of slag, 5% of clinkers, and 15% of anhydrite, or the like. The product, in contrast to ordinary cements of this type, is rapid hardening and possesses a high initial strength.

B. W. CLARKE.

Manufacture of fused cement. G. POLYSIUS (G.P. 434,187, 19.9.24).—The materials, fused in the rotary kiln, are immediately run into a chamber in which an intimate mixing takes place, with the addition of a flux if necessary, the molten material being then subjected to a reduction process. The nozzle serving to conduct the heating medium is arranged so that the hottest part of the flame can reach the outlet of the kiln. The process can also be carried out on the counter-current principle. B. W. CLARKE.

Manufacture of artificial stone. O. A. TANNER, Assr. to ARTSTONE BURIAL VAULT Co., INC. (U.S.P. 1,617,927, 15.2.27. Appl., 25.7.25).—Stone is made from a mixture of 30 pts. of fireclay, 30 pts. of silica, 30 pts. of sulphur, 5 pts. of plumbago, and 5 pts. of talc. F. G. CROSSE. 222

Wood-preserving composition. F. RASCHIG (U.S.P. 1,616,468, 8.2.27. Appl., 20.5.25. Conv., 13.2.25).—See E.P. 246,010; B., 1926, 241.

Siliceous composition (U.S.P. 1,613,448).—See VIII.

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

Relation of the mechanical properties of steel wire to the properties of the original wire and to the method of drawing. W. PÜNGEL (Stahl u. Eisen, 1927, 47, 172-182).-The effects of cold-drawing on the mechanical properties of four steels, the carbon contents of which were 0.24, 0.41, 0.50, 0.62%, are considered. Ductility increases with decreasing carbon content, and the softer the steel the greater the amount of work it can withstand with safety. The tensile strength of both drawn and annealed wire increases proportionally to the carbon content. The ability to withstand bending and alternating torsion increases with increasing carbon content in wires of the same diameter and the same final strength. The tensile strength rises initially in proportion to the reduction in cross-section, but more rapidly with continued reduction. The change in bend strength follows that in tensile strength if the wire is bent over a constant radius. Bending tests carried out with a bending radius double that of the wire show a constant value for the number of bends sustained before fracture. Simple torsion tests, using a length of wire $l = 100 \times \text{diameter}$, give results showing a constant or slightly falling strength in torsion with increasing reduction in area. Wires are examined for mechanical uniformity by twisting together two lengths laid side by side. This test gives constant values up to a certain reduction in cross-section, which is greater with smaller carbon content, and enables the limit to be fixed to which the material can be cold drawn. Endurance in the repeated torsion test falls with continued drawing; wires drawn from an original small diameter are superior to those drawn from a larger wire to give the same tensile strength. It is concluded that the higher carbon steels should be used for drawing wires which will be required to withstand repeated alternating torsion loading, since with higher carbon material a given tensile strength is produced with less cold work. The tests previously used for rope are not sufficient. The uniformity of the wire and its resistance to repeated alternating torsion should be examined.

L. M. CLARK.

Effect of electrolytic hydrogen on the tensile strength of steel in the presence of other elements. D. W. ALEXEEV and M. N. POLUKAROV (J. Russ. Phys. Chem. Soc., 1926, 58, 511—517).—The time required for a given steel wire to break under a load of 3 kg. when acting as a cathode in solutions of potassium hydroxide and sulphuric acid under different conditions was investigated. In pure acid or alkaline solutions electrolytic hydrogen had no appreciable effect on the tensile strength of the steel, but small quantities of mercury in the alkaline solutions, or arsenic, antimony, and lead in the acid solutions, lowered it to about 1/30 of its original value. The magnitude of the lowering effect depended on the concentration of the metals, of the electrolytes, the current density, and the temperature. The effective concentrations of mercury were 0.03-0.125%, whilst arsenic was active even at 0.005%. The concentration of alkali below 0.25N and above N favour the lowering, as also increase of current density up to a maximum at 0.2 amp. per sq. cm. With polished wires, increase of temperature from 10° to 17° favours the lowering, but further rise inhibits it. Unpolished wires are unaffected at all temperatures above 10°. The action of arsenic, antimony, and lead is very similar to that of mercury. In all cases a surface deposit of the metal on the steel is formed, which promotes the action of the electrolytic hydrogen. A theory of the mechanism is suggested.

M. ZVEGINTZOV.

Influence of compression on the fragility of steel. Existence of a limit of fragility. P. DEJEAN (Compt. rend., 1927, 184, 188—189).—The resilience of a steel containing 0.180% C, 0.265% Si, 0.54% Mn, 0.016% S, and 0.016% P has been determined, after annealing for various times at various temperatures. The resilience was then re-determined after the sample had been subjected to various forces of compression. In each case the pre-compression had no effect on the resilience until a critical value (ranging from 55—130 kg./mm.²) was attained, when the latter fell rapidly. J. GRANT.

Fluorspar flux in the iron foundry cupola furnace. E. WILKE-DÖRFURT and T. KLINGENSTEIN (Stahl u. Eisen, 1927, 47, 128—133).—The use of fluorspar as a flux in the cupola furnace produces a slag which is less basic and less fluid than that obtained by using a pure limestone. This is ascribed to combination of the lime with silica and alumina. The slag from a charge mixed with spar contains no fluorine compounds, these probably being completely volatilised during the formation of the slag before the molten iron is covered by it. It is concluded that fluorspar can have no desulphurising action in the furnace, and that its use is harmful.

L. M. CLARK.

Testing moulds and mould materials. TREUHEIT and L. TREUHEIT (Stahl u. Eisen, 1927, 47, 121-128).-The ramming strength, binding properties, and permeability to gas of sand moulds were determined for varying moisture and clay content. Various methods of mechanical and hand ramming were used. Ramming strength was measured by the size of indentation produced by a cone when pressed into the material under known load. Binding strength was determined by the ratio between the cross-section of a rectangular slab and the weight of that portion of the slab that could project unsupported without failure. All mechanical processes gave higher hardness values than hand ramming. High hardness was generally accompanied by flaws owing to unequal distribution of stresses throughout the material. The most useful hardness values were obtained with 7-10% of moisture and 8-12% of clay. In general, binding strength increased with resistance to indentation. L. M. CLARK.

Recovery of flue dust containing zinc and lead oxides from Siemens-Martin furnace flue gas. S. SCHLEICHER (Stahl u. Eisen, 1927, 47, 169-172).-- Addition of scrap containing galvanised sheet, leadbearing material, and enamelled iron to the charge of the open-hearth furnace produces considerable amounts of zinc and lead oxides in the flue gases. Adaptation of the Cottrell-Möller electrostatic precipitation method enables this dust to be recovered. Precautions are necessary against explosion due to admission of unburnt gas to the flue gas in the precipitation chamber during reversal of the furnace, or to pocketing of coal dust in sheet scrap in the bath with subsequent sudden combustion. The efficiency of the recovery process is increased by elimination of air leaks in the flue-gas leads and valves, and by lowering the temperature of the gases by water-spraying before their entry into the precipitation chamber. Lead and zinc resemble manganese in having a deoxidising and desulphurising action on the melt, whilst enamel is taken up by the slag at a very small expense of lime. The use of scrap containing tinplate may be more objectionable; since tin enters into the steel to an appreciable extent.

L. M. CLARK.

Electrolytic working of brass cuttings in hydrochloric acid solution. W. W. STENDER (Z. anorg. Chem., 1926, 159, 145-157).-The difficulties of recovering copper electrolytically from brass on a commercial scale are discussed. The recovered copper must be such that it is readily dissolved by dilute sulphuric acid, and the zinc produced in a form other than zinc sulphate which is of little technical use. The possible methods of procedure are discussed and a solution of the problem is found in the electrolysis of brass in hydrochloric acid solution. A detailed account of the apparatus and process is given, and it is pointed out that (1) the yield for the current used was 88% of the theoretical, and (2) the energy expended was about 0.50 kw.-hr./kg. of copper precipitated in the form of powder. Zinc chloride was obtained as a useful by-product. The best results were obtained using ferroconcrete tubs with asphalt linings or wooden tubs with lead casings. The final product must be washed free from hydrochloric acid to prevent loss by oxidation. The course of the reaction is discussed theoretically, and an explanation put forward to account for the breaks in the curve reaction voltage-time, which occur towards the end of the reaction. M. CARLTON.

Efficiency of ferrosilicon furnace. Schlumberger. —See VII.

Effect of slag on refractories. HARTMANN.—See VIII.

PATENTS.

Producing corrosion-resisting coating on iron and steel. C. H. HUMPHRIES, ASST. to METALS PROTEC-TION CORP. (U.S.P. 1,614,303, 11.1.27. Appl., 22.11.26; cf. 1,545,196; B., 1925, 726).—Iron and steel articles are protected against corrosion by coating them with a metal which is electropositive to iron (zinc), then with a metal which is electronegative to the first coating (copper) and finally with chromium. T. S. WHEELER.

Adherent, rust-proof, electrolytic metallic coatings on iron and steel. LANGBEIN-PFANHAUSER-WERKE A.-G. (G.P. 433,037, 28.6.25).—Before the deposition of the final coating, two intermediate layers, the second of cadmium and the first of a metal easily alloying with cadmium (zinc, tin, or the like), are deposited on the iron. The coatings are readily polished and rust-proof. L. M. CLARK.

Tempering steel with hydrogen or gases containing hydrogen. GELSENKIRCHENER BERGWERKS A.-G., ABT. SCHALKE (G.P. 431,622, 25.1.24).—A fixed upper limit of concentration (determined by the pressure and temperature) of methane produced in the reaction must not be exceeded, otherwise the reaction is retarded or stopped. L. M. CLARK.

Method of increasing the ohmic resistance of pure iron, especially electrolytic iron. SIEMENS & HALSKE A.-G. (E.P. 245,753, 21.12.25. Conv., 9.1.25). —A very adherent deposit of silicon or boron is formed on the surface of pure iron by heating it at 600—700° in a current of a volatile compound of silicon or boron, e.g., silicon hydride. This deposit is then made to diffuse into the iron by raising the temperature to 1000°, either in a current of hydrogen or *in vacuo*. To obtain a great increase in the ohmic resistance of the iron, the whole process may be repeated several times. The silicated layer on the iron may also be produced by embedding the iron in finely-pulverised silicon or in ferrosilicon rich in silicon, and heating at 1000°.

M. E. NOTTAGE.

Alloy steel. C. M. JOHNSON, ASST. to CRUCIBLE STEEL CO. OF AMERICA (U.S.P. 1,617,334, 15.2.27. Appl., 27.6.25).—A steel containing 25—30% Cr, 20—30% Ni, and 1—3.5% Si. F. G. CROSSE.

Copper-extraction process. W. E. GREENAWALT Appl., [A], 5.10.25. (U.S.P. 1,614,668-70, 18.1.27. Renewed 20.7.26. [B], 10.4.26. [C], 8.6.26).—(A) The ore is finely ground in a relatively small amount of water, a dilute acid solution added to it, the resulting acid ore pulp graded to remove the oversize, which, after reducing its acid content, is added to new ore to be reground. (B) The copper ore is separated into a high-grade and a low-grade concentrate, the latter is roasted and leached with a dilute acid solution to extract the copper. The resulting solution, containing iron salts, is electrolysed, by which means the copper is deposited, and the acid and ferric iron are regenerated. The high-grade concentrate is fused and further concentrated, and added to the electrolysed solution to reduce the ferric iron. (c) The unroasted high-grade concentrate as above is added to the electrolysed solution to reduce the ferric iron. The solution is again electrolysed to deposit more copper. M. E. NOTTAGE.

Production of stains and gold tones on brass. W. STAHLSCHMIDT (G.P. 432,827, 10.7.24).—Brass is stained by treatment at ordinary temperatures with a bath of potassium hydroxide (168 pts.), sodium potassium tartrate (280 pts.), and copper sulphate (104 pts.), dissolved in water (3000 pts.). Immersion in dilute sulphuric acid produces a gold tone. L. M. CLARK.

Granular brazing solder. C. H. DAVIS, ASST. to AMERICAN BRASS CO. (U.S.P. 1,617,285, 8.2.27. Appl., 21.7.26).—The solder consists of granules of a copperzinc alloy coated with copper. M. E. NOTTAGE.

Condensation of zinc vapours on heated metallic surfaces: Gelsenkirchener Bergwerks A.-G., Abt. Schalke and F. Caspari (G.P. 432,795, 11.2.22).—Zinc vapours produced by the action of an electric current are deposited on metallic surfaces maintained at temperatures varying from 400—700°. Careful temperature control is necessary. L. M. CLARK.

Zinc blende roasting furnace. G. BALZ (G.P. 432,232 and 432,303, [A], 6.12.25. Addn. to 419,308, [B], 2.4.25).—(A) Introduction of secondary air takes place from above to the transmission opening in the inner cock. By means of a directing device, the air stream is thrown upon all the zinc blende as it enters. The tube for introducing the air is led in through the waste-gas exit, and is moveable. (B) The rotating stages are adjusted to move in opposite directions to produce homogeneous distribution of the material. Separation of the stages is effected by a sand trap formed from the roasted blende. L. M. CLARK.

Separation of antimony and lead from mixtures of the oxygen compounds. A.-G. F. BERGBAU, BLEI-U. ZINKFABRIKATION ZU STOLBERG U. IN WESTFALEN, and G. DARIUS (G.P. 433,031, 4.3.24).—The compounds are heated, in the absence of air and without fusion, with alkaline-earth sulphides or with materials from which these are produced during the process (such as a mixture of iron pyrites and alkaline earths). Sulpho-antimony compounds and insoluble lead sulphide are thus formed. L. M. CLARK.

Treatment of impure molten metallic masses. H. HARRIS (E.P. 244,424, 17.10.25. Conv., 11.12.24).-Impure molten lead, containing one or more alloying metals, such as arsenic, antimony, or tin, is mixed with sodium hydroxide, with or without sodium chloride, heated at 500°, and an alkali oxy-salt of a lead-alloying metal gradually added. The lead-alloying metal must have less affinity for oxygen than the metal or metals to be removed from the lead. A reaction of the following type takes place : $-4NaSbO_3 + 6NaOH + 5Sn$ $= 5Na_2SnO_3 + 3H_2O + 4Sb$. The metal set free in this reaction alloys with the lead. The alkali oxy-salt is used in conjunction with, or instead of, a commercial oxidiser, such as sodium nitrate, and it may be derived from the spent reagent used in a previous treatment. By this means the whole of the alkali can be utilised without separate recovery from the spent reagent, and the amount of commercial oxidiser needed is much reduced (cf. E.P. 142,315, 142,398, and 184,639; B., 1920, 456 A, 1922, 821 A). M. E. NOTTAGE.

Heat treatment and concentration of ores. E. EDSER, B. TAPLIN, and METALS PRODUCTION, LTD. (E.P. 264,584, 21.10.25. Cf. 250,991; B., 1926, 590) .--The ore is heated in the presence of carbonaceous material and a halogen at a temperature such that the metal is reduced from the ore, and is subsequently separated from the gangue either by a physical concentration process or by leaching. The halogen employed is preferably chlorine, and is present in the form of a chloride of an alkali or alkaline-earth metal unless the ore itself contains compounds of these metals, in which case the chlorine should be added in the form of chlorides of manganese, iron, or copper. When calcite is present in the ore in large quantities it is advantageous to convert it into calcium sulphide by adding a metallic sulphide, e.g., pyrites or chalcopyrite during the heat treatment.

This process is applicable to ores containing lead or silver. M. E. NOTTAGE.

Decomposition of cobalt ores. E. SCHULZE (G.P. 432,305, 21.8.24).—Ores containing cobalt as oxide or carbonate are decomposed by treatment with sulphurous acid under suitable conditions of temperature and pressure. Gangue is only slightly attacked by this reagent, so that the solutions obtained have a high degree of purity. L. M. CLARK.

Separation of metals which form volatile compounds. SIEMENS & HALSKE A.-G. (G.P. 433,218, 17.2.24).—The mixture of volatile compounds is brought into contact with a gas stream the speed of which is adjusted so that the less volatile compound is carried away in the stream while the more volatile compound diffuses against the gas stream. The process is especially suitable for the separation of hafnium and zirconium.

L. M. CLARK.

Gold-saving device. H. A. CROSBY (U.S.P. 1,616,784, 8.2.27. Appl., 25.1.26).—The machine consists of a separator inside which are two concentric cylinders mounted coaxially on a shaft. The outer cylinder is provided with a discharge spout, and connected with it, at the bottom, is a bowl containing mercury. The material to be separated is received in the inner cylinder. The shaft carries a partially spherical, agitating member placed within the bowl and formed with an opening for the passage of material through it. M. E. NOTTAGE.

Silver alloy. W. L. MITCHELL, ASST. to TIFFANY & Co. (U.S.P. 1,614,752, 18.1.27. Appl., 14.8.24).— An alloy of silver with up to 10% Na is mixed with an alloy of silver and zinc to give a product containing 93% Ag, 6.5% Zn, and 0.5% Na, which does not form an adherent deposit on exposure to air. A small quantity of a hardening agent, *e.g.*, tin or antimony, can be added. T. S. WHEELER.

Apparatus for heat-treating metals and alloys. W. S. SMITH, H. J. GARNETT, and J. A. HOLDEN (E.P. 263,923, 3.10.25).—The apparatus, designed for the annealing of electric cables etc., consists of a furnace, preferably electrically heated, inside which is a heatingtube through which the conductor is passed. This tube may be extended outside to form a cooling-tube which is water-jacketed. A portion of the tube within the furnace is perforated and jacketed, the jacket being provided with a pipe connected with a supply of inert gas; a second gas-supply pipe is fixed to the tube at a substantial distance apart from the jacket. Alternatively, the jacket may be replaced by a pipe which traverses a considerable length of the furnace before making connexion with the pipes attached to the heating tube. The gas entering the tube divides into two streams, one of which passes out into the atmosphere through the cooling-tube, the other flows through the heating-tube and escapes through the inlet end. The pressure of the gas supplied may be so adjusted that practically all the gas inside the jacket and that passing through the perforations into the heating-tube is discharged into the atmosphere at the inlet end, whereas the gas entering through the second supply-pipe passes out mainly through the outlet end. Thus the inert gas is raised to the temperature of the conductor before coming into contact with it, and any traces of oil or grease become volatilised and are blown out into the atmosphere at the inlet end, whereby no reduction of copper oxide in the copper is possible.

M. E. NOTTAGE.

Furnace for annealing sheet-metal plates. STAHLWERKE A.-G., and W. BERNATZKY (E.P. 264,110, 22.10.26).—The sets of materials to be treated are placed on portable supports by means of which they are inserted into and removed from the furnace. These supports are made longer than the inner furnace length so that their edges are not exposed to the direct furnace heat, and the coupling can be done during the annealing process outside the furnace. The furnace has two doors, and coupling and conveying contrivances are provided for the supports at each end of the furnace.

M. E. NOTTAGE.

Annealing metal. H. W. SANFORD (U.S.P. 1,613,726, 11.1.27. Appl., 11.2.22).—Castings are annealed by being placed in an enclosure through which air or other gas, *e.g.*, waste furnace-gas, at a suitable temperature is passed, so that the metal is slowly heated, and then slowly cooled. T. S. WHEELER.

Manufacture of chill castings. E. KÖTTER-ITZSCH (E.P. 263,123, 6.12.26. Conv., 15.12.25).-The mould is provided at one side with a slot which extends nearly to the bottom, and which can be gradually closed by a series of independent movable pieces so arranged that, once closed, they do not move again in relation to the metal. The filling of the mould is thus effected by compartments, in each case through the aperture of the next higher compartment, which aperture is closed when this compartment is to be filled. The crucible, equal in content to the mould, is so guided that its inclination is automatically adjusted to the quantity of metal contained in it, and may be so mechanically associated with the closing pieces that as the casting progresses the next compartment to be filled is automatically closed. M. E. NOTTAGE.

Fusion in a rotatory furnace. G. POLYSIUS EISEN-GIESSEREI U. MASCHINENFABR. (G.P. 432,511, 20.9.24).— In addition to coal dust or usual fuels, the heat from an electric current is used. One portion of the furnace is arranged as the fusion chamber, and into it the fuel and auxiliary heating are introduced. The process is especially suitable for the reducing treatment of melts. L. M. CLARK.

Rotatory roasting furnace. E. H. KAUFFMANN (G.P. 432,947, 11.3.24).—The front of the furnace is built up as a dust chamber. The ore is introduced in the second part directly behind the dust chamber, and ore dust beyond that. An economy in fuel is obtained. L. M. CLARK.

Determining the melting point of metals. G. MANTELET (G.P. 433,244, 21.12.24. Conv., 20.12.23).— The metal is melted in a crucible attached to one end of a fire-proof rod. The specimen is electrically connected to a warning device, and on the breaking of the circuit at the instant of melting a bell rings. A galvanometer, calibrated for temperature measurement, then indicates the fusion temperature. L. M. CLARK.

Concentration of ores. J. L. STEVENS (U.S.P. 1,614,089, 11.1.27. Appl., 1.7.26).—The addition of 0.1—1 lb. of an organic thiocyanate, e.g., n-butyl thiocyanate, to 1 ton of a sulphide ore pulp greatly facilitates its froth flotation, especially in presence of an acid electrolyte. It is not necessary to isolate the thiocyanate, the liquid obtained by the interaction of *n*-butyl alcohol, potassium thiocyanate, and sulphuric acid can be employed. T. S. WHEELER.

Decomposing oxidisable ores by roasting. Soc. METALURGICA CHILENA "CUPRUM" (G.P. 412,134, 29.7.23).—The oxidising material is added to the ore in solid, liquid, or gaseous form in such manner and quantity that reduction to the metal is avoided. The pure metals are more difficult to separate from the ores than are the oxides. L. M. CLARK.

Process of preparing metals. F. KOREF and H. HOFFMANN, ASSTS. to GENERAL ELECTRIC CO. (U.S.P. 1,617,161, 8.2.27. Appl., 13.3.23. Conv., 7.8.22).---Metal wire consisting of a single crystal may be made by depositing metal of the same kind from a gaseous atmosphere on a single crystal, the deposit being conducted at a limited rate so as to avoid the formation of small crystals. M. E. NOTTAGE.

Recovering metals from liquids and compositions therefor. A. L. FEILD, Assr. to ELECTRO METALLUR-GICAL Co. (U.S.P. 1,617,206, 8.2.27. Appl., 20.6.22).— The liquid is brought into contact with activated carbon having an iodine adsorption value in excess of 20%. H. ROYAL-DAWSON.

Recovery of zinc and zinc compounds. E. C. R. MARKS. From AMERICAN SMELTING & REFINING CO. (E.P. 265,036, 7.4.26).—See U.S.P. 1,605,641; B., 1927, 114.

Means for sintering fine ores or pulverous ores. H. G. TORULF (U.S.P. 1,618,116, 15.2.27. Appl., 30.10.24. Conv., 22.8.23).—See E.P. 220, 924—5; B., 1924, 985.

[Dismantling rabble-arms of] pyrites and other furnaces. E. BRACQ (E.P. 264,411, 27.8.26. Conv., 7.4.26).

Coating articles with metals (U.S.P. 1,617,166).— See VIII.

XI.—ELECTROTECHNICS.

Effect of moisture on electrical properties of insulating waxes, resins, and bitumens. J. A. LEE and H. H. Lowry (Ind. Eng. Chem., 1927, 19, 302-306).-Measurements of the dielectric constant, effective conductivity at 1000 cycles, and resistivity were made with thirty-one waxes, resins, and bitumens, natural and synthetic, in the initially thoroughly dry condition and after six months' immersion in a salt solution corresponding to exposure to 98% relative humidity. In general, increase in capacity and conductivity and decrease in resistivity were greatest with those materials absorbing the most water. The substances least affected and absorbing least water were of the hydrocarbon type (paraffin wax). All the materials examined absorbed moisture, the most marked absorptions being as follows : bayberry wax (6.1%), blown gilsonite and residual

petroleum oil $(3 \cdot 3\%)$, aluminium stearate $(2 \cdot 7\%)$, zinc stearate $(3 \cdot 0\%)$, stearic acid $(3 \cdot 2 - 4 \cdot 0\%)$, and shellac $(4 \cdot 3 - 5 \cdot 1\%)$. C. O. HARVEY.

Efficiency of carbide and ferrosilicon furnaces. Schlumberger.—See VII.

PATENTS.

Thermo-couples and thermo-elements. W. C. HERAEUS G.M.B.H., and O. FEUSZNER (E.P. 264,201, 7.9.25).—One wire of a thermo-electric couple consists of an alloy of at least three precious metals, including a gas-adsorptive precious metal, *e.g.*, palladium, together with a precious metal of Group I of the periodic system, *e.g.*, gold, and one other precious metal of the platinum group, *e.g.*, platinum, in relatively small proportion. The other wire of the couple may be composed of platinum or platinum-rhodium etc. Couples so constructed yield constant values of thermo-electric potential when exposed to definite temperatures.

J. S. G. THOMAS.

Electric discharge tube. N. V. PHILIPS' GLOEILAM-PENFABR. (E.P. 250,928, 6.4.26. Conv., 18.4.25).—In an electric discharge tube adapted more especially for guarding against excessive voltages, one or both electrodes consist partly of a mixture of an alkali compound, e.g., sodium chloride, placed in a cup-shaped portion of the electrode, and a substance, e.g., magnesium, capable of liberating the alkali metal from the compound. The cup-shaped portion of the electrode is preferably closed by metal gauze. If desired, the electrodes, e.g., of nickel, may be amalgamated. J. S. G. THOMAS.

[Magnesium electrodes] for electric discharge tubes. N. V. PHILLPS' GLOEILAMPENFABR. (E.P. 249,847, 15.3.26. Conv., 28.3.25).—Magnesium is volatilised in a discharge tube and caused to deposit upon a conducting layer, e.g., composed of graphite emulsion, coating the leading-in wire and the inner surface of the tube in the neighbourhood of the wire. J. S. G. THOMAS.

Introducing potassium, caesium, or rubidium into electric discharge tubes. H. WADE. From N. V. PHILIPS' GLOEILAMPENFABR. (E.P. 264,258, 22.10.25 and 20.1.26).—A mixture of one or more compounds of potassium, caesium, or rubidium, *e.g.*, caesium chloride, with one or more azides of the metals of the second principal group of the periodic system, preferably barium azide, is introduced into the discharge tube or into a receptacle connected therewith, and heated, whereby the metallic vapour of potassium, caesium, or rubidium spreads within the tube without risk of oxidation.

J. S. G. THOMAS.

Electric storage batteries. C. E. LINEBARGER (E.P. 264,205, 17.9.25).—A storage battery is provided with channel ways communicating with the main part of the battery and containing hydrometric units, *e.g.*, small pellets or balls, for indicating the sp. gr. of the electrolyte. J. S. G. THOMAS.

Electric gas-filled discharge device. G. HOLST, E. OOSTERHUIS, and J. BRUIJNES, ASSTS. to N. V. PHILIPS' GLOEILAMPENFABR. (U.S.P. 1,617,684, 15.2.27. Appl., 8.2.22. Conv., 9.2.21).—See E.P. 175,275; B., 1923, 762 A.

Electric induction furnaces. J. R. DE ZUBIRIA (E.P. 251,608, 15.4.26. Conv., 29.4.25).

Electrodes for electric furnaces. Norske Aktie-SELSKAB for ELEKTROKEMISK IND. (E.P. 252,153, 6.5.26. Conv., 15.5.25).

Electric discharge devices. BRITISH THOMSON-HOUSTON CO., LTD., Assees. of H. D. BROWN (E.P. 253,126, 3.6.26. Conv., 3.6.25).

[Separators for the plates of] electric storage batteries or electric accumulators. Fuller's UNITED ELECTRIC WORKS, LTD., and S. C. WHAITE (E.P. 265,000, 18.1.26).

[Plate pillars for] electric storage batteries or electric accumulators. EDISON SWAN ELECTRIC Co., LTD., and G. E. WEBSTER (E.P. 264,970, 25.11.25).

Asbestos (E.P. 241,576).—See VII.

Heat-treatment of metals [cables] (E.P. 263,923).— See X.

Alcohol from sugar (U.S.P. 1,612,361).-See XVII.

XII.—FATS; OILS; WAXES.

Theory of the hardening of fats. H. P. KAUFMANN and E. HANSEN-SCHMIDT (Ber., 1927, 60, [B], 50-57).-Periodical determination of the iodine and thiocyanogen values during the course of mild technical hydrogenation of arachis oil shows that oleic acid is not reduced, whereas the main part in the change is played by linoleic acid, which is converted into singly unsaturated acids solid at the atmospheric temperature ; the proportion of saturated components remains unchanged. More prolonged hydrogenation of sunflower oil causes an increase in saturated compounds at the expense of linoleic acid, the bulk of which is, however, transformed into singly unsaturated acids. Subsequently, reduction of oleic acid and of its intermediately formed isomerides commences. Simultaneously, displacements of the double linking occur (recognised by the discrepancy between the iodine and thiocyanogen values) which are due to dehydrogenation in an unexplained manner.

H. WREN.

Solidification point of edible fats. T. MEYER (Z. Unters. Lebensm., 1926, 52, 461—465).—The method of Mohr (Milchw. Forsch., 1923, 1, 15) for determining solidification curves of fats was found reliable for use in the margarine industry. The curves obtained were characteristic for the different fats. A good margarine mixture showed a solidification curve closely resembling that for butter. A. G. POLLARD.

Rapid method for the sorting of butters and margarines. C. H. MANLEY (Analyst, 1927, 52, 67-72).— The method depends on the butyric acid content, and a new value "M" is obtained which ranged from 20.6 -26.4 for pure butters (20 samples) and 0-5.1 for margarines (18 samples). 5 g. of filtered fat are saponified with 20 c.c. of glycerol-soda solution (900 c.c. of glycerol and 100 c.c. of 50% aqueous sodium hydroxide solution), the soap is dissolved in 100 c.c. of boiled distilled water, and 4 drops of 0.5% methyl orange solution are added to the cooled solution, and 25% by vol. of sulphuric acid run in till the solution is faintly pink. The total volume of solution and precipitated acids is taken, 100 c.c. are filtered off, nearly neutralised with 10% sodium hydroxide solution, and neutralisation is completed with 0.1N-sodium hydroxide. Phenolphthalein solution is then added and the soluble fatty acids are titrated, and the number of c.c. taken less that required for the blank is the "M" value. If to the neutral solution from a butter fat 0.5 g. of silver sulphate is added and a Kirschner value determined, the result (KM) is the same or very nearly so as the " M " value, it being probable that volatile soluble acids other than butyric acid are co-precipitated with the insoluble acids. For margarines the "KM" value is lower than the "M" probably owing to some caprylic acid escaping co-precipitation. Precipitation is complete in 5 min. Butter fat cannot be determined by this method in the presence of 5% of coconut oil, but boric acid has no influence. D. G. HEWER.

"Hydrogenation" of oleic acid with activated hydrogen. H. I. WATERMAN and S. H. BERTRAM (Chem. Umschau, 1927, 34, 32—35; cf. Eichwald, A., 1922, i, 982).—The so-called hydrogenation of oleic acid by means of activated hydrogen (Bonhoeffer, A., 1925, ii, 52) has been critically examined. In a series of experiments the iodine value of oleic acid so treated never fell below 78, the refractive index rose consistently, and no appreciable alteration in elementary composition could be detected. The view that no hydrogenation takes place, but that the reaction is essentially a polymerisation, in the sense of two mols. of oleic acid giving rise to one mol. of a saturated dibasic acid, is supported by m.p. and mol. wt. evidence. E. HOLMES.

Examination of mixtures of coconut oil and palmkernel oil. Determination of butter fat in margarine. G. D. ELSDON and P. SMITH (Analyst, 1927, 52, 63-66).-The Reichert-Meissl and Polenske values have been determined for a complete range of mixtures of coconut and palm-kernel fats. From a consideration of the Reichert-Meissl, Polenske, and Kirschner values of a given mixture the proportion of butter fat is deduced, and the Reichert-Meissl and Polenske values due to it are allowed for; from the resulting figures the proportion of coconut and palm-kernel fats is deduced from the table. Accuracy depends upon the factors of the oils (chiefly of the butter fat) used in the mixture. Different mixtures of coconut and palm-kernel fats in certain proportions may give identical results. A table showing percentages of butter fats in margarines of varying Polenske and Kirschner values is included.

D. G. HEWER.

Oxidation and hydrolysis of light wood oil. P. O. POWERS, A. LOWY, and W. A. HAMOR (Ind. Eng. Chem., 1927, 19, 306—308).—Fractions of light oil boiling below 195° obtained during the industrial distillation of hardwood (maple, beech, birch, ash, and oak), gave good yields of organic acids upon oxidation, the best results being obtained by boiling with 6% nitric acid. Vanadium pentoxide catalysed the reaction and diminished side reactions. Hydrolysis (by nitric acid) of the esters present in the oil takes place at 70°; at 80° the oil is oxidised. Hydrolysis of the oil by refluxing with lime and water gave methyl alcohol and calcium salts of acetic, propionic, butyric, and higher acids. No traces of alcohols other than methyl alcohol were found, but this contained appreciable amounts of ketones, chiefly methyl

ethyl ketone. Removal of aldehydes and ketones from the original oil by means of sodium bisulphite caused a diminution in volume of 40%.

C. O. HARVEY.

Effect of moisture on waxes etc. LEE and LOWRY. —See XI.

Milk fat in foodstuffs. LÜHRIG.—See XIX.

·Salts of linolenic hexabromide from lumbang oil. IMPERIAL and WEST.—See XX.

PATENTS.

Bleaching fatty oils, mineral oils, etc. H. BOLLMANN (E.P. 245,745, 2.12.25. Conv., 6.1.25).— The bleaching of oils by bleaching earth is accomplished most quickly and effectively if oil and bleaching agent be intimately mixed in optimum proportions, saturation of the bleaching earth with oil already bleached being avoided. An apparatus is described wherein fresh portions of preheated oil and bleaching earth are continually brought into contact in requisite proportions, and removed from the bleaching chamber.

S. S. WOOLF.

Purification of dirty soap- and soda-solutions. A. STERN (Austr. P. 103,708, 5.2.25).—Dirty wash-liquors containing soap and soda are treated with a sufficient weight of alkali carbonate to restore their original alkali content, and the dirt is removed by filtration, preferably through spodium. S. S. Woolf.

[Soap for] cleaning fabrics (U.S.P. 1,615,146).— See V.

Siliceous composition (U.S.P. 1,613,448).—See VIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Physical concepts on problems in the paint and allied industries. A. DE WAELE (J. Soc. Dyers and Col., 1927, 43, 42-47).-The permeability of an oilcontaining protective coat of paint is inversely proportional to its degree of saturation (oxidation), and results from the presence of a polar group (relative to the oil) capable of lowering the contact angle of the coating to water. The property of paint by which it flows (deflocculates) during brushing and stiffens (reflocculates) after brushing, is dependent on the fact that whilst static rigidity is a function of the solid-liquid interfacial tension into the absolute surface of the interface, the rate of regain of rigidity after shear (rate of reflocculation) is an inverse exponential function of the viscosity of the medium $dF/dt = nfe^{-n}$, where F = the rigidity at any stage of deflocculation, n =viscosity of the medium, f = true static rigidity (rigidity after infinite rest), and $e = \log$. base; thus with a unit increase in the viscosity of the medium the rate of reflocculation diminishes at a tenfold rate. The "solidity " or rigidity of an oil-bearing coating is a function of heterogeneous grading of the pigment present. The drying of printing ink on paper is mainly determined by the rate of deflocculation of the ink and its absorption by the paper material; the rate of penetration of paper by an ink is proportional to the viscosity of the medium. It is necessary to introduce suitable pigments into cellulose nitrate

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lacquers for the purpose of inhibiting destruction of the cellulose nitrate by incident ultra-violet light.

A. J. HALL.

New paint and varnish remover. M. PHILLIPS and M. J. Goss (Chem. Met. Eng., 1926, 33, 745). *p*-Cymene mixed with ethyl or methyl alcohol etc. forms an excellent solvent for the removal of paint or varnish. *p*-Cymene has the advantage over other solvents that it has a high b.p. (176—176.6°). (See U.S.P. 1,580,914; B., 1926, 554.) S. PEXTON.

Degree of saturation of the resin acids. I. B. M. MARGOSCHES, K. FUCHS, and W. RUZICZKA (Chem. Umschau, 1927, 34, 29-32).-Mainly introductory. After discussing the methods previously used for determining the iodine values of resins, it is demonstrated that the rapid method previously developed (Margosches, Hinner, and Friedmann; B., 1924, 639) is applicable to the examination of the resin acids. In this method 0.10-0.11 g. of substance is dissolved in 10 c.c. of 96% alcohol and mixed with 25 c.c. of 0.2N-alcoholic iodine solution and 200 c.c. of water, the time of reaction being 5 min. Tables are given showing (a) the effect on the observed iodine value of varying amounts of iodine in excess of that required for saturation, whereby the 5 min. method gives results comparable with those from the Hübl 24 hr. method only when this excess is approximately 75%, and (b) comparative iodine values by the Hübl and Margosches methods for a series of thirteen resinous materials. E. HOLMES.

Esters of Congo and Manila resins. W. T. PEARCE, R. CARLSON, and C. L. RYDSTROM (Ind. Eng. Chem., 1927, 19, 285–286).—The high acid values developed by Congo and Manila resins upon heating until oil-soluble cause "livering" in pigmented varnishes. Varnishes of low acid value may be produced from these resins, esterified by heating with glycerol at temperatures up to 325°, with or without the addition of catalysts. The acid value may also be reduced by heating and driving off volatile matter. C. O. HARVEY.

Effect of moisture on resins etc. Lee and LOWRY. —See XI.

Pigment finishes [for leather]. Vogel.-See XV.

PATENTS.

Composition of cellulose ethers and esters with hygroscopic substances. [Flexible films.] C. DREYFUS and G. W. MILES, Assrs. to AMERICAN CELLU-LOSE & CHEMICAL MANUF. CO., LTD. (U.S.P. 1,611,169, Appl., 27.12.20) .- The addition of zinc 21.12.26. chloride or similar inert hygroscopic substance (2-10 pts.) to a solution of a cellulose ether or ester, e.g., cellulose acetate (100 pts.) in acetone, enhances the flexibility of the film formed when the solvent is evaporated in thin layers, provided the film is kept slightly moist, until the hygroscopic substance has absorbed such water as it can retain. T. S. WHEELER.

Cellulose-ester composition. R. H. VAN SCHAACK, JUN. (U.S.P. 1,612,669, 28.12.26. Appl., 21.8.25).— Benzyl esters of hydroxy-aliphatic acids, *e.g.*, benzyl lactate, tartrate, or citrate, are of value as blending agents for cellulose esters and alcohol-soluble resins.

T. S. WHEELER.

Making a phenolic resin varnish. L. M. Rossi, Assr. to BAKELITE CORP. (U.S.P. 1,613,724, 11.1.27. Appl., 15.12.24; cf. U.S.P. 1,146,299—330; B., 1915, 914).—Phenol (1 pt.), formaldehyde (0.9 pt.), and sodium hydroxide (0.03 pt.) are boiled together in aqueous solution for $\frac{1}{2}$ hr., powdered rosin (0.38 pt.), and then hexamethylenetetramine (0.091 pt.), in concentrated solution are added, and the mixture is cooled, and employed as a varnish to coat papers, in the manufacture of moulding mixtures, and, generally, as a substitute for alcoholic solutions of phenol resins.

T. S. WHEELER.

Manufacturing plastic compositions [artificial mother-of-pearl]. Obtaining coloured, polymerised styrene and its homologues and products [artificial amber]. I. OSTROMISLENSKY, ASSR. to NAUGATUCK CHEMICAL CO. (U.S.P. 1,613,673-4, 11.1.27. Appl., [A], 29.1.25; [B], 3.2.25; cf. E.P. 236,891; B., 1925, 771).-(A) 1-10% of balata, rubber, or like gum is dissolved in styrene, with or without addition of a common solvent, e.g., xylene, and the styrene is polymerised by heating at 135-140°. The product has a nacreous lustre similar to that of mother-of-pearl, and is less brittle than untreated polymerised styrene. (B) 0.5-1.0% of an azo dye is dissolved in styrene, which is then polymerised by heat. The product is ground and added to styrene, which on polymerisation yields a substance resembling amber. T. S. WHEELER.

Hardening phenol-urea formaldehyde products. H. V. POTTER, J. W. CRUMP, and DAMARD LACQUER Co., LTD. (E.P. 264,601, 23.10.25).—The syrupy condensationproducts described in E.P. 256,711 (B., 1926, 889) can be hardened and eventually converted into an insoluble and infusible form by the addition, in the cold, of acids or acid-producing substances, e.g., salts of strong acids and weak bases. The rate of hardening depends on the phenol-urea ratio and the accelerator used in the preparation of the original syrup, as well as on the nature and amount of hardening agent used in the present hardening process. S. S. WOOLF.

Preparation of condensation products from carbamide, or its derivatives, and formaldehyde. Reconversion of insoluble carbamide-formaldehyde condensation products into soluble form. GES. FÜR CHEM. IND. IN BASEL (F.P. 609,108-9, 11.1.26. Conv., 17.1.25).-(A) According to the duration of heating and the temperature employed, water-soluble, water-insoluble, or gelatinous condensation products are obtained when carbamide or its derivatives and formaldehyde are condensed together under increased pressure and at temperatures above 100°. The products are used for insulating varnishes, moulding compositions, etc. Splinters or borings from hardened carbamide-(B) formaldehyde condensation products are heated under increased pressure and at above 110° with excess of formaldehyde. The latter is subsequently distilled off or further condensed with an appropriate amount of carbamide. A soluble resin-syrup is obtained in each case, and can be used for the same purposes as is the original resin before hardening. S. S. WOOLF.

Preparation of artificial resin. CONSORTIUM FÜR ELEKTROCHEM. IND. G.M.B.H., Assees. of H. DEUTSCH W. HAEHNEL, and W. O. HERRMANN (G.P. 433,853, 10.8.22. Addn. to 422,538).—A mixture of acetaldehyde and mesityl oxide is heated under reflux with dilute sodium hydroxide solution, distilled, and heated at 150°, and the resinous residue is ground with 3% acetic acid. The resin powder is separated, washed, and heated at 200°, yielding elastic, alcohol-soluble, light-coloured, and easily-fusible resin that can readily be rolled out to laminæ. Benzophenone may be used as solvent during the heating of the resin at 150°. S. S. WOOLF.

Manufacture of paints. D. GARDNER (U.S.P. 1,617,754, 15.2.27. Appl., 21.8.22. Conv., 11.10.21).— See E.P. 195,996; B., 1923, 564.

Preserving specimens (E.P. 263,674).—See I.

Ester of *n*-butyl alcohol (U.S.P. 1,613,366).—See XX.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Accelerators of vulcanisation : their influence towards one another and towards various rubbercompounding ingredients. R. DITMAR (Gummi-Ztg., 1927, 41, 992-994, 1048-1050).-A comparison of the behaviour of a series of accelerators of vulcanisation alone and in the presence of various common ingredients for rubber, using a basic mixture of rubber (100 pts.), sulphur (6 pts.), and zinc oxide (20 pts.). It is found that the effects produced are not explicable by any simple chemical law, so that it is necessary to investigate independently for each accelerator the behaviour under different conditions. White and brown factice, lithopone, and whiting impair the activity of the accelerators, the degree, however, being different in each case and for different accelerators ; the direction of the effect of barytes is dependent on the accelerator; kieselguhr, lime, magnesium oxide, and magnesium carbonate intensify the accelerating effect.

D. F. Twiss.

Classification and testing of regenerated rubber. P. ALEXANDER (Kautschuk, 1927, 67-70).-The chief forms of old rubber serving as stock for reclaiming or regenerating, in decreasing order of magnitude, are motor covers, inner tubes, and rubber shoes. Distinction is necessary between "pure" and "mixed" reclaimed rubber ; during the manufacture of the latter extraneous compounding ingredients have been incorporated. For chemical examination of reclaimed rubber the determination of acetone extract, saponifiable matter in the residue after extraction, bituminous ingredients, and ash suffice for practical purposes. A vulcanisation test, e.g., for 20 min. in steam at a pressure of 3 atm. after the addition of 3% of sulphur, is particularly valuable, consideration being given both to the tensile strength and the ultimate elongation of the product.

D. F. Twiss.

Sedimentation analysis of fillers (for rubber). F. EVERS (Kautschuk., 1927, 70—77).—A description of the Wiegner-Gessner sedimentation apparatus (A., 1926, 377), and its applicability to the investigation of the relative proportion of particles of various sizes in powders intended for incorporation in rubber. Results are quoted of experiments with golden antimony sulphide, magnesium carbonate, magnesium oxide, gas black, zinc oxide, sulphur, litharge, and lead sulphate. D. F. Twiss.

PATENTS.

Method of treating rubber and the like, and the products obtained thereby. J. H. REEL, Assr. to GENERAL RUBBER Co. (U.S.P. 1,612,780, 28.12.26. Appl., 20.6.24).—Dry rubber obtained in an uncompact plastic form by an atomising treatment is subjected to a process removing non-rubber constituents and yielding purified rubber in a similar uncompact condition. D. F. Twiss.

Rubber-latex coagulum. A. H. PETERSEN, ASST. to KELLY-SPRINGFIELD TIRE Co. (U.S.P. 1,611,278, 21.12.26. Appl., 26.9.22).—The coagulant (1 pt. by wt.) dispersed in a liquid medium (5 pts.) is mixed with rubber latex (containing 2 pts. of rubber); the mixture is agitated and the resulting coagulum is removed from the liquid. D. F. TWISS.

Process of softening rubber. C. P. HALL (U.S.P. 1,611,436, 21.12.26. Appl., 23.7.25).—In order to facilitate the milling of rubber there is added a softening agent with the following characteristics : Minimum solubility in carbon disulphide, 99%; in carbon tetra-chloride, 98%; in hexane, 75%; minimum $d^{15.5}$ 1.06, d^{25} 1.05. Maximum fixed carbon 14%, paraffin scale 2%, flash point 190°, evaporation loss 3.0% on 50 g. in 5 hrs. at 162.5°. Engler viscosity 5—7.

D. F. Twiss.

Production of a water-soluble evaporation product from [rubber] latex. M. S. STUTCHBURY, Assee. of W. BACHMANN and F. HEBLER (G.P. 432,894, 30.9.23. Addn. to 419,658).—The effectiveness of the protective colloids in the evaporation of latex is raised by the addition of hydrocyclic compounds such as tetra-, hexa-, methylhexa-, and deca-hydronaphthalene, cyclohexanol, etc. D. F. TWISS.

Method of treating balatas and gutta-perchas. C. H. SMITH, ASST. to GOODYEAR TIRE & RUBBER CO. (U.S.P. 1,614,541, 18.1.27. Appl., 13.12.24).—Balata or gutta-percha is repeatedly treated with a solvent progressively lower in resin content for the removal of its natural resins; the de-resinised product is dissolved in fresh solvent and treated with an inert decolorising agent, which is then removed, the balata or gutta product being finally precipitated. D. F. TWISS.

Chemical process for the etching of rubber. E. SARDOU (U.S.P. 1,614,935, 18.1.27. Appl., 29.9.25. Conv., 15.10.24).—The lines of the design reproduced on rubber sheets, which have been subjected to superficial super-vulcanisation, are covered with an impalpable, powdery mixture of fatty and resinous substances; the surface of the sheet is then subjected to the action of a solution of nitric acid and potassium bichromate.

D. F. Twiss.

Method and apparatus for uniting crude rubber to leather or other supporting surfaces. E. F. H. ENNA (E.P. 247,929, 26.1.26. Conv., 21.2.25).—A layer of raw rubber is united with a supporting surface of leather, rubber, or other material by roughening the surface of the former, and immediately, without the application of chemicals, pressing it into close contact with the supporting surface. Two supporting surfaces can be similarly joined by pressing together with a freshly-roughened, intermediate uniting layer of raw rubber. Suitable apparatus is described.

D. F. Twiss.

Use of mono- and di-carbalkoxydiarylthiocarbamides as accelerators in the vulcanisation of rubber. BRITISH DYESTUFFS CORP., C. J. T. CRONSHAW, and W. J. S. NAUNTON (E.P. 264,682, 1.3.26. Cf. 244,159; B., 1926, 138).—The reaction product obtainable by treating an alkyl anthranilate with thiophosgene, *e.g.*, di-o-carbethoxydiphenylthiocarbamide, or the further product of heating this at vulcanising temperatures, is used as an accelerator of vulcanisation.

D. F. Twiss.

Process for vulcanising rubber. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 264,673, 15.2.26).— The condensation products of crotonaldehyde or of an $\alpha\beta$ -disubstituted acraldehyde with an aromatic amine are applied as accelerators of vulcanisation. D. F. TWISS.

Manufacture of new condensation products of substituted acroleins. W. CARPMAEL. From I. G. FARBENIND. A.-G. (E.P. 264,674, 15.2.26).—Aromatic amines react with $\alpha\beta$ -disubstituted acraldehydes with formation of condensation products. Suitable solvents or condensation agents may be used if desired (cf. preceding abstract). D. F. Twiss.

XV.-LEATHER; GLUE.

Influence of the degree of liming on the amount of tannin absorbed by the hide. K. H. GUSTAVSON and P. J. WIDEN (Collegium, 1926, 562-569) .- Pieces of pelt were limed for different periods, unhaired, washed, delimed with ammonium chloride solution, washed, preserved for 12 hrs. in a boric acid solution, washed with distilled water, treated with a sodium-acetic acid buffer $p_{\rm H}$ 5.0, washed, cut into small pieces, and submitted to various tanning tests with basic chromium sulphate solutions of 22%, 37%, 54%, and 60% basicities, and an anodic oxalato-chromium solution. The amount of chromium absorbed by raw hide and the other pieces from the different chrome liquors showed that the longer the liming up to 2 weeks, the greater is the amount of chromium absorbed. The percentage increase was greater in the more basic liquors. This was expected, and was due to the action of the colloidal constituents and the anodic complexes, which action increases with the basicity. The basicity of the chromium salt on the fibres of raw hide was much less than that of the salt on the fibres of the limed pieces of pelt. The basicities of the salts fixed by raw hide from 22% and 37% liquors were 15% and $36 \cdot 2\%$, respectively, lower than that of the original liquor used for tanning. Hide powder and limed pelt fixed a more basic salt from these chrome liquors. This might be attributable to a stronger activation of the acid groups due to salt formation of lime and soda with the collagen. If this were so, it would agree with the view that cathodic complexes are taken up to a much greater extent from liquors of greater basicity (65-75%) than the hydrolysed acid. It was found that just as much chromium was fixed if the basic groups were inactivated. The increase in the amount of

tannin absorbed, due to liming the pelt, is due just as much to colloidal changes as to the activation of the protein groups. Samples of hide powder were treated with acids and alkalis, respectively, then brought to the isoelectric point, and their behaviour towards different tanning materials determined and the pelt tests confirmed. Hide which had been one-third peptised by treatment with trypsin showed diminished chromium absorption. The colloido-chemical conception of tanning can explain the formation of high molecular compounds just as well as the chemical theory, and both theories should be combined. The experiments show that even raw hide possesses a great affinity for those basic chromium compounds in which the colloidal nature is not too pronounced. It is still doubtful whether the ring structure of the raw hide is opened to liberate some auxiliary valencies to combine with the hydrolysed acid, or whether the ring structure itself has the power to combine directly with the chromium salts. Another possibility is that the elementary components possess free acid and basic groups. Liming results in the formation of a chemical compound with hide protein involving primary valencies. This leads to a splitting up into the component parts, thus increasing the acid and basic groups. Salt formation causes a new orientation of the auxiliary valencies owing to new structural arrangements, and there is consequently an increase in the auxiliary valencies. The aggregates of elementary constituents which had formed by cohesion, residual valencies, and similar forces are broken up by liming. D. WOODROFFE.

Influence of temperature on the leaching of oak wood, willow bark, pine bark, and badan root. P. PAWLOWITSCH (Collegium, 1926, 570-571).-Oak wood, willow bark, pine bark, and badan root have been leached at different temperatures, respectively, and the leach liquor was analysed in each case. The leached tannin increased with increase of temperature to a maximum and diminished with further increase of temperature in the case of willow bark and badan root. The best temperature for the extraction of oak wood was 90-100° and higher up to 121°, for pine bark 90-100°, for willow bark 64-70°, and badan root 70-80°. The optimum temperatures for leaching non-tans are 70-80° for badan root and willow bark, 90-100° and higher for oak wood and pine bark. The percentage of tannin in total solids extracted does not depend on the temperature for oak wood and willow bark. This figure is lower in case of pine bark for temperatures above 60°, and higher for badan root at temperatures above 40°. All four materials yielded a good percentage of extract at ordinary temperatures (20-60°), viz., oak wood 57%, pine bark 59.5%, willow bark 87%, and badan root 62% of that obtained at the optimum temperature. D. WOODROFFE.

Gambier: its extraction and valuation. B. J. EATON and R. O. BISHOP (J. Soc. Leather Trades' Chem., 1926, 10, 395—400).—A series of extracts have been prepared from the young leaf shoots and twigs of 18 months' old plants from plantations, and also from wild plants by boiling 5 lb. of each sample with 4 gals. of water in an open steam pan with constant stirring for 1 hr. The exhausted cuttings were removed, and the liquor was strained and concentrated just below its b.p. It yielded a sticky, light mustard-yellow extract containing 50% of water and with acidity of aqueous solution of $p_{\rm H}$ 5.5. Leaves kept 1-3 days yielded softer extracts of more reddish colour and lower acidity $(p_{\rm H} 6-7)$. Evaporation of the extract at low temperatures is practised in Sumatra and yields gambier of high quality and good colour. Microscopical examination showed no vegetable débris, no amorphous aggregates or starch, but mostly minute needle-shaped crystals, which on melting and cooling deposit typical crystals of calcium oxalate. Additions of starch or china clay are easily detected. Chemical analysis of different prepared extracts showed them to be entirely soluble in water and to contain 22-70% of water. The tannin content of extracts prepared from plantation leaves was 38.38- $52 \cdot 1\%$, whilst that from wild leaves was $10 \cdot 6 - 21 \cdot 1\%$. One month's storage of the moist gambier extract without preservation induced mould growths, and the nontans were diminished by $6 \cdot 1 - 9 \cdot 7 \%$. The authors determined moisture by adding a few c.c. of alcohol to a weighed quantity of gambier in a flat-bottomed dish and heating to constant weight in a vacuum oven at 70°. Analyses of eight commercial cube gambiers and 14 bale gambiers showed the following percentage variations :— Cube: tans, $8 \cdot 1 - 45 \cdot 0$; non-tans, $8 \cdot 0 - 44 \cdot 0$; moisture, 4.5 - 15.54; acidity, $p_{\rm H} 4.6 - 5.8$; ash, ash, 4.11-6.71. Two samples of gambier were heavily adulterated with mineral matter. D. WOODROFFE.

Reaction between tannin and carbohydrates. II. H. B. STOCKS and C. V. GREENWOOD (J. Soc. Leather Trades' Chem., 1926, 10, 404-409; cf., B., 1925, 818).-The absorption of tannin from a concentrated solution by gum tragasol is much higher than that of gelatin, following the same order as less-concentrated solutions described (loc. cit.). The longer the gum tragasol and tannin solution are in contact, the greater the amount of tannin absorbed, varying from $26 \cdot 3$ to 74% for 6 hrs. to 6 days respectively. In the reaction between tannin and gelatin when the proportion of tannin to gelatin is 2:1 or 3:1, the composition of the washed coagulum is practically constant; tannin 66, gelatin 34. With a lower proportion of tannin to gelatin precipitation is incomplete, and the ratio of tannin to gelatin in the coagulum is less than 2:1. Dilution decreases the weight of coagulum obtained in the precipitation of gelatin with tannin; starch is precipitated by tannin, the amount of tannin absorbed and the weight of the coagulum being less than that obtained with gelatin or gum tragasol. The amount of tannin absorved by starch films from solutions of various strengths is slightly higher than that of gelatin, but much lower than that of gum tragasol.

D. WOODROFFE.

Reaction between tannin and casein. H. B. STOCKS (J. Soc. Leather Trades' Chem., 1926, 10, 409— 410).—Alkaline solutions of two different samples of casein, an "acid" and a "rennet" casein, were respectively treated with solutions of tannin, mixed, and sufficient dilute hydrochloric acid added to render the "rennet" casein faintly acid and the other neutral. The coagulum was dried and corresponded to 255% and 261% on the original weight of the casein, which is higher than that obtained by treating gelatin with tannin. Experiments with casein and tannin solutions of different strengths showed that the casein absorbs about the same amount of tannin as does starch, but more than gelatin. D. WOODROFFE.

Mangroves in Indo-China. A. H. DE BALSAC and A. DEFORGE (J. Soc. Leather Trades' Chem., 1926, 10, 418-423).-The principal species are Rhizophera Mucronata, R. Conjugata, R. Mangle, R. capsularis, and R. cochinchinensis. The trees are fairly rich in tannin (10-24%), but not sufficiently so to be exported. The ratio tans: non-tans was less than 1 for two samples of R. Mucronata, but 2-3 for the others. Except this species, the mangroves of Indo-China should be highly suitable for extract manufacture. The colour of leather tanned with these mangroves is bad as with other mangrove-tannages, but Ceriops sp. ("Cay-da") is very satisfactory from this point of view. The Indo-China mangroves are, however, much inferior to those of D. WOODROFFE. Madagascar or the Malays.

Water-resistant animal glue. F. L. BROWNE and C. E. HRUBESKY (Ind. Eng. Chem., 1927, 19, 215-219).-Animal glue 100 pts. dissolved in 225-250 pts. of water was mixed with small amounts of formaldehyde polymerides, hydrolysable formaldehyde compounds, or formaldehyde adsorption complexes, and the products gave water-resistant glued joints. The reaction of the formaldehyde with the glue was retarded sufficiently to give a working life practicable for woodworking, but the latter was extended by adding small amounts of acids. Some additions diminish the water resistance, but oxalic acid is an exception. A mixture of 10 pts. of paraformaldehyde and 5.5 pts. of oxalic acid is recommended per 100 pts. of glue in 225 pts. of water. This has a working life of 7-9 hrs. at 40-45°, and its water resistance develops slowly, attaining a maximum after 7 days. D. WOODROFFE.

Gelatin viscosity and related problems. M. BRIEFER and J. H. COHEN (Ind. Eng. Chem., 1927, 19, 252-257).- A gelatin gel probably consists of an elastic fibrillar structure, the individual fibres of which are swollen by imbibition until they cohere, forming as a whole an elastic gel or multiple effect of the individual fibrils. When heat is applied the fibres shrink, excreting the imbibed water of swelling. As the temperature rises, the threads begin to curl up and separate, and with further increase in temperature contract into tighter and tighter spirals. They retain their elasticity and ability to resume their original form on cooling. When the temperature and time are sufficient the spherical form of the fragments may become fixed, the elastic limit of the threads exceeded, and permanent deformation result. The viscosity of a 3% gelatin solution at 24° increases, due to the setting phase, the rapid diminution of free space outside the solid gelatin particles, due to swelling. The gelatin can be swollen and shrunk and still have its original viscosity because the number of gelatin particles present in any unit volume remains constant. The imbibition alone 232

varies and depends upon the relative volume or concentration of the gelatin in water. Gelatin solutions exhibit three phases, the jelly phase, the equilibrium or true solution phase, and the melting phase. Viscosity increases with time in the setting or jelly phase, but does not change in the equilibrium phase, and diminishes in the melting phase. Moderate agitation of a gelatin solution delays jelly formation, but does not appreciably affect the viscosity. Gelatins nearly alike in viscosity are not differentiated by measurements at 6.66% concentration and at 60° . At 60° the fluidity of gelatin solutions is too great to indicate their actual differences in viscosity. Wider differences are obtained with 10% solutions or with a temperature of 40-45°. Low-grade gelatins are not liable to degrade so quickly at this lower temperature. D. WOODROFFE.

PATENTS

Dyeing of leather (Swiss P. 114,271).—See IV. Brown dye for leather (G.P. 431,776).—See IV. Dyeing leather (G.P. 433,154).—See VI.

XVI.-AGRICULTURE.

Organic matter in heavy alkaline soils. A. F. JOSEPH and B. W. WHITFEILD (J. Agric. Sci., 1927, 17, 1-11).-Sudan (Gezira) soils generally contain less than 1% of organic carbon. The humus carbon is about 40% of the total carbon. Alkaline humus solutions for use in the colorimetric method of determining humus keep fairly well in darkness, or in sunlight when air is excluded. Good soils have generally a higher humus content than poor soils, and there is an inverse relationship between salt content and humus content. In a vertical section, however, the maximum salt content and maximum humus content occur at about the same depth. The total nitrogen content is usually about 0.03%, of which about one-fifth is humus nitrogen. The carbon-nitrogen ratio is similar to that for English soils, namely, about 12:1. G. W. ROBINSON.

Moisture equivalent of heavy soils. II. A. F. JOSEPH (J. Agric. Sci., 1927, 17, 12—20).—The moisture equivalent (Briggs-McLeane) and the imbibitional water content of purified clay fraction vary with chemical composition, method of preparation, if centrifuged, and the character of the replaceable bases. Additive relationships can only be obtained for soils of the same nature. Silt fractions show marked differences in chemical composition and moisture equivalent.

G. W. ROBINSON.

Proteins of green forage plants. III. Proteins of cruciferous forage plants (genus Brassica). Comparison with colzalin, a globulin from rapeseed. W. L. DAVIES (J. Agric. Sci., 1927, 17, 33-40).— The coagulable protein from different species of Brassica shows practically identical distribution of nitrogen among the different amino-acids, and is closely similar in this respect to colzalin, the globulin from rapeseed. It differs in showing a lower proportion of amide nitrogen. G. W. ROBINSON.

Proteins of green forage plants. IV. Proteins of some plants of the natural order Umbelliferæ. W. L. DAVIES (J. Agric. Sci., 1927, 17, 41-43; A., 1926, 761).—Data are given for the nitrogen distribution in the proteins of parsnips and carrots. Whilst a general similarity is shown, the carrot protein contains a larger proportion of monoamino-acids, whereas in the parsnip protein there is a larger proportion of proline and hydroxyproline. The carrot protein has a higher percentage of arginine and a lower percentage of histidine than the parsnip protein, but the sum of these two amino-acids is approximately the same.

G. W. ROBINSON.

Solubility of some likely spray substances in solvents containing soap. Preparation of spraying emulsions. R. M. WOODMAN (J. Agric. Sci., 1927, 17, 44-59).-Commercial paraffin oil is unsuitable as an insecticide owing to its low proportion of fractions boiling above 250°. The approximate solubilities of various organic liquids used in sprays, in solvents such as soap solutions, with and without addition of phenols, hydrogenated phenols, and pyridine, have been determined. Spray fluids containing paraffin oil, benzene, and aniline in solution may be economically employed, but coal-tar fractions such as anthracene and creosote oils must be applied as emulsions. Cresylic acid is the best aid to solution of paraffin oil, but is more injurious than the hydrogenated phenol, "hexalin" (cyclohexanol). Emulsification in soap solutions is facilitated by rise in temperature, but the effect is more complex in the case of gelatin solutions. G. W. ROBINSON.

Losses of added phosphate by leaching from North Welsh soils. G. W. ROBINSON and J. O. JONES (J. Agric. Sci., 1927, 17, 94–103).—Under the very humid conditions obtaining in North Wales, the effect of basic slag applied to poor pastures disappears after 6—10 years. It is shown from profile analyses that this is due to a leaching out of added phosphate from the surface layers, whereby soils tend to revert to their original phosphorus status. G. W. ROBINSON.

Action of hydrogen peroxide on farmyard manure in different stages of decomposition. G. H. G. JONES (J. Agric. Sci., 1927, 17, 104-108).— The degree of "humification" of samples of farmyard manure of differing age was determined by the peroxide method proposed by Robinson and Jones (cf. B., 1925, 140) for soil organic matter. A good correlation was observed between the degree of decomposition of the manure as judged by its appearance and history and the degree of humification found by the peroxide method. The degree of humification varied from 35% in the case of samples containing much litter to 75% in the case of old, well-rotted samples. G. W. ROBINSON.

Studies on Bacillus amylobacter, A.M. et Bredemann. A. CUNNINGHAM and H. JENKINS (J. Agric. Sci., 1927, 17, 109—117).—An aerobic coccus which appears to be a stage in the life cycle of the motile butyric acid bacillus is described. The coccus does not fix nitrogen in soil extract containing dextrose. G. W. ROBINSON.

Types of soil acidity and adsorption capacity of soils and the importance of these factors for liming and manuring with phosphorite. D. L. Askinasi (Z. Pflanz. Düng., 1927, A8, 194—221).—Based on the study of a number of acid soils of different types, a classification of soil acidity is proposed, which differs somewhat from that of Kappen. Forms of soil acidity are divided into two groups-" active" (A) and "passive" (B). Group (A) consists of acidity due to the free hydrogen ions of acids or acid salts, which can be determined directly in a water extract of the soil; group (B) includes acidity due to hydrogen ions which are adsorbed and inactive, and are detected by treatment of the soil with salts. According to the behaviour of the adsorptively-bound hydrogen ions towards salts, the latter group is subdivided into (a) "acidity of unsaturation," in which the hydrogen ions are displaceable by neutral salts, and (b) "hydrolytic acidity," in which the hydrogen is only displaced by alkalis or alkaline salts (e.g., sodium acetate). The various methods proposed for determination of the acidity or "limerequirement" of soils do not give uniform results because they determine different forms of acidity. The results of methods depending on extraction with neutral salts cannot be calculated directly in terms of the "lime-requirement" of the soil, the interaction of calcium oxide and carbonate with the soil being more complicated than the action of neutral salts. By treatment of a soil with baryta and subsequent washing with distilled water, the original adsorption capacity of the soil is increased 2-3 times. The effects on the degree of dispersion of soil colloids of saturation of the soil with sodium, with and without previous treatment with C. T. GIMINGHAM. baryta, are also studied.

Influence of external factors on soil structure. F. GIESECKE (Z. Pflanz. Düng., 1927, A8, 222-247).-Laboratory and field experiments are recorded on the effect of different types of cultivation (ploughing, harrowing, etc.) on certain properties of soils. Both soil and subsoil samples were examined. With an almost pure sand, cultivation caused no changes. With other soils, the water capacity was definitely increased, and, in most cases, there was a slightly increased power of nitrification. Wiegner's continuous sedimentation method of mechanical analysis gave good indications of the changes in physical structure brought about by cultivation. Differences between the effects due to different methods of cultivation were completely obliterated by climatic influences, particularly rainfall. Hygroscopicity and water capacity were not altered by the action of frost. It is emphasised that the methods available for this kind of investigation serve only to assist in the determination of soil structure, and do not give the real magnitude of the changes brought about by cultivation. C. T. GIMINGHAM.

Calcium salts of phenols. GREENBAUM.-See III.

PATENTS.

Material for control of *Peronospora*. J. H. HORST (G.P. 427,075, 12.8.21).—The material consists of a copper-lime powder, kieselguhr, casein or sodium sulphite, and sodium silicofluoride. *E.g.*, copper sulphate and sodium silicofluoride are treated with quicklime until the reaction is alkaline, and the mixture is dried and finely powdered. Kieselguhr is added, the whole mass sieved, and mixed with finely-powdered casein or sodium sulphite. A very light, bulky dust is obtained, which adheres well to foliage, and is not easily washed off by rain. C. T. GIMINGHAM.

Material for control of *Peronospora*, mildews, and vine moths. J. H. HORST (F.P. 602,113, 14.8.25. Conv., 15.8.24. Addn. to G.P. 427,075; cf. preceding abstract).—Modification of the order in which the constituents of the dust are mixed, and addition of sodium bicarbonate and starch increase its efficiency and adhesiveness. The sodium bicarbonate prevents too rapid drying of the deposit. *E.g.*, copper sulphate is ground with kieselguhr, water added, and the whole intimately mixed with milk of lime. The product is dried, again powdered, and sieved, and is then mixed with sodium bicarbonate and starch, and repowdered. The dust thus prepared is not washed off foliage by rain, even after 3—4 weeks. C. T. GIMINGHAM.

Process for increasing adhesiveness of dusting preparations for control of animal and plant pests. I. G. FARBENIND. A.-G., Assess. of W. BONRATH, R. LIESKE, and A. THAUSS (G.P. 433,556, 4.4.25).—Addition of small quantities of certain compounds of cellulose with alkali and halogen-substituted aliphatic acids, prepared according to G.P. 332,203 (cf. B., 1921, 344 A), to insecticidal and fungicidal dusts, such as calcium arsenate and insoluble copper compounds, causes the dusts to adhere to foliage so that they are not removed by heavy rain. C. T. GIMINGHAM.

Production of mono- and di-ammonium phosphate. I. G. FARBENIND. A.-G., Assess. of R. GRIESS-BACH and K. RÖHRE (G.P. 433,742, 24.3.25).—Gases containing phosphorus pentoxide are absorbed in a solution of ammonium phosphate and the appropriate amount of ammonia is added before, during, or after absorption. C. T. GIMINGHAM.

Means for combating plant pests. I. G. FAR-BENIND. A.-G., Assees. of A. STEINDORFF and H. MEYER (G.P. 433,653, 9.12.22).—Emulsions for spraying plants contain ammonium naphthenate, which is less harmful to the plants than naphthenic acids or their alkali or alkaline-earth salts (cf. G.P. 407,576; B., 1925, 471), together with hydrocarbons, their halogen substitution products, basic compounds, or aromatic nitro-compounds. E.g., an emulsion containing ammonium naphthenate and solvent naphtha is suitable for spraying plants attacked by the aphis or caterpillars. L. A. COLES.

Fungicide. I. H. H. JACOBSEN (U.S.P. 1,617,255, 8.2.27. Appl., 15.4.26. Conv., 31.7.25).—See E.P. 259,803; B., 1926, 1025.

Colloidal materials [sprays] (E.P. 263,670).--See I.

XVII.—SUGARS; STARCHES; GUMS.

Industrial production of lævulose. B. HOCHE (Z. Ver. deut. Zuckerind., 1926, 821—833).—Referring to the work of the Bureau of Standards, Washington, it is remarked that the Salus-Werke in 1920—22 extracted inulin from chicory, using the methods of the beet factory, viz., diffusion, carbonation, filtration, and crystallisation, after which the inulin was hydrolysed, and the "molasses" used for the preparation of "coffee extract" or cattle food. It is admitted that the methods of the American chemists hardly appears to present any difficulty in practice, and in fact promises success.

J. P. OGILVIE.

Volume of the mark in the digestion method. O. SPENGLER and C. BRENDEL (Z. Ver. deut. Zuckerind., 1926, 880—886).—Re-determinations of the volume of beet mark or insoluble matter, taking into account the so-called "colloid water," lead to the conclusion that in the hot water digestion method of determining sugar in beets the flask should be calibrated at 202·1 c.c., instead of 201·2. With a sugar content of $16 \cdot 0\%$ by the present method, the results would be $15 \cdot 88\%$ if this new correction were adopted. J. P. OGILVIE.

Determination of sugar in carbonatation scums. E. KUNZ (Z. Ver. deut. Zuckerind., 1926, 834—879).— Making an allowance for the possible effect of calcium acetate on the rotation, a number of determinations have again been made (B., 1925, 155) comparing Vondrák's method with the German official procedure, but the former is still found to be higher. The author's theory of the presence in scums of "carbonate sugar," which is decomposed under the conditions of Vondrák's method is maintained. J. P. OGILVIE.

Origin and migration of the sugars in the beetroot. O. SPENGLER and R. WEIDENHAGEN (Z. Ver. deut. Zuckerind., 1926, 767—779).—Periodical examinations of the content of various sugars present in the plant during its period of growth show that the stalks throughout contain a considerable amount of reducing sugars, dextrose predominating, and an inconsiderable amount of sucrose. In the top, sucrose is present in excess, though the dextrose content is always distinctly higher there than in the body of the root. It appears likely that the migration of sugars from leaf to root takes place in the form of monosaccharides. J. P. OGILVIE.

Purification of juice in the cane sugar industry. H. I. WATERMAN (Chem. Weekblad, 1927, 24, 66-73).-The molasses produced in Java is found to contain a mixture of non-fermentable reducing sugars, conveniently described as glutose. This material is present to some extent in the expressed juice; it is not formed during sucrose extraction from the glucose present, but from the fructose, or other reducing sugars sensitive to alkalis. High alkalinity and slow working encourage the formation, but evaporation and heating do not affect it. Molasses from Java and Egypt contained 6%, from Cuba nearly 10%. It is important, therefore, to keep the concentration of lime as low as possible during the manipulation of the juice, and the methods of purifying the solutions are considered from this aspect. The double carbonatation method of de Haan, with subsequent sulphitation, is considered the most suitable for this purpose. S. I. LEVY.

Destruction of sugar during the evaporation of juice [in beet factories] using high temperatures. P. ORTH (Bull. Assoc. Chim. Sucr., 1926, 43, 458— 488, 44, 5—12).—Using an experimental evaporator with high-temperature steam, and operating so as always to maintain the dry substance at a constant value, a large number of tests were conducted with secondcarbonation juice and with diluted syrup. It was, however, not found possible to obtain any accurate values for the destruction of sucrose, owing to the formation of dextrorotatory substances, which vitiated the double-polarisation method used for the determination of the sucrose. On considering only the minimum values obtained for the destruction of sugar, the general conclusion arrived at is that the use of temperatures greater than 115° is uneconomical in evaporation, the value of the sugar then lost exceeding that of the coal saved in the high-temperature evaporation.

J. P. OGILVIE.

PATENTS.

Refining unwashed sugar. Refining sugar with "Carbrox." C. J. GAMBEL (U.S.P. 1,606,215—6, 9.11.26. Appl., 13.5.22).—(A) A solution of unwashed raw sugar is clarified and partially decolorised by treatment with a mixture of lime, an inert filtering material, and a decolorising carbon ("Carbrox"), the solution being maintained alkaline. This is filtered and the filtrate finally decolorised and concentrated to produce a refined sugar. (B) A solution of sugar is clarified and filtered, and the filtrate partially decolorised in an agitator by the action of a quantity of "Carbrox" equal to 0.75%of the sugar present. This solution is again filtered and concentrated. J. P. OGILVIE.

Manufacture of crude lactose. R. W. BELL, Assrto GOVT. AND PEOPLE OF U.S.A. (U.S.P. 1,600,573, 21.9.26. Appl., 15.4.26).—Casein and fat being removed, the whey is adjusted to $p_{\rm H}$ 7.0 (approx.) by adding a suitable alkali, after which it is heated at about 60° and concentrated at a temperature below the coagulating point of the albumin contained therein to a density at which the lactose just begins to crystallise, the temperature being subsequently lowered to 0° and there maintained until the maximum crystallisation has occurred. J. P. OGILVIE.

Production of crystalline dextrose from starchbearing materials. CORN PRODUCTS REFINING CO., Assees. of W. B. NEWKIRK (E.P. 246,098, 11.8.25. Conv., 17.1.25).—A preliminary crystallisation is induced, the solid dextrose thus obtained being partially melted, so as to leave some of the crystals in the liquid, and the magma subjected to a final crystallisation while maintaining the solid phase dispersed through the liquid. The solid dextrose of the preliminary crystallisation may be either anhydrous or hydrate, and the final crystallisation is carried on at temperatures favourable to the type of crystals predominating in this first crystal mass. The mass of first crystals is then centrifuged.

J. P. OGILVIE.

Production of tricalcium saccharate rich in sugar and poor in lime and of a very high degree of purity [from beet molasses]. C. STEFFEN (E.P. 252,110, 1.8.25. Conv., 18.5.25).—Tricalcium saccharate is obtained by mashing saccharate obtained from a molasses solution into a cold low-percentage sugar solution, $1\frac{1}{2}$ —3 times the quantity of sugar in the sugar solution being added in the form of saccharate, and then adding lime powder to precipitate the calcium saccharate dissolved in the mixture, the saccharate being finally separated, e.g., by filter-pressing.

J. P. OGILVIE.

Electrolytic reduction of sugars to alcohol. H. J. CREIGHTON, ASST. to ATLAS POWDER Co. (U.S.P. 1,612,361, 28.12.26. Appl., 26.3.26).—Reduction of sugars to alcohols, *e.g.*, mannose to mannitol, is carried out in an electrolytic cell having an anode coated with lead dioxide and surrounded by a porous diaphragm, and a cathode consisting of a layer of mercury at the bottom which can be mechanically stirred. The anode compartment contains 5% sodium sulphate solution, and the cathode compartment a mixture of that electrolyte with sugar solution (15-25%). On passage of the current $(1-1\frac{1}{2})$ amp./dm.² and 5-8 volts), the sugar is reduced with formation of sodium hydroxide, while oxygen is liberated in the anode compartment, the solution becoming acid with sulphuric acid. The diaphragm, while preventing the diffusion of the sugar and alcohol solution into the anode compartment, is sufficiently porous to allow the migration of hydrogen and hydroxyl ions, so that there is a continuous re-formation of sodium sulphate in the two compartments. The solution in the cathode compartment remains neutral or very slightly alkaline, a condition which is favourable to the reduction of sugars by F. R. ENNOS. nascent hydrogen.

XVIII.—FERMENTATION INDUSTRIES.

Scientific control in the preparation of bottled champagne. E. MANCEAU (Ann. Falsif., 1927, 20, 7-19) .- Control of the preparation of champagne comprises a rapid analysis of the "projet de cuvée" consisting of a determination of density, alcohol, total acidity, and sugar, and sometimes sulphurous acid, and a microscopical examination. The proportion and nature of the wines to be mixed to form the "cuvée de tirage" is fixed by taste and on the mixture are determined density, alcohol, total and volatile acidity, sugar, dry extract, ash, potassium tartrate and free tartaric acid, tannin, total and ammoniacal nitrogen, and total and free sulphurous acid. From these results are determined the weight of tannin and of fining to be added, and the first evaluation of sugar to be added is made. After 2-4 weeks the clear wine is examined as before, and the proportion of sugar that it should contain when bottled determined, and the analysis repeated after addition of the "liqueur de tirage." The same determinations are again made after the second fermentation, and in addition the pressure at 0° is found and a microscopical examination of the deposit often made. A final analysis is made after the shaking and clearing of the wine. Details are given of the methods of analysis used, and variations in composition discussed. Scientific control has reduced the usual loss by explosion of bottles, made unsuccessful fermentation exceptional, and defined conditions resulting in "maladie du Bleu" which affects clarity. D. G. HEWER.

Bac. amylobacter, A.M. et Bredemann. CUNNINGHAM and JENKINS.—See XVI.

PATENTS.

Simultaneous dehydration and purifying of alcohol. DISTILLERIES DES DEUX-SÈVRES (E.P. 253,128, 3.6.26. Conv., 4.6.25).—In the azeotropic distillation of crude alcohol in apparatus similar to that described in E.P. 243,368 (cf. B., 1926, 604), esters are hydrolysed and acids are neutralised by the introduction of concentrated sodium hydroxide solution into the column at a point below that at which the first distilled products are eliminated. When esters are not present, neutralisation of the acids is not essential. High-boiling impurities, such as alcohols, aldehydes, bases, esters, and acids, are concentrated in the column below the point at which the anhydrous alcohol is withdrawn, the lower end of the column being extended, if necessary, and are subsequently rectified in an auxiliary column which returns any alcohol to the main column. L. A. COLES.

Process of making proteolytic enzymes. S. A. WAKSMAN (U.S.P. 1,611,700, 21.12.26. Appl., 19.1.20).— A suitable culture is propagated and the successive generations resown on a medium containing protein. The spores are then developed for several days at 30° on a sterilised mixture of wheat, bran, bean cake, and alfalfa meal with water, whereby the proteolytic properties are greatly increased. The resulting mass or the separated spores are further developed on a similar medium for 24—48 hrs. at 28—32°. The product is either dried, ground, and used as such, or the enzymes may be obtained from the water extract by concentration or precipitation with alcohol or ammonium sulphate. F. R. ENNOS.

Alcohol from sugar (U.S.P. 1,612,361).-See XVII.

XIX.-FOODS.

Composition of milk. I. Variation in solids-notfat, fat, and protein of cow's milk, and their relationship. H. T. CRANFIELD, (MISS) D. G. GRIFFITHS, and E. R. LING (J. Agric. Sci., 1927, 17, 62-71).—The percentages of fat, solids-not-fat, and protein respectively for 700 samples of mixed milk taken from 15 different herds during 1925-6 are reported. Frequency distributions are shown and standard deviations calculated for each constituent. In the curve showing the correlation between fat and solids-not-fat, the percentage of fat appears to pass through a minimum which corresponds with the average percentage $(8 \cdot 8)$ of solids-not-fat. There is a marked correlation between protein and solids-not-fat. There is no definite seasonal effect on protein percentage, but there is a tendency for the ratio solids-not-fat : protein to be low in summer and high in winter, so that deficiency in solids-not-fat would appear to be due to lactose deficiency in summer and to protein deficiency in winter. G. W. ROBINSON.

Composition of milk. II. Variation in percentage of mineral constituents in cow's milk, and their relationship with solids-not-fat and protein content. H. T. CRANFIELD, (MISS) D. G. GRIFFITHS, and E. R. LING (J. Agric. Sci., 1927, 17, 72-93; cf. preceding abstract).-Ash data are given for 670 samples of mixed milk from 15 different herds. The correlations of the different constituents are shown by means of graphs. Total ash falls with solids-not-fat until, when low values of the latter constituent are reached, the ash content tends to rise. This was also shown in studies of the milk of individual cows. Soluble ash varies inversely and insoluble ash directly with solids-not-fat. Lime and phosphoric acid vary with solids-not-fat. Total ash and soluble ash reach a maximum in summer, whilst insoluble ash shows a minimum in May and a maximum in autumn and winter. Phosphoric acid shows little seasonal change, but lime falls in spring and G. W. ROBINSON. summer, and rises in autumn.

Evaluation of sour cream. M. A. DICHNO and O. M. BRISKIN (Z. Unters. Lebensm., 1926, 52, 469-475).-To be classed as sour, a cream sample should be character-

ised by the following :— $d \ 1.0135$; fat, not less than 23.46%; acidity, not less than 0.7% of lactic acid; coloration in reductase test after 2 hrs.; clotting in fermentation test after $2\frac{1}{2}$ hrs. The importance of care in the commercial handling of milk is emphasised.

A. G. POLLARD.

Loss of mineral matter from potatoes during ordinary culinary preparation. C. GRIEBEL and A. MIERMEISTER (Z. Unters. Lebensm., 1926, 52, 458-461).-Cooking water from boiling potatoes contains considerable amounts of calcium, magnesium, and potassium salts, chlorides, sulphates, and phosphates. Unpeeled potatoes lost 5.8% of their mineral content on boiling in water, and only 1.4% when steamed. Peeled potatoes lost 17% of minerals on boiling and 7.1% when steamed. The manner of cooking (steaming or boiling) considerably affected the relative proportions of the minerals appearing in the cooking water. Boiling in salt water considerably reduced the loss of potassium salts.

A. G. POLLARD.

Determination of milk fat in foodstuffs by the Reichert-Meissl value. H. LÜHRIG (Pharm. Zentr., 1927, 68, 49-54, 65-68).-In the determination of milk fat in foodstuffs, containing other fats such as coconut oil, palm kernel oil, etc., by means of the table of Kuhlmann and Grossfeld (B., 1926, 252), it is not always possible to obtain 5 g. of fat for the Reichert-The original semi-microchemical deter-Meissl value. mination (B., 1922, 508 A) is not satisfactory, and for the above fat mixtures a modified microchemical method which has been found to give substantially correct results is as follows: 0.5 g. of fat and 2 g. of glycerin are saponified with 0.2 c.c. of sodium hydroxide solution (1:1). 10 c.c. of hot water and 5 c.c. of sulphuric acid are added, and 14 c.c. are distilled over in 5 min. 10 c.c. of the filtrate are titrated with 0.025N-alkali. The titration figure multiplied by $1 \cdot 4/0 \cdot 4$ gives the Reichert-Meissl value corresponding to 5 g. of fat.

F. R. Ennos.

Solidification point of edible fats. MEYER. Sorting of butters and margarines. MANLEY. Determination of butter fat in margarine. ELSDON and SMITH.-See XII.

PATENTS.

Process of treating grain and product produced thereby. J. A. WESENER (E.P. 263,213, 13.10.25).-The unhusked grain, more especially oats, is treated with an aqueous solution of an alkali or alkaline earth in predetermined quantity, sufficient to neutralise the natural acids and those developed in the subsequent processes, without making the product alkaline. After cooking the grain under steam pressure, the husks are ruptured and the whole is dried ; the husks are subsequently removed and the treated kernels made into the desired form. F. R. ENNOS.

Method of producing groats from the soft endosperm of grains of cereals. L. BARTMANN (E.P. 254,748, 3.7.26. Conv., 3.7.25).-After steeping a cereal grain, the endosperm is expelled from the husks in a pasty condition and moulded into groats by forcing it into metal tissue or into the perforations in metal. After drying in these moulds, it is suitably removed.

F. R. ENNOS.

Manufacture of meat juice. LES ETABL. BYLA (F.P. 606,962, 10.3.25).-Coagulation of the proteins is prevented by macerating finely-chopped meat with water containing papain at about 46°. L. A. COLES.

Method and apparatus for the manufacture of food for dogs and other animals. MOLASSINE CO. and H. C. DAVIS (E.P. 264,278, 13.11.25).-Sterilised meat and finely divided dog biscuit in a horizontal, steam-heated cylinder are subjected to jets of steam, which may be superheated at low pressure. A binding material consisting of flour and water is sprayed in under air pressure, while rotating paddles mix the ingredients, causing them to pass from one end of the cylinder to the other, where they are discharged, moulded, and dried. F. R. Ennos.

Dessication of milk (E.P. 257,893).—See I.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Salts of linolenic hexabromide from lumbang oil. G. A. IMPERIAL and A. P. WEST (Philippine J. Sci., 1926, 31, 441-449).-Hexabromolinolenic acid, m.p. 179.5-180.5°, prepared from lumbang oil, has been used in the preparation of a number of its metallic salts. Potassium hexabromolinolenate (cf. Erdmann and Bedford, A., 1909, i, 357), obtained by direct neutralisation of the acid in hot benzyl alcohol solution, turns brown at 180°, m.p. with decomp. 185-190°. Double decomposition of this salt with barium bromide, both in hot methyl alcohol (95%) solution, gives barium hexabromolinolenate (ibid.) which browns at 197° and blackens without melting at 200°, whilst similar treatment with zinc chloride gives zinc hexabromolinolenate, decomp. sharply at 174°. Lead hexabromolinolenate, prepared from the free acid and lead acetate in hot ethyl acetate and alcoholic solution, respectively, browns at 160°, m.p. with decomp. 190-195°. A table is given showing the relative solubilities of the free acid and the four salts in twenty-eight different solvents, and it is specially noted that free hexabromolinolenic acid is soluble to the extent of 5% in warm xylene and in benzyl alcohol at 100°, and 1% soluble in warm isobutyl alcohol. E. HOLMES.

Volumetric determination of commercial synthetic vanillin. V. ZANOTTI (Boll. Chim. Farm., 1927, 66, 33-34).-Vanillin may be determined by titration with 0.1N-sodium hydroxide solution in presence of phenolphthalein: 1 c.c. of 0.1N-alkali = 0.0152 g. of vanillin. If the product contains 2% of acetanilide, which is the commonest impurity of commercial vanillin, rather low results are given by the titration.

T. H. POPE. Pine-needle extracts. M. KLOSTERMANN and H. QUAST (Z. Unters. Lebensm., 1926, 52, 476-478).-To detect sulphite-cellulose liquor in adulterated pineextracts, the determination of sulphate in the ash is valuable. Adulterated samples contained three times the sulphate content of pure material. The percentage of magnesium, iron, aluminium, and phosphate in the ash of adulterated extract was less than in the pure extract, and the total mineral substance in the pure extract was very low. A. G. POLLARD.

Conversion of ethylene into alcohol. GLUUD and SCHNEIDER.—See II.

PATENTS.

Production of oxygen-containing and other organic compounds. H. DREYFUS (E.P. 263,503, 1.7.25) .- Methyl alcohol, formaldehyde, keten, acetic acid, and other aliphatic or cyclic oxygenated compounds, and also higher hydrocarbons, are formed from mixtures of carbon monoxide and hydrogen, or gases containing them, at about atmospheric pressure, in the presence of catalysts, other than those (such as nickel, iron, and cobalt) which favour the production of methane. As catalysts, there may be used, for the production of methyl alcohol, zinc oxide (cf. E.P. 262,494; B., 1927, 124) or the substances mentioned in E.P. 227,147 and 229,714-5 (B., 1925, 189,338), and 20,488/13 (B., 1915, 788); for acetic acid, the substances mentioned in E.P. 262,832 (B., 1927, 125); and for keten, those mentioned in E.P. 262,364 (B., 1927, 125). In all these specifications high pressures are indicated. Apart from the modification in this sense, the processes are carried out in the present instance substantially under the conditions (temperature, proportions, etc.) described in the specifications. The gases used may be freed from impurities such as organic sulphur compounds and volatile iron compounds prior to use. B. FULLMAN.

Ester of [n-]butyl alcohol. R. H. VAN SCHAACK, JUN. (U.S.P. 1,613,366, 4.1.27. Appl., 21.8.25).—Esters of n-butyl alcohol with saturated aliphatic acids containing more than 8 carbon atoms in the molecule, e.g., n-butyl stearate, m.p. 18°, render nitrocellulose films soft and flexible, and are of value in the manufacture of lacquers. T. S. WHEELER.

Manufacture of esters of oxy[keto]-acids [pyruvic acid]. C. H. BOEHRINGER & SOHN, Assees. of A. HAUS-SLER (U.S.P. 1,614,195, 11.1.27. Appl., 20.2.25. Conv. 5.3.23).—An ester of a hydroxy-acid, *e.g.*, ethyl lactate, is passed in the vapour state with air or other gas containing oxygen or ozone over a catalyst, *e.g.*, vanadium pentoxide or molybdenum trioxide, at 100—500°, when the corresponding keto-acid ester, *e.g.*, ethyl pyruvate, is obtained in a yield of about 60%.

T. S. WHEELER.

Production of esters of volatile organic acids. I. G. FARBENIND. A.-G., Assees. of G. VON BRÜNING and O. NICODEMUS (G.P. 434,279, 21.11.24).—Mixtures of alcohols and acids in the form of vapour are passed over active charcoal at raised temperatures. As the presence of water has no effect upon the yield of ester, dilute acids or alcohols can be used; *e.g.*, a 90.8% yield of ethyl formate is obtained by passing 79% formic acid and alcohol vapour over active charcoal at 150°.

L. A. Coles.

Manufacture of a liquid chlorothymol preparation. F. RASCHIG, CHEM. FABR. (G.P. 433,293, 3.2.25). —Chlorothymol is melted with camphor. *E.g.*, by melting 10 pts. of chlorothymol with 5 pts. of camphor a mixture is obtained which is liquid at all temperatures above 5°, and may be used as a dental disinfectant.

E. H. SHARPLES.

Making ethylene glycol monoalkyl ethers. J. G. DAVIDSON, ASST. to CARBIDE & CARBON CHEMICALS CORP. (U.S.P. 1,614,883, 18.1.27. Appl., 7.2.24).—Ethylene

glycol (2 mols.), sodium hydroxide (2 mols.), and ethyl sulphate (1 mol.) are boiled under reflux for 3 hrs., and distilled *in vacuo* when ethylene glycol monoethyl ether is obtained in a yield of 60%. T. S. WHEELER.

Manufacture of lead alkyl compounds [lead tetraethyl]. F. W. SULLIVAN, JUN., and L. CHALKLEY, JUN., ASSTS. to STANDARD OIL CO. (U.S.P. 1,611,695, 21.12.26. Appl., 6.10.24).—Sodium-lead alloy containing 10% Na (100 pts.), ethyl sulphate (50 pts.), toluene (65 pts.), potassium iodide or other alkaline or alkaline-earth halide (0.5 pt.), and a trace of water are boiled under reflux with agitation for 4—6 hrs., and the lead tetraethyl, which is formed in a yield of 80%, is recovered by distillation with steam, or *in vacuo*, or by extraction with ether. T. S. WHEELER.

Manufacture of barbituric acid derivatives. J. D. RIEDEL A.-G. (E.P. 244,122, 5.12.25. Conv., 6.12.24).—Disubstituted barbituric acids in which the substituents are an unsaturated radical (sometimes halogenated, e.g., β -bromo- Δ^{β} -propenyl) and a radical of the type --CHR₁R₂ (R₁and R₂ being different aliphatic, aromatic, or alicyclic radicals), show much increased soporific action, which is ascribed to the asymmetry produced in the carbon atom connecting the second substituent to the barbituric acid residue. For the introduction of the β -bromo- Δ^{β} -propenyl group into diethyl malonate or barbituric acid derivatives either $\beta\gamma$ -dibromo- Δ^{β} -propene or $\alpha\beta\gamma$ -tribromopropane may be used. The following barbituric acid derivatives are described : 5-isobutyl-, m.p. 194-195°; 5-isobutyl-5- Δ^{β} -propenyl-, m.p. 109—110°; 5-isobutyl-5- β -bromo- Δ^{β} propenyl-, m.p. 131-132°; 5-a-methylbutyl-, m.p. 162-163°; and 5- α -methylbutyl-5- β -bromo- Δ^{β} -propenyl-, m.p. 164—165°: and also diethyl α -methylbutylmalonate, b.p./13 mm. 122-125°. B. FULLMAN.

Methods for producing scarlet fever toxin and antitoxin. G. F., and G. H. DICK (E.P. 243,675, 31.8.25. Conv., 28.11.24).—Broth is inoculated with a pure culture of hæmolytic streptococci specific to scarlet fever, and a little blood is added. After incubation, the bacteria are removed by passage through a porcelain filter, or killed by heat treatment or treatment with an antiseptic. To prepare the antitoxin, sterile toxin is inoculated in horses, the blood-serum or blood-plasma of which is concentrated or refined by precipitation with ammonium sulphate. The latter is removed from the precipitate by dialysis, and the antitoxin dissolved in physiological salt solution with the addition of a preservative. B. FULLMAN.

Emulsifying and dissolving media. E. SCHMIDT (G.P. 432,942, 11.12.23).—These consist of the watersoluble salts of hydroaromatic (especially of polynuclear) carboxylic acids, substituted by higher aliphatic radicals such as propyl, butyl, and amyl. Thus, by adding butyltetrahydronaphthalenecarboxylic acid to tetralin, a clear solution is obtainable on dissolving in water. R. A. A. TAVLOR.

Manufacture of pyridine-3-carboxylic acid amides. M. HARTMANN and M. SEIBERTH, Assrs. to Soc. of CHEM, IND. IN BASLE (U.S.P. 1,617,332, 15.2.27. Appl., 11.12.25. Conv., 20.12.24).—See E.P. 244,747; B., 1926, 720. Preserving specimens (E.P. 263,674).—See I.

Preparation of 3-nitro-4-aminobenzoyl-o-benzoic acid (U.S.P. 1,614,584).—See IV.

Preparation of 2:5-diaminobenzene-1:4-dicarboxylic acid (G.P. 433,277).—See IV.

Polymerised styrene (U.S.P. 1,613,673—4).—See XIII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Difference between the reducing powers of metoquinone and a mixture of methyl-p-aminophenol sulphate [metol] and quinol. A. and L. LUMIÈRE and A. SEYEWETZ (Bull. Soc. Franç. Phot., 1926, [iii], 13, 312–314).—Reply to Hübl (Phot. Korr., 1926, 62, 1).—It is maintained that the result of mixing in solution 2 mols. of metol and one of quinol is a stable compound rather than an addition compound which dissociates in solution. An analogous example of salt formation between developers possessing acid and those possessing basic groups is provided by hydramine (p-phenylenediamine + quinol). W. CLARK.

Desensitisation. A. P. RICHARD (Bull. Soc. Franç. Phot., 1926, [iii], 13, 331—332).—Desensitisation of a panchromatic plate was studied, using the chief commercial desensitisers, by desensitising and exposing under a wedge provided with blue, green, and red filters. The results obtained are tabulated. Some emulsions readily fog in presence of desensitisers, but it is always possible to find a desensitiser which does not fog a given emulsion, provided a suitable developer is used.

W. CLARK.

Hypersensitisation. R. MAUGE and A. P. RICHARD (Bull. Soc. Franç. Phot., 1926, [iii], 13, 332-335).-A 3% ammonia solution with no silver salts gave slightly less fog than the Ninck hypersensitiser containing silver salts, for a sensitivity of two and a half times less ; slightly superior results were obtained with a 2% solution. Ninck's formula is superior from the point of view of rapidity, and is preferable. With autochrome plates, a slight intensification is necessary to give the brilliance and depth of colour desired. Plates treated with pantochrome are less contrasty than those treated with pinachrome-pinacyanol. The rendering of autochromes can be improved by colour sensitising, in which case, for use with over-run electric lamps, a colour screen is not needed. In open air, the screen recommended by Ninck is suitable. Other aspects of hypersensitisation and desensitisation are considered. With illumination over-run 20% in voltage, the amount of pinacyanol can be reduced by one-third, owing to the higher red content of the light, compared with daylight. W. CLARK.

PATENTS.

Colour kinematography. TECHNICOLOR MOTION PICTURE CORP. (E.P. 264,369, 12.4.26).—Means are described for making complementary kinematograph films preparatory to dyeing the films different colours for use as matrices in mechanical printing processes or to cementing the two films in super-position to form a composite film in natural colours. The general principle is dealt with, and a mechanical arrangement is described in detail. W. CLARK. Photographic process. F. MÜHLING (F.P. 607,915, 12.12.25).—The coated emulsion layer has a maximum thickness of 0.005 mm. and contains only the amount of silver required for the production of the image. Development is very rapid, *e.g.*, 1.5 min. W. CLARK.

Applying photographic baryta or emulsion coating. MIMOSA A.-G. (G.P. 433,387, 29.1.26).—The material is applied to the support with the aid of reduced pressure. Separate parts of the supports can also be coated. W. CLARK.

Developer for photographic plates, films, papers, and the like. K. BINDER (U.S.P. 1,617,434, 15.2.27. Appl., 25.8.25. Conv., 14.7.25).—See F.P. 600,801; B., 1926, 566.

XXII.—EXPLOSIVES; MATCHES.

PATENT.

Low-density dynamite. J. MARSHALL, ASST. to E. I. DU PONT DE NEMOURS & CO. (U.S.P. 1,614,447, 11.1.27. Appl., 30.7.24; cf. 1,113,275 and 1,124,679; B., 1914, 1116; 1915, 251).—Dried ground maize stalks, when used as an absorbent in the preparation of ammonium nitrate dynamites, give a product which has a low density and a low velocity of explosion, and is suitable for use as a safety explosive in mines.

T. S. WHEELER.

XXIII.—SANITATION; WATER PURIFICATION.

Volumetric determination of sulphate in drinking water. A. BAHRDT (Z. anal. Chem., 1927, 70, 109-119). -To remove the metallic ions in the water a small quantity of sodium hydrogen carbonate is added (to neutralise any acidity) and 300 c.c. are filtered through 10 g. of washed sodium permutit contained in a small bulb tube. The filtrate contains only alkali metals together with all the sulphate ions; 200 c.c. are neutralised with 0.1N-hydrochloric acid using methyl orange as indicator and 1 c.c. excess of acid is added. After boiling to expel carbon dioxide, 10-30 c.c. of 0.1Nbarium chloride solution are added to precipitate the sulphate, an aliquot part of the filtrate is neutralised exactly with sodium hydroxide, and the excess barium chloride titrated with 0.1N-potassium palmitate using phenolphthalein as indicator. The palmitate solution is standardised against the barium chloride solution and is prepared by adding a 16% solution of potassium hydroxide in propyl alcohol to a warm mixture of 26 g. of palmitic acid, 500 c.c. of propyl alcohol, 250 c.c. of water, and 0.1 g. of phenolphthalein until a faint pink colour is obtained, filtering, and diluting to 1 litre. The permutit may be regenerated after use by washing with 5% sodium chloride solution then with cold water.

A. R. POWELL.

Treating steam-boiler water. Treatment of boiler water. R. E. HALL, Assr. to J. M. HOPWOOD (U.S.P. 1,613,656 and 1,613,701, 11.1.27. Appl., [A] 28.6.26; [B] 6.6.24).—See Hall, B., 1925, 421.

Means for cleaning sand filters of large surface. A. SIVADE (U.S.P. 1,617,654, 15.2.27. Appl., 18.10.23. Conv., 20.10.22).—See E.P. 205,818; B., 1924, 652.

Analysis of liquids [water] (E.P. 264,237).-See I.