

# BRITISH CHEMICAL ABSTRACTS

## B.—APPLIED CHEMISTRY

AUG. 3, 1928.

### I.—GENERAL; PLANT; MACHINERY.

**References to colloid technology. II. Plastic substances.** J. OBRIST (Kolloid-Z., 1928, 45, 82—92).—A review of the literature on plastic substances under the following heads: colloid nature and plasticity, the plasticising process, cellulose products, synthetic resins, proteinoplasts.

E. S. HEDGES.

#### PATENTS.

**Calcining furnaces.** A. J. STEPHENS. From ZAHN & Co., G.M.B.H. (B.P. 290,837, 2.6.27).—An annular, mechanical, muffle furnace is constructed with the inner walls—between the annular heating portion and the central driving shaft for the stirrer—so thick that air-cooling is sufficient. The heating gases pass first right round the furnace in a flue above the goods, then about three quarters round the furnace in the same direction in a flue under the goods, and leave at a point near where the goods enter, no lower fire passage being provided at that point; the goods travel round counter-current to the gases.

B. M. VENABLES.

**[Tunnel] furnaces.** H. A. PROCTER (B.P. 291,570, 9.4.27).—Pulverised fuel is used to fire a tunnel kiln and is burned in separate combustion chambers alongside the hottest zone of the tunnel. A method of cooling the walls of the combustion chambers by water is described.

B. M. VENABLES.

**Furnaces.** C. B. DANN and F. THORESBY (B.P. 290,846 and 291,335, 14.6.27).—(A) A complicated form of hollow fire bridge is described by which steam and air may be introduced between a primary grate space and secondary combustion chamber so as "to assist in the consumption of unburnt gases." In (B) a vaporised light oil may also be supplied through the fire bridge.

B. M. VENABLES.

**Regenerative ovens or furnaces.** H. SCHMIDT (B.P. 279,505, 24.10.27. Ger., 23.10.26).—A reversing regenerator is filled with loosely packed removable filling which, when choked with dust, is removed from the lower end and replaced by clean at the upper end.

B. M. VENABLES.

**Firing arrangement for muffle furnaces.** W. J. HARRIS, JUN., Assr. to SURFACE COMBUSTION Co., Inc. (U.S.P. 1,672,862, 5.6.28. Appl., 26.9.27).—The muffle is heated by heating gases introduced transversely at the lower part of one side, a portion of the gases passing upwards at the further side and part being diverted back to pass up the side at which they were introduced.

B. M. VENABLES.

**[Brick for] furnace structure.** H. B. GRONINGER (U.S.P. 1,672,524, 5.6.28. Appl., 20.11.26).—A brick or tile for use in the construction of reverberatory

furnaces comprises a moulded shape of a neutral or basic refractory material enclosed in a metal sheath.

A. R. POWELL.

**Heat-exchange cylinder.** J. W. OLTMAN, Assr. to BARRETT Co. (U.S.P. 1,672,036, 5.6.28. Appl., 17.1.25).—A stationary cylindrical container is supported by hollow projections which extend axially at both ends. A rotary cylinder surrounds the stationary one, the hollow extensions of which act as bearings. Heat is transmitted from a fluid which is introduced into the stationary container, through one of the hollow supports, to a fluid in the space between the two cylinders.

F. G. CLARKE.

**Heat exchanger.** W. LONSDALE, Assr. to FOSTER WHEELER CORP. (U.S.P. 1,672,650, 5.6.28. Appl., 27.7.27).—A form of packing joint for baffles in a shell-and-tube heat exchanger comprises a tube split longitudinally down one side and receiving the edge of the baffle.

B. M. VENABLES.

**Construction of heat-interchange apparatus.** G. CAHILL, Assr. to WINCHESTER REPEATING ARMS Co. (U.S.P. 1,672,708, 5.6.28. Appl., 12.3.26).—A number of thin-walled tubes have enlarged ends fitting together as a honeycomb, and a method of bonding them to each other to form the end wall and to fluid receiving chambers is described.

B. M. VENABLES.

**Tubular heat exchangers.** CONTRAFLO ENGINEERING Co., LTD., and J. GUNN (B.P. 291,551, 18.3.27).—A screwed joint for securing the tubes in the plates and means for allowing for expansion are described.

B. M. VENABLES.

**Water-cooling towers.** P. J. ROBINSON and A. T. J. GUERITTE (B.P. 290,321 and 290,553, 10.1.27).—To adjust the water supply uniformly over the area of a water-cooling tower, in (A) the distributing troughs are adjustable as a whole, particularly as to slope, in (B) fixed nozzles in the troughs are provided with easily removable inner nozzles by which the height and aperture of overflow may be varied.

B. M. VENABLES.

**High-speed [wet colloid] grinding mills.** G. BATER and A. HAMMER (B.P. 290,374, 15.2.27).—The grinding is effected between a fixed stone with a conical space hollowed out on its underface and a lower cone rotated by a vertical shaft; this shaft extends upwards into a feed reservoir and is there provided with stirring arms to prevent settling of the feed mixture. The supply of material is maintained regular by means of air pressure within the closed reservoir.

B. M. VENABLES.

**Multichamber mill for grinding materials of all kinds.** J. IHLEFELDT (U.S.P. 1,671,291, 29.5.28. Appl.,

4.3.27).—A horizontal, rotary, cylindrical casing is divided into compartments by vertical divisions, each having a segment removed to enable the material being ground to pass from one compartment to the next. The apertures in adjacent divisions are staggered.

F. G. CLARKE.

**Rotary mill.** J. IHLEFELDT, Assr. to G. POLYSIUS (U.S.P. 1,671,243, 29.5.28. Appl., 31.8.26. Ger., 1.9.25).—The mill comprises a horizontal, cylindrical framework within an axially disposed casing, the space between them forming the sifting compartment, whilst the framework, covered with sifter sections, comprises the grinding compartments. Those sections are secured to ledges on the framework by devices which are operated from the exterior of the casing. The latter has covered openings, through which the sifter sections may be removed.

F. G. CLARKE.

**Centrifugal grinding mills.** R. M. HUGHES. From BRADLEY PULVERIZER Co. (B.P. 291,696, 28.12.27).—In a mill of the horizontal ring and roller type provided with air separation, streams of air are admitted immediately above the grinding ring and are controlled as to direction by vanes which may be simultaneously adjusted.

B. M. VENABLES.

**Roller grinding mills.** O. MOOG (B.P. 291,702, 2.1.28).—A servo-feed regulator designed to keep the material in the feed hopper at a constant level.

B. M. VENABLES.

**Pulverising mill.** W. M. BARKER and L. C. BONNOT (U.S.P. 1,673,483, 12.6.28. Appl., 23.7.24).—Fine powder is exhausted from a ball mill by means of a tube through the axis bent upwards within the mill and having its open mouth protected by a deflector device close to the inner wall of the rotating drum, which deflects the grinding media and ground material downwardly to the rear of the exhaust tube.

B. M. VENABLES.

**Pulverising machine.** W. L. and H. L. McLAUGHLIN (U.S.P. 1,673,465, 12.6.28. Appl., 5.7.27).—A toothed crusher rotated by a power-driven shaft co-operates with two sets of jaws pivoted about two other shafts and connected together by linkwork.

B. M. VENABLES.

**Coal and ore washing plant.** C. CLOUWEZ (U.S.P. 1,672,448, 5.6.28. Appl., 4.1.26. Fr., 9.1.25).—The apparatus comprises an inclined fixed table provided with numerous openings, all of which contain a pair of adjustable parallel planes.

A. R. POWELL.

**Mixing machines.** W. H. SMITH (B.P. 291,509, 1.3.27).—In a mixing machine of the spade type, means for keeping dirt out of the bearings and for tipping are described.

B. M. VENABLES.

**Grading and separation of mixed materials.** PETRIE & McNAUGHT, LTD., and J. T. CRAVEN (B.P. 290,422, 11.4.27).—A combination of grid tables and conveyor chains for grading mixed materials such as towns' refuse.

B. M. VENABLES.

**Continuous centrifugal dryers.** T. BROADBENT & SONS, LTD., and W. HALLITT (B.P. 290,432, 30.4.27).—In a separator of the type in which the collected solid matter is discharged by the relative motion of an inner and an outer basket, the outer basket is formed with

non-chokable apertures for the outlet of liquid by constructing it of a number of superposed rings so shaped that the slit-like apertures between the rings enlarge outwardly.

B. M. VENABLES.

**Drying apparatus.** J. H. RICE (B.P. 290,776, 14.3.27).—An apparatus for the drying of granular material is provided with a fixed bed of wave-like form; in each depression of the waves rotates a wheel carrying a number of buckets which push forward the bulk of the material during the lower part of their rotation and which, at the same time, lift and scatter the material from the highest point they reach. The furnace is heated by a fire the gases from which pass first under the conveyor bed, affording indirect heating and reduction of temperature of the gases, then turn back over the conveyor, giving direct heating of the showered material.

B. M. VENABLES.

**Drying ovens.** DRYING SYSTEMS, INC., Assocs. of G. M. ARGABRITE (B.P. 275,650, 5.8.27. U.S., 5.8.26).—The goods are moved in trays or like containers through one longitudinal tunnel, across to an adjacent tunnel, and back again, by means of synchronised conveyors.

B. M. VENABLES.

**Drying drum with distributing apparatus.** BÜTTNER-WERKE A.-G. (G.P. 447,529, 1.10.25).—The distributors comprise double hoppers with sloping walls which adjoin at the base, and are so arranged in the drum that the adjacent hoppers of two neighbouring distributors are set opposite to one another.

L. A. COLES.

**Drying machine.** H. A. HATFIELD (U.S.P. 1,673,241, 12.6.28. Appl., 23.4.27. Can., 26.4.26).—The material passes downwards (in presence of a drying agent) in a zigzag direction through a casing with shelf-like baffles. The baffles are pivoted and balanced, and their slope is controlled by the change in the weight of material discharged from the machine.

B. M. VENABLES.

**Apparatus for separating liquids of different sp. gr.** W. LINNMANN, JUN. (U.S.P. 1,671,115, 29.5.28. Appl., 22.11.26. Ger., 28.1.26).—The separating tank contains an annular float surrounding a fixed vertical tube, open at the top and bottom, which acts as a guide for the vertical movement of the float. A pipe communicating with the outlet of the tank and extending vertically into the guide tube is closed by a valve-disc supported centrally by the float when the latter is lowered due to a decrease in the buoyancy of the liquid.

F. G. CLARKE.

**Apparatus for removing gases from liquids.** L. D. MILLS, Assr. to MERRILL Co. (U.S.P. 1,671,601, 29.5.28. Appl., 16.7.25).—The liquid passes from a supply tank into the top of a de-aerating receptacle, in which a vacuum is maintained. The de-aerated liquid is pumped from the bottom of this receptacle through a pipe which passes through the liquid in the supply tank, the pump being also immersed in the latter.

F. G. CLARKE.

**Centrifugal filter.** W. WEISSGERBER (G.P. 447,583, 16.5.24).—The filtering medium in a centrifugal apparatus in which the material to be filtered, e.g., oil, is driven through a gap between the drum and the cover

is arranged outside the drum and is held in position against the gap by a clamping ring. L. A. COLES.

**Rotary vacuum filters and like machines.** BRINJES & GOODWIN, LTD., and F. TITTERTON (B.P. 291,148, 24.2.27).—A number of abutting filter chambers are formed round the circumference of an imperforate drum; the filter medium is attached to each chamber individually and may be supported and protected by perforated metal (or textile material) inside and out, the outer protector being preferably a complete cylinder embracing all the sections. B. M. VENABLES.

**Hot filtration.** C. G. HAWLEY, Assr. to CENTRIFIX CORP. (U.S.P. 1,668,807, 8.5.28. Appl., 30.7.26).—A vertical cylindrical chamber has means for admitting water and steam at the top in combination with an agitating and whirling device, and for draining the lower part of the chamber, which is separated by a partition from the upper part so as to form a settling chamber in restricted communication with the upper part. A. R. POWELL.

**Production of dispersions.** L. MELLERSH-JACKSON. From BENNETT, INC. (B.P. 291,502, 28.2.27).—The two liquids, one of which may be a molten thermoplastic substance, are fed in accurately controlled quantities at different places in the upper end of an elongated sloping vessel containing agitators, and the emulsion emerges at the lower end. To prevent the thermoplastic material coagulating into larger drops, counter-current water-cooling may be employed. B. M. VENABLES.

**Apparatus for dehydrating liquids.** S. M. DICK, Assr. to INTERNAT. DRY MILK CO. (U.S.P. 1,673,066, 12.6.28. Appl., 22.10.20).—A spray dryer comprising upper and lower drying compartments with a main exhaust space between the two and a subsidiary exhaust also from the lower compartment. Heated air is supplied to both compartments, but the liquid is introduced only in the top one. B. M. VENABLES.

**Apparatus for distillation.** H. M. GODSEY (U.S.P. 1,673,238, 12.6.28. Appl., 9.7.23).—Oil is supplied to the top of a fractionating column, and falls through it to the still below, where it is distilled by gases of combustion from a furnace which are bubbled through the oil. The distillate passes through a condenser, and the outlet from this divides into a vertical pipe, terminating in a liquid seal for continuous draw-off of liquid, and a pipe leading to a gas exhauster. B. M. VENABLES.

**Effecting [continuous] sublimation of volatilisable substances.** J. THAME (B.P. 290,849, 23.6.27).—The apparatus comprises a retort with automatic float-operated feed, and thermostatically controlled heating, together with a condenser with internal scraper and air locks or other devices so that the collected sublimate may be removed even though the condenser is under a pressure less than atmospheric. The vapour may be carried forward from the retort to the condenser by a stream of inert gas. B. M. VENABLES.

**Crystallisation apparatus.** F. JEREMIASSEN (B.P. 290,369, 14.2.27).—Supersaturated liquid is introduced into the crystallising vessel downwards (in a pipe) through a bed of granules, and then turns upward in

contact with the granules. A pipe for the supply of unsaturated or only slightly supersaturated liquid to the space below the granules is also provided.

B. M. VENABLES.

**Centrifugal dust separators.** ATELIERS J. HANREZ (B.P. 283,146, 29.11.27. Belg., 5.1.27).—The gas current is caused to spin by deflectors, and the centrifugally thrown dust is caught on the outer wall of the apparatus, down which a thin layer of liquid flows. Means for distributing the water and the continuous removal of mud are described. B. M. VENABLES.

**Carrying-out exothermic chemical reactions under pressure and at a high temperature.** L'AIR LIQUIDE SOC. ANON., Asses. of SOC. CHIM. DE LA GRANDE PAROISSE (AZOTE & PROD. CHIM.) (B.P. 282,658, 13.12.27. Fr., 24.12.26. Addn. to B.P. 268,721; B., 1927, 688).—An excess of gas over that taking part in the reaction is used, the excess being exhausted from the catalysing receptacle at the opposite end to which the gases are admitted, through a tube constructed of heat- and pressure-resisting material. B. M. VENABLES.

**Carrying-out exothermic gas reactions.** H. HARTER (B.P. 291,253, 4.7.27).—Several methods of effecting uniform distribution of the reacting gases in the mass of a catalyst are described. One form comprises several inlet pipes penetrating to different depths, the outlet from the pipes being through nozzles at the ends, or, at any rate, only in that portion which projects beyond its next shorter neighbour. B. M. VENABLES.

**[Automatic] apparatus for the control of temperatures.** A. G. S. SANDISON, and ELECTROFLO METERS Co., LTD. (B.P. 290,402, 17.3.27).—A bulb containing a temperature-responsive fluid is connected to a Bourdon tube or other pressure-responsive device which controls a pilot valve through linkwork. The pilot valve may comprise a piston valve which by its longitudinal movement controls a fluid under pressure, and to avoid lag by friction the valve is kept in constant rotation by a jet of fluid acting on a paddle attached to it. The fluid controlled by the pilot valve actuates a piston connected to the fuel-regulating gear, and the piston is also connected to the linkwork, so that when the piston has moved to a new position it returns the pilot valve to normal. B. M. VENABLES.

**Thermostats.** A. J. THOMAS and A. A. STOW (B.P. 290,423, 11.4.27).—A thermostat, of the type in which an expanding and collapsing capsule obstructs a fuel-supply conduit, is provided with a sliding or rotating carrier, so that any one of several capsules containing liquids which boil at different temperatures may be brought into operation to alter the temperature which is to be maintained constant. B. M. VENABLES.

**Thermostats.** W. A. VAN BERKEL (B.P. 291,669, 20.10.27).—A rigid reservoir is filled with a temperature-sensitive medium and communicates through a flexible partition to a piston which operates any desired regulating valve. The reservoir is preferably spherical and directly attached to the casing containing the partition and valve. B. M. VENABLES.

**Testing the physical properties of materials.** R. ESNAULT-PELTERIE (B.P. 289,960, 4.2.27).—The hardness

of two balls of the same material is determined by measuring the electrical resistance of the contact when the balls are pressed together under varying loads. As the load increases, the resistance decreases owing to the greater area of contact, and from the load-resistance curve the hardness may be calculated according to Hertz's equation.

A. R. POWELL.

**Hardness testing device.** C. H. WILSON (B.P. 290,729, 18.2.27).—A device acting on the same principle as that described in B.P. 277,517 (B., 1927, 863).

B. M. VENABLES.

**Colorimeter.** R. L. REES (B.P. 291,174, 11.3.27).—Automatic means are described for mixing the liquid to be tested with indicator liquid and transferring the mixture to a colorimetric tube, leaving only the actual comparison of colour to be done by human agency.

B. M. VENABLES.

**Apparatus for separating liquids of different sp. gr.** W. LINNMAN, JUN. (B.P. 291,608, 9.6.27).—See U.S.P. 1,671,115; preceding.

**Introducing and removing goods into or from the working chambers of furnaces.** A. SMALLWOOD and J. FALLON (B.P. 291,153, 25.2.27).

**Construction of brickwork walls exposed to high temperatures.** ÉTABL. F. LABESSE (B.P. 285,050, 10.9.27. Fr., 10.2.27).

**Adjustment for retort mouthpiece doors.** W. NORRIS (B.P. 291,573, 13.4.27).

**Refrigeration processes and apparatus.** SILICA GEL CORP., Assees. of E. B. MILLER (B.P. 266,747, 25.2.27. U.S., 26.2.26).

**Evaporators for refrigerating machines.** ELECTROLUX, LTD., Assees. of PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (B.P. 275,576, 30.6.27. Ger., 3.8.26).

**Measurement of sp. gr.** (B.P. 290,913).—See II. Containers (B.P. 283,868).—See VII.

## II.—FUEL; GAS; TAR; MINERAL OILS.

**Bituminous coal of the Plau series near Dresden.** F. FOERSTER and A. LANDGRAF (Brennstoff-Chem., 1928, 9, 169—174).—The bituminous coal of the Döhle basin in the Plau series near Dresden has in all seams the same proportion of coal substance which is in close agreement with that of the upper Zwickau coal. The carbon content of the coal substance is nearly 84%, the maximum given by Bergius for coal formed naturally from cellulose or peat. Under low-temperature coking the coal behaves in the same way as that from Zwickau, Upper Silesia, and the Saar Valley.

A. E. MITCHELL.

**Microbiology of coal and its associated strata. I. Microflora of brown coal deposits.** R. LIESKE and E. HOFMANN (Brennstoff-Chem., 1928, 9, 174—178).—Microscopical examination of brown coals from several deposits has shown that the microflora is considerably less plentiful than in ordinary soil, there being a general reduction in both the higher and lower plants. Of the higher plants only *Tussilago farfara* was observed. There is a moderate development of Gram-positive soil bacilli

of the phosphorescent group together with several sorts of sporeless fungi. The species observed grow better in ordinary coal than in brown coal.

A. E. MITCHELL.

**New theories of coal formation.** W. FUCHS (Brennstoff-Chem., 1928, 9, 153—156).—A general discussion of the theories of Bergius (Naturwiss., 1928, 16, 1) and of Taylor (B., 1927, 691; 1928, 238) on the methods of formation of coal.

A. E. MITCHELL.

**Use of the Endell heating microscope for the examination of solid fuels.** E. BERL and H. SCHILDWÄCHTER (Brennstoff-Chem., 1928, 9, 159—160).—A microscope with an electrically-heated stage has been adopted for the examination of solid fuels. The stage has been fitted with a chamber so that the heating may be carried out in any required atmosphere. With coals it is possible to observe very closely the temperatures at which reactions begin, at which coking is complete, and at which gas ceases to be evolved. A number of coals have been examined in nitrogen, hydrogen, and carbon dioxide, and the effects of these gases on the temperatures at the various stages of the reaction have been determined.

A. E. MITCHELL.

**Recognition and determination of the constituents of coal by the "float and sink" method.** G. DÖRFLINGER (Arch. Eisenhüttenw., 1927, 1, 3—8, Chem. Zentr., 1927, II, 1527).—The individual constituents of a coal may be separated by the use of a series of solutions of graduated density. From the results obtained, a "value number" of the coal may be obtained which is characteristic for every type of coal, and from which conclusions may be drawn as to the value of the coal for the manufacture of gas and coke.

A. R. POWELL.

**Analytical characterisation of coals.** W. FUCHS (Brennstoff-Chem., 1928, 9, 198—200; cf. B., 1928, 145).—In addition to carboxyl groups (present only in geologically recent coals), which can displace acetic acid from calcium acetate, old and young coals contain acidic hydroxyl groups which can be titrated by means of aqueous or alcoholic alkali hydroxide. Determination of the "hydroxyl number" serves to characterise coals analytically. The sample, corresponding with about 0.3 g. of dry coal, is shaken and kept with 50 c.c. of 0.1N-sodium hydroxide solution; a few c.c. of 10% barium chloride solution are added and water to a total of 100 c.c., and a filtered aliquot portion is titrated using 0.1N-sulphuric acid and phenolphthalein. A blank experiment is also carried out. Alternatively, a sample corresponding with about 1 g. of dry coal is boiled for 30 min. with 50 c.c. of 0.1N-alcoholic potassium hydroxide, and the solution titrated as before, after adding sufficient alcohol to keep the alcohol concentration not less than 75% at the end of the titration. Since the same results are obtained working in cold or in boiling alcoholic solution, humic anhydride, if present, does not take part in the reaction. Eight coals have been investigated. The hydroxyl numbers determined in aqueous solution were mostly smaller than those found in alcoholic solution, and showed greater differences between different coals. The hydroxyl number is greater in recent coals than in older ones.

W. S. NORRIS.

**Fusion of coal, coke, and motor fuel by sodium peroxide.** G. E. MABEE (Ind. Eng. Chem., 1928, 20, 644—645; cf. Selvig and Fieldner, B., 1927, 513).—In the determination of sulphur in coke by means of sodium peroxide according to usual methods unburned material occurs to the extent of about 2%; addition of benzoic acid etc. to the charge helps to supply the volatile matter which anthracite and coke lack. Alternatively, it is recommended that the cartridge containing the charge be placed in a muffle at 800° for 2 min., thus ensuring even heating and better combustion. Sulphur in volatile substances, e.g., petrol, benzene, etc., is determined by igniting a mixture of the volatile material and sodium peroxide in a nickel crucible which stands in water to half its height. A copper canopy covers the crucible, and spontaneous ignition is started by introducing 0.5 c.c. of methyl alcohol into the charge. For a satisfactory energetic combustion, about 15—18 g. of sodium peroxide and 1 c.c. of the liquid fuel to be tested should be used.  
C. A. KING.

**Humic acids. Pyrohymatomelanic acid, a new compound isolated from Merck's humic acid.** D. J. W. KREULEN (Brennstoff-Chem., 1928, 9, 197—198).—Merck's acidum humicum contains an insignificant quantity of water-soluble humic acid (fulvic acid), and about 27% of alcohol- and phenol-soluble, yellowish-brown hymatomelanic acid, 9% of brownish-black *pyrohymatomelanic acid* (insoluble in 95% alcohol or ether, soluble in phenol), and 64% of darker-coloured, insoluble, residual humic acids. The new acid is intermediate between hymatomelanic acid and the insoluble humic acids in ease of precipitation from an alkaline solution by means of mineral acids. A similar brown granular compound is precipitated when a solution of hymatomelanic acid in 95% alcohol is boiled; if the operation is too prolonged the precipitate is also insoluble in phenol (cf. Erdmann and Dolch, "Chemie der Braunkohle," 1927, 124).  
W. S. NORRIS.

**So-called "nitrohumic" acid.** W. FUCHS (Brennstoff-Chem., 1928, 9, 178—182).—The product obtained by treating humic acid, from brown coal, with nitric acid and its methyl derivative have been examined and their properties compared with "nitrohumic" acid, prepared from carbamide, and its nitroso-derivative. "Nitrohumic" acid is shown to have properties similar in all respects to the nitroso-derivative from carbamide. Mol. wt. determinations combined with corresponding determinations of the equivalent weight lead to the suggestion that the compound is an isonitrosoketotrihydroxytetracarboxylic acid with a mol. wt. of 1300 (approx.).  
A. E. MITCHELL.

**Carbonisation. III. Temperature, size of coal, blending with coke and inorganic compounds.** 20TH REP. OF RES. SUB-COMM. OF GAS INVESTIGATION COMM., INST. GAS ENG. (Gas J., 1928, 182, 883—888; cf. B., 1927, 592).—Experiments on carbonisation of a moderate-coking Nottinghamshire coal have been continued, the apparatus used being the same as that previously described except that improvements in the scrubbing and purifying systems have been made. With temperatures below 820° the yields of coke, tar, liquor, and gas were only slightly affected by grading, but at

higher temperatures the calorific value of the gas was lower and the tar yield greater when large coal was used. Although the total volume of gas produced did not vary greatly, the initial rate of evolution was lower with small coal and the total duration of carbonisation was considerably prolonged. The retort temperature influences the period of carbonisation, so that 2.5 hrs. at 915° produce the same effect as 10 hrs. at 630° and 20 hrs. at 525°, and the yield of therms per ton of coal falls from 75.8 at 979° to 4.8 at 344°. The composition of the gas varies with rising temperature, carbon dioxide decreasing, hydrogen and carbon monoxide increasing, and unsaturated hydrocarbons reaching a maximum at about 450°. Blending with coke produced no beneficial results, but the mixture was not briquetted, and the coal was one of only moderate coking properties. Addition of 2% of sodium or calcium carbonate or iron oxide all gave increased thermal yields of gas at temperatures above 815°, and formation of ammonia varied in the same direction. Preliminary tests on the reactivities and physical properties of the cokes show that lowering the temperature of formation increases the reactivity to steam and to carbon dioxide, and decreases the mechanical strength, but does not affect the ignition temperature except in cases where inorganic oxides have been added to the coal.

R. H. GRIFFITH.

**Factors influencing reactivity of coke. I (a). Carbonising temperature and heat-treatment in nitrogen.** J. A. SUTCLIFFE and J. W. COBB. I (b). **Heat-treatment in hydrocarbon and other gases.** F. J. DENT and J. W. COBB (Gas J., 1928, 182, 946—948, 948—951).—I (a). The addition of inorganic oxides to a coal has been shown to influence the properties of the coke formed by its carbonisation (cf. preceding abstract, also B., 1927, 833), and the effects obtained by mixing sodium, calcium, and potassium carbonates and iron oxide with Sharlston Wallsend coal have been studied. At 500° the untreated coal gave a spongy coke, and that produced by addition of calcium carbonate was similar, whilst those containing other oxides were finely porous and homogeneous. At 1100° all the cokes except that containing potassium were hard. Study of the reaction of these cokes with steam showed that those obtained at 1100° were the least reactive, whilst 500° cokes did not react as extensively as those produced at 800°; in all cases the influence of inorganic oxides was marked, particularly with sodium. Further experiments with a coke formed at 500° showed that heating in nitrogen for several hours at 1000° or gasifying in steam at 1000° produced no material change in its reactivity, but prolonged heating (50 hrs. at 900°) of 800° coke reduced its activity considerably.

I (b). Coke obtained from Sharlston Wallsend coal, containing 1.3% of ash, at 800° for 6 hrs., was heated for 1 hr. at different temperatures in hydrogen, carbon monoxide, methane, and ethylene, and changes in the reactivity of the coke with carbon dioxide were investigated. Heating in hydrogen or carbon monoxide at 900° led to slight loss of activity, whilst the effects with methane were greater; the influence of ethylene was much more pronounced and appeared at lower temperatures. The reduction of reactivity was also more

persistent in the last case, and decomposition of the ethylene was detected; at 900° tarry matter was formed which contained naphthalene, and a hard carbon deposit was visible. The rate at which the coke regains its activity on prolonged heating in carbon dioxide appeared to depend on the extent to which hydrocarbon decomposition had occurred.

R. H. GRIFFITH.

**Influence of inorganic constituents in the carbonisation and gasification of coal. II. Liberation of sulphur.** J. J. PRIESTLEY and J. W. COBB (Gas J., 1928, 182, 951—954. Cf. B., 1925, 620; 1926, 1002; 1927, 833).—Experiments have been carried out with coals to which inorganic substances were added, in nitrogen and hydrogen; charges of about 20 g. of Sharlston Wallsend coal, heated in a Morgan tube, were used. The "pure" coal in nitrogen gave off 42% of its sulphur by heating to 1000°, of which the bulk appeared at about 500°, whilst in hydrogen the evolution of hydrogen sulphide continued at higher temperatures and reached 68% at 1000°. With 5% of iron oxide added to the coal only 9% of the sulphur was liberated in nitrogen, but in hydrogen rapid decomposition occurred from 800° upwards, amounting to 64% at 1000°. When lime was added to the coal the decomposition in nitrogen or hydrogen was less than 3%. Mixing with sodium carbonate gave increased liberation of sulphur in nitrogen until the process was interrupted by the formation of sodium oxide at about 600°, whilst in hydrogen similar results were observed to a greater degree.

R. H. GRIFFITH.

**Effect of alkali-metal compounds on combustion.** C. A. THOMAS and C. A. HOCHWALT (Ind. Eng. Chem., 1928, 20, 575—577).—Since a rather concentrated solution of sodium potassium carbonate in water has been found to extinguish flames, the effect on combustion of a large number of compounds in solution has been studied. A jet of the solution under trial was directed on to the internal wall of a fire pan containing ignited gasoline, the whole being contained in a draught-proof chamber. The temperature of the fire pan was allowed to reach 270° before the extinguishing jet was opened, and all conditions were adjusted accurately for comparative purposes. With few exceptions every element capable of forming a water-soluble salt was studied. Practically all salts of the alkali metals exhibited this fire-extinguishing effect, which is described as "catalytic," although quantitative results were influenced very decidedly by the radicals attached to the metal, the effect also increasing with increase in the at. wt. of the metal. The extinguishing effect of compounds of alkali metals, e.g., halides, was increased considerably by the presence of combined oxygen, though the presence of an alkali metal appeared to be essential. Organic compounds of the alkali metals were effective extinguishers, the degree being generally proportional to their oxygen content. Although sodium potassium carbonate was remarkably effective, carbonates of other metals gave a negative result, and even ammonium carbonate, which dissociates easily, failed entirely to extinguish the fire. In working with the minimum effective concentrations of the alkali metals, these weak solutions were instantly effective when the tem-

perature of the sides of the fire pan above the gasoline level was 200—325°; above that range an interval occurred before the fire was extinguished, and apparently the solution cooled the pan to the effective range before the "catalytic" effect was possible.

C. A. KING.

**Effect of physical characteristics of coke on reactivity.** J. D. DAVIS and D. A. REYNOLDS (Ind. Eng. Chem., 1928, 20, 617—621).—Low-temperature cokes are of a distinctly higher order of reactivity than those produced at higher temperatures, though little difference was noted between similar cokes from different coals, and variation of the method of high-temperature production within the range of American practice has no pronounced effect on reactivity of the coke. No close relation exists between the properties of lower bulk density and higher reactivity of low-temperature cokes, and the increase in reactivity corresponding with a high content of volatile matter is probably incidental. Reactivity varies inversely with the size of test particles and generally directly as the adsorptive power. With high-temperature cokes external surface has a greater effect on reactivity than capillary surface. Different coke particles of the same sample show different reactivities, the duller portions from the centre of the piece being more reactive than the brighter portions.

C. A. KING.

**Properties of coke.** H. GREGER (Brennstoff-Chem., 1928, 9, 156—159).—An apparatus for studying the ignition and burning of solid fuels is described. Tests on different varieties of coke show that the inception and maintenance of the combustion depend not only on the ignition temperature but also on the oxygen supply and its concentration, the heat loss from the combustion chamber, and the nature of the igniting influence. It is proposed that the term "combustion threshold" embodying all these factors should be applied as indicating the suitability of a fuel for burning in any particular manner.

A. E. MITCHELL.

**Firedamp explosions: projection of flame. II.** M. J. BURGESS (Safety in Mines Res. Bd., Paper No. 42, 1928, 8 pp.; cf. B., 1926, 906).—The distance of projection of flame from the explosion of mixtures of methane and air has been determined in a gallery 7½ ft. in diam., with columns of explosive mixture of 26¾ and 53¾ ft. in length, respectively, and with varying proportions of methane in the mixtures. With the shorter column the distance of projection was 60 ft. with a mixture containing only 6.3% of methane. The maximum projections, obtained with mixtures containing about 10.5% of methane, were 120 and 220 ft. with the shorter and longer columns of explosive mixture, respectively. These distances are somewhat shorter than those obtained in laboratory experiments or calculated theoretically.

A. B. MANNING.

**Disposal of liquor effluents from gas works.** 2ND REP. INST. GAS ENG. LIQUOR EFFLUENTS RES. COMM. (Gas J., 1928, 182, 1016—1018; cf. B., 1927, 864).—The condensation of tar and liquor from a vertical retort setting at Hinckley has been studied. The gas was passed through air-cooled and water-cooled condensers, an exhaustor, Livesey washers, and tower

scrubbers before entering the oxide boxes; the tar and liquor from all points ran into a common well from which liquor was removed periodically or pumped to scrubbers. 17.2 gals. of tar and 32 gals. of liquor were obtained per ton of coal, and the oxygen-absorption value of the liquor was 950 pts. per 100,000, of which the majority was due to phenols and tar acids, but a great increase in the thiocyanate and thiosulphate content occurred in liquor which had been used in washers after storage in contact with air. The content of higher tar acids was reduced by introduction of a tar extractor in the foul main, and still better results would be anticipated if more tar could be condensed before separation of any liquor. Thiocyanate and thiosulphate increased sevenfold when air was admitted at the inlet to the condensers, so that the presence of these substances can be lessened by adding air only at the oxide boxes, and also by reducing the temperature of the circulating liquor. The final effluent from the ammonium sulphate plant was 1.4 times the volume of liquor handled, and was about 1% of the total dry-weather sewage; this figure might be reduced to 0.5% by provision of suitable balancing tanks. Disposal of effluent, under careful control, into sewage is considered satisfactory, whilst separate disposal of devilliquor, by means of chimney-spraying etc., reduces the work of effluent purification by about 20%.

R. H. GRIFFITH.

**Products of combustion from typical gas appliances. III. Appliances using free-burning flames.** 19TH REP. OF RES. SUB-COMM. OF GAS INVESTIGATION COMM., INST. GAS. ENG. (Gas J., 1928, 182, 880—882; cf. B., 1927, 593).—As in the previous work, iodine pentoxide has again been used to determine the carbon monoxide produced, but the gas was first freed from carbon dioxide, and from oxides of nitrogen by condensation in liquid air. In all cases of isolated burners such as Bunsen, Argand, or Méker, the production of carbon monoxide was very small, being less than 3 pts. per 10,000 of gas used. A condensing-type flueless heater gave 0.1 pt. at its rated capacity and only slightly more with excessive gas supply; a 3-gal. water heater with automatic control gave 2.0 pts. at low gas rates, but with high water and gas rates only 0.1 pt. A geyser burning 136 cub. ft./hr. was fitted with flue pipes below the baffle, of varying lengths, and the carbon monoxide fell rapidly from 120 pts. at about 10 in. to negligible amounts at 5 ft. A Junkers calorimeter, in which the Bunsen flame burns in a water-cooled chamber, gave lower results than a similar flame in an open space. Extensive experiments have been made with a gas oven heated by two side burners; the carbon monoxide content is found to fall, whereas the flue temperature and amount of carbon dioxide rise as the gas consumption increases. Preliminary tests on gas fires with the new technique show that, when properly adjusted and running at full capacity, not more than 50 pts. of carbon monoxide should be formed per 10,000 pts. of gas burned.

R. H. GRIFFITH.

**Design of gas-burning equipment.** N. T. BRANCHE (Chem. Met. Eng., 1928, 35, 357—360).—A short review of fundamental principles.

**Comparison of mechanical tar washing and electrical precipitation processes.** F. SEIDENSCHNUR and E. GROH (Brennstoff-Chem., 1928, 9, 188—193).—The performances of a Theisen mechanical tar washer and a single-stage electro-filter of the Siemens-Schuckertwerke type have been compared when working on gas obtained from central German brown coal briquettes in a revolving-grate gas generator with a low-temperature carbonisation attachment. The electro-filter removed 99.4% of the tar whilst the Theisen washer, using as wash water the brown coal carbonisation water, removed only 95.3%. The tar obtained by the two methods of recovery was of good quality and of almost identical properties. The experiments indicated that by the correct choice of working conditions and type of generator complete recovery of tar and light oils should be possible.

A. E. MITCHELL.

**Determination of water [in coal, tars, and oil] by distillation with xylene or tetrachloroethane.** K. SCHAEFER (Chem.-Ztg., 1928, 52, 408).—The author discusses various modifications of his original apparatus (B., 1924, 973) which have been suggested by others, and describes an improved form which can readily be adapted for use with tetrachloroethane instead of xylene.

W. J. BOYD.

**Conversion of coal into oil by the Bergius method.** J. I. GRAHAM and D. G. SKINNER (J. Inst. Petroleum Tech., 1928, 14, 78—93).—Coal samples (60-mesh I.M.M.) were treated in a 3-litre steel autoclave, gas-heated and rotated at about 60 r.p.m. In all experiments 200 g. of coal were used suspended in 100 g. of phenol. The maximum pressure during hydrogenation was 145—150 atm., the temperature was kept at about 430°, and the total duration of heating was 8 hrs. carried over two days, the hydrogen being renewed. The products of reaction were first distilled in an aluminium retort up to 150°. The light spirit fraction was washed with dilute caustic solution and the remaining products were further treated with chloroform, thus yielding (a) phenol-insoluble, (b) phenol-soluble, chloroform-insoluble, and (c) phenol-soluble, chloroform-soluble fractions. Products (c) were further separated into fractions distilling up to 300°, and between 300° and 450°. The results show yields varying from 5.8 to 109 gals. of total oil per ton of coal, corresponding to petrol yields of 2.8 to 23.9 gals. per ton of original coal. The addition of ferric oxide as catalyst to the original charge increased the petrol yield from an equivalent of 9.5 to 15 gals. per ton of coal; there was also an increase in tar oil and amount of aqueous liquor produced, but the yield of product (b) was practically unaffected. In general, the yields of tar oil (product c) are less than those obtained by Bergius. The effect of raising the hydrogen pressure was to increase the yield of tar oil. The tables indicate that the solid residue left after hydrogenation averages about 20%, and the yield of gaseous products is about 20% by wt. of the original coal. The general conclusions are that petrol suitable for internal-combustion engines may be obtained, on an average, in amount up to 25 gals. per ton of coal treated. The value of the heavier oil, however, is not so assured. Certain coals have proved to be more suitable for treatment than others, and these appear to

fall into the parabituminous division of the Seyler classification. Those having a carbon:hydrogen ratio between 15.5 and 16.5 appear to give the highest oil yields. From calculations of the costs of the process it is considered that such coals could possibly be worked at the present time with profit. H. S. GARLICK.

**Vapour-phase oxidation of aromatic hydrocarbons and of petroleum distillates.** A. R. BOWEN and A. W. NASH (J. Inst. Petroleum Tech., 1928, 14, 106—114).—The possibility of the conversion of certain petroleum distillates by vapour-phase oxidation was considered by first investigating its effect on pure aromatic hydrocarbons. In the apparatus used, air was measured in a wet meter and drawn through scrubbing towers containing caustic potash and strong sulphuric acid, respectively, then passed through a copper worm, and bubbled through the liquid under test, both being immersed in a thermostat. The vapour-enriched air was led into the reaction tube resting in a stout iron tube in an electric furnace. The hard glass reaction tube contained 60—70 c.c. of 5—10-mesh aluminium grains to serve as preheater, followed by the catalyst, consisting in each case of 60 c.c. of similar aluminium grains, but coated with vanadium pentoxide. The exit gases were led through a water-cooled condenser to an ice-cooled flask, then through two water washers, and finally through two U-tubes filled with activated charcoal. 50 c.c. of pure toluene were run into the "carburettor" kept at 50°, and the enriched air passed over the catalyst maintained at 400° at the rate of 12 litres/hr. In all 127.5 litres of air were used. At the cool end of the exit tube a mixture of crystals separated which were identified as anthraquinone (0.3 g.), benzoic acid (4.87 g.), and 0.37 g. of the mixed crystals. An oil condensate (24.7 c.c.) and reaction water (7.3 c.c.) were obtained. From 18 c.c. of the oil condensate, on fractionation, were obtained 16 c.c. volatile up to 115° and a residue of 2 c.c. of crude benzaldehyde. The aqueous distillate had an acid reaction, decolorised acidic potassium permanganate solution and bromine water, and reduced ammoniacal silver nitrate. The activated charcoal tubes gave 6.5 c.c. of unchanged toluene. A further experiment with "toluol benzine" *ex* Borneo crude gave substantially similar results. *n*-Hexane was found to give oxidation products under similar conditions to the above. Out of 50 c.c. of this hydrocarbon 45.9 c.c. were recovered as an oil. H. S. GARLICK.

**Sulphur compounds in transformer oil.** E. FERBER (Z. angew. Chem., 1928, 41, 680—682).—The complete removal of sulphur from the heavier distillates of petroleum or lignite tar, which is necessary before hydrogenation, is effected by treatment with metallic sodium. The carbonaceous residue was acidified with dilute hydrochloric acid and extracted with light petroleum, from which a yellow oil was obtained by evaporation. This proved to be a mixture of disulphides, from which, by reduction, amyl, heptyl, and octyl mercaptans were isolated. C. IRWIN.

**Designing equipment for chemical treatment of oil distillates.** J. C. MORRELL and D. J. BERGMAN (Chem. Met. Eng., 1928, 35, 291—295).—To proportion

the reagents when blow-cases are used under various differential pressures, several sizes of orifices must be used. A table and chart are given showing the rates of flow and pressures with different diameter orifices. A differential pressure across the orifice of 6—20 lb. is recommended. Pumps for acid, caustic, and plumbite feed should be of acid-resisting bronze or of cast iron and steel with liners, and should be of the positive piston, duplex or rotary type having an approximate capacity of 10 brls. per hr. Recirculating pumps of the rotary gear or centrifugal types should pass 20 brls. per hr. Both types should have by-pass arrangements. The inlet to the settling tank should be made at the separating level, and tangential to the tank, in order to set up a whirling motion which assists in settling. The water spray may be a cross-pipe with perforations on one side of each pipe. An orifice mixer for water washing is not recommended. A system for removing hydrogen sulphide from cracked distillates is described consisting of a water wash followed by a caustic wash. The same equipment can serve for pretreatment of cracked distillates with plumbite solution. The design of a 1000-brl. agitator for batch-treating systems is discussed in which a centrifugal pump is installed in connexion with recirculation lines for drawing off separately the reagents and pressure distillate, the relative proportions being controlled by a valve. The reagent and pressure distillate enter the suction side of the line leading into the top of the agitator, the discharge being below the level of the oil.

H. S. GARLICK.

**Operating a continuous plant for refining [petroleum] distillates.** J. C. MORRELL and D. J. BERGMAN (Chem. Met. Eng., 1928, 35, 350—354).—A continuous treating plant consists of mixers for acid, sodium plumbite, and caustic soda, with intermediate settling tanks and provision for water-washing. For mixing, orifice columns followed by baffled columns are used. The latter prolong the time of contact and allow of recirculation of the reagent if desired. The proportioning of the reagents is effected by pumps. Plant dimensions are discussed in detail. Lead-lined pipe or chromium alloys are available for the acid used. Stoneware towers and stoneware-lined pipes are suggested for such reagents as cupric chloride. The use of separating sumps in which oil may be collected from aqueous drainage is desirable. C. IRWIN.

**Simplified calculations in design of natural gasoline absorbers.** W. K. LEWIS (Chem. Met. Eng., 1928, 35, 93—95).—A method of computation of continuous counter-current systems for the absorption of any single component in a gaseous mixture by a non-volatile liquid absorbent in which the other components of the gas are substantially insoluble is applied to the absorption of the large number of components present in natural petroleum. In a system in which a single component is being absorbed, an equation in which the gaseous phase is linear in terms of the corresponding concentration in the liquid phase may be obtained representing the operating conditions at every point in the absorber. The slope of this line (the "operating" line) is  $L/G$ , the ratio of absorbing liquid to inert gas



submitted to treatment. From this ratio the operating conditions throughout the absorber can be determined. The distance between the operating line and the equilibrium curve represents the driving force producing absorption, and is therefore a quantitative measure of the rate of absorption in the unit. The operating lines for each component of natural gas, considered separately, are parallel straight lines. The equilibrium curves are straight lines through the origin with the slope  $T/\pi$ , where  $T$  is the temperature of absorption and  $\pi$  the operating pressure on the unit. For high-boiling constituents the driving force becomes very large at the rich end of the diagram but very small at the lean end, accounting for the difficulty in completely removing the high-boiling very soluble constituents from the gas by liquid absorption, despite their solubility.

H. S. GARLICK.

#### Continuous treatment of light oil products.

A. A. KECHER (Azerbejdianskoye Neft. Khoz., 1927, No. 10, 77—82).—Polemical. CHEMICAL ABSTRACTS.

**Distillation of oil products in a stream of different gases.** N. TSCHERNOSHUKOV (Neft. Khoz., 1927, 13, 63—65).—The speed of vaporisation of Baku or Grozny petroleum (b.p. 100—150°) is unchanged when the distillation is carried out in hydrogen, carbon dioxide, nitrogen, or air. CHEMICAL ABSTRACTS.

#### Determination of water and mud in oil products.

T. A. SELSKI (Neft. Khoz., 1927, 13, 623—631).—The water layer is drawn off and the water-petroleum emulsion is broken up by shaking. The use of a centrifuge is desirable for the separation and for the determination of mud. CHEMICAL ABSTRACTS.

**Determination of sulphur in crude petroleum and its products.** M. KORSKOV (Neft. Khoz., 1928, 14, 68—81).—The funnel of the absorption apparatus is provided with an inverted rim to collect water condensing on the walls; this water contains 15% of the sulphur dioxide produced. The U-tube of the absorption column is fitted with a draining cock, and the lamp has a ground-in cover and stopper to prevent evaporation. The titration is carried out electrometrically, using platinised platinum electrodes, at  $5 - 6 \pm 0.2^\circ$  above the ordinary temperature. CHEMICAL ABSTRACTS.

#### Determination of sulphur in volatile fuels.

H. T. KENNEDY (Ind. Eng. Chem., 1928, 20, 201—202).—A modified type of test lamp is described (cf. Lomax and Bevan, B., 1925, 124), in which the fuel is vaporised in a carburetted device and burned, and the oxides of sulphur so produced are absorbed by a sodium carbonate solution of known concentration. Advantages of speed and accuracy over other methods are claimed.

H. S. GARLICK.

**Separation of lead tetraethyl from solution in petroleum spirit.** F. W. TOMS and C. P. MONEY (Analyst, 1928, 53, 328—329).—When "ethyl petrol" is saturated with sulphur dioxide it deposits after keeping a white solid, which on treatment with concentrated sulphuric and nitric acids yields a white precipitate. This was weighed and further purified by dissolution in hot ammonium acetate. Assuming lead tetra-

ethyl to have  $d 1.62$ , then 0.0833 vol.-% was found in a sample. Petrol extraction followed by treatment with sulphur dioxide is suggested in the case of other suspected materials.

D. G. HEWER.

**Distribution of sulphur in [American] oil shale.** II. E. P. HARDING and W. H. DUMKE (Ind. Eng. Chem., 1928, 20, 164).

**Premature failure of refractories.** DALE.—See VIII. **Welding with coal gas.** MÜLLER and BIBUS.—See X. **Carbon black for rubber.** GOODWIN and PARK.—See XIV.

#### PATENTS.

**Coke-oven heating. Retort oven.** H. KOPPERS, ASSR. to KOPPERS DEVELOPMENT CORP. (U.S.P. 1,671,194—5, 29.5.28. Appl. [A] 5.7.21, [B] 31.8.21. Ger., [A] 4.4.17, [B] 4.3.19).—(A) The heat economy of a regenerative, gas-fired, coking furnace is improved by shutting off the supply of gas at a suitable moment during carbonisation and circulating air through the combustion chamber in such a way that the air, acting as a heat distributor, transfers heat from the hotter to the relatively cooler parts of the combustion chamber and regenerators. The supply of gas to the combustion chamber is then resumed. (B) An oven plant comprises vertical retort chambers, parallel vertical heating flues, regenerators so arranged that the hot waste gases flow through them from top to bottom and the combustion gases in the reverse direction, an upper horizontal channel connecting the heating-flues with the top of one of the regenerator groups, and a lower horizontal channel and guide channel connecting the heating-flues with the other regenerator group.

A. B. MANNING.

**Multiple-chamber oven chiefly for distilling at low-temperature carboniferous material.** SOC. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS (B.P. 279,130, 17.10.27. Ger., 15.10.26).—The material to be carbonised is heated in a series of chambers in succession, by the passage through them of a gaseous heating medium, e.g., steam. Means are provided for controlling the temperatures employed, which vary from one chamber to the next in any desired manner. The material remains stationary during each stage of the heating process. The chambers are arranged on the same level and the floors are vertically movable, e.g., by jack pistons, so that the charge in each chamber, which is contained in a tub, may be lowered, moved horizontally, and raised into the next chamber.

A. B. MANNING.

**Ovens for treating fuels or fuel-containing materials by heat.** O. HELLMANN (B.P. 290,838, 2.6.27. Addn. to B.P. 272,493; B., 1928, 240).—Hollow spaces with perforated walls are provided in the compartments containing the material, in order to facilitate the escape of the volatile products evolved. Also, to enable uniform heating in the acute-angled heating chambers of the ovens with annular platforms to be secured, the heating agent is caused to enter the flues not only at the outer periphery, but also at points at distances away from the outer periphery.

A. B. MANNING.

**Production of solid, smokeless fuel from carbonaceous material.** A. E. WHITE. From ILLINOIS

ANTHRACITE CORP. (B.P. 291,206, 26.4.27).—The material is fed at a comparatively fast rate into a producer, in which a relatively shallow fuel bed of constant depth is maintained. The material, which is continuously agitated, is subjected to restricted combustion so that only part of the volatile matter and none of the fixed carbon is consumed. The product is continuously discharged. A producer, suitable for carrying out the process, is of the rotary-shell type, with an idly rotating hearth for supporting the bed of material, a stirrer, and a stationary discharging mechanism. A. B. MANNING.

**Fuel material [briquettes].** T. NAGEL (U.S.P. 1,666,663, 17.4.28. Appl., 31.10.24).—A binding material for anthracite briquettes is obtained by dextrinising a mixture of equal parts of flour waste, 20% phosphoric acid, and water. Powdered anthracite is mixed with 10% of the resulting solution, briquetted, and baked at 300°. A. R. POWELL.

**Apparatus for measuring sp. gr., adapted for determining the ash or mineral content of coal or other samples.** K. KEGEL (B.P. 290,913, 19.11.27).—A device for measuring the volume of the coal sample by displacement of water is incorporated with an automatic weighing machine, which is provided also with a computing scale to indicate not only the weight of the sample, but also the ash content according to its sp. gr. A. B. MANNING.

**Production of a gaseous mixture from pulverised coal.** F. HERZBERG (B.P. 266,354, 16.2.27. Ger., 19.2.26).—The powdered coal is charged into an externally heated vertical retort down a tube which terminates a considerable distance below the gas outlet, so that no coal is carried away by the gas. Superheated steam is introduced at the bottom of the retort, and the process is conducted so that as far as possible all the fuel is gasified. The retort may be enlarged in cross-section at the level of the coal supply pipe in order to reduce the relative velocity of the gas and coal at that point. A gas of high calorific value is produced. A. B. MANNING.

**Process for gas making.** H. R. BERRY (U.S.P. 1,672,052, 5.6.28. Appl., 5.4.28).—The heat produced in air-blasting one fuel bed is used to distil the volatile matter from a second fuel bed. The air blast is then discontinued, and a combustible gas is produced by the passage of steam, together with the volatile products distilled from the second fuel bed, through the first fuel bed. A. B. MANNING.

**Separation and recovery of olefines from gases containing same.** SYNTHETIC AMMONIA & NITRATES, LTD., and G. F. HORSLEY (B.P. 291,186, 30.3.27).—Ethylene or other olefines are separated from coal distillation gases etc. by scrubbing the gas, from which the sulphur compounds and ammonia have been removed, with an acid solution of silver nitrate, either under ordinary or increased pressure; the ethylene is subsequently recovered by heating the solution. A solution 0.3N with respect to nitric acid and containing 200 g. of silver nitrate per litre is suitable for the purpose. The temperature of the solution is preferably maintained at 0–10° during absorption and at 50–70° during regeneration. A. B. MANNING.

**Production of carburetted water-gas.** C. W. ANDREWS (U.S.P. 1,672,109, 5.6.28. Appl., 3.4.22).—Carbonised material is air blasted and the blast gases are passed through a heat-absorbing structure surrounding a coking retort. The material is then steamed and the hot water-gas, after being further heated by passage through the structure previously heated by the blast gases, is passed through coal in a separate coking retort. The coal is thereby distilled and the mixture of water-gas and coal gas produced is carburetted by the addition of enriching material and passage through a suitable cracking and fixing chamber. A. B. MANNING.

**Manufacture of producer gas and water-gas.** HUMPHREYS & GLASGOW, LTD., Assees. of SOC. DE CONSTRUCTION D'APPAREILS POUR GAZ À L'EAU ET GAZ INDUSTRIELS (B.P. 285,004, 6.12.27. Fr., 8.2.27).—The fuel bed in a suitably designed producer can be subjected to down-steaming as well as up-steaming; oxygen is admitted with the steam either during the up- or the down-run or both. Thus, in one method of working, excess oxygen is injected during the up-run, whilst steam only is injected during the down-run. A. B. MANNING.

**Apparatus for the splitting of acetylene.** P. BURGER, Assee. of "HYDROCARBON A.-G. F. CHEM. PROD." (B.P. 264,500, 12.1.27. Ger., 12.1.26).—The explosive decomposition of acetylene is carried out in a long horizontal cylindrical pipe. To minimise damage in case of accidents the heavy main fittings are fixed in the longitudinal direction of the pipe, and protecting walls of concrete, iron, sand, etc. are erected a short distance from them. A. B. MANNING.

**Composition for use in substitution for asphalt and bituminous materials and for electrical insulation.** G. T. FUERY. FROM AUSTRALIAN BITUMENOUS COMPOUNDS, LTD. (B.P. 290,886, 20.9.27).—The base of the composition consists of a mixture of pulverised oil shale and tar. With this is incorporated a suitable filling material for the production of road coverings, damp courses for buildings, electrical insulating materials, etc. A. B. MANNING.

**Protecting the interior of an oil-cracking retort.** A. C. HOLZAPFEL (B.P. 291,585, 30.4.27).—The interior of the retort is coated with a cementitious composition which is allowed to set. A suitable composition consists of 45 pts. by wt. of water-glass, 28 pts. of water, 5 pts. of magnesite, 2 pts. of slaked lime, and 10 pts. of fire-clay, with or without the addition of a pigment such as titanium dioxide. C. O. HARVEY.

**Pressure-still process.** C. B. BUERGER, Assr. to GULF REFINING Co. (U.S.P. 1,672,801, 5.6.28. Appl., 26.4.27).—In a pressure still, clogging of the outlet for tar and residuum is prevented by intermittently forcing a solvent through this outlet in a direction opposed to that of normal flow. C. O. HARVEY.

**Manufacture of liquid hydrocarbons of low b.p. from olefines.** J. Y. JOHNSON. FROM I. G. FARBERIND. A.-G. (B.P. 291,137, 22.2.27).—Hydrocarbons of the naphthene and aromatic series are obtained from olefines or gases containing them by the application of heat and pressure in the presence of suitable cata-

lysts. At 300—400° the products consist principally of liquid olefines, whilst at higher temperatures (up to 900°) aromatics and naphthenes are the principal products. Suitable catalysts are metallic gold, silver, or copper, in such form as to exhibit coherent surfaces, *e.g.*, a copper tube, oxygen-containing compounds of the alkali metals, oxyacids of phosphorus, boron, and antimony, or their salts, excepting, in the case of gases containing carbon monoxide and hydrogen, those catalysts capable of forming methyl alcohol. The formation of methane may be checked by adding a gas containing methane. C. O. HARVEY.

**Production of low b.p. and other hydrocarbons by the destructive hydrogenation of coals, tars, mineral oils, etc.** I. G. FARBENIND. A.-G. (B.P. 273,337, 27.6.27. Ger., 26.6.26).—The starting materials, if liquid, are separated into fractions of narrow b.p. range, each fraction being then subjected separately to destructive hydrogenation under pressure. If the initial material is solid, it is first converted wholly or partially, by some known process, into liquid products. Liquid starting materials may also be subjected to a preliminary hydrogenation, with or without the employment of pressure or catalysts, in order to modify their boiling ranges, before submitting them to the described process. A. B. MANNING.

**Conversion of saturated hydrocarbons, in gas or vapour form, especially methane, into unsaturated hydrocarbons.** I. G. FARBENIND. A.-G. (B.P. 264,845, 19.1.27. Ger., 20.1.26).—The saturated hydrocarbons are passed through a disc-shaped flame of high temperature, formed by combustion of a by-passed portion of the gas with air or oxygen. Acetylene is the principal product. A. B. MANNING.

**Cracking and hydrogenation of hydrocarbons, oils, or tars.** P. WÜRTH (F.P. 622,715—6, 9.10.25).—A mixture of hydrogen sulphide and (A) the products obtained from a cracking process or (B) hydrocarbon vapours is subjected to a process in which nascent hydrogen is liberated by the thermal decomposition of the hydrogen sulphide. A. R. POWELL.

**Treatment of oil-bearing shales and kindred oil-bearing minerals.** N. H. FREEMAN (B.P. 291,475, 1.12.26; cf. B.P. 248,014; B., 1926, 396).—In cases where the preliminary heat-treatment of the shales etc. causes considerable liberation of liquid products, the latter are allowed to act as solvents and entraining agents in place of added solvent. Superheated steam or oil vapours may also be used as entraining and distilling agents. C. O. HARVEY.

**Treatment of shale or the like.** H. D. RYAN (U.S.P. 1,672,231, 5.6.28. Appl., 2.1.20. Renewed 23.8.27).—The shale is ground with a hydrocarbon oil at a temperature which, whilst sufficient to melt the bituminous material, limits the vaporisation, so that the mixture remains fluid. The bitumens are finally separated from the solid matter. F. G. CLARKE.

**Purification of mineral oils.** M. L. CHAPPELL, G. J. ZISER, and E. L. MOYER, ASSRS. to STANDARD OIL CO. OF CALIFORNIA (U.S.P. 1,672,304, 5.6.28. Appl., 18.8.24).—In the manufacture of lubricating oil,

the oil, after acid treatment and separation of the acid sludge, is repeatedly extracted with an alkali solution containing 90% by vol. of ethyl alcohol.

C. O. HARVEY.

**Refining of [hydrocarbon] oil.** J. R. NELLER and G. M. VANCE, ASSRS. to TEXAS CO. (U.S.P. 1,672,621, 5.6.28. Appl., 30.4.23).—Colour-forming constituents are removed from the acid-treated and neutralised oil by washing with alcoholic alkali solution.

C. O. HARVEY.

**Purifying the used lubricating oil of internal-combustion engines.** R. WISCHIN (B.P. 290,923, 8.12.27. Ger., 3.11.26).—The oil is mixed with concentrated sulphuric acid in a water-jacketed vessel and the temperature of the mixture is gradually raised (4—5°/hr.) to 50—60°. After separation of the sludge the oil is passed through a filtering agent, *e.g.*, fuller's earth, and is then treated with superheated steam at about 200°.

A. B. MANNING.

**Mineral lubricating, transformer, or other oils exposed at raised temperatures to air.** F. HOFMANN and M. DUNKEL (B.P. 284,616, 22.11.26. Ger., 24.11.25).—Oxidation of the oils is inhibited by adding up to 2% of an acid amide, such as urea or oxamide, or a nitrile (cf. B.P. 262,107; B., 1928, 472).

C. O. HARVEY.

**Liquid fuel.** M. MÜLLER-CUNRADI, ASSR. to I. G. FARBENIND. A.-G. (U.S.P. 1,673,620, 12.6.28. Appl., 4.2.25. Ger., 4.2.24).—A liquefied mixture of butane and butylene is claimed.

F. G. CROSSE.

**Purifiers [with removable covers] for use in the manufacture of gas.** WHESSOE FOUNDRY & ENGINEERING CO., LTD., and R. L. CHAMBERS (B.P. 290,793, 1.4.27).

**Apparatus for promoting the combustion of fuel.** R. H. HEPBURN (B.P. 291,180, 22.3.27).

**Washing of coal** (U.S.P. 1,672,448).—See I. **Hydrogen from gas mixtures** (B.P. 291,576).—See VII.

### III.—ORGANIC INTERMEDIATES.

**Higher aldehydes.** SCHIMMEL & Co. (Ber. Schimmel, 1927, 131; Chem. Zentr., 1927, II, 1518).—The aldehydes known in commerce as aldehydes C<sub>14</sub>, C<sub>16</sub>, C<sub>18</sub>, and C<sub>20</sub> belong, in their chemical nature, to lactones and esters, and they do not correspond in carbon content with their names. E. H. SHARLES.

**“Nitrohumic” acid.** FUCHS. **Action of sulphuric acid on aromatic hydrocarbons.** TILICHEV and DUMSKI.—See II.

### PATENTS.

**Manufacture of aromatic nitriles.** I. V. GILES, ASSR. to AMER. CYANAMID CO. (U.S.P. 1,672,253, 1.6.28. Appl., 25.8.26).—Halogenated aromatic hydrocarbons are heated with copper cyanide in the presence of an alkali-forming metal cyanide. F. G. CLARIE.

**n-Butyl lactate.** C. L. GABRIEL and C. BOGIN, ASSRS. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,668,806, 8.5.28. Appl., 29.11.26. Renewed 24.2.28).—A mixture of 70% lactic acid and excess of n-butyl alcohol is distilled at 92° whereby water is removed as the constant-boiling mixture with butyl alcohol. The residual liquid

in the distillation apparatus is saturated with dry hydrogen chloride and refluxed for 1 hr. On cooling, the lower layer of *n*-butyl lactate (b.p. 186–189°) is separated, washed, dried, and distilled. A. R. POWELL.

***n*-Tributyl borate.** W. J. BANNISTER, Assr. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,668,797, 8.5.28. Appl., 26.9.27).—Boric acid is distilled with an excess of butyl alcohol until the temperature rises suddenly from 117° to 150°, the excess of butyl alcohol is then distilled off in a vacuum, and the residual *n*-butyl borate, b.p. 190°/220 mm., is purified by distillation under reduced pressure. A. R. POWELL.

#### IV.—DYESTUFFS.

**Alizarinsulphonic acid ester—a water-soluble alizarin preparation.** E. GEBAUER-FÜLNEGG and I. EISNER (Ind. Eng. Chem., 1928, 20, 637–638).—With chlorosulphonic acid in pyridine alizarin affords the *monopyridine salt* of an alizarinmonosulphonic acid, C<sub>19</sub>H<sub>13</sub>O<sub>7</sub>NS, which when treated with calcium or barium hydroxide or with the alkali carbonates affords the corresponding bimetallic salts, C<sub>14</sub>H<sub>6</sub>O<sub>2</sub>(OM)·OSO<sub>3</sub>M. In dimethylaniline lower yields are obtained and fractional crystallisation is necessary to separate the sodium salt from sodium acetate. All salts of the ester undergo quantitative hydrolysis with concentrated hydrochloric acid. The pyridine salt is decomposed on heating at 110° and alizarin is regenerated on crystallising this salt from boiling water. Brilliant and clear shades of alizarin-red can be obtained by padding material, previously treated in the usual manner with aluminium and calcium salts, with a 1–4% solution of this pyridine salt (containing 2.5% of pyridine for each 1% of dye). After drying, the orange-yellow material is heated at 2 atm. in a Mather-Platt for 10–15 min. and washed with hot soapy water to remove non-hydrolysed and insufficiently fixed calcium and aluminium salts of the alizarin ester, the latter salts requiring the presence of an acid for decomposition at this temperature. Better results are obtained by padding with a cold solution containing 3–5% of the sodium or potassium salt of the alizarinmonosulphonic acid ester and an equal amount of oxalic acid, and, after drying, developing in the Mather-Platt at 110° for 10–15 min. with fairly dry steam; after-washing is unnecessary. R. BRIGHTMAN.

#### PATENTS.

**Manufacture of water-soluble ester-like derivatives of vat dyes.** W. BAUER, Assr. to DURAND & HUGUENIN SOC. ANON. (U.S.P. 1,668,392, 1.5.28. Appl., 15.10.26. Ger., 26.10.25).—Leuco-compounds of indigo vat-dyes (e.g., dibromoindigo-white) are treated with pyrosulphuryl chloride in the presence of an organic base, e.g., dimethylaniline (cf. U.S.P. 1,448,251; B., 1923, 398 A). A. R. POWELL.

**Manufacture of vat dyes of the 2-thionaphthen-2'-indo/eindigo series.** I. G. FARBENIND. A.-G. (B.P. 266,582, 21.2.27. Ger., 20.2.26. Cf. B.P. 274,527; B., 1927, 743).—Vat dyes especially fast to boiling sodium carbonate solution are obtained by condensing thioindoxyls, carrying in positions 4, 6, and 7 three halogen atoms, or two halogens and an alkyl group, or one halogen and two alkyl groups, with an isatin- $\alpha$ -anil or

$\alpha$ -halide. Thus, 6 : 7-dichloro-4-methylthioindoxyl, prepared from 4-chloro-*o*-toluidine by way of 5 : 6-dichloro-2-amino-3-methylphenylthioglycollic acid (*lactam*, m.p. 231–232°) gives with 5 : 7-dichloroisatin  $\alpha$ -chloride a reddish-violet vat dye. C. HOLLINS.

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

**Dispersoidological investigations. XVII. Application in industry of silk-fibroin, and other similar chemically-composite compounds, in its colloidal solutions.** P. P. VON WEIMARN (Rep. Imp. Ind. Res. Inst. Osaka, 1928, 8, 47 pp.; cf. B., 1912, 768).—Threads produced under suitable conditions by coagulating concentrated solutions of silk in neutral solutions of neutral salts (e.g., in sodium iodide or thiocyanate solutions) by means of an aggregating solution (sodium citrate or sodium potassium tartrate) remain unchanged for more than a year. Under less favourable conditions of preparation they become brittle. Ultramicroscopical investigation of the phenomenon of "fibril cleavage" in the swelling of natural silk fibres shows that the latter can be divided into fibrils smaller than 200  $\mu\mu$  in size, i.e., they are of colloidal dimensions in thickness and breadth. Threads obtained from a silk-tannin coagulum are more stable the greater the elimination of tannin from them. Vegetable or wool fibres coated with silk fibroin (e.g., by immersion first in a 35–40% solution of silk in sodium iodide solution and then in a coagulating bath of sodium potassium tartrate) become more lustrous and stronger, and the increase in strength of woollen fibres so treated is very pronounced. Scroop and crêpon effects are produced by treatment of silk material first with a neutral salt swelling agent such as sodium iodide, and then with a coagulating agent, there being less likelihood of damage to the fabric than when concentrated acids are used for a like purpose. Concentrated aqueous salt solutions of such composite substances as casein, chitin, keratin, and fibrin are suggested for use in the textile industry (cf. A., 1926, 1203) and an investigation of the action of very soluble salts corresponding with the Hofmeister series on textile fibres is recommended. B. P. RIDGE.

**Natural silk. I. Iodine-absorbing power of silk fibroin.** T. TAKAHASHI (J. Soc. Chem. Ind. Japan, 1928, 31, 152–155).—Silk fibroin, which had been treated with various reagents and regenerated, showed varying iodine-absorbing power, thus indicating that the chemical reactivity of fibroin depends greatly on its fibrous structure. Y. TOMODA.

**Crystalline-liquid state as a general property of matter. VI. Aggregative liquid-crystal state of natural silk.** P. P. VON WEIMARN (Kolloid-Z., 1928, 45, 161–162).—A description is given of the microscopic structures produced by pouring a concentrated solution of silk in a dispersing medium into a coagulating solution. These forms are compared with those produced in the precipitation of barium sulphate (A., 1928, 584).

E. S. HEDGES.

**Degumming of silk. V. Influence of fatty acid.** T. TAKAHASHI (J. Soc. Chem. Ind. Japan, 1928, 31, 148–151).—Fatty acid prevents the degumming of silk either in acid or in alkaline medium, but the effect

is not distinct when the acidity of the medium is above the isoelectric point of sericin. It appears that the degumming action of soap solution is due to its alkalinity, whereby the sericin becomes dissolved and the fatty acid or acid soap liberated as the result of combination of alkali with sericin is adsorbed on the fibre and protects the fibre from the further action of alkali.

Y. TOMODA.

**Loss of strength [tendering] of cotton exposed to light.** P. W. CUNLIFFE and F. D. FARROW. **Effect of structure and of bleaching on the strength of cotton yarns.** P. W. CUNLIFFE and E. MIDGLEY (J. Text. Inst., 1928, 19, 169—188 T).—Comparison is made between the strength of cotton in the form of hairs, yarn, or cloth after exposure to mercury-vapour lamps, the carbon arc, and to sunlight, both in England and abroad, and that of similar unexposed materials. Cotton hairs exposed to the quartz mercury-vapour lamp lose strength at a constant rate until the tendering amounts to about 40%; the rate then diminishes. Over a small range the rate of tendering is proportional to the intensity of the light. There are specific differences between the susceptibilities to light tendering of cotton hairs of different origin, and destruction proceeds more rapidly in the presence of oxygen, water, or carbon dioxide than in hydrogen, nitrogen, or *in vacuo*. The proportional loss of strength of yarns is about half that of hairs fully exposed under the same conditions, the hairs in the yarns being tendered to the same extent as the yarns themselves. Fine yarns are more rapidly tendered than coarse, and soft twisted than hard, both for bleached and raw cotton. Bleached cotton is more rapidly tendered than raw, and material dyed chrome-green is much more resistant to destruction than the undyed, scoured material. Ferric hydroxide has a slight protective action, whilst cloth dyed mineral-khaki is as resistant as the chrome-dyed material, the effect being such as to extend the life of fabric subject to strong illumination to as much as five or six times that of untreated material. Organic dyes modify the rate of tendering of cotton by light, some unfavourably, others favourably, the effects never being so large as those found with chromium hydroxide. In an appendix it is observed that when the results of breaking tests on yarns of different counts are made comparable by expressing them in terms of the strength of equal weights of cotton in a standard length, for the same twist constant, coarse yarns are inherently stronger than fine, and doubled yarns are stronger than the two singles from which they are spun, but weaker than a single yarn equal in actual counts to the doubled. Bleached yarns are weaker than raw, and, taking the work done in breaking a standard strip of cloth as a measure of its strength, bleached cloth is weaker than unbleached.

B. P. RIDGE.

**Relation between atmospheric humidity and breaking strengths and extensibilities of textile fabrics before and after weathering.** A. J. TURNER (J. Text. Inst., 1928, 19, 101—168 T).—Doped and undoped flax and cotton fabrics, ramie and jute fabrics, brown paper, cellophane sheet, cellulose acetate film, and pigmented nitrocellulose varnish film were tested in an

Avery machine at various relative humidities from 30% to saturation, before and after weathering for different periods. The warp of cotton fabrics is more affected by humidity changes than the weft, and so are coarse than fine fabrics, whilst mercerised cotton fabrics are less sensitive to such changes than unmercerised. Physical differences, such as differences in the counts and twist of yarns from the same fibre, and the calendering of fabrics, do not appreciably alter the "humidity-strength coefficient" of the material (*i.e.*, the percentage increase of strength for a 1% increase of humidity expressed in terms of the strength at 70% R.H.), but chemical treatments such as the mercerisation of cotton, or the cuprammonium or bitumen proofing of flax fabrics, cause considerable changes in this factor. The effect of doping depends largely on the extensibility of the material treated, whilst the effect of humidity on doped fabric corresponds roughly to the sum of its separate effects on the fabric and on the dope. The humidity-strength coefficients of all classes of fabrics are greatly changed as a result of weathering, the strength and extensibility of the weathered fabric decreasing with increasing humidity.

B. P. RIDGE.

**Pentosans in the sulphite[-cellulose] cooking process.** L. P. ZHEREBOV (Bumazhnaya Promishlennost, 1927, 6, 387—404).—When heated with sulphite cooking acid above 80° (aspen) pentosans form a compound with calcium hydrogen sulphite in which 1 mol. is attached to a pentosan molecule consisting of four pentose remnants; at 136° the ratio is 1 mol. to 2 pentose remnants, and hence the basic pentosan unit is regarded as  $(C_5H_3O_4)_2$ . Above 136°, disintegration of the molecule takes place with production of sulphuric acid or sulphate and carbon. On cooking with hydrogen sulphite the compounds resulting from the decomposition of the pentoses contain 1 mol. of sulphur dioxide for each reacting pentose molecule. The action of hydrogen sulphite differs from that of free sulphur dioxide. Replacement of calcium by magnesium results in less decomposition of pentosans. The unstable compound which is decomposed by ammonia, liberating calcium sulphite, results from interaction of the hydrogen sulphite with lignin or hexosans, but not with pentosans.

CHEMICAL ABSTRACTS.

**Alkali-soluble constituents of sulphite-celluloses and artificial silks.** W. WELTZIEN (Papier-Fabr., 1928, 26, Fest- u. Auslands-Heft, 115—120).—The solubility of different kinds of cellulose and of artificial silk in sodium hydroxide solutions at 18—19° has been determined. On plotting the percentage of cellulose dissolved against concentration of sodium hydroxide solutions (in vol.-%) characteristic curves are obtained which in all cases rise steeply to a maximum corresponding to 10—12% of sodium hydroxide. Increasing the time of treatment of the cellulose from 3 to 30 hrs. gives maximum solubility in a solution containing nearer 10% than 12% of sodium hydroxide. The percentage of cellulose dissolved under these conditions of maximum solubility varies with the material examined, 15—25% of sulphite cellulose, 30% of cuprammonium silk, 40—50% of viscose, and 100% of nitro-silk being representative values.

B. P. RIDGE

**Washing and treatment of sulphite-cellulose during its preparation.** D. E. OMAN (Papier-Fabr., 1928, 26, Fest- u. Auslands-Heft, 92—96).—The properties of paper produced from sulphite-cellulose are to some extent dependent on the  $p_H$  value of the liquid with which the latter is washed. For some papers, change of this value to the alkaline side, *e.g.*, by the addition of milk of lime, gives better sizing properties and an improved appearance of the final material. For grease-proof paper, on the other hand, washing with a slightly acid liquid appears advantageous.

B. P. RIDGE.

**Determination of the degree of decomposition of sulphite-celluloses.** E. HÄGGLUND (Papier-Fabr., 1928, 26, Fest- u. Auslands-Heft, 88—92).—The lignin content of non-bleachable sulphite-cellulose, which represents the true degree of decomposition, is proportional to the chlorine consumption as determined by the methods of Enso and Sieber, and to the bromine absorption as determined by Tingle's method. The Roschier numbers, and values given by other permanganate methods (*e.g.*, Björkman's), correspond approximately with the degree of decomposition only for very hard celluloses with a greater lignin content than 3—4%; for a greater degree of decomposition, *i.e.*, a lower lignin content, there is no proportionality, the deviation being due to the greater or less degree of sulphonation of the lignin—the more highly sulphonated lignin being less easily oxidised. In general, no relation holds between the degree of decomposition and the strength of the fibre, although if equal cooking conditions be assumed, it is possible to specify exact relations between these factors.

B. P. RIDGE.

**Action of strong sodium hydroxide on cellulose.** P. WAENTIG (Papier-Fabr., 1928, 26, Fest- u. Auslands-Heft, 64—66; cf. B., 1927, 773).—The spontaneous decomposition of alkali-cellulose at the ordinary temperature is caused by the action of oxygen from the air, which is absorbed by the material. It is concluded that the oxycellulose content of the alkali-cellulose is not thereby increased, since, although its  $\alpha$ -cellulose content is considerably decreased as a result of prolonged exposure to the air in contact with sodium hydroxide solution, its copper number is not significantly raised. Alkali-cellulose from American cotton is more resistant to decomposition under these conditions than that from pinewood sulphite-cellulose. If air be completely excluded, no decomposition takes place; on the contrary, the  $\alpha$ -cellulose content of the material is slightly increased, whilst the corresponding viscose solutions obtained from it are more viscous.

B. P. RIDGE.

**Quality control in the sulphite pulp industry.** A. LAMPÉN (Zellstoff u. Papier, 1928, 8, 289—293).—The factors which affect the quality of sulphite pulp are outlined and discussed. The chief cause of variations in quality is lack of uniformity in the pulp wood itself as regards age, rapidity of growth, and moisture content. The various methods of testing sulphite pulp are described, and a plea is advanced for the introduction of standard methods to avoid the present confusion. Bleach consumption is most accurately indicated by the Bergman chlorine number, which corresponds very

closely with the actual chlorine consumption of the pulp on the large scale. For the determination of strength after beating, a single-ball mill is recommended; the most reliable results are obtained if the pulp is always beaten to the same degree, *viz.*, 75° as measured by the Schopper-Riegler tester. At 300 r.p.m., the time required varies from 1½ to 2¼ hrs., and in this way useful indications are obtained of the beating properties of the pulp. The strength of the final test sheet is further influenced by the pressure exerted during the formation of the sheet, the dilution of the pulp in the sheet mould, the intensity of suction, the weight of the sheet, and its moisture content. Each of these factors would require to be rigidly defined in any proposed standard method for determining the strength of pulps.

D. J. NORMAN.

**Rosin sizing [of paper].** S. R. H. EDGE (World's Paper Trade Rev., 1928, 89, 616—620).—The time of penetration in the ferric chloride-ammonium thiocyanate sizing test is correlated with the bulk of the sheet and the temperature of drying. Sizing is not proportional to the rosin content of the paper. CHEMICAL ABSTRACTS.

**Detection of sulphur and sulphurous acid.** NOLL.—See VII.

## PATENTS.

**Treatment of natural silk.** S. S. SADTLER and E. C. LATHROP (U.S.P. 1,671,786, 29.5.28. Appl., 1.6.25).—The partially spent liquor which has been used for softening one batch of silk is made up to its original volume with fresh softening liquor, and is then treated with an alkaline solution in sufficient quantity to adjust the  $p_H$  of the bath to such a value that a further batch of silk may be softened therein without injury.

D. J. NORMAN.

**Treatment of wool.** J. A. CRAVEN, and YORKSHIRE DYEWARE & CHEM. Co., LTD. (B.P. 290,805, 23.4. and 18.5.27).—The shrinkage of wool, caused by washing or milling in alkaline soap solutions, is considerably reduced by precipitating basic salts of iron, aluminium, or chromium on the fibre, or by treating it with a slightly alkaline solution of formaldehyde. *E.g.*, the material may be soaked for about 24 hrs. in a dilute basic solution of iron ammonium alum, after which it is rinsed and neutralised with borax or other mild alkali. If desired, a final treatment with a soap-oil emulsion or a sulphonated oil may be given. With chromium compounds a single or two-bath chrome tanning process may be adopted, but in the latter case it is preferable to use sodium bisulphite as the reducing agent. The wool may in all cases be pretreated with alkalis and then, if desired, with a natural or artificial bate.

D. J. NORMAN.

**Manufacture of artificial silk etc. by the dry or evaporative method.** N. V. NEDERLANDSCHE KUNSTZIJDEFABR. (B.P. 282,326, 12.1.27. Holl., 17.12.26).—The solution is spun downward into a cylindrical spinning chamber (about 2 m. long and 25 cm. in diam.) open at the bottom and provided with a jacket, the circulation of the heating medium through this jacket being so regulated that the temperature gradually falls, *e.g.*, for a solution of cellulose acetate in acetone, from 50° at the top to 20° at the bottom. The air or inert gas into

which the filaments are spun flows slowly, *e.g.*, at about 8 cm./sec., upward through the chamber, and is withdrawn through an adjustable outlet near the spinning nozzle. In this way turbulence of the evaporative medium is practically eliminated, and, during the earlier stages of filament formation, sufficient solvent vapour is present to ensure the thread having a uniform cross-section. D. J. NORMAN.

**Manufacture of artificial threads, filaments, bands, etc.** COURTAULDS, LTD., and [A] W. H. STOKES, [B] C. F. TOPHAM, E. HAZELEY, and E. A. MORTON (B.P. 290,693 and 290,833, [A] 15.1. and 5.11.27, [B] 23.5.27).—(A) Substances such as oils, waxes, finely-divided solids, leuco-compounds of vat dyes, etc. which it is desired to incorporate with viscose threads are fed in predetermined quantity, optionally in the form of a concentrated solution or suspension in a small quantity of the spinning solution, into the filtered and de-aerated viscose solution on its way to the spinning nozzles. Efficient mixing is ensured by the provision of a series of finely-perforated plates supplemented by a small mixing chamber containing a rotating paddle. Air should be excluded at all stages of the mixing operation. (B) When artificial silk produced by box-spinning processes is washed and dried in cake form, an uneven thread results owing to the fact that the threads on the outside of the cake dry under a greater tension than that to which the inside threads are subjected. This may be avoided by deforming the annular cake before drying, by, *e.g.*, pressing the cake inwards at four approximately equidistant points on its circumference to such an extent that the thread at all parts dries without undue tension. D. J. NORMAN.

**Manufacture of cellulose acetate.** H. LE B. GRAY and C. J. STAUD, Assrs. to EASTMAN KODAK CO. (U.S.P. 1,668,959, 8.5.28. Appl., 17.2.26).—Clear, grainless cellulose acetate is produced from cheap cellulose material, such as cotton linters, cotton dust, and sulphite pulp, by first treating it at 20–30° with 35–75% sulphuric acid, whereby injurious anhydride constituents are removed without degrading the cellulose. After washing until free from acid, and drying, the acetylation is performed using zinc chloride, or chlorine and red phosphorus, or other condensing agent less active than sulphuric acid. F. G. CLARKE.

**Removal of impurities from paper pulp and the like.** S. MILNE (B.P. 291,154, 25.2.27).—The pulp is suspended in water and passed through a series of vessels of such design, *e.g.*, containing a central partition extending almost to the bottom, that the mixture flows therethrough in a tortuous up-and-down path. The impurities settle to the bottom and are continuously withdrawn through a grating by a pump, which returns them into the top part of the preceding vessel in the series until ultimately they are collected in a strainer above the main water supply tank. D. J. NORMAN.

**Treatment of cellulosic fabrics.** ARNOLD PRINT WORKS, Asses. of D. DEGÖNCZ and A. S. JONES (B.P. 282,002, 3.9.27. U.S., 9.12.26).—See U.S.P. 1,661,881; B., 1928, 330.

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

**Effect of adding oxidants in the steeping process [in bleaching].** HALLER and P. SEIDEL (Z. angew. Chem., 1928, 41, 698–702).—Contrary to earlier views it is shown that the addition of oxidising agents at the steeping stage in the process of bleaching is undoubtedly advantageous. Oxidising agents, however, which readily give up their oxygen in the alkaline bath are to be avoided; the best results are obtained with "aktivin" (sodium *p*-toluenesulphonchloroamide), which affords on hydrolysis neutral easily soluble products removable by washing. The use of such agents enables the bleaching to be conducted at lower pressures, and a steeping period of 4 hrs. serves instead of 6–8 hrs. as formerly. Satisfactory results are not obtained by steeping with lime alone; a further treatment with 2% sodium hydroxide solution gives a well-bleached product. In the steeping process the loss in weight is proportional to the alkali consumed and the organic material dissolved, and the function of the oxidising agent appears to be that of converting the impurities into products soluble in alkali. Microscopical examination shows that the operation removes pectins and the cuticle incrustation without impairing the tensile strength of the material. Inferior results with lime alone appear to be due to the failure of this reagent to act on the cuticle. Oxycellulose is only formed to a slight extent as shown by the copper numbers and "boiling-out" numbers of the steeped material. The best results are obtained with a bath containing about 10% of aktivin (corresponding to 2% of "active" chlorine) and 2% sodium hydroxide solution. For the tests, crude cellulose from nettles, which gave no starch reaction with iodine, was used. R. BRIGHTMAN.

**Bleaching of sulphite-cellulose in higher stuff-density.** E. HOCHBERGER (Papier-Fabr., 1928, 26, Fest-u. Auslands-Heft, 66–88).—Bleaching in higher stuff-density has some advantages especially in the pre-bleaching, the precise conditions for which have been investigated. For the prebleaching of a readily bleached cellulose the variable factors involved change according to simple laws; thus, the rate of bleaching is proportional to the initial concentration of the bleaching agent, and the reaction velocity to the square of the concentration of unchanged bleaching agent at the time considered. Dilution of the active bleaching agent increases in arithmetical progression, whilst the  $p_H$  value decreases rectilinearly with time. The efficiency of the bleaching process, especially during the after-bleach, depends on the velocity of diffusion of the soluble incrusting substances from the interior of the fibre into the surrounding liquid, and thorough washing between the pre- and after-bleaching is necessary not only to increase this velocity, but also to remove the incrusting substances in the liquor which would otherwise use up chlorine unnecessarily. B. P. RIDGE.

**Determination of chlorate-chlorine in bleach liquor.** H. PRELINGER (Zellstoff u. Papier, 1928, 8, 294–295). The ferrous sulphate-permanganate method for determining chlorates is inadmissible in the case of spent bleach liquor owing to the presence therein of

oxidisable organic matter. Satisfactory results may, however, be obtained by determining the chloride-chlorine by Volhard's method before and after reduction with sulphurous acid. Active chlorine, if present, should first be quantitatively converted into chloride by alkaline hydrogen peroxide solution. D. J. NORMAN.

**Causes of uneven dyeing [of wool].** H. R. HIRST (J. Soc. Dyers and Col., 1928, 44, 163—169).—Curves showing the rates of absorption at various temperatures of dyes by wool are given, and it is shown possible by means of them to select conditions of dyeing favourable to the production of level shades. It is suggested that dye-makers should issue similar curves for all wool dyes. The presence of unequally distributed alkali in scoured wool promotes uneven dyeing afterwards. *E.g.*, wool immersed for 20 min. in a solution of sodium carbonate ( $d$  1.026), whereby it retained 1.14%  $\text{Na}_2\text{CO}_3$ , had an increased affinity for dyes, whilst wool similarly treated with a solution of sodium carbonate ( $d$  1.050), whereby it retained 1.42%  $\text{Na}_2\text{CO}_3$ , had a decreased affinity. Wool treated with an alkaline solution and then thoroughly washed dyes to a fuller shade than similarly treated wool only slightly rinsed. Wool impregnated with a dilute alkaline solution and dried has a decreased affinity for acid dyes, but if steamed instead of being dried its affinity is considerably increased. Thus, wool impregnated with a solution of sodium carbonate ( $d$  1.006) and then steamed for 7.5 min. gave a dyeing 48% fuller in shade than dyeings obtained on wool similarly treated with an alkali but not steamed. The affinity of wool for indigo, acid, and chrome dyes is decreased by bacterial attack. Neutral or alkaline wool is particularly susceptible to attack by spore-forming bacteria, such as are present in the soil, *e.g.*, *B. mesentericus* and *B. subtilis*; the optimum moisture content of wool favourable to bacterial attack is 30%.

A. J. HALL.

**Reserve salts [in textile printing].** C. M. KEY-WORTH (J. Soc. Dyers and Col., 1928, 44, 177—178).—A number of reserve salts have been identified by means of their arylamine salts (A., 1927, 235) prepared by treating 5 g. of the commercial reserve salt dissolved in 50 c.c. of water with 2.5 g. of the hydrochlorides of aniline, or *o*- or *p*-toluidine dissolved in 20 c.c. of water, and crystallising the product from 0.2*N*-acetic acid. They consisted in most cases of sodium nitrobenzene-*m*-sulphonate; Reserve Salt O (Leon) was identified as sodium nitrotoluene-*p*-sulphonate.

A. J. HALL.

**Improvements in dry-cleaning and laundry processes.** A. E. HATFIELD and E. A. ALLIOTT (J. Soc. Dyers and Col., 1928, 44, 170—177).—A new cyclic dry-cleaning process is described in which soiled garments are treated with a solvent-soap solution in a rotating washing machine, the soiled liquor is rapidly and continuously withdrawn, pumped through a Sweetland filter press after the addition of a filter acid, and then returned to the washing machine without any intermediate process of settling or distillation. Advantages over other methods are absence of re-settlement of dirt on the cleaned articles, small losses of solvent and soap, and the articles are practically freed from bacteria, these being retained by the filter-press cake.

A. J. HALL.

**Fastness of dyed fabrics to laundering.** R. G. PARKER and D. N. JACKMAN (J. Text. Inst., 1928, 19, 223—232 r).—Methods hitherto suggested for testing fastness to washing are criticised and the necessary treatments for different classes of goods during laundry washing processes summarised. It is suggested that in any system of testing the fastness of dyes the following should be taken into account: the purpose for which the dyed fabric may be used; the vigour of the cleansing process necessary to remove stains; the effect of the mechanical motion of a relatively large weight of fabrics in a rotary washing machine, also of repeated laundering, use, exposure to light, moisture, fog, and perspiration; and effects due to textile finishing processes on the subsequent washing properties of the fabric.

B. P. RIDGE.

**Alizarinsulphonic acid ester.** GEBAUER-FÜLNEGG and EISNER.—See IV.

PATENT.

**Treatment of penetrable [fibrous] substances by liquids.** COHOE PROCESSES INC., Assees. of W. P. COHOE (B.P. 263,113, 16.11.26. U.S., 19.12.25).—Liquid, such as dye, is forced through material, such as cloth, by submerged rollers running at a speed of the order of 1,500 ft./min. in close proximity to the cloth, the layer of liquid dragged by the skin friction of the roller being sufficient to prevent actual rubbing between the roll and the cloth which must move at very different speeds if not in opposite directions. Various arrangements of rolls are described.

B. M. VENABLES.

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

**Ammonia oxidation replaces nitre for chamber acid plants.** S. F. SPANGLER (Chem. Met. Eng., 1928, 35, 342—344).—The use of ammonia oxidation plants in connexion with the lead-chamber sulphuric acid process is rapidly extending in America. The stripping of the 25% ammonia solution used is now effected without steam by the waste heat from the converter. Preheating of the ammonia-air mixture is also usual, but it must be done in an aluminium or nickel pipe owing to the catalytic effect of iron. Cylindrical gauzes are most usual, and the converter chamber is lined with firebrick. It is customary to control the temperature of the converted gases with a thermocouple. The relative proportions of ammonia and air used may be automatically controlled.

C. IRWIN.

**Volumetric and thermal study of ammonia and its synthesis.** R. NITZSCHMANN (Chem. Listy, 1928, 22, 169—177, 199—202, 241—244).—The relations between pressure, temperature, and composition of mixtures of nitrogen and hydrogen are determined, and, together with thermal exchanges and liquefaction after production of ammonia, are expressed in a number of equations and graphs, whence may be calculated, amongst other data, the optimum dimensions for the surface of exchange under given conditions. The values obtained for the calorific exchange are of a very high order.

R. TRUSZKOWSKI.

**Ammonia liberation from ammonium sulphate solutions by various limes.** R. A. RACATZ and



J. M. SPEES (Gas Age Rec., 1927, 60, 953—955).—The presence of magnesia in lime used for the liberation of ammonia from ammonium sulphate solutions does not affect the total yield in 90 min., but diminishes the rate of evolution in the early stages.

CHEMICAL ABSTRACTS.

**Direct gypsum process of ammonium sulphate recovery.** H. W. JACKMAN (Gas Age Rec., 1927, 60, 107—108, 116).—In the process for the production, on a semi-commercial scale, of ammonium sulphate by passing ammonia and carbon dioxide through water containing gypsum, 52.4% of the ammonia was recovered as sulphate.

CHEMICAL ABSTRACTS.

**Indirect gypsum process for sulphate manufacture.** R. A. HOFFMAN (Gas Age Rec., 1928, 61, 111).—In the production of ammonium sulphate from gas liquors and gypsum, the average yield was 65% and the purity of the product 95%. Discoloration was due to the action of hydrogen sulphide on the iron evaporator.

CHEMICAL ABSTRACTS.

**Analysis of sodium sulphate used in glass manufacture; direct determination of  $\text{Na}_2\text{SO}_4$ .** A. BESOMBE (Bull. Soc. chim. Belg., 1928, 37, 164—165).—A sample (2 g.) is dissolved in 30 c.c. of water and the carbonates of iron, aluminium, calcium, and magnesium are precipitated by adding excess of 0.1N-sodium carbonate. The solution is made up to 100 c.c., filtered, and 50 c.c. of the filtrate are placed in a tared basin and exactly neutralised to methyl-orange with 0.2N-sulphuric acid. The solution is evaporated to dryness, heated to dull redness for a few moments, cooled, and weighed. The sodium chloride present and the sodium sulphate added are subtracted from the weight of the residue to give the weight of sodium sulphate originally present in 1 g. of the sample.

W. J. BOYD.

**Stable sodium thiosulphate solution.** L. W. WINKLER (Pharm. Zentr., 1928, 69, 369—371).—Decomposition of 0.01N-sodium thiosulphate solution by exposure and by sulphur bacteria can be prevented by the addition of 0.01% of mercuric cyanide. A solution thus prepared remained clear and had a constant titre over a period of two months, whereas an unpreserved solution decreased in thiosulphate content and deposited sulphur. Details of the preparation of sodium thiosulphate solution and its standardisation both with potassium iodate and iodine are given. For most accurate work the thiosulphate should be standardised against pure, sublimed iodine, the preparation of which is described.

E. H. SHARPLES.

**Manufacture of barium and strontium nitrates.** F. CHEMNITUS (Chem.-Ztg., 1928, 52, 465—466).—An account of the production of barium nitrate from the carbonate and of strontium nitrate from the hydroxide.

**Sensibility of the thermobalance and its use in the analysis of hydrated lime.** T. SOMIYA (J. Soc. Chem. Ind. Japan, 1928, 31, 217—223).—A modification of Honda's thermobalance is described; in accuracy it is claimed to be equal to that of the analytical balance even at temperatures above 1000°. By its means a sample of hydrated lime can be quantitatively analysed. The sample, suspended from one end of the beam in

an electric furnace, is weighed continuously, and curves relating temperature to loss in weight are plotted. The percentage of hydroxide present was calculated from the amount of water given off at 400—500° and that of carbonate from the amount of carbon dioxide evolved at 500—950°. The amount of calcium hydroxide as determined by this method was less than the theoretical amount by 2.1%, but that of calcium carbonate agreed.

Y. TOMODA.

**Chemical engineering may revive sublimation of sulphur.** E. F. WHITE (Chem. Met. Eng., 1928, 35, 355—356).—Although the competition of ground sulphur has rendered the older forms of subliming plant uneconomic, yet flowers of sulphur are superior to the ground product for both vulcanisation and agricultural purposes. The author employs protected sheet iron in place of brick for condensing chambers and an arrangement of condensing surfaces. The firing is by a separate furnace, and the inert atmosphere is of flue gases instead of sulphur dioxide, which are circulated with a fan. Entrained molten sulphur is separated by a baffle, and the flowers of sulphur are removed mechanically from the chambers without stopping the plant. It is claimed that with this plant costs are very little higher than with gridding.

C. IRWIN.

**Detection of sulphur and sulphurous acid.** A. NOLL (Papier-Fabr., 1928, 26, Fest-u. Auslands-Heft, 59—61).—Sulphur (elementary or in combination) is detected by heating a sample of the substance with excess of sulphur-free iron powder, dissolving the melt in pure dilute hydrochloric acid, and demonstrating the presence of hydrogen sulphide by its odour or by means of lead acetate paper. Alternatively, the acid solution is rendered alkaline and the presence of sulphur shown by means of sodium nitropusside solution. In testing for sulphurous acid in such materials as half-stuff or other products of the cellulose and paper industries, a sample of the material is pulped with distilled water, digested on the water-bath, filtered, acidified with hydrochloric acid, and chemically pure zinc added. The resulting hydrogen sulphide is recognised as above. Alternatively, the aqueous extract of the material is heated on the water-bath with zinc powder, whereby the sulphurous acid is converted into hyposulphite, the presence of which is shown by its characteristic reducing action upon solutions or test papers made from indanthrene-yellow G, methylene-blue, or the sodium salt of anthraquinone- $\beta$ -sulphonic acid. When the latter are used it is not advisable to heat during the extraction of the material with water, since substances of a reducing nature other than sulphurous acid may thus be extracted, which would give the same colour changes with the dye solutions as hyposulphite.

B. P. RIDGE.

**Rate of absorption of sulphurous gases by magnesium hydroxide [and sulphite].** P. RIOU and A. P. BÉARD (Compt. rend., 1928, 186, 1465—1467; cf. B., 1928, 482).—The rates of absorption of the gases by saturated solutions of magnesium hydroxide or sulphite are similar to that by water, but increase in the presence of an excess of the solid

constituent. In both cases they decrease with rise in temperature.

J. GRANT.

**Compounds and combustion.** THOMAS and HOCHWALT.—See II. Chlorate in bleach liquor. PRELINGER.—See VI.

PATENTS.

[Catalyst for] contact sulphuric acid process. MONSANTO CHEM. WORKS, Assees. of A. O. JAEGER and J. A. BERTSCH (B.P. 266,007, 14.2.27. U.S., 15.2.26).—The catalyst comprises an artificial zeolite containing vanadium pentoxide in a non-exchangeable form. It may be mixed with suitable porous non-reactive carriers, or finely-divided porous materials, such as kieselguhr or asbestos, may be incorporated with it prior to drying. The prepared catalytic mass may be treated with a solution of one or more catalytically active compounds which enter into base exchange with the zeolite.

A. R. POWELL.

**Containers for hydrofluoric acid and other highly corrosive chemicals.** H. O. TRAUN (DR. H. TRAUN & SÖHNE) (B.P. 283,868, 10.8.27. Ger., 18.1.27).—The containers are constructed of artificial resins, preferably phenol-formaldehyde condensation products mixed with 15–25% of powdered graphite, and may be coated externally with varnish etc.

L. A. COLES.

**Production of ammonium nitrate free from nitrite.** ELEKTIZITÄTWERK LONZA (GAMPEL & BASEL), and E. LÜSCHER (Swiss P. 118,962, 23.10.25).—Nitric oxide obtained, *e.g.*, by the oxidation of ammonia, is passed together with oxygen into a saturated ammonium nitrate solution containing manganese compounds, and ammonia is added continuously or intermittently to neutralise the nitric acid or to interact with the manganese nitrate formed. The ammonium nitrate crystallising out is removed from the solution.

L. A. COLES.

**Manufacture of alkali cyanides.** C. P. DAVIS and G. B. FROIT, Assis. to AMER. CYANAMID CO. (U.S.P. 1,672,449, 5.6.28. Appl., 24.12.24).—Alkali cyanides are obtained by heating the corresponding carbonates in a current of hydrogen cyanide to progressively rising temperatures below the m.p. of the resulting mixture but sufficiently high to cause conversion of the greater portion of the carbonate into cyanide.

A. R. POWELL.

**Preparation of [anhydrous] metal halides.** J. W. MARDEN, Assr. to WESTINGHOUSE LAMP CO. (U.S.P. 1,665,634, 10.4.28. Appl., 3.9.21).—Anhydrous halides of metals may be recovered from their aqueous solutions by evaporating the solutions to dryness after addition of an excess of the corresponding ammonium halide, and heating the dry residue in a current of the dry hydrogen halide free from oxygen. This procedure avoids hydrolysis of the metal halide.

A. R. POWELL.

**Manufacture of alkali sulphhydrates [hydrogen sulphides].** H. P. BASSETT (U.S.P. 1,662,735, 13.3.28. Appl., 15.12.25).—A portion of the sodium sulphide content of a saturated solution of this compound is crystallised out, and the mother-liquor is treated with sodium hydrogen sulphate to obtain hydrogen sulphide, which is then caused to react with a solution of the crystals first obtained.

A. R. POWELL.

**Production of a solution of cyanamide from calcium cyanamide.** A. N. ERICKSON, Assr. to UNION CARBIDE CO. (U.S.P. 1,671,183, 29.5.28. Appl., 20.4.27).—The calcium cyanamide is treated with carbon dioxide in the presence of water at 10–20°, whereby the carbonated lime-nitrogen compounds are precipitated and the production of dicyandiamide is avoided. After partial removal of water the sludge is again treated with carbon dioxide at 32° and the calcium carbonate separated from the resulting solution of cyanamide.

F. G. CLARKE.

**Preparation of titanium compounds and pigments.** P. SPENCE & SONS, LTD., and S. F. W. CRUNDALL (B.P. 290,683–4, 17.11.26).—(A) Titanium phosphate is prepared by addition of a soluble phosphate to a solution of a titanium salt containing more than 10% of titania and more than 15% of free sulphuric acid or its equivalent. To obtain a precipitate that filters readily a temperature of 50° must not be exceeded. (B) Titanium phosphate is converted into hydroxide or oxide by heating with alkali carbonates or hydroxides either in aqueous solution or in powder form. The soluble alkali phosphate is removed by leaching. To obtain coloured pigments the titanium phosphate may be calcined with salts of a coloured base with a volatile acid, *e.g.*, ferrous sulphate for red pigments or barium sulphate and ammonium dichromate for green pigments.

A. R. POWELL.

**Manufacture of moulded products.** L. H. HARTUNG and F. FOLBERT (U.S.P. 1,668,768, 8.5.28. Appl., 9.1.25).—Crude asbestos is mixed with water, zinc chloride, and soap, and the product moulded under pressure, dried, immersed in a hot soap solution, and again dried. Magnesite and diatomaceous earth may be added to the mix, also aluminium sulphate or sodium and potassium silicates to serve as binding and hardening agents. Resin as well as fatty soaps may be used, and treatment with aqueous calcium chloride renders the product more waterproof. After drying, it may be treated with alkali silicate to enable it to withstand high temperatures.

F. G. CLARKE.

**Apparatus for the separation of hydrogen from hydrogenous [gas] mixtures [water-gas etc.].** H. M. R. BARJOT (B.P. 291,576, 14.4.27).—The gases are pumped through a combination of diffusion units consisting of discoid compartments having their flat faces constructed of porous material and surmounted by conical covers for receiving the gases diffusing through the faces. The units are so connected that the gases which have diffused through the porous partitions and those which have escaped diffusion flow separately into the central compartments of different units, the process being repeated until separation is complete. A modified form of apparatus comprises a single unit in the form of a double cone separated by porous partitions into a number of compartments each of which is connected with the adjacent compartments by external pipes provided with pumps, so that the gas passing upwards is progressively richer, and that passing downwards is progressively poorer in hydrogen.

L. A. COLES.

**Production of absorbents for carbon dioxide, for use in respirators etc.** C. A. F. KAHLBAUM

CHEM. FABR. G.M.B.H. (G.P. 447,425, 7.3.26).—Calcium oxide slaked with the theoretical quantity of water or previously prepared calcium hydroxide, alone or mixed with binding agents or fillers, *e.g.*, alkali hydroxides, salts, colloids, organic compounds, etc., is converted by heating or other means into a compact, easily granulated, hydrated product having a water content of 20–40%.

L. A. COLES.

Red lead (B.P. 283,898).—See XIII.

### VIII.—GLASS; CERAMICS.

Resistance of ordinary window-glass to the action of water. M. SCOHY (Bull. Soc. chim. Belg., 1928, 37, 186–203).—The effect of water on glass is best determined from either the dissolved alkali or the total dissolved solids. Measurement of the loss of weight of the glass is unsatisfactory. As the process is simply the hydrolysis of silicates, an increase of silica should lessen the action; it should also vary with the heats of formation and solubilities of the different hydroxides. Slow cooling of the glass should favour resistance. In the manufacture of window glass by the Fourcault machine it is necessary to increase the soda content relative to lime (as compared with hand-working) in order to avoid devitrification; this decreases resistance to moisture. A better alternative is to use lime and magnesia in equimolecular proportions. The resistance of a large number of samples was determined by heating the powdered glass with water at 80° and determining the dissolved alkali by conductivity measurements. The degree of corrosion is approximately proportional to the square of the soda-lime ratio, treating magnesia as lime, and silica being constant. As a result, the desirable composition of window glass for the Fourcault machine has been determined as 72.5% SiO<sub>2</sub>, 13.5% Na<sub>2</sub>O, 10.5% CaO, 2.0% MgO, and 1.5% of impurities. This glass does not devitrify, works well, and is very resistant to atmospheric action. The silica content approaches closely to that indicated as desirable by Tscheuschner's formula. C. IRWIN.

Effects of carefully annealing optical glass. L. W. TILTON, A. N. FINN, and A. Q. TOOL (J. Amer. Ceram. Soc., 1928, 11, 292–295).—Deviations from the mean index of refraction in six well-annealed blanks from the same barium-flint melt were shown to be due to small differences in temperature during annealing. These variations in optical density were largely removed by preheating and re-annealing, provided that the temperature gradients in the annealing furnace were sufficiently low. F. SALT.

Elastic constants of glass. E. P. PERMAN and W. D. URRY (Proc. Physical Soc., 1928, 40, 186–192).—The compressibility coefficients of an alkali-lime-alumina-silicate glass and of Jena 16<sup>111</sup> glass, determined over the temperature range 30–80° by compressing a bulb containing water and closed by a graduated capillary, were  $(238 + 0.185t) \times 10^8$  and  $(220.6 + 0.28t) \times 10^8$ , respectively. For the same glasses, by application of pressure only on a piezometric bulb, values for Poisson's ratio, Young's modulus, and rigidity modulus have also been determined.

A. COUSEN.

Devitrification of old glass. H. R. CHIPMAN and D. McINTOSH (Proc. Nova Scotian Inst. Sci., 1927, 16, 144–146).—Some Dumas bulbs 20–30 years old, and sealed at the time of manufacture, devitrified (even at 100°) on the outside only, showing that exposure to water vapour is essential for devitrification; also, by previously washing with hydrofluoric acid to remove silicic acid, devitrification was prevented. These observations support Germann's theory (A., 1921, ii, 262).

S. J. GREGG.

Characterisation of clay. A. F. JOSEPH (Trans. Ceram. Soc., 1928, 27, 1–11).—The term "clay" is restricted to that portion of the raw material of which the largest particles are 0.002 mm. The proportion of this true "clay" varied from 12% to 90% in twelve samples of ceramic clays. The properties of a clay depend on the nature rather than on the amount of the "clay" fraction present. The higher the silica: alumina ratio in the "clay" portion, the more highly developed are such properties as imbibitional power for water, heat of wetting, shrinkage, tensile strength, and absorptive power for vapours and dyes. The colloidal content of a raw clay is taken as identical with its "clay" content. F. SALT.

Drying of clay under definite conditions. I, II, III. Relation between drying rate and air condition. R. S. TROOP and F. WHEELER (Trans. Ceram. Soc., 1927, 26, 231–238, 239–248, 261–275).—I. A Stourbridge fireclay, after suitable treatment (wedging etc.), was moulded in cylindrical glass moulds, one end of each mould being sealed, so that drying of the clay took place from one end only. Six cylinders were treated at a time in a drying chamber and air previously conditioned was made to pass at a velocity of 0.5 m./min. over the exposed ends. Each experiment lasted 36 hrs., and a cylinder was removed every 6 hrs. and sampled along its length for moisture content. The relative humidity of the air was maintained constant at 90%, and the temperature was varied from 30° to 80° in steps of 10°.

II. Under the conditions of the experiments, evaporation of water followed the law:  $W = A(P_s - P_a)$ , where  $A = 0.0158$ . Tables and curves are given showing the distribution of water in the clay cylinders.

III. Experiments were carried out on Stourbridge fireclay, by the foregoing method, for air temperatures ranging from 30° to 80°, the humidity varying from 50% to 90%. The effect on the rate of drying of relative humidity, temperature, and velocity of the air was studied. With the clay used, the rate of drying during the first stage corresponded roughly with that to be expected from water under the same conditions; later the internal movement of the water within the clay controlled the rate of drying. F. SALT.

Factors influencing the thermal properties of minerals and products of the ceramic industry. W. M. COHN (J. Amer. Ceram. Soc., 1928, 11, 296–306).—A brief survey is presented of factors such as chemical composition, degree and duration of firing, rate of heating and cooling, porosity, grain size, etc., which affect the thermal properties of certain ceramic raw materials and fired bodies. An extensive bibliography is included.

F. SALT.

**Three fundamental principles of ceramics.** H. H. STEPHENSON (Trans. Ceram. Soc., 1928, 27, 21—22).—The term thixotrope, used by Freundlich to indicate a colloid which changes in properties by mechanical treatment, is applied to clays. The behaviour of a ceramic body during and after heat-treatment is a function of the silica inversion. The chemistry of glazes is one of finished reactions; that of bodies one of arrested reactions. F. SALT.

**Acid-resisting over-glaze colours.** R. V. TAILBY (J. Amer. Ceram. Soc., 1928, 11, 307—309).—To meet modern requirements (mechanical washing etc.) on-glaze colours must have a coefficient of expansion closely approximate to that of the glaze, a maturing temperature not above cone 017, be capable of application in a uniform manner, particularly for transfer work, and be resistant to acids and alkalis. A suitable test for acid-resistance consists of immersing the ware in a 3% hydrochloric acid solution for 5 hrs. at 20°; 4% acetic acid and 5% caustic soda solution may also be used. F. SALT.

**Methods for testing crazing of glazes caused by increases in size of ceramic bodies.** H. G. SCHURECHT (J. Amer. Ceram. Soc., 1928, 11, 271—277).—The type of crazing which becomes apparent some considerable time after firing was investigated. Ware which had become crazed after 12 years' outdoor storage was found to have expanded, owing to hydration, by approximately 0.09%, whilst the glaze had remained constant in size. Methods of testing bodies for this type of crazing are: absorption after 2 hrs.' boiling and 24 hrs.' soaking in water; solubility in sulphuric acid; ignition loss above 110° after outdoor storage for 3 years; subjecting specimens to a steam pressure of 150—175 lb./in.<sup>2</sup> in an autoclave for 1 hr. Bodies having a low porosity, low solubility in sulphuric acid, and low ignition loss above 110° show the least tendency to produce this type of crazing. F. SALT.

**Peeling of "slip-banded" ware.** W. EMERY (Trans. Ceram. Soc., 1927, 26, 276—289).—A study was made of the fault known as "peeling" of the engobes applied in the form of bands and lines to coloured bodies (e.g., red teapots) or to earthenware bodies. Experiments were made on a plastic red-burning clay, a plastic buff-burning clay, and on an earthenware body; six different bases were used for the coloured slips. Mechanical adhesion, or bond, between the ware and the applied slip before firing, and the temperature-contraction range during firing are important factors. The greatest margin of safety was obtained with the red clay bodies. For the slips, mixtures having a comparatively low vitrifying temperature gave best results; a refractory slip (china clay) was least successful. For an earthenware body, the slip should contain about 10% of ball clay and 90% of dry earthenware body scraps. F. SALT.

**Electrical pottery firing.** B. J. MOORE and A. J. CAMPBELL (Trans. Ceram. Soc., 1928, 27, 12—20).—A "unit-size" electrical enamel tunnel kiln is described, which is about 82 ft. long and consists of an entrance zone, preheating zone, firing zone, and a cooling zone. The placing capacity of the trucks is 4 ft. 5 in. by

1 ft. 3 in. by 2 ft., and the propulsion is at the rate of one truck per hr. The method of B.P. 270,035 (B., 1927, 492) is used for installing the heating units in the kiln. Comparative costs of running and maintaining both electrical and coal-fired kilns are given.

F. SALT.

**Influence of oxidising and reducing atmospheres on refractory materials. II. Experiments with a cone mixture containing added amounts of pure ferric oxide.** A. E. J. VICKERS (Trans. Ceram. Soc., 1927, 26, 177—184; cf. B., 1925, 849).—The effect of heating such material in atmospheres of nitrogen, oxygen, air, carbon dioxide, carbon monoxide, sulphur dioxide, hydrogen, and water vapour was studied. Nitrogen, oxygen, and air have no detrimental effect; carbon dioxide is comparatively harmless. The other atmospheres produced a marked decrease in the refractoriness of the material, water vapour being particularly active in this respect. The effects produced appeared to be proportional to the amount of ferric oxide added. F. SALT.

**Prevention of disintegration of blast-furnace linings.** H. K. MITRA and A. SILVERMAN (J. Amer. Ceram. Soc., 1928, 11, 278—291).—A study was made of the disintegration of refractory materials due to "iron spots," the object being to identify, and prevent the action of, the substance in the "iron spots" which acts as catalyst. Spots of ferric oxide in a firebrick were found to be the original cause of disintegration of blast-furnace linings. Ferric oxide is reduced to ferrous oxide by carbon monoxide at 500°, and ferrous oxide is the catalyst which hastens the reaction  $2CO \rightarrow CO_2 + C$ , the deposited carbon being the cause of the disruption of the brick. Ferrosferric oxide is immune in this action; hence, by converting the ferric oxide in a brick into this oxide, disintegration is prevented. Such conversion is, however, extremely difficult. F. SALT.

**Premature failure of combustion chamber material.** A. J. DALE (Trans. Ceram. Soc., 1927, 26, 290—296).—The failure of a material containing 88% of silica in the combustion chamber of a gas-retort setting is examined and explained in the light of results of the ordinary refractory test and the refractoriness-under-load test carried out on the unused material. The latter test was made with loads of 50 lb., 10 lb., and 4 lb. per sq. in. It is concluded that combustion chamber material must have at least a moderate refractoriness, and there must be good cohesion between grog and matrix up to maximum working temperatures. The suitability of a material can be gauged from the results, properly interpreted, of two under-load tests (high and low loadings). F. SALT.

**Use of the simulative test furnace as a means of making comparative tests of fire bricks.** G. L. ROGERS (J. Amer. Ceram. Soc., 1928, 11, 323—329).—The U.S. Navy Simulative Service Test for refractories is conducted in small oil-fired furnaces. For purposes of comparison, one side wall of the combustion chamber is built up of bricks and cement of approved quality, and the other side wall of bricks and cement under test. A test consists of two runs of 24 hrs. each, at

furnace temperatures of 1590° and 1650°, respectively. After each run, a spalling test is conducted by injecting air at room temperature, under pressure, into the furnace immediately after the burner has been shut off.

F. SALT.

**Open-hearth steel works' refractories.** A. T. GREEN (Trans. Ceram. Soc., 1928, 27, 63—92).—The design and application of the open-hearth furnace are discussed. Silica bricks used in these furnaces must be sufficiently coarse in texture to counteract the tendency to spall, but the original grading should also contain a large proportion of "flour," which determines the matrix formation. Screen analyses of six bricks are given, and the suitability of such bricks for different parts of the furnace is discussed. Bricks having a sp. gr. of about 2.42 are most suitable; more highly converted material has a greater tendency to spall. The phenomena of corrosion and erosion, and the desirable properties and characteristics of refractories suitable for furnace doors, regenerators, chequer brickwork, and the ladle are discussed. Soaking pits and reheating furnaces are dealt with in a similar manner. Finally, the importance of careful storage of the refractories, under cover and properly enclosed, is pointed out. F. SALT.

**Temperature diffusivity and thermal conductivity of silica refractory material at high temperatures.** A. T. GREEN (Trans. Ceram. Soc., 1927, 26, 159—167, 168—176).—The temperature diffusivity and thermal conductivity were determined by the method previously described (B., 1927, 547) on nine different silica products used in industry. The relation between thermal conductivity on the one hand and texture, constitution, and degree of heat-treatment on the other was studied. The effect of a high firing temperature is to produce high coefficients of thermal conductivity and temperature diffusivity in modern silica products. A product containing a relatively high proportion of cristobalite had exceptionally good conductivity and high thermal diffusivity. High "permeable" porosity favoured a high rate of increase in diffusivity at high temperatures.

Comparative data are presented on the temperature diffusivity and thermal conductivity of silica and fire-clay (containing less than 75% SiO<sub>2</sub>) materials. A measure of the rate of increase of diffusivity and conductivity is obtained by deducting the average values of the constants at 600°, 700°, . . . 1000° from the average values at 1000°, 1200°, and 1300°. In general, the diffusivities of silica products, at both lower and higher temperatures, are higher than those of fireclay, but individual samples of either material may vary considerably. The apparent sp. gr. of a well-fired silica brick is much less than that of a fireclay brick, and this tends to lower the coefficient of thermal conductivity of the silica product. Well-fired silica bricks are better conductors than firebricks at high temperatures (1200°); poorly burned silica bricks are comparatively poor conductors. At lower temperatures (800°) many silica bricks and firebricks have about the same conductivity. Silica bricks, in general, show a greater rate of increase of diffusivity and thermal conductivity with rise in temperature than firebricks. A material of low porosity is not necessarily a good conductor of heat; at high

temperatures the reverse is frequently true. The rate of increase of diffusivity and conductivity with temperature is very high in certain highly porous materials.

F. SALT.

**Effects of temperature on the mechanical properties of silica products.** A. J. DALE [with A. SCOTT] (Trans. Ceram. Soc., 1928, 27, 23—62).—Experiments were carried out on bricks made in the laboratory from different raw materials, on actual commercial products, and on selected clay-bonded silica bricks. Three different kinds of raw material were used in the laboratory bricks, and the effect of different gradings was studied. Not only the degree but also the homogeneity of conversion of the quartz is an important factor determining the temperature at which failure takes place under load. The effect of varying proportions of cristobalite, tridymite, and unconverted quartz in the fired bricks is noted. Lime-bonded bricks were more rigid at high temperatures than clay-bonded bricks. No clear relation was found between refractoriness, density, porosity, and chemical composition, and the behaviour of silica bricks under load at different temperatures; making, mixing, firing, and the nature of the bond, however, are important factors. It is suggested that two under-load tests (50 lb. and 4 lb. per sq. in.) would give a sufficiently clear indication of the thermal and mechanical properties of silica bricks.

F. SALT.

**Sodium sulphate for glass.** BESOMBE.—See VII.  
**Calcium-sodium ratio of water.** HART.—See XXIII.

PATENT.

**Electric [tunnel] kiln.** T. C. and W. O. PROUTY (U.S.P. 1,671,742, 29.5.28. Appl., 27.6.27).—The kiln has heating elements mounted upon a conveyor and electrically operated during the passage of the ware through the kiln.

H. ROYAL-DAWSON.

## IX.—BUILDING MATERIALS.

PATENTS.

**Production of fused cements of predetermined setting time.** STUDIENGENS. P. NUTZBARMACHUNG DER SCHWEIZ. ERZLAGERSTÄTTEN (Swiss P. 119,656, 4.7.25).—The fused product is separated into portions which are cooled at different rates, the setting time decreasing as the time of cooling is increased. The portions are mixed before grinding in such proportions as to give a cement having the desired setting time. L. A. COLES.

**Treatment of timber for the destruction of the borer, larvæ, beetles, or other pest.** A. M. KOBOLKE (U.S.P. 1,672,326, 5.6.28. Appl., 30.1.25. Austral., 14.2.24).—The timber is placed in a kiln, a vacuum created, and heat applied. By means of a vacuum pump gases are drawn from the timber into cooler zones on each side of the kiln, which are partially separated from the latter by condenser plates. When the timber is nearly dry the vacuum is released by the admission of poisonous fumes.

F. G. CLARKE.

**Apparatus for mixing liquids and solids such as concrete or mortar.** P. VOGLSAMER (B.P. 284,634, 1.2.28. Ger., 1.2.27).

Manufacture of asbestos-cement and like slabs or tubes. R. B. CHEDLER (B.P. 291,660, 30.9.27).

Veneering of brick. E. V. POSTON (B.P. 291,639, 2.8.27).

Cement for oil stills (B.P. 291,585).—See II.

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

Preparation and properties of silicon steel. C. WALLMANN (Stahl u. Eisen, 1928, 48, 817—821). H. KOPPENBERG (*Ibid.*, 821—822).—For the production of a high-silicon steel for constructional purposes the materials used must be relatively pure and almost free from phosphorus and sulphur, and, owing to the high viscosity of the steel, a high temperature and a long period in the furnace must be employed. This results in a larger fuel consumption and a shorter life for the refractories than is the case with ordinary steels. Silicon steels always solidify with a deep pipe, and therefore there is a large proportion of scrap from every ingot. Unless the heat-treatment during working is carried out slowly and carefully there is liability to loss by cracking either during the annealing or in the subsequent rolling operation. The tensile strength of hard-rolled sheets of silicon steel increases as the degree of rolling is increased from 54 kg./mm.<sup>2</sup> with 30 mm. thickness to 60 kg./mm.<sup>2</sup> with 9 mm. thickness. After annealing, the average tensile strength is 54—55 kg./mm.<sup>2</sup>, and the yield point 36—38 kg./mm.<sup>2</sup> Koppenberg briefly reviews the difficulties met with in melting, casting, and working silicon steel, and covers similar ground to that of Wallmann.

A. R. POWELL.

Constitution of the iron-silicon alloys, particularly in connexion with the properties of corrosion-resisting alloys of this composition. M. G. CORSON (Amer. Inst. Min. Met. Eng. Tech. Pub., 1928, No. 96, 47 pp.).—A constitutional diagram, based on points of agreement in other published diagrams, is constructed. The formation of a compound Fe<sub>3</sub>Si is reaffirmed. At 20% Si the alloys show a eutectic structure composed of Fe<sub>3</sub>Si and FeSi. No evidence of the existence of Fe<sub>2</sub>Si, Fe<sub>3</sub>Si<sub>2</sub>, or FeSi<sub>2</sub> was found. The ductility, malleability, and resistance to corrosion of the alloys are discussed; the corrosion-resistance is attributed to the compound Fe<sub>3</sub>Si. CHEMICAL ABSTRACTS.

Rate of carbon elimination and degree of oxidation of the metal bath in basic open-hearth practice. A. L. FEILD (Amer. Inst. Min. Met. Eng. Tech. Pub., 1928, No. 111, 17 pp.).—Equations are given for the computation from operating data of the relation between rate of refining and degree of oxidation of the metal bath. Increased rate of refining appears to increase the concentration of ferrous oxide in the metal. If two of the three factors, carbon content, ferrous oxide content of slag, and temperature, are known, the third may, under certain conditions, be determined from tabulated data. CHEMICAL ABSTRACTS.

Production of high-alumina slags in the blast furnace. T. L. JOSEPH, S. P. KINNEY, and C. E. WOOD (Amer. Inst. Min. Met. Eng. Tech. Pub., 1928, No. 112, 20 pp.).—In general, slags containing nearly equal

amounts of alumina and lime have the lowest m.p. when the percentage of calcium is higher than that of alumina. Calcium aluminates desulphurise metal rapidly at 1500—1520°. CHEMICAL ABSTRACTS.

Hardening of carbon steels by deformation; effect of temperature, time, and structure. F. SAUERWALD, L. MICHALSKY, R. KRAICZEK, and G. NEUENDORFF (Arch. Eisenhüttenw., 1927—8, 1, 717—720; Stahl u. Eisen, 1928, 48, 770—771).—"Cold" deformation of metals causes hardening and the formation of a fibrous structure; "hot" deformation, in the strict sense, produces no hardening effects, but causes the metal to recrystallise spontaneously. For pearlitic and hyper-eutectoidal steels the region of "cold" deformation extends to the pearlite line in the iron-carbon diagram, whereas the  $\gamma$ -solid solution region is entirely a region of "hot" deformation in which rapid deformation, e.g., hammering, produces immediate and complete recrystallisation. The temperature range of "blue brittleness" is also the range in which cold deformation produces the maximum hardening effect.

A. R. POWELL.

Electrochemical action of inhibitors in the acid dissolution of steel and iron. E. L. CHAPPELL, B. E. ROETHELI, and B. Y. MCCARTHY (Ind. Eng. Chem., 1928, 20, 582—587).—Results of fundamental experiments on the pickling of iron and steel, using quinoline ethiodide as a standard inhibitor, showed that the rate of hydrogen evolution decreased with increasing concentration of inhibitor, which also caused a regular decrease in the anode potential. This decrease is, however, believed to be too small to account for the lower rate of evolution of hydrogen. The cathode potential increases with increasing current density and, on the addition of inhibitors, with a reverse effect at higher temperatures. Increase of overvoltage varies with the metal and the condition of the surface; e.g., Armco iron, steel, and white cast iron are more resistant to acid attack than malleable and wrought iron on the surfaces of which inhibitors give a less overvoltage increase. When etching polished steel the gas was evolved principally from the grain boundaries and scratch marks, and, in iron, from slag areas also. It is considered that when immersed in acid iron enters into solution at the anode areas and discharges hydrogen ions at the cathode areas defined by the narrow spaces of the grain boundaries and slag areas. Most inhibitors being either bases or positively charged colloids travel to the cathode with the hydrogen and form a protective layer upon the surface of the iron.

C. A. KING.

Determination of aluminium in steel. W. P. KUEHLER and S. SHANEMAN (Chemist-Analyst, 1928, 17, 4).—The hydrochloric acid solution, free from silica, is boiled with sodium phosphate, the hot solution neutralised with ammonia, boiled with sulphurous (and, if necessary, hydrochloric) acid, and precipitated with acetic acid and ammonium acetate. The precipitate is dissolved in hydrochloric acid, oxidised with nitric acid, and the iron precipitated with sodium hydroxide. The aluminium in the filtrate is then precipitated with ammonia and hydrogen peroxide, or (after evaporation with nitric acid and oxidation of chromium with

potassium chlorate) with ammonia and ammonium carbonate. CHEMICAL ABSTRACTS.

**Application of a high-vacuum induction furnace to the study of gases in metals.** P. H. BRACE and N. A. ZIEGLER (Amer. Inst. Min. Met. Eng. Tech. Pub., 1928, No. 59, 21 pp.).—Iron, contained in zircon or alumina crucibles in a high-frequency induction furnace in a vacuum, was melted and the gases were analysed, allowance (10%) being made for gases evolved from the apparatus. Electrolytic iron evolved 25% more gas than Armco iron, including water, but no nitrogen from the former. Carbon and oxygen were present in constant ratio to one another and to the total gas. A marked evolution of gas shortly before melting was probably due to greater solubility of the gases in  $\gamma$ - than in  $\delta$ -iron. CHEMICAL ABSTRACTS.

**Influence of certain elements present in steel on the determination of oxygen in steel by the hydrogen reduction method.** P. BARDENHEUER and C. A. MÜLLER (Arch. Eisenhüttenw., 1927-8, 1, 707-712; Stahl u. Eisen, 1928, 48, 795).—Determination of oxygen in steel by heating the turnings in hydrogen and collecting the water formed in phosphorus pentoxide leads to high results if the steel contains nitrogen unless the sample is mixed with an equal weight of pure antimony before treatment. A high content of phosphorus leads to low results, but sulphur is without influence. The oxygen content due to included silica, alumina, and other oxides not reduced by hydrogen cannot be determined by this method, but must be determined separately by the bromine or iodine procedure (B., 1927, 966) or by the method of Hessenbruch and Oberhoffer (B., 1928, 409). A. R. POWELL.

**Determination of traces of antimony in copper.** H. BLUMENTHAL (Z. anal. Chem., 1928, 74, 33-39; cf. A., 1922, ii, 231).—A solution of the metal in nitric acid ( $d_{1.4}$ ) is diluted and dilute ammonia added as long as any precipitate continues to be formed. The latter is dissolved in a little nitric acid, 5 c.c. of a 5% manganous sulphate solution are added, followed by 3 c.c. of *N*-potassium permanganate, and the mixture is heated with agitation. The liquor becomes decolorised and the manganese dioxide precipitated in a state of conglomeration. A further 3 c.c. of permanganate solution are added, agitation and heating being continued, followed by filtration and a rapid wash with hot water. The clear filtrate is once more similarly treated, and the precipitates of manganese dioxide are combined and washed down with dilute hydrochloric acid containing a little hydrogen peroxide before being brought completely into solution by heating with hydrochloric acid till chlorine is no longer evolved. The insoluble residue is collected on a filter, washed, mixed with sodium peroxide, and fused, the melt being taken up in water. After acidifying with hydrochloric acid it is combined with the last filtrate. After neutralisation of free acid with ammonia, hydrogen sulphide is used to precipitate all the antimony together with tin, arsenic, bismuth, lead, and some copper. This precipitate is collected, washed, extracted with hot sodium sulphide, the solution filtered, and the filtrate containing the sulphides of antimony, tin, and arsenic reprecipitated with dilute sulphuric acid, filtered, and

dissolved in hot brominated hydrochloric acid. The separation and determination of the antimony are then carried out by the usual methods. R. A. PRATT.

**British standard specification for chemical lead** (Brit. Engineering Standards Assoc., 1928, No. 334, 18 pp.).—The standard lead shall contain 99.99% Pb (up to 0.05% of which may be replaced by copper), and the content of impurities shall not exceed the following: 0.002% Ag, 0.005% Bi, 0.003% Fe, 0.002% Sb, 0.002% Zn, 0.001% (Ni + Co), and only traces of tin, cadmium, and arsenic. The flash and aqua regia tests for lead are described. These are recommended as useful indicators subsidiary to complete analysis, a detailed scheme for which is set out with the comparative results obtained by five analysts for one sample. Other analyses of different leads are given together with flash points (ranging from 315° to 225°) and results of the aqua regia test. Whilst in general lower flash point and poor results with aqua regia are associated with excessive impurities (bismuth and antimony), in some cases the results are quite anomalous. C. IRWIN.

**British standard specification for regulus metal** (Brit. Engineering Standards Assoc., 1928, No. 335, 9 pp.).—The lead used shall not contain more than 0.1% of impurities other than antimony, nor the antimony more than 0.5% of impurities other than lead. Four types of regulus metal are specified, viz., 6-8% regulus for tanks and containing vessels, 8-10% metal for valves, plugs, and working parts of pumps etc., 10-12% metal for screws or other parts requiring machining, and metal containing over 12% of antimony. For all these alloys the contents of arsenic and zinc should not exceed 0.01% of each, copper and tin 0.10% of each, and sulphur 0.02%. The minimum ultimate tensile strength of the four alloys and their Brinell hardness numbers are specified. Bend tests are also described which are, however, chiefly of value for 6-8% regulus. The recommended analytical methods are subjoined. C. IRWIN.

**Electrolytic refining of copper, using complex salt of cuprous chloride.** I, II. N. KAMEYAMA and T. NODA (J. Soc. Chem. Ind. Japan, 1927, 30, 773; 1928, 31, 343).—I. As an electrolyte the use of a cuprous salt instead of the usual cupric sulphate for the purpose of saving electrical power consumption was tried. An aqueous solution of potassium chloride nearly saturated with cuprous chloride was found advantageous at 50-75°, such a solution containing about 4% Cu; a little gelatin and about 2% of hydrochloric acid should be added. Nitrogen was passed into the electrolytic bath in order to stir it and exclude air therefrom. A current density of about 3 amp./dm.<sup>2</sup> was possible with high current efficiency and without giving a bad cathodic deposit; the anode used was pure copper. When impure copper (98.8% Cu) was used a cathode copper of 99.92% purity was obtained.

II. Aqueous solutions of sodium chloride and calcium chloride were used for the dissolution of cuprous chloride, and the solutions obtained were used as electrolytes for the refining of copper. These electrolytes were found just as suitable as those in which potassium

chloride was used, and even preferable when higher concentrations of copper in the electrolyte are required.

S. OKA.

**Hydrogen in electrolytic zinc.** W. R. ELLIOT (Proc. Nova Scotian Inst. Sci., 1927, 16, 152—154).—The zinc was placed in a pyrex tube connected to a Toepler pump, exhausted to 0.01 mm., and allowed to remain for some hours; it was then heated to 200° and finally melted, and a total of 0.5—1 c.c. of hydrogen per g. of zinc was evolved (according to the sample). The following stages were observed in one typical case: during exhaustion, 13% of gas; after 24 hrs., 9%; on heating to 200°, 11%; and on melting, 67%. Both laboratory and commercial samples gave similar results. These figures are tenfold smaller than those of Schwarz (cf. Ralston, B., 1925, 361), consequently the pressures developed inside the zinc are small.

S. J. GREGG.

**Reduction roasting, leaching, and electrolytic treatment of Bolivian tin concentrates.** C. G. FINK and C. L. MANTELL (Eng. Min. J., 1928, 125, 452—455).—Gaseous reduction of the concentrate is followed by leaching with a solution containing sulphuric acid (15%) and sodium chloride (5%); tin is recovered (95—98%) electrolytically.

CHEMICAL ABSTRACTS.

**Blast-furnace linings.** MITRA and SILVERMAN. **Steel works' refractories.** GREEN.—See VIII.

PATENTS.

**[Multiple-hearth] furnace construction and operation.** D. BAIRD, Assr. to NICHOLS COPPER Co. (U.S.P. 1,671,395, 29.5.28. Appl., 12.3.26).—In a mechanically-rabbed, multiple-hearth, roasting furnace the individual hearths have discharge openings alternately at the centre and at the periphery, and at least one of the hearths having an opening at the periphery has also an opening at the centre to provide a direct gas passage to the other hearths partially independent of the path of the material being treated.

A. R. POWELL.

**Shaft furnaces [cupolas].** G. SIMON (B.P. 291,258, 21.7.27).—A vertical shaft is connected at its lower end by means of a channel to a fore-hearth above which is the recuperator, the connexion between the two being provided with adjustable dampers. The fore-hearth is provided with a slag overflow at the top, and at the bottom with an upwardly inclined conduit communicating with an adjacent collecting chamber for the metal. This chamber is heated by means of liquid fuel, the flames and products of combustion from which pass over the fore-hearth and upwards through the vertical shaft thereby assisting the melting operation therein.

[Stat. ref.] A. R. POWELL.

**Semi-muffle forge furnace.** W. McM. HEPBURN, Assr. to SURFACE COMBUSTION Co. (U.S.P. 1,672,863, 5.6.28. Appl., 30.4.27).—The goods are heated first by direct contact with gases freely circulating in a heating zone, and then for final heating pass into a passage open to the heating gases but from which the heating gases are excluded by another fluid. B. M. VENABLES.

**Muffle furnaces for annealing.** GIBBONS BROS., LTD., M. VAN MARLE, and T. E. BRIDGFORD (B.P.

291,580, 21.4.27).—The ingress of air to a muffle annealing furnace is prevented by providing a continuous cascade of oil or water at the inlet and outlet of the furnace, in such a way that the articles to be annealed have to pass through the liquid curtains on entering and leaving the furnace. The curtains are produced by allowing liquid to fall continuously from an upper tank against a stream of liquid projected upwardly under pressure from a lower tank, the liquid being kept in circulation by means of suitable pumps.

A. R. POWELL.

**Charging of high-frequency melting furnaces.** HIRSCH, KUPFER- & MESSING-WERKE A.-G. (B.P. 282,656, 12.12.27. Ger., 23.12.26).—Metal to be treated is packed, outside the furnace, in a metal basket, preferably composed of the same metal as the charge or containing one or more constituents of the charge. The basket melts with the charge.

J. S. G. THOMAS.

**Concentrating tables.** A. R. HARVEY (B.P. 291,498, 26.2.27).—The table is hung by link work and is provided with a number of riffle trays. It is shaken by a rotating crank which has lost motion either in the crank bearing of or on the small end of the connecting rod. Side sway may also be introduced by shaping the ends of the crank bearing as cams.

B. M. VENABLES.

**Roasting of [tin] ores and oxidation of pyritic and sulphide ores etc.** F. L. WILDER, E. MORRIS, E. SCHIFF, and E. S. KING (B.P. 291,568, 6.4.27).—The ore is mixed with an aluminous binding material, e.g., china clay, and ferrous sulphate solution, and the mixture is formed into ring-shaped briquettes for roasting in vertical retorts or kilns. When the ore contains a deficiency of sulphur, iron pyrites is added to the ore-clay mixture. Tin ores or residues are ground to pass 200-mesh and made into a plastic mass with about one fifth their volume of china clay and sufficient of a 10% ferrous sulphate solution to provide 2.5% of ferrous sulphate in the dried product. The mass is briquetted, roasted, and subsequently treated to recover a high-grade tin concentrate by leaching, oil flotation, or the like.

A. R. POWELL.

**Manufacture of steel in the Siemens-Martin furnace.** F. SIEMENS A.-G., R. DURRER, F. C. SIEMENS, and A. SPRENGER (B.P. 291,717, 24.12.26).—The furnace is fired with blast-furnace gas into which a stream of poor coal, coke, semi-coke, or dust from a coal poor in gas is introduced, and the air is preheated by means of the waste heat from the furnace. During the fining period a stream of fine coal dust is blown with air over the surface of the molten metal below the stream of heating gases so as to form a protective layer, and after the fining period a stream of coal dust without air is fed on to the charge; impurities are then allowed to separate.

A. R. POWELL.

**[Cast iron] ingot mould.** E. R. WILLIAMS, Assr. to VULCAN MOLD & IRON Co. (U.S.P. 1,672,479, 5.6.28. Appl., 20.6.27).—A cast-iron mould having a structure composed of ferrite, graphite, and other constituents, such that the content of combined carbon is 0.7—1.1% has a low permanent expansion after repeated heating and cooling.

A. R. POWELL.



**Production of rimmed steel ingots.** A. T. CAPE, Assr. to MIDWEST METALLURGICAL CORP. (U.S.P. 1,672,446, 5.6.28. Appl., 8.2.27).—The structure and surface appearance of rimming steel are improved by adding 1–6 oz. of a fluoride to 3000 lb. of molten steel immediately after tapping it from the furnace.

A. R. POWELL.

**Heat-treatment of metal [iron or steel] articles.** A. HILGER, LTD., and F. TWYMAN (B.P. 291,483, 27.1.27).—The article is made the whole or part of the secondary winding of a transformer, to the primary of which is applied alternating current of low frequency and, when the article is heated to the requisite temperature, a quenching medium is applied to the part to be hardened while the rate of cooling of the other parts of the article is retarded by maintaining part or the whole of the electrical heating.

A. R. POWELL.

**Annealing of articles of iron or steel. Apparatus for use in annealing metal articles.** V. DEMMER (B.P. 268,740 and 291,718, 3.3.27. Ger., [A] 31.3.26).—(A) The articles to be annealed are placed in a sheet-iron box, the top is welded on except for a small vent, the box is exhausted of air, and the vent sealed. Alternatively, the box is heated to the maximum annealing temperature and the vent sealed with or without replacing the air by an inert gas. (B) A container suitable for use in the above bright-annealing process is described.

A. R. POWELL.

**Coating of iron articles with a good heat-conducting metal.** F. KUNZ (Swiss P. 118,977, 11.11.25. Ger., 17.7.25).—The iron article is dipped into a molten bath of the fluorides of sodium, potassium, calcium, barium, and manganese until the carbon is removed from the surface layers, then into a molten alloy of aluminium with zinc, magnesium, and manganese, whereby a coating of the alloy adheres tightly to the iron surface owing to the rapidity with which it diffuses into the ferrite layer produced in the fluoride bath.

A. R. POWELL.

**Production of alloys for the construction or lining of apparatus etc.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 291,522, 3.3.27).—Pure alloys of iron and nickel free from sulphur and phosphorus are prepared by melting with the desired alloying elements the metal powder obtained by decomposition of the corresponding carbonyl. The operation is preferably carried out in a high-frequency induction furnace.

A. R. POWELL.

**Tinning of [metal] containers.** W. RAUCH and H. SANDREUTER (Swiss P. 119,996, 28.12.25).—The articles are pickled in hydrochloric acid (containing copper sulphate if the articles are made of a ferrous metal), coated with a paste of ammonium chloride, hydrochloric acid, and zinc and tin powders, heated until the paste melts, and finally washed to remove excess.

A. R. POWELL.

**Manufacture of protective covering for aluminium bodies.** W. C. PETERSON, Assr. to PACKARD MOTOR CAR Co. (U.S.P. 1,672,280, 5.6.28. Appl., 8.5.20).—Phenol and formaldehyde are heated until the volume of the mixture is reduced to one half, and it attains the consistency of molasses; an aluminium

silicate is then added in the proportion of 10% by wt. of the final mixture.

F. G. CLARKE.

**Production of corrosion-resistant surfaces on metals.** F. M. BECKETT, Assr. to ELECTRO-METALLURGICAL Co. (U.S.P. 1,672,444, 5.6.28. Appl., 17.3.26).—The surfaces of iron and steel articles are rendered highly resistant to corrosion by heating them in contact with a finely-divided iron alloy containing chromium and silicon until cementation takes place.

A. R. POWELL.

**[Alloy for] bells.** K. MUCHENBERGER, SEN. (Swiss P. 118,348, 24.3.26).—The alloy contains 92% Al, 6% Cu, 1.5% Sn, and 0.5% Ag.

A. R. POWELL.

**Decomposition of chromium ores with acids.** P. ASKENASY and W. MOHRSCHEIDT (G.P. 447,537, 29.12.25).—The ore (chromite) is treated with an alkaline solution or with a basic substance prior to the acid treatment for dissolving the chromium but after any necessary acid treatment for the removal of soluble impurities.

A. R. POWELL.

**Purification of metal [uranium or thorium] powder.** J. W. MARDEN, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,665,635, 10.4.28. Appl., 21.8.22).—The powder obtained by reducing the chloride of the metal with metallic sodium or calcium is washed with a solution of hydrogen chloride in methyl alcohol.

A. R. POWELL.

**Alloys of high m.p.** A. KROFF (B.P. 264,528 and 270,640, 15.1.27. Ger., [A] 16.1.26, [B] 10.5.26).—(A) Hard, tenacious alloys suitable for cutting tools are made by melting in a carbon resistance furnace a mixture of 5–80% of tungsten, 90–20% of molybdenum, and 5–0.5% of carbon. Part or all of the tungsten and/or part of the molybdenum may be replaced by tantalum, and 0.5–20% of cobalt, uranium, chromium, vanadium, titanium, zirconium, or silicon either alone or together may also be added. (B) Alloys containing 5–80% Ta, 5–0.8% C, and the remainder tungsten are claimed. Part of the constituents may be replaced by up to 25% of one of the metals mentioned in (A), and the tantalum may be replaced by a tantalum-chromium alloy containing up to 40% Cr.

A. R. POWELL.

**Desilverising of lead bullion.** B. M. O'HARRA, Assr. to AMER. SMELTING & REFINING Co. (U.S.P. 1,672,465, 5.6.28. Appl., 9.2.27).—Argentiferous lead is melted with zinc under a layer of a halide salt which dissolves the metal oxides present to form a slag, and the mixture is allowed to cool until the upper layer of zinc-silver alloy has solidified. The lower liquid layer of lead is removed and both layers are refined by known methods.

A. R. POWELL.

**Preparation of articles for nickel plating.** L. F. NELISSEN (B.P. 282,748, 17.12.27. Belg., 30.12.26).—A sufficient thickness of copper is deposited upon an oxidisable metal, e.g., steel, to ensure that pores etc. in the metal are filled with copper forced into them during the subsequent polishing operation.

J. S. G. THOMAS.

**Nickel-plating of aluminium articles.** R. MÜRSET (Swiss P. 118,976, 12.12.25).—The articles are pickled in a boiling solution of sodium carbonate, brushed with

a dilute solution of citric acid, potassium hydrogen tartrate, or aluminium acetate, washed in hot water, and plated in a nickel citrate or borate bath.

A. R. POWELL.

**Chromium-plating of iron articles.** STUDIENGES. F. WIRTS. U. IND. M.B.H. (Swiss P. 120,265, 18.9.25. Ger., 11.8.25).—The electrolyte comprises a solution containing chromic sulphate and chromium silicofluoride or borofluoride, and lead or graphite anodes are used. The bath is operated at 40–50°.

A. R. POWELL.

**Providing a resistant coating upon surfaces of aluminium or its alloys.** C. H. R. GOWER and S. O'BRIEN & PARTNERS, LTD. (B.P. 290,901, 20.10.27).—The article is subjected to anodic treatment at 15–20° in a bath containing sulphuric acid, together with potassium dichromate, sodium thiosulphate, lead acetate, barium sulphite, or ammonium or potassium thiocyanate. A darker coating is obtained by the addition of an ammonium salt to the bath, and a thicker coating by repeated treatment in the same or a different bath with intermediate periods of exposure to the air.

A. R. POWELL.

**Electroplating the surface of aluminium or its alloys.** C. H. R. GOWER and S. O'BRIEN & PARTNERS, LTD. (B.P. 290,903, 25.10.27).—The article is first made an anode in a solution containing sulphuric and hydrochloric acids or a sulphate or chloride, then washed and treated anodically in a solution containing potassium hydroxide and ammonia. Finally it is plated in any of the usual baths with copper, nickel, chromium, etc.

A. R. POWELL.

**Cold-rolling of bands and strips from metals and alloys.** O. BUSSE (B.P. 291,323, 21.1.28. Ger., 3.12.27).

**Washing of ores (U.S.P. 1,672,448).**—See I. **Paint for iron or steel (B.P. 291,486).**—See XIII.

## XI.—ELECTROTECHNICS.

**Valve-maintained high-frequency induction furnace; performance of induction furnaces.** G. E. BELL (Proc. Physical Soc., 1928, 40, 193–203).—The furnace, in the design of which a modification of the Hartley circuit, employing a centre-tapped coil for the valve oscillator, was used, melted kg. charges of palladium, chromium, nickel, and iron with about 8.5 kw. input. In a mathematical analysis of the problem of heating by high-frequency induction, the energy values deduced agreed well with those obtained experimentally with the furnace.

A. COUSEN.

**Breakdown of solid insulators.** W. WERNER (Ann. Physik, 1928, [iv], 86, 95–128).—A method is described for investigating the breakdown potential of various insulators. The substances used were mica, glass, rock salt, sulphur, celluloid, etc. The breakdown potential was determined for several thicknesses of each substance, except in the case of celluloid, when only one thickness was used. The experiments were carried out in oil at room temperature, and in liquid air and liquid hydrogen. It was found that, in general, the breakdown potential was considerably less in liquid air than in oil. Exceptions, however, are noted. The

results when plotted on a graph between breakdown voltage and thickness give, for experiments in oil and in liquid air, straight lines of which the equation is  $U = ad + b$ , where  $U$  is the breakdown voltage,  $d$  is the thickness of the dielectric, and  $a$  and  $b$  are constants. The discharge takes place first through the medium. Breakdown never occurs between the points of contact of the electrodes with the dielectric, although the field strength is greatest here. It is due not to the presence of ions in the insulator, but to the fact that all substances contain gases. There is a good deal of evidence to show that the discharge is a gas-discharge. At low temperatures all substances become brittle, and it is considered that this brittleness has some connexion with the lower breakdown voltage at the temperature of liquid air. The photographs of mica pierced by the discharge show the same lines as are obtained when a sheet of mica is gently punctured by means of a needle. Experiments were also carried out with dielectrics in a high vacuum. Previous results on the breakdown voltage of insulators are too low for dielectrics free from gases. A. J. MEE.

**Photogalvanic cell furnished with silver iodide electrodes, and its application to photometry and illuminometry.** S. IIMORI and T. TAKEBE (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1928, 8, 131–160).—The photoelectric phenomena associated with the illumination of one electrode of a photogalvanic cell containing electrodes of silver iodide (the so-called Becquerel effect) are investigated, and attributed principally to the construction of the electrode film. The practical application of the cell in photometry is briefly discussed.

J. S. G. THOMAS.

**Preparation of chromium plating solution. Physicochemical studies of the solution. Phenomena taking place during electrolysis.** Y. KATO, T. MURAKAMI, and S. SAITO (J. Soc. Chem. Ind. Japan, 1928, 31, 128–131).—The solution is generally prepared from chromic acid solution by partial reduction or by addition of chromic hydroxide. It is recommended that chromic acid solution should be treated with insoluble organic colloids (cf. Jap. P. 71,950). In plating, a film of chromic chromate is first formed on the surface of the cathode, and during electrolysis chromic acid is reduced to chromic hydroxide, a film of which forms when the concentration of the latter becomes sufficiently high near the cathode. From the results of ultra-filtration and diffusion experiments it is confirmed that the chromic chromate solution is not colloidal. F.p. depression and electric conductivity measurements of the solution show that chromic chromate resembles the sulphate when dissolved in water. The electrical condition through the plating solution is therefore concluded to be one of electrolysis and not of cataphoresis, as is sometimes supposed. K. KASHIMA.

**Precipitation of tar.** SEIDENSCHNUR and GROH.—See II. **Fixation of nitrogen.** BRINER.—See VII. **Pottery firing.** MOORE and CAMPBELL.—See VIII. **Electrolytic copper.** KAMEYAMA and NODA. **Bolivian tin concentrates.** FINK and MANTELL.—See X.

## PATENTS.

**Electric furnace.** H. L. WATSON, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,672,667, 5.6.28. Appl., 13.11.26).

—A continuous resistor comprising refractory bars arranged vertically in spaced relation, joined at their upper and lower ends by cross-pieces and resting on the lower cross-pieces, extends along the side wall inside the furnace chamber.

J. S. G. THOMAS.

**Electric vacuum furnaces.** [A] M. D. SARBEY, [B] G. D. BAGLEY, Assrs. to KEMET LABORATORIES CO., INC. (U.S.P. 1,671,451 and 1,671,461, 29.5.28. Appl., [A] 1.12.25, [B] 28.4.27).—(A) An accessible device for supporting a charge is arranged within a furnace chamber, adapted for operations under high vacua, sealed by a barometric column, and provided with a conduit. (B) A dense, non-porous screen surrounds a resistor within a gas-tight chamber.

J. S. G. THOMAS.

**Manufacture of electric resistances.** S. G. S. DICKER. From N. V. PHILIPS' GLOELAMPENFABR. (B.P. 291,591, 5.5.27).—A wire, preferably of a highly refractory metal, is disintegrated within an exhausted tube of insulating material through which leading-in wires, preferably of ferrochrome, are led at definite distances apart, and then definite lengths are cut from the tube. The exhausted tube may, if desired, be filled with a neutral gas.

J. S. G. THOMAS.

**Non-aqueous electrolytic condenser.** E. W. ENGLE, Assr. to FANSTEEL PRODUCTS CO., INC. (U.S.P. 1,672,714, 5.6.28. Appl., 29.8.27).—An electrolytic cell contains an electrolyte consisting of a solution of a dissociable salt in an anhydrous alcohol, e.g., glycerol, below a layer of oil, and two electrodes, one of which is an aluminium plate provided with a protective film.

A. R. POWELL.

**Manufacture of [wooden] separators [for accumulators].** W. S. GOULD and W. B. OSBORNE, Assrs. to GOULD STORAGE BATTERY CO., INC. (U.S.P. 1,666,007, 10.4.28. Appl., 23.10.23).—Flat strips of wood are heated for 8 hrs. at 100° in 3% sodium hydroxide solution, washed, immersed in sulphuric acid (*d* 1.02) until neutral, and dried.

A. R. POWELL.

**Electric resistance.** G. EGLY, Assr. to GEBR. SIEMENS & Co. (U.S.P. 1,671,469, 29.5.28. Appl., 31.3.25. Ger., 12.5.24).—See Swiss P. 116,016; B., 1927, 257.

**Cathodes for mercury vapour apparatus [rectifiers].** W. DÄLLENBACH (B.P. 291,683, 24.11.27).

**Insulating composition** (B.P. 290,886).—See II. **Heat-treatment of metals** (B.P. 291,483). **Nickel plating** (B.P. 282,748 and Swiss P. 118,976). **Chromium plating** (Swiss P. 120,265). **Plating on aluminium or its alloys** (B.P. 290,901 and 290,903).—See X.

## XII.—FATS; OILS; WAXES.

**Combined method of determining soluble and insoluble volatile fatty acids in butter and fats.** E. TCHÉTCHEROV (Bull. Soc. chim. Belg., 1928, 37, 153—163).—In the method described the saponification, Reichert–Meissl, butyric acid, and Polenske values can be determined successively on one 5 g. portion of the sample. After determining the saponif. value, using alcoholic potash, the higher fatty acids are removed as insoluble magnesium soaps and the alcohol is distilled

off from half (75 c.c.) of the filtrate. The Reichert–Meissl and Polenske values are determined on this portion. For the butyric acid value a slight modification of van Raalte's xylene method (cf. B., 1926, 563) is used, the determination being made on the solution used for the Reichert–Meissl number. The process was tested on various samples of butter and synthetic mixtures of butter with other fats with satisfactory results. From the data obtained, the average xylene value for butter by the method described is taken as 22.

W. J. BOYD.

**Detection of decomposition in fatty oils and other fats.** J. STAMM (Pharmacia, 1926, [5]; Chem. Zentr., 1927, II, 1520—1521).—Ten drops of the fatty oil are mixed with 5 drops of a suspension of 0.1 g. of finely powdered *s*-diphenylcarbazide in 10 g. of vaseline oil, and the mixture is warmed for 3 min. in a boiling-water bath and then cooled. A control is carried out with vaseline oil alone and solid fats are dissolved in an equal quantity of vaseline oil. The degree of rancidity in the sample is judged from the intensity of the red colour produced in the reaction together with the odour and taste of the oil.

E. H. SHARPLES.

**Working-up of soap lyes.** J. GROSSER (Allgem. Öl- u. Fett-Ztg., 1927, 24, 375—376, 387—388, 399—400; Chem. Zentr., 1927, II, 1520).—Mechanical impurities are removed by filtration, hydrochloric or sulphuric acid is then added until the liquid is only faintly alkaline, and the mixture is boiled to remove carbon dioxide. Resinous and tarry substances are skimmed off, aluminium sulphate is added, and the liquid is boiled again. After removal of the precipitated solids the liquid is distilled in a vacuum evaporator.

E. H. SHARPLES.

**Determination of iodine value [of fats].** E. LINDENBERG (Bol. Soc. Chim. São Paulo, 1928, 1, 92).—The iodine value of sparingly soluble or solid fats may be determined conveniently by Margosches' method (B., 1924, 639) by using alcohol containing 1—2% of hydrochloric acid, by boiling the fat with alcohol, and then cooling to 25°, or by adding 5—10% of chloroform to the alcohol used.

R. K. CALLOW.

**Differentiation of [vegetable] oils by P. Jäger's "flow method."** H. VON NABELL (Chem. Umschau, 1928, 35, 121—123).—The method of differentiation of oils due to Jäger ("Fließverfahren zur Unterscheidung pflanzlicher Oele," Stuttgart, 1927) depends on the characteristic phenomena observed when oils are dropped on suitable cardboard of specified nature, which is subsequently immersed in cold water for a brief period. The results obtained in this way with linseed oil, boiled oil, and tung oil (dealt with in Jäger's original publication) are reproduced and discussed, and a further series of photographs illustrate the characteristics of other oils and mixtures.

S. S. WOOLF.

**Differentiation of fatty oils by the [Jäger] "flow method."** J. SCHEIBER (Chem. Umschau, 1928, 35, 123—125).—Jäger's "flow method" (cf. preceding abstract) is adversely criticised. It is suggested that the "stains" produced be examined by transmitted light. The phenomena observed can be divided into three types, into which, however, the different classes of oil do not

regularly fall. It is pointed out that whilst tung oil and linseed oil show distinct characteristics in this test, the stain produced by tung oil that has been treated so that it does not exhibit the normal frosting effect (*e.g.*, by addition of  $\beta$ -naphthol) is indistinguishable from the linseed oil stain.

S. S. WOOLF.

**Detection of the decomposition of linseed oil by the diphenylcarbazine reaction of Stamm and the Fellenberg test.** E. JÄGERHORN (Pharmacia, 1926, [5]; Chem. Zentr., 1927, II, 1521).—Linseed oil, acid value 3.6, after storage under different conditions, has been examined by Stamm's diphenylcarbazine reaction and by Fellenberg's fuchsin reaction. Oil exposed to light in open vessels after 80 days gave a weakly positive reaction in Stamm's test, after 180 days a rancid taste and smell with a still faintly positive reaction, and after 245 days' exposure decomposition was strongly advanced. Samples kept in the dark, in either open or closed vessels, gave negative Stamm reactions, and filtered and unfiltered oils decomposed at the same rate as a sample which had been heated at 100° for 1 hr. before storage. A positive reaction in the Fellenberg test was observed in open samples kept in the dark and samples exposed to the light, after 42 days. Linseed oil for pharmaceutical purposes should give no diphenylcarbazine reaction. E. H. SHARPLES.

**Composition of normal oleines.** M. DITTMER (Chem. Umschau, 1928, 35, 150—152).—Discrepancies are noted between the results of analysis of oleines by the usual methods, checked by a lead salt-alcohol separation, and the composition as deduced from the Kaufmann thiocyanogen value, the latter giving too high a proportion of linoleic and saturated acids. The author recommends that, while these contradictions remain unexplained, the Mackey value and resinification test should be used as criteria of the oxidisability of oleines (*cf.* Seifensieder-Ztg., 1928, [16, 17], 141).

E. LEWKOWITSCH.

**Tetrabromide of elæostearic acid.** O. MERZ (Farben-Ztg., 1928, 33, 2423—2424).—A review of published work on the bromination of the elæostearic acids. Experiments on the m.p. of mixtures of the tetrabromides of  $\alpha$ - and  $\beta$ -elæostearic acids support the view of Rollett (*B.*, 1911, 293) that isomerisation from the  $\alpha$ - to the  $\beta$ -form occurs on bromination, the  $\beta$ -form remaining unaffected.

E. LEWKOWITSCH.

**Soya bean oil. IV. Separation of its glycerides by bromination.** K. HASHI (J. Soc. Chem. Ind. Japan, 1928, 31, 117—123).—From the bromination product of soya bean oil three bromides, m.p. 154°, 147°, and 74—75°, respectively, have been separated by means of various solvents. From an examination of the properties of these bromides and their derivatives, the author considers them to be, in the above-mentioned order, linoleodilinolenic bromide, a mixture of oleodilinolenic bromide with dilinoleolinolenin bromide or with linoleodilinolenic bromide, and a mixture of trilinoleic bromide with oleolinoleolinolenic bromide.

Y. NAGAI.

**Connexion between analyses and properties of sulphonated oils.** F. G. A. ENNA (J. Soc. Leather Trades' Chem., 1928, 12, 204—210).—Sulphonated

castor oil consists almost entirely of one sulphonated fatty acid, whereas fish oils, which contain five different fatty acids, on sulphonation must consist of a variety of products. Castor oil should, theoretically, require 35% of sulphuric acid, but in practice 25—30% is sufficient. Similarly, fish oils should take 60%, but only 15—20% is used. Sulphonated castor oil only makes a leather full and soft, but with sulphonated fish oils the leather is soft, elastic, and well lubricated. A highly sulphonated oil dissolves in water, whilst a moderately sulphonated oil only emulsifies. The presence in fish oils of a large proportion of highly unsaturated fatty acids which can form hydroxy-acids probably explains the superior emulsifying properties of sulphonated fish oils over castor oil sulphonated to the same degree. The methods of analysis used are based on Stiasny and Riess' work (*cf.* *B.*, 1925, 964) and include total fatty matter, unsaponifiable matter, ash, acidity, and total, inorganic, and organic sulphuric acid.

D. WOODROFFE.

**Sulpholeates in tanning.** GERONAZZO.—See XV.

### XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

**Modern methods of testing paints etc. for weathering and rust-preventive properties.** R. KEMPF (Farben-Ztg., 1928, 33, 2359—2361).—Accelerated weathering tests are discussed generally and a bibliography of published work on the subject is given. An alternative to the intensive-cycle procedure is furnished by refined methods of detecting failures in normal exposure tests. Factors influencing outdoor exposure tests are noted and suggestions are offered for controlling these variables so as to increase the value of an outdoor exposure by giving it the reproducibility of a laboratory-accelerated test without the errors inherently induced by the artificial nature of the latter.

S. S. WOOLF.

**Accelerated tests of organic protective coatings.** P. H. WALKER and E. F. HICKSON (Ind. Eng. Chem., 1928, 20, 591—596).—The apparatus used by the authors for subjecting protective coatings to the destructive agency of artificial light, water, temperature changes, and ozonised air is described. The cycle at present in use comprises refrigeration 2.4%, ozonised air 10.3%, water 19.4%, and light 67.9%, and strict parallelism with outdoor exposures is observed, although no ratio has yet been established. The varying conclusions drawn from the same exposure panel by different competent observers, and by the same observers at different times, emphasise the necessity for refined methods of quantitatively measuring the time and degree of failure of coatings. Suggested procedures are the determination of the permeability of the paint coating to water vapour or air, and the location and measuring of discontinuities in the coating by electrical means. A qualitative method for detecting "pinholes" etc. is described.

S. S. WOOLF.

**Rapid determination of chromium in lead chromate pigments.** G. SIROIS (Chemist-Analyst, 1928, 17, 10).—The pigment (0.2—0.5 g.) is boiled with concentrated hydrochloric acid (20 c.c.), the solution diluted to 60 c.c. with hot water, boiled for 5 min. and

filtered, made slightly alkaline with ammonia, and hydrochloric acid added to dissolve lead hydroxide. The solution is then diluted to 300 c.c., sodium peroxide (3 g.) added, boiled for 20 min., acidified (5 c.c. excess) with hydrochloric acid, cooled quickly to 85°, mixed with 10 c.c. of 20% potassium iodide solution, and immediately and rapidly titrated with thiosulphate.

## CHEMICAL ABSTRACTS.

**China wood oil [tung oil] in lacquer.** I. W. E. FLOOD and D. C. BOOTH [with W. H. BEISLER] (Ind. Eng. Chem., 1928, 20, 609—611).—By introducing raw tung oil into nitrocellulose lacquers opaque films of low tensile strength are obtained. If, however, the tung oil be heated in the presence of ester gum it may be satisfactorily incorporated into lacquers as a "resin component," effecting increased durability, which is still further enhanced by the use of butyl phthalate as plasticiser. S. S. WOOLF.

**Adhesion of [lacquer] films.** H. A. GARDNER and A. W. VAN HEUCKEROTH (Ind. Eng. Chem., 1928, 20, 600—601).—The adhesion of various lacquers to black iron, galvanised iron, glass, wood, tin, and aluminium were determined using the Gardner-Parks tensile strength meter (cf. Amer. Paint & Varnish Manufs.' Assoc., 1928, Circ. No. 323). A sheet of silk is embedded in the lacquer coating, which is then pulled off in strips from its iron etc. backing, the instrument indicating tensile strength. The results obtained are interpreted with reference to cohesion of the film, and adhesion of the film to surface and to silk. From the tabulated values it appears that the adhesion of lacquer films to metals increases with the amount of resin up to a certain percentage. S. S. WOOLF.

**Resins from chlorinated cymene.** P. H. GROGGINS (Ind. Eng. Chem., 1928, 20, 597—599).—When chlorine is bubbled into *p*-cymene alone or admixed with naphthalene, *o*-dichlorobenzene, etc., in the presence of a metallic catalyst, *e.g.*, aluminium, iron, or zinc, resins insoluble in acids, alkali, and alcohol are obtained. These are not rendered infusible by heat and pressure treatment, and are suitable for use as coating and insulating compositions. S. S. WOOLF.

**Acetone condensation resins.** H. A. GARDNER and C. A. KNAUSS (Ind. Eng. Chem., 1928, 20, 599—600).—A preliminary account of the production of durable resins by condensation of acetone with acetaldehyde, paraldehyde, aldol, furfuraldehyde, etc. in the presence of 10% potassium hydroxide solution. Direct addition of rosin and of cellulose esters to the reaction mixtures (using acid in place of alkaline condensation agents) gives resins of satisfactory durability but rather dark colour in comparison with dammar and pale ester gum. S. S. WOOLF.

## PATENTS.

**Anti-corrosive paint for iron, steelwork, etc.** S. A. McMINN (B.P. 291,486, 28.1.27).—Dehydrated oil-gas tar is mixed with aluminium powder or similar metallic substance. F. G. CROSSE.

**Production of lead minium [red lead] having a high peroxide content.** CONSORT. ELECTRO-CHIM. DE FRANCE, Assees. of J. J. TARDAN (B.P. 283,898, 18.1.28.

Fr., 19.1.27).—Lead converted into a spongy or pasty condition, *e.g.*, by electrolytic means, is dried slowly at a temperature rising progressively to 200°, *e.g.*, by conveying it through a shallow chamber in which it is dried by a current of hot air, before it is oxidised by roasting in a furnace of the rotating and rocking type.

L. A. COLES.

**Removal of drawing ink.** F. N. STEIGLEDER (U.S.P. 1,672,790, 6.5.28. Appl., 20.7.25).—An ink eradicator consists of the reaction products of an alkali hypochlorite, chlorine water, and carbon dioxide in water.

H. ROYAL-DAWSON.

**Manufacture of butaldehyde-phenol resins.** C. F. SCHRIMPE, Assr. to BAKELITE CORP. (U.S.P. 1,667,872, 1.5.28. Appl., 27.9.22. Renewed 26.9.27).—Butaldehyde is heated with a phenol, preferably in the presence of an acid condensing agent, such as hydrochloric acid. The resulting resin is not converted into an inert, infusible resin by heating unless compounds containing a reactive methylene group, such as formaldehyde and hexamethylenetetramine, are added. F. G. CLARKE.

**Containers for corrosive chemicals** (B.P. 283,868). **Titanium pigments** (B.P. 290,683-4).—See VII. **Protective coverings for aluminium** (U.S.P. 1,672,280).—See X.

## XIV.—INDIA-RUBBER; GUTTA-PERCHA.

**Seasonal variations in the composition of the latex of *Hevea brasiliensis*.** N. RAE (Analyst, 53, 330—334).—Monthly analyses of the latex of *Hevea brasiliensis* and its ash were made from Colombo trees that were being heavily tapped. Variations in content of resin, water, rubber, and in  $p_H$  value showed no relation to rainfall; a relationship between the conductivity and ash of the latex was established, and a general correspondence between proteins in the latex and ash and therefore the mineral salts. Nitrogen, potash, and phosphoric acid were at a minimum in August, when seed fall occurs; they increased till February, and then decreased rapidly till May, followed by a slight increase to July and a drop to August. The large fall in March coincides with leaf fall and renewal of leaf, and it is suggested that the latex acts as a food reserve to be used up when leaf and seed growth are at a maximum.

D. G. HEWER.

**Carbon blacks and their use in rubber. I. Comparative properties of blacks and tests in uncured rubber.** N. GOODWIN and C. R. PARK (Ind. Eng. Chem., 1928, 20, 621—627).—A lamp black, two gas blacks produced by the channel process for use in rubber and varnish respectively, and two blacks obtained from natural gas by thermal decomposition and by incomplete combustion at high temperature are examined as to sp. gr., bulkiness, particle size (in rubber), X-ray pattern, tinting strength, colour undertone, particle shape, extractable matter, adsorptive capacity for iodine or methylene-blue, moisture content, oil absorption, sedimentation in various media, maximum proportion introducible into rubber, and behaviour of rubber mixings, containing the respective blacks, towards milling, solvents, and blooming. D. F. TWISS.

## PATENTS.

**Production of rubber articles.** K. MEDGYES (B.P. 277,928, 4.3.27. Hung., 25.9.26).—The use of the customary dusting powders to prevent inadvertent adhesion between plies of sheet rubber has the effect of greatly reducing the strength of the seams produced when such sheets are formed into articles by joining their edges with pressure. Almost the full strength of the rubber in such welded seams can be obtained by using for dusting purposes substances which lose their anti-cohesive effect during subsequent heating or vulcanisation. Examples are naphthalene, hexamethylenetetramine, salts of fatty acids with zinc or lead, alcoholic solution of acetanilide, and aqueous suspension of thiocarbanilide.

D. F. TWISS.

**Manufacture of reinforced rubber articles.** W. B. WESCOTT, Assr. to RUBBER LATEX RES. CORP. (U.S.P. 1,671,914, 29.5.28. Appl., 25.11.25).—By passage through a bath of latex, fibrous material is impregnated with latex and given a surface coating of rubber. After coagulation of the absorbed latex, compression is applied to remove water, and soluble impurities are leached out by washing. The material is then dried in a vacuum at about 65°, and compacted by pressure while warm.

D. F. TWISS.

## XV.—LEATHER; GLUE.

**Chrome tanning.** XVIII. Analytical figures for [chrome-tanned] leather. D. BURTON and H. CHARLTON (J. Soc. Leather Trades' Chem., 1928, 12, 210—216).—The sum of the percentage amounts of moisture, grease, hide substance, water-soluble matter, and ash as determined by the analysis of chrome-tanned leather is frequently much less than 100. The grease determination by extraction of the leather with petroleum spirit is inaccurate. Up to 1.5% of skin fat may be retained by the leather. Contrary to Stiasny and Riess' results (cf. B., 1925, 964), the authors found that sulphonated oils are extracted by petroleum spirit. Wool fat soaps and neutral soaps of the alkali metals are not readily soluble in petroleum spirit, and only 83% of rosin dissolves in the solvent. Again, extraction with petroleum spirit of a leather containing sulphur removes some of the sulphur. Low results are obtained for the water-soluble matter owing to the difficulty of wetting back chrome-tanned leathers. It is shown that the grease in a waterproofed chrome-tanned leather causes low results for the nitrogen determination, and such leather should be degreased before Kjeldahling. In order to determine the specific gravity of a leather, a burette is half filled with mercury and the reading noted. Weighed strips of the leather, 4 in. long, are inserted until the mercury rises nearly to the zero mark, the leather being kept below the surface of the mercury with a pin; the reading is again taken. The difference in the readings will give the volume, from which the density can be calculated.

D. WOODROFFE.

**Depilation of skins by means of alkaline solutions.** R. H. MARRIOTT (J. Soc. Leather Trades' Chem., 1928, 12, 216—234).—The effect of various oxidising and reducing agents in suspensions of calcium hydroxide was tried on sun-dried goat skin, which had been previously soaked back in water. After 19 hrs. the order of

depilatory power was: lime and potassium cyanide, lime and sodium sulphite, lime and ferrous sulphate, old lime from ox hide, old lime from ox hair, fresh lime suspensions, lime and ferric sulphate, lime and chloroform. These results indicate that the unhairing properties of lime liquors are mainly due to the reduction of the keratin molecule, probably of the —S—S— linking in cystine, since cyanides, sulphites, and sulphides, which are known to reduce this grouping, markedly increase the rate of unhairing. Air-free lime liquors loosened the hair more quickly than an ordinary lime liquor, which fact supports the above theory. When 0.5% of potassium cyanide was added to a lime liquor, and the solution tried on goat skin, the hair was rotted in 24 hrs.; similarly, 1/2% of sodium sulphite just loosened the hair, 1/2% of calcium sulphite showed less loosening, but was more affected than the lime liquor alone; 1/2% of ferric chloride and potassium persulphate respectively, prevented any loosening of the hair. The addition of sodium sulphite to a lime liquor gives a much higher concentration of sulphite ion than the addition of calcium sulphite. The presence or absence of suspended matter in the lime liquors did not affect the unhairing properties. It was found that, by soaking the skins in a solution containing sodium sulphite, bisulphite, or sulphurous acid, the loosening of the hair was accelerated in the subsequent liming process. The effect of sulphites was greatest in alkaline solution. A 0.1N-sodium hydroxide solution containing 5 g. of sodium sulphite crystals per 400 c.c. of solution was used for soaking sun-dried goat skin for 2 days, after which the latter was transferred to a 1% solution of sodium sulphide crystals for 6 hrs. The hair roots came out easily, leaving the grain white and clean. The hair was not damaged.

D. WOODROFFE.

**Effect of egg yolk on the distribution of oil in chrome calf leather.** H. B. MERRILL (Ind. Eng. Chem., 1928, 20, 654—656).—Samples of wet, neutralised, chrome-tanned calfskins were fat-liquored with sulphonated neatsfoot oil and egg yolk in various proportions respectively, then rinsed, partly dried, split into five layers, and the fat and moisture determined in each layer. The use of sulphonated oil alone caused the fat content of the skin immediately below the grain to be higher. The addition of egg caused the flesh side to absorb twice as much oil as the grain. As the egg content of the fat-liquor was increased, the ratio of the fat content of the grain to that of the flesh decreased. Further, when the total amount of fat used was kept constant and no egg was used, the grain layer contained 25% more fat than the flesh. As the ratio of egg to oil was increased the ratio of fat in the grain to fat in the flesh fell, until with a pure egg fat-liquor the grain contained only two fifths as much fat as the flesh. The addition of fresh egg white to a fat-liquor increased the amount of fat taken up by the flesh side much more than egg yolk or whole egg. The addition of egg to a sulphonated oil emulsion increased the size of the droplets considerably, which may account for the diminished penetration of the grain layer.

D. WOODROFFE.

**Analytical control of sulpholeates used in tanning.** II. Sulphoricinoleates. M. GERONAZZO (Boll. Uff.

Staz. Sperim. Ind. Pelli, 1927, 5, 416—420).—Good sulphuricinoleate should be clear; of straw to golden-yellow colour, and homogeneous, the presence of suspended or dissolved matter indicating watering or faulty manufacture. Its reaction may vary according to the methods of washing and neutralisation followed; alkaline preparations are unstable, and different acidities are desirable for different purposes. Determination of the reaction towards test-papers might well be replaced by that of the acid value, which agrees best with the reaction to phenolphthalein. Whether ammonia or soda or both have been used in neutralising the excess of sulphuric acid used in the manufacture may be determined by the ordinary methods. The emulsive power may be measured by shaking 2 c.c. of the sulphuricinoleate for about 2 min. with 20 c.c. of water, the quality of the product being related directly to the duration of the emulsion and to the emulsive capacity, i.e., the property of retaining a definite quantity of another fatty substance in homogeneous emulsion. Addition of ammonia, drop by drop, to the emulsion should result in a clear liquid, turbidity indicating defective manufacture or the presence of mineral or vaseline oil etc. The titre of the sulphuricinoleate may be determined by shaking 25 c.c. of the material in a graduated cylinder with 25 c.c. of dilute sulphuric acid (from 30 c.c. of acid,  $d$  1.835, and 70 c.c. of water) for about 1 min., and leaving at rest for about 12 hrs.; the number of c.c. of the upper oily layer, when multiplied by 4, gives the commercial titre of the product. The presence of iron in the sulphuricinoleate may be detected by treating the lower liquid layer formed in the previous test with a few drops of 5% aqueous potassium ferrocyanide; not more than a small proportion of iron should be present.

T. H. POPE.

**Fixation of aluminium by hide substance.** A. W. THOMAS and M. W. KELLY (Ind. Eng. Chem., 1928, 20, 628—632).—Portions of defatted hide powder were treated with a large excess of solutions of aluminium sulphate and chloride for 24 hrs., well washed, air-dried, ashed, and weighed. It was found that the  $p_H$  value of the solutions could be varied from 3.2 to 3.8 for the sulphate and from 3.4 to 4.0 for the chloride. Very little aluminium was fixed from the normal salts, but the amount fixed by the powder increased with increasing  $p_H$  value, while at the same time the tannage improved. Greater fixation of aluminium took place from aluminium chloride solutions up to  $p_H$  3.65; beyond this point the salt was precipitated. Aluminium sulphate was the better tanning agent, because it could be rendered more basic without precipitating the hydroxide. The maximum amount of alumina fixed was 3.5 g. (as  $Al_2O_3$ ) per 100 g. of hide substance. The optimum concentration of the aluminium salt for the fixation of aluminium was 0.2*N*. The time required for complete tannage was only a few hours. Additions of sodium chloride or sulphate, especially of the latter, to the tanning solutions diminished the amounts of aluminium fixed by the hide substance.

D. WOODROFFE.

**Fixation of iron by hide substance.** A. W. THOMAS and M. W. KELLY (Ind. Eng. Chem., 1928,

20, 632—634).—Portions of defatted hide powder were treated with solutions of ferric sulphate of different basicities, washed free from iron and sulphates, dried, ashed, and weighed. Iron was fixed from solutions of normal ferric sulphate, but the amount increased as the basicity increased. The tanning action was very rapid—1 hr. with normal sulphate solutions and 6 hrs. with basic solutions; 7 g. of iron oxide (as  $Fe_2O_3$ ) combined with 100 g. of hide substance, whilst the minimum quantity required to form an iron collagenate would be 7.1 g. Sodium chloride diminished the amount of iron fixed by the powder. Sodium sulphate showed less inhibitory effect in basic solutions, and small quantities favoured the fixation of iron from normal ferric sulphate solutions, thus differing from its effect on chrome and alum tanning.

D. WOODROFFE.

**Sulphonated oils.** ENNA.—See XII. **Tannery waste** (U.S.P. 1,672,586).—See XXIII.

## XVI.—AGRICULTURE.

**Soil adsorption.** D. J. HISSINK [with J. VAN DER SPEK, A. and M. DEKKER, and H. OOSTERVELD] (Proc. Internat. Soc. Soil Sci. [Suppl.], 1928, 1, 4—42).—Comparison is made of the methods for determining exchangeable bases in soils. The determination of the value  $S$  in chalk-free soils by leaching with neutral salts presents no difficulty, but in carbonated soils some calcium carbonate is extracted during leaching. In successive leachings with  $N$ -sodium chloride solution (Hissink) this amount is practically constant. This is not the case in the Kelley method using ammonium chloride. Further, during the distillation of adsorbed ammonia from soil (Kelley) some ammonia results from the decomposition of organic matter. Values of  $S$  are usually lower by Kelley's method than by Hissink's. In acid soils exchange of hydrogen ions for ammonium ions tends to increase the Kelley values. The removal of ammonia from the soil complex in colloidal solutions during washing tends to reduce the value of  $S$  (Kelley) in clays and humus soils. In the Bobko-Askinasi process similar factors operate, and, in addition, more hydrogen ions in soils are replaced by barium ions than by ammonium ions, and less barium is removed during the washing operation. The value of  $S$  (Bobko-Askinasi) is higher than that of  $S$  (Hissink) for very acid soils, and lower for slightly acid or alkaline ones. In Kappen's method for determining hydrolytic acidity, the factor 1.5 used to calculate lime requirement is applicable to mineral soils, but should approach the value 2 where appreciable quantities of humus exist. Methods for determining lime requirements involving treatment of soil with lime, chalk, or bicarbonate solution yield values largely influenced by the relative proportions of soil, reagent, and water. The  $p_H$  value of soils in aqueous suspension, as determined by the Biilmann electrode, are greater than when a  $N$ -potassium chloride or  $N$ -calcium acetate suspension is used. The term "adsorption capacity" (Gedroiz) is based on the adsorptive value of the soil for barium and is not representative of the total adsorption capacity, since hydrogen ions in soil are not completely replaceable by barium ions. In order satisfactorily to deter-

mine the lime requirement of a soil and to include therein a correct representation of the physical and chemical effects of calcium salts on the mineral and organic complexes, it is recommended to determine chalk, humus, and clay (diam.  $<16\mu$ ) contents, reaction, state of saturation, and adsorption potential calculated per g. of soil and per 100 g. of adsorbing agents (clay and humus), and hence the lime factor.

A. G. POLLARD.

**Absorption phenomena in acid soils.** W. HILLKOWITZ (Z. Pflanz. Düng., 1928, A11, 229—264).—Treatment of soil with increasing amounts of hydrochloric acid showed that no decomposition of the zeolite complex occurs with acids weaker than 0.1*N*. Changes in the adsorptive power of acidified soils for calcium were irregular, but generally speaking those originally having considerable amounts of exchangeable calcium adsorbed but little more, and those having much exchangeable aluminium possessed strong adsorptive power for calcium. Increased exchange acidity in soils is accompanied by greater adsorptive power for phosphate applied as calcium dihydrogen phosphate. Adsorption from ammonium phosphate follows different lines. Similar phenomena were observed in experiments with permutite. The relative "adsorptive energy" of the zeolite-humus complex for different cations is not always in accord with Hissink's views. Neutralisation of previously acidified soils and permutites does not completely restore their original adsorptive powers. Simplified methods for determining exchangeable calcium and the total exchangeable bases in soils are described and their limitations discussed.

A. G. POLLARD.

**Acid properties of artificial and soil permutites.** W. U. BEHRENS (Z. Pflanz. Düng., 1928, A11, 281—287).—Permutites from which bases are removed function as acids and can be titrated as such. The  $p_H$  values of partially neutralised "permutite acids" depend upon the proportion of electrolyte present. "Permutite acids" are comparable in strength with carbonic acid, the soil acids being slightly stronger than artificial ones. The results of treating permutites with neutral salt solutions are explicable on the basis of the law of mass action.

A. G. POLLARD.

**Titration curves and buffer actions of soils.** F. TERLIKOWSKI and T. WLOCZEWSKI (Rocz. Nauk Rolniczych i Lesnych, 1925, 13, 602—603; Bied. Zentr., 1928, 57, 150—151).—The buffering properties of fifteen soils, including various horizons of those soils, were examined, on the ground that such properties vary in significance according to the horizon. The reaction of these soils with hydrochloric and sulphuric acids was determined at  $C_H$  values ranging from  $2.5 \times 10^{-4}$  to  $2.25 \times 10^{-2}$  g./litre. The reaction with superphosphate containing free acid, in quantities equivalent to the pure acid solutions and also similar to those used in agricultural practice, was also investigated. 10 g. of soil were mixed with 20 c.c. of acid and maintained at 18° for 48—96 hrs.; and the  $p_H$  value was then determined potentiometrically. There were examined seven humus horizons, of partially podsolised, podsol, and meadow soils; three eluvial horizons; three illuvial horizons of the same soil; and also two C-horizons of sandy forest soils. The chief

findings were as follows: All soils, independent of their initial reaction, showed buffer action, even pure sand formations. As a measure of the buffering properties can be taken the area, bounded on the one side by the theoretical titration curve and on the other by the experimental titration curve, taking into account the initial reaction. In the soil profile, the least buffer action is found in the eluvial horizon; this is explained by the soil-building process in this horizon. In this connexion are often found significant buffering properties in illuvial horizons, which are produced therein by the products of leaching of the  $A_1$ - and  $A_2$ -horizons. The  $A_2$ -horizon particularly has the highest buffer action, indicating therein the rôle of humic substances. No distinction in buffering properties could be drawn between forest and arable soils. Greater buffer action is displayed by soils towards free acids than towards superphosphate. The use of the latter in quantities corresponding to those used in agricultural practice caused little or no alteration in soil reaction.

H. J. G. HINES.

**Liming [of soils].** A. GEHRING (Z. Pflanz. Düng., 1928, B7, 249—264).—Important points in liming practice are discussed. The form of lime used, the manner and period of application in the crop rotation, and the conjoint use of fertilisers are considered.

A. G. POLLARD.

**Influence of soil structure on fertility.** A. ACHROMEIKO (Z. Pflanz. Düng., 1928, A11, 36—50).—Comparative cropping experiments are described in soils in natural, crumbly, and powdery conditions. If nutrient and water supplies are similar, the crop yield is not appreciably affected, but differences in "non-capillary porosity" markedly influence germination, low porosity being coincident with poor germination. A loose, as compared with a compacted, soil surface favours germination, but does not affect the total crop yield to a marked degree.

A. G. POLLARD.

**Texture and structure of soils as influenced by chemical reagents.** G. J. BOUYOUCOS (J. Amer. Soc. Agron., 1927, 19, 788—797).—The behaviour of various soils on treatment with salts, acid, alkali, or sugar was studied.

CHEMICAL ABSTRACTS.

**Chemical analysis of soils and the molecular ratios.** K. UTESCHER (Z. Pflanz. Düng., 1928, A11, 265—281).—The methods of the Preussen Geologisches Landes-anstalt for the extraction of soils with hydrochloric acid are discussed, and the molecular ratios thus obtained are compared with soil acidity measurements. A more concentrated acid is recommended for use. Details for a complete chemical analysis of soil are appended.

A. G. POLLARD.

**Determination of magnesium in soils.** E. DUPONT (Ann. Sci. agron. Franç., 1927, 43, 458—470; Chem. Zentr., 1927, II, 1392).—I. The soil extract (100 c.c. = 10 g. of soil) is neutralised with ammonia and the mixture shaken with 10 c.c. of acetic acid to dissolve the iron precipitate. The mixture is diluted to 300 c.c. and treated with the calculated amount of 4.7% ammonium oxalate solution on the basis of oxalic acid =  $1.3CaCO_3 + 7Fe + 2$ . After 3 hrs. the liquid is tested to show the complete precipitation of calcium, a little kiesigluhr is added, and the whole diluted



to 500 c.c. and filtered. To 301.7 c.c. of the filtrate a few drops of phenolphthalein are added, followed by 50 c.c. of a neutral citrate solution (40% citric acid), 15 c.c. of ammonium diphosphate solution (15%  $P_2O_5$ ), and ammonia (*d* 1.23) till alkaline. The magnesium precipitate is stirred up and 60 c.c. of ammonia solution are added. After 24 hrs. the solution is filtered, the precipitate washed and dissolved from the filter with warm nitric acid (5%), and the solution evaporated to dryness in a platinum dish; the residue is ignited and weighed as magnesium pyrophosphate.

II. To 90.5 c.c. of soil extract (9.05 g. of soil) without preliminary treatment are added 50 c.c. of citrate solution, 10 c.c. of phosphate solution, and ammonia till alkaline to phenolphthalein and the solution precipitated as before. After filtration the precipitate is digested with 10 c.c. of citrate solution and 40 c.c. of ammonia for 2—3 min., filtered, washed free from citrate, and treated as described above.

A. G. POLLARD.

**Mechanical analysis [of soils], national and international.** B. A. KEEN (Proc. Internat. Soc. Soil Sci. [Suppl.], 1928, 1, 43—49).—The official English (1925) method for the mechanical analysis of soils as now modified (Dec., 1927) brings it into line with the method prescribed by the International Society with the sole exception that values are expressed as percentages of air-dried soil. A plea is made for general agreement among other countries for the adoption of the International method or one the values of which can be converted into the International scale by a simple calculation.

A. G. POLLARD.

**Mechanical analysis of soils. III. A new pipette.** M. KÖHN (Z. Pflanz. Düng., 1928, A11, 50—54. Cf. B., 1927, 855; 1928, 27).—A special pipette for the new method for the mechanical analysis of soils is described. The larger particles are determined by elutriation methods. Errors in the Atterberg sedimentation process are illustrated.

A. G. POLLARD.

**Mitscherlich's method for determining the fertiliser requirement of soils.** M. GERLACH, E. GÜNTHER, and C. SEIDEL (Z. Pflanz. Düng., 1928, A11, 1—35).—The Mitscherlich hypothesis of growth factors is not in accord with experimental results. Mitscherlich's equation represents only the nutrients absorbed by the growing plants and not the total soil nutrient. The value of the growth factor is constant only when the water and nutrient supplies to the plant are maintained at a constant value and the progressive increases in crop yield are generally applicable to the calculation of nutrient values. Only the actual experimental figures in the Mitscherlich process are utilisable, and these accomplish no more than a well-conducted field trial.

A. G. POLLARD.

**Action of nitrogenous fertilisers on the quality of potatoes for "seed" and on the composition of potatoes grown on four different soils.** E. KRÜGER (Landw. Jahrb., 1927, 66, 781—843; Bied. Zentr., 1928, 57, 156—158).—The quality of seed potatoes was distinctly influenced by the application of different nitrogenous fertilisers in increasing amounts. The soils themselves were an important factor also, moorland

soils giving the best and heavy calcareous soils the worst types of seed potatoes. The heavier nitrogenous dressings gave increased yields on the moorland and sandy soils without diminution in quality, but the increase in yield on the heavier soils was accompanied by a lowering of quality. Ammonium sulphate and urea were more effective than sodium and calcium nitrates or calcium cyanamide. Analyses of the differently fertilised crops revealed differences in the total nitrogen contents and in the distribution of the nitrogen. A low ratio of amino-acid to total nitrogen during the winter resting period is an indication of good seed quality.

H. J. G. HINES.

**Factors determining the availability to plants of difficultly soluble calcium phosphates.** W. W. BUTKEWITSCH (Landw. Jahrb., 1927, 66, 947—992; Bied. Zentr., 1928, 57, 154—156).—The type of culture vessel used in this work consisted essentially of a large glass cylinder in which was placed a narrower glass cylinder. In the outer compartment was a complete nutrient solution omitting phosphate. The inner cylinder contained sand resting on a porous plate, leaving a small space below. A siphon and air tube reached this space. Seedlings germinated in pure water were placed with their roots partially in the sand and partially in the nutrient solution. In order to study the behaviour of various phosphates, these were mixed with the sand. The effect of various solutions percolating the sand on the solubility of the phosphates could be estimated by withdrawing the percolated solution through the siphon. It was shown that the availability of the insoluble calcium phosphates depends in the first place on the properties of the soil solution, particularly on the concentrations of calcium, bicarbonate, and hydrogen ions. The utilisation of these phosphates by plants does not depend entirely on their solubility, and is influenced by the buffer system in the soil solution. The separate and combined influences of various ions on the solubility of the phosphates and on their utilisation by plants are described.

H. J. G. HINES.

**Chemical treatments for controlling the growth of buds of plants.** F. E. DENNY (Ind. Eng. Chem., 1928, 20, 578—581).—Early germination of recently harvested potatoes may be brought about by treating them with a solution of sodium thiocyanate or by exposing them to vapours of ethylene chlorohydrin, gains of 2 weeks to 2 months in the time required to cause sprouting having been obtained. With chlorohydrin the temperature should be below 32°, otherwise the potatoes are injured. The development of buds in certain woody plants such as lilac, crab-apple, deutzia, etc. may be accelerated to a similar extent by preliminary treatment with chlorohydrin, ethylene dichloride, furfuraldehyde, ethyl bromide, or vinyl chloride, the type and rate of growth depending on the concentration of the chemical used. Chlorohydrin is also effective with gladiolus bulblets. When growing potatoes for seed purposes, the tuber may be advantageously soaked in a solution of thiourea, which induces multiple bud development.

F. R. ENNOS.

**Acetic acid as a soil disinfectant.** W. L. DORAN (J. Agric. Res., 1928, 36, 269—280).—The application

of 1—1.2% acetic acid to soil is found to protect tobacco against black root rot, brown root rot, and bed rot, and to protect cucumber, tomato, lettuce, and white spruce from injury by damping off during or after germination. The time which must elapse between the application of the acetic acid and the planting of seed has been found to vary with the species of plant and the variety of soil. E. A. LUNT.

**Soil treatments and seasonal chemical changes in the sour cherry.** A. G. ANDERSON and H. D. HOOKER (Missouri Agric. Exp. Sta. Res. Bull., 1927, No. 108, 27 pp.).—Spurs and shoots of sour cherry trees on plots (a) tilled, (b) in sod, (c) in sod with spring applications of sodium nitrate, were analysed. Conversion of starch into sugar takes place during the winter, and re-synthesis of starch in March. There is marked increase of nitrogen in spurs and shoots at the beginning of active spring growth. Carbohydrate is maximal in March, May (end), and September. Maximum fruit bud formation is associated with maximum carbohydrate accumulation by the end of June.

CHEMICAL ABSTRACTS.

**Concord grape: fruiting habits of the vine.** A. L. SCHRADER (Maryland Agric. Exp. Sta. Bull., 1926, No. 286, 62—118).—In the dormant season the roots of a 1-year vine contained 75% of the total carbohydrates and 80% of the total nitrogen. Nodes 1, 2, and 3 are low in starch, nitrogen, and sugar; 4 and 5 are high in starch, medium in sugar and nitrogen; 6, 7, 8, and 9 are medium in starch and high in sugars and nitrogen.

CHEMICAL ABSTRACTS.

**Influence of environmental conditions on the activities of cellulose-decomposing organisms in the soil.** R. J. DUBOS (Ecology, 1928, 9, 12—27).—The moisture content is important; the abundance or otherwise of the nitrogen supply does not appreciably influence the nature of the organisms concerned. In acid soils under aerobic conditions the decomposition is effected only by fungi.

CHEMICAL ABSTRACTS.

**Maple sap and its improvement.** E. HART (Ind. Eng. Chem., 1928, 20, 581).—Maple sap normally contains 2—3% of sugar. An attempt is being made to increase this yield by seed selection, in order to allow of a more economical production of maple sugar.

F. R. ENNOS.

**Fertiliser tests with flue-cured tobacco.** E. G. MOSS, J. E. McMURTREY, W. M. LUNN, and J. M. CARR (U.S. Dep. Agric. Tech. Bull., 1927, No. 12, 1—58).

**Salt requirement of tobacco grown in sand cultures.** H. LIN (Maryland Agric. Exp. Sta. Bull., 1926, No. 288, 132—153).

PATENTS.

**Production of fertilisers from vegetable refuse.** J. JACKSON (B.P. 291,514, 2.3.27).—Waste vegetable matter is pulverised and agitated with water to separate extraneous matter. The wet material is collected, e.g., on a continuous band strainer, pressed between rollers, dried, and powdered. The press juice may be collected and treated to recover alcohol etc. Suitable machinery is described.

A. G. POLLARD.

**Treatment of phosphate rock.** G. T. HARNED, Assr. to PHOSPHATE MINING Co. (U.S.P. 1,671,765,

29.5.28. Appl., 20.7.27).—Calcined rock, while hot, is mixed with a predetermined proportion of wet rock, thus using the sensible heat to dry and increase the calcium phosphate content of the latter.

H. ROYAL-DAWSON.

## XVII.—SUGARS; STARCHES; GUMS.

**Effect of animal char on the invert sugar in products of the sugar-refining industry.** M. I. NAKHMANOVICH and I. F. ZELIGMAN (Nauch. Zapiski, 1927, 5, 81—87).—The interaction of animal char with inverted sucrose causes a lowering of the levorotation, due to adsorption or to chemical action catalysed by the carbon. With low-purity products the levorotation is increased on account of adsorption of dextrorotatory substances.

CHEMICAL ABSTRACTS.

Maple sap. HART.—See XVI.

## XVIII.—FERMENTATION INDUSTRIES.

**Analytical characterisation of fermentation vinegar.** L. A. JANKE and F. POPBERGER (Deuts. Essigind., 1927, 31, 257—259, 265—267; Chem. Zentr., 1927, II, 1410).—Fermentation vinegar may be distinguished from dilute spirit vinegar by the determination of its iodine value (mg. of iodine required to react with that amount of the original substance which contains 10 g. of acetic acid), which at 40° should be at least 50. A sample (about 40 c.c.) of the vinegar is evaporated to approximately one quarter of its volume and made up again to its original volume. To 10 c.c. of this solution are added 40 c.c. of 0.01N-iodine and 8 c.c. of 2N-sodium hydroxide more than are required for neutralisation, and the whole is warmed to 40°. After 2 hrs. 2N-hydrochloric acid is added (4 c.c. more than the volume of sodium hydroxide previously required), and 8 min. later the liquid is titrated with 0.01N-thiosulphate. Admixture of the fermentation vinegar cannot be determined unless the iodine value is known. Filtration of the fermentation vinegar through wood charcoal lowers the iodine value owing to the adsorption of a portion of the iodine-reacting constituents, which appear to be related to vitamin-D.

C. RANKEN.

**Citric acid fermentation.** M. S. FILOSOFOV and V. E. MALINOVSKI (Nauch. Zapiski, 1928, 5, 235—239).—In 20 days *Citromyces* produced citric acid equal to 17.1% of the sugar in the modified Henneberg medium; other moulds were also examined.

CHEMICAL ABSTRACTS.

**Fermentation of toddy and the micro-organisms producing it.** M. DAMODARAN (J. Indian Inst. Sci., 1928, 11A, 63—74).—Yeasts and bacteria concerned in the fermentation of toddy are isolated and described. These appear common to all samples of toddy irrespective of origin and locality. The bacteria (sp. *Acetobacter*) do not markedly influence alcohol production, but are responsible for turbidity, unpleasant odour, and the production of acetic acid. The elimination of these bacteria by heat-treatment is suggested, the death point of the bacteria being 38—39° as against 52—53° for the yeasts. Vinegar production by mere prolonged storage of toddy is uneconomical. A. G. POLLARD.

## PATENTS.

**Manufacture of yeast.** H. C. and J. P. H. JANSEN (B.P. 291,127, 3.5.27).—The solution of the nutrients is introduced in the form of a spray into the air or other gas used for aerating the wort, and the mixture passed into the seeded wort. Should ammonia or other volatile liquid be used in the process, the air may be passed through such liquid on its way to the aeration vessel. It is claimed that with this arrangement the yield of yeast is increased (cf. B.P. 270,770; B., 1927, 568).

C. RANKEN.

**Manufacture of yeast.** J. Y. JOHNSON. From H. BÜCHER (B.P. 291,146, 24.2.27).—In a continuous process, a sugar solution containing mineral yeast food flows slowly with seeded yeast from a storage vessel into a propagating vessel provided with suitable aerating devices. Nutrients and sugar are added at points to ensure a suitable concentration of such substances being maintained. The liquid, separated by a centrifuge from the yeast, is pumped back to the storage vessel and used again after the addition of fresh nutrient substances. After repeated use of such wort, it may be sterilised by heat or purified by passing over activated charcoal. The discharged air, automatically freed from foam, flows into an absorption vessel where the alcohol and aldehyde are absorbed by a suitable liquid.

C. RANKEN.

**Treatment of yeast.** W. SCOTT (B.P. 291,135, 22.2.27).—Yeast, after fermentation, is skimmed or sucked into an enclosed vessel provided with a rouser, which is adapted to circulate the liquid portion of the skimmings until the desired degree of maturity of the yeast is reached. Subsequent to the reconditioning of the yeast, the bulk of the liquid is allowed to separate by gravitation and filtered separately from the yeast. By means of a jacket or a coil the contents of the enclosed vessel may be brought to any desired temperature.

C. RANKEN.

## XIX.—FOODS.

**Tallowiness or rancidity in grain products.** M. S. FINE and A. G. OLSEN (Ind. Eng. Chem., 1928, 20, 652—654).—Grain products such as entire-wheat flour, white patent flour, maize, and wheat germ containing less than 2% of moisture develop a tallowy odour relatively rapidly, especially at higher temperatures. With 5% of moisture the change is considerably delayed, this "protective" effect increasing with rise in the moisture content, so that samples with 10—12% of moisture may be preserved fresh for 3 years. Suitable addition of moisture can also exert a "curative" effect in materials of initially low moisture which have developed tallowiness. As little as 0.25% and 0.5% of glycerol exerts a protective action on baked grain products for 2 and 3 years respectively.

F. R. ENNOS.

**Analytical detection of bleaching of wheat flour.** H. JØRGENSEN (Res. Bage- og Mellaboratoriet, Copenhagen, 1928, 70 pp.).—The agents at present used in the bleaching of flour are nitrogen peroxide, chlorine, nitrogen trichloride, and benzoyl peroxide, and methods of using them are reviewed. A modification of Winton's gasoline colour value test (U.S. Dept. Agric., Bull. No.

137, 1911) in which the colour given to gasoline by the carotin in the flour is compared with that of a 0.05% solution of potassium chromate in water is described. The lowest colour value which 66 samples of recently-milled unbleached flour were found to have was 110, compared with the standard chromate solution as 100. Since the colour value decreases on storage owing to natural bleaching, test samples should always be drawn from the core of the bag. The lowest colour value unbleached flour may be expected to have in practice is 95; if it falls below 90 the flour must be classified as "bleached." Nitrogen peroxide bleaching may be detected, and the nitrous acid in the flour determined, by the Griess-Ilosvay test, which depends on the red coloration given by sulphanilic acid and  $\alpha$ -naphthylamine together in presence of nitrous acid. If a sample of flour contains more than  $40 \times 10^{-5}$  g. of nitrite nitrogen per kg., treatment of the flour with nitrogen peroxide or with some other agent that leaves a residual nitrous acid content may be suspected. Chlorine bleaching may be detected by the presence of chlorine in the fat. For this purpose the Beilstein flame test is unreliable, but incineration of the saponified fat and titration of the chloride with 0.02N-silver nitrate solution and ammonium thiocyanate solution is effective. If 15 mg. or more of chlorine are found in the fat from 1 kg. of flour, chlorine bleaching may be assumed. Bleaching with nitrogen trichloride may be inferred from the extent of the chlorine present in the fat. Benzoyl peroxide bleaching cannot be detected after two days, as the peroxide disappears and the residual benzoic acid is only present in the proportion of 0.02 pt. per thousand. Rothenfusser's test, in which *p*-diaminodiphenylamine sulphate is the reagent, can, however, be used to detect undecomposed benzoyl peroxide.

W. J. BOYD.

**Relation of milk solids-not-fat to overrun and quality of ice cream.** P. S. LUCAS and W. J. ROBERTS (Mich. Agric. Exp. Sta. Tech. Bull., 1927, No. 86, 1—16).—The apparent viscosity of an aged ice cream mix is increased by increasing the milk solids-not-fat content; these have little effect on the overrun, but increase the density and lower the f.p.

CHEMICAL ABSTRACTS.

**Glycerin in cream.** A. F. LERRIGO (Analyst, 1928, 53, 335—336).—Glycerin in cream may be detected during and immediately after determination of total solids. Fumes may be observed on removing the dish from the oven after  $\frac{1}{2}$  hr. with as little as 1% of glycerin. After weighing, further heating will produce a slight rise in weight with genuine cream, but a continued loss will occur if glycerin is present, when darkening of the solids after 2 hrs.' heating is also much more marked.

D. G. HEWER.

**Tests for reconstituted cream.** F. W. RICHARDSON (Analyst, 1928, 53, 334—335).—5 c.c. or 5 g. of cream are shaken with a mixture of equal parts of benzene and methylated spirit (60 o.p.) and the mixture is centrifuged. Fresh cream even when it has become sour will remain as an emulsion, but reconstituted cream will throw up its butter fat; after strong centrifuging in the latter case three layers will be present, and in the former only the aqueous layer and the upper opaque stratum.

Reconstituted cream submitted to a sterilising process will give no reductase action with methylene-blue.

D. G. HEWER.

**Determination of butter in margarine.** L. V. COCKS and E. NIGHTINGALE (Analyst, 1928, 53, 322—327).—Deviations in results for Reichert–Meissl–Polenske–Kirschner determinations were obtained in spite of strict attention to details (cf. B., 1911, 975). Low Kirschner values resulted from the use of inferior quality silver nitrate, and sulphuric acid was found in the Kirschner distillate when the asbestos shield did not perfectly fit the bottom of the distillation flask, owing to volatilisation by overheating through the annular spaces; this is avoided if uralite plate is used instead of asbestos, with a central 5 cm. diam. bevelled hole, and the final joint made with asbestos paper. Sulphuric acid did not volatilise in the presence of the fatty acids on the walls of the flask, but with the larger excess of acid in the Kirschner determination it distilled over. Interpretation of results necessitates the knowledge of the Kirschner value of the original butter fat, since this may vary from at least 19 to 27. Assuming an original value of 23.5 in the computed tables, a correction should be applied for the actual value, and in its absence accuracy can only be between the range of -13 to +24%.

D. G. HEWER.

**Chemical sterilisation in the dairy industry.** M. J. PRUCHA (World's Butter Rev., 1928, 2, 12—17).—The chlorine group is most satisfactory. The solutions employed were fairly stable up to 1 hr. at 26—71°; the addition of small amounts of milk caused a reduction in the amount of available chlorine. Addition of sodium hydroxide increased the stability in the absence, and decreased the stability in the presence, of milk.

CHEMICAL ABSTRACTS.

**Manganese content of raw and cooked vegetables.** S. MUNGER and W. H. PETERSON (J. Home Econ., 1928, 20, 194—200).—Spinach, string beans, and beets have a high, and rutabaga, cabbage, and onions a low, manganese content. The manganese content of stalks and leaves is generally higher than that of roots, tubers, and bulbs. The element is best conserved by steaming.

CHEMICAL ABSTRACTS.

**Pectic constituents of tomatoes and their relation to the canned product.** C. O. APPLEMAN and C. M. CONRAD (Md. Agric. Exp. Sta. Bull., 1928, No. 291, 1—17).—In green tomatoes protopectin predominates over pectin, but is rapidly transformed into pectin during the later ripening stages; from the pink to the red stage the ratio of pectin to protopectin increases from 1.13 to 2.56. Further conversion occurs by acid hydrolysis during processing and continues during cooling. Mid-season pickings, preferred for canning, showed the least transformation of protopectin to pectin.

CHEMICAL ABSTRACTS.

**Biological values of certain types of sea foods.** III. **Vitamins in clams.** D. B. JONES, E. M. NELSON, J. C. MURPHY [with J. P. DEVINE] (Ind. Eng. Chem., 1928, 20, 648—652).—Feeding experiments carried out on the same lines as those with oysters (B., 1928, 242) showed that clams are a good source of vitamin-A and -D, the soft-shell variety being somewhat richer in vitamin-A than the hard-shell variety. Compared with

oysters clams contain less vitamin-A but more of -D and -E. Unlike oysters they are practically devoid of vitamin-B.

F. R. ENNOS.

**Digestibility of certain fruit by-products as determined for ruminants.** S. W. MEAD and H. R. GULBERT (Calif. Agric. Exp. Sta. Bull., 1927, No. 439, 1—11).

**Digestibility and production coefficients of poultry feeds.** G. S. FRAPS (Texas Agric. Exp. Sta. Bull., 1928, No. 372, 1—24.)

**Water content of jelly.** SOMIYA.—See VII.

PATENT.

**Fertilisers from vegetable refuse** (B.P. 291,514).—See XVI.

## XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

**Tests for impurities in anæsthetic ether.** E. B. ROBINSON (Lancet, 1928, 214, 856).—The aldehyde and peroxide tests first given by Wobbe (B., 1903, 1067) are described. The peroxide test is not as sensitive as that described by Middleton (B., 1924, 806), but is much simpler, and samples of anæsthetic ether which contain sufficient peroxide to respond to this test should be suspected.

E. H. SHARPLES.

**Determination of atropine.** E. RICHTER (Apoth.-Ztg., 1928, 43, 47; Chem. Zentr., 1928, i, 1076).—The determination of atropine in "granulæ atropine sulphur. 0.0005" is carried out by extraction of the aqueous solution with ether after addition of ammonia, evaporation of the ethereal extract, extraction of the atropine with absolute alcohol, dilution with water, and titration with 0.01N-hydrochloric acid, using methyl-red.

A. A. ELDRIDGE.

**Assay of kalium sulphoguaiaicolicum.** E. RUPP (Apoth.-Ztg., 1928, 43, 74; Chem. Zentr., 1928, i, 1076—1077).—The procedure of the German Pharmacopœia VI is criticised, and modifications are proposed.

A. A. ELDRIDGE.

**Evaluation of liquor kalii arsenicosi and the fixanal method.** W. BÖTTGER (Apoth.-Ztg., 1927, 42, 1399—1400; Chem. Zentr., 1928, i, 1077).—Titrations with solutions of (a) iodine and potassium iodide, (b) iodine, potassium iodide, and a little hydrochloric acid, (c) iodate, iodide, and acid, gave concordant results. Discordant results reported with the fixanal method are ascribed to errors in its use.

A. A. ELDRIDGE.

**Essential oils.** SCHIMMEL & Co. (Ber. Schimmel, 1927, 4—5, 25—26, 53, 60—61, 66—67, 78, 85—86, 86, 114—115, 135; Chem. Zentr., 1927, II, 1518—1519).—*Araucaria oil.* The West Australian oil is a granular mass of a pleasant balsamic odour, having m.p. 30°,  $d_{20}^{15}$  0.9764,  $\alpha_D +14^\circ 25'$ ,  $n_D^{20}$  1.50928, acid value 3.7, ester value 21.5, ester value after acetylation 173.6 (= 79.1%  $C_{15}H_{26}O$ ), and is soluble in 3.5 vols. of 70% alcohol. From the fresh wood a yield of 10.5% of araucaria wood oil having  $d_{20}^{15}$  0.9756,  $\alpha_D +4^\circ 10'$ ,  $n_D^{20}$  1.51139, acid value 10.2, ester value 24.3, ester value after acetylation 177.3 (= 81.1%  $C_{15}H_{26}O$ ) is obtained. From the weathered wood 11.7% of oil having  $d_{20}^{15}$  0.9742,  $\alpha_D +8^\circ 5'$ ,  $n_D^{20}$  1.51520, acid value 8.4, ester value 46.7, ester value after acetylation 186.7 (= 86.0%

$C_{15}H_{26}O$ ) is obtained. Both wood oils are soluble in 1.1 vols. of 80% alcohol. *Dill plant oil*. isoMyristicin (m.p. 44°) and myristicin have been identified in dill plant oil. By oxidation of isomyristicin with ozone, myristicin aldehyde (m.p. 131°) has been obtained. *Indian geranium oil*. A South Indian oil had  $d^{15}_4$  0.9148,  $\alpha_D - 8^\circ 31'$ ,  $n_D^{20}$  1.47524, acid value 5.6, ester value 77.5 (32.6% of esters as geranyl tiglate), ester value after acetylation 210 (total geraniol 68.5%), solubility in 70% alcohol 1 in 2.5 vols. after rectification with steam the oil had  $d^{15}_4$  0.9105 and  $n_D^{20}$  1.47407. Oil from *Laurelia serrata* ("Huahuan"). The leaf oil of *L. serrata* grown in Chili had  $d^{15}_4$  0.9469,  $\alpha_D - 11^\circ 25'$ ,  $n_D^{20}$  1.48731, acid value 0.8, ester value 8.4, solubility in 70% alcohol 1 in 2 vols. Oil from the bark had  $d^{15}_4$  1.0426,  $\alpha_D - 2^\circ 5'$ ,  $n_D^{20}$  1.52482, acid value nil, ester value 6.5, solubility in 90% alcohol 1 in 0.5 vol. The characteristic constituent of both oils was safrol, the bark oil containing the most. *Mexican linaloe oil*. Steam-distillation of linaloe wood from Mexico gave 8.1% of oil having  $d^{15}_4$  0.8781,  $\alpha_D + 8^\circ 15'$ ,  $n_D^{20}$  1.46072, acid value 1.5, ester value 47.5, solubility in 60% alcohol 1 in 4.5 vols., and consisting largely of *d*-linalool (75%). *Mexican petitgrain oil*. Leaf oil from sweet oranges had  $d^{15}_4$  0.8675,  $\alpha_D + 41^\circ 40'$ ,  $n_D^{20}$  1.47407, acid value 2.4, ester value 12.1, and leaf oil from bitter oranges had  $d^{15}_4$  0.8578,  $\alpha_D + 42^\circ 55'$ ,  $n_D^{20}$  1.47299; acid value 1.2, ester value 10.3. Both oils were soluble in 0.4 vol. of 90% alcohol, but not completely so in 10 vols. of 80% alcohol. The odour of both oils was stupefying and they did not appear to be suitable for use in perfumery. *Peppermint oil from Palestine*. Oil from the shade-dried plant had  $d^{15}_4$  0.9096,  $\alpha_D - 22^\circ$ ,  $n_D^{20}$  1.46261, acid value 0.8, ester value 13.1 (menthol esters 3.6%), ester value after acetylation 154.9 (total menthol 48.8%), solubility in 70% alcohol 1 in 2.6 vols. (solution opalescent). Oil from sun-dried plant had  $d^{15}_4$  0.9084,  $\alpha_D - 21^\circ 17'$ ,  $n_D^{20}$  1.46340, acid value 0.4, ester value 14.0, menthol esters 3.9%, ester value after acetylation 139.1, total menthol 43.3%, solubility in 70% alcohol 1 in 2.9 vols. (solution opalescent). Shade drying appears to be advantageous. *Pichurim bean oil*. From Brazilian Pichurim beans 2.1% of oil having  $d^{15}_4$  1.0538,  $\alpha_D - 3^\circ 30'$ ,  $n_D^{20}$  1.52076, acid value 9.7, ester value 4.6, ester value after acetylation 44.8, solubility in 90% alcohol 1 in 0.5, was obtained. The oil had a sassafras odour. Oil from *Geranium macrorrhizum*. The oil had m.p. 25—35°,  $d^{15}_4$  0.9431—0.9638,  $\alpha_D - 5^\circ 45'$  to  $-7^\circ 38'$ ,  $n_D^{20}$  1.50642—1.51538, acid value 1.2—1.5, ester value 5.6—14.9, ester value after acetylation 33.6—35.5, solubility in 80% alcohol 1 in 6—7 vols. (slight turbidity), in 90% alcohol 1 in 1 vol. The oil had a soft, crystalline consistency and after separation of the solid constituent (about 50%, m.p. 54—55°) had  $d^{15}_4$  0.9460,  $\alpha_D - 8^\circ 10'$ ,  $n_D^{20}$  1.50698, ester value after acetylation 54.1. *Castoreum*. Steam-distillation of Canadian castoreum gave 2.1% of oil about half of which consisted of phenols. *o*-Cresol and a phenol,  $C_{12}H_{16}O$ , were detected, and, in the phenol-free oil, acetophenone, benzyl alcohol, and *l*-borneol. E. H. SHARPLES.

**Adulteration of essential oils and natural perfumes.** SCHIMMEL & Co. (Ber. Schimmel, 1927, 7, 8, 43—44, 48, 56, 64, 90, 93—94, 137—138, 144; Chem. Zentr., 1927, II, 1519).—The following adulterations

have been detected: birch-bud oil with methyl salicylate, cedar oil, and methyl phthalate; bitter almond oil with a crude benzaldehyde containing chlorine; lemon oil with 6% of spirits and 50% of lemon oil turpenes, and in another case with about 20% of mineral oil; a eucalyptus oil consisting almost completely of terpineol first-runings; a cherry laurel oil consisting largely of benzaldehyde containing chlorine and containing no hydrocyanic acid; a lavender oil made from spike oil and methyl phthalate; rose oil with synthetic esters; East Indian sandalwood oil with phthalic and benzoic acid esters and with West Indian sandalwood oil, another sample consisting almost wholly of cedar oil, and another with a mineral oil fraction volatile in steam; juniper oil with nutmeg oil; liquid thymol consisting of oil of thyme and partly of carvacrol. E. H. SHARPLES.

**Determination of citronellal in Java citronella oil.** K. J. HOLTAPPEL (Perf. Ess. Oil Rec., 1928, 19, 210—212).—2 g. of oil in a 100 c.c. flask are cooled to about  $-2^\circ$  and 20 c.c. of a neutral 5% alcoholic solution of hydroxylamine hydrochloride at a similar temperature are added together with bromothymol-blue. The flask is removed from the cooling bath and the contents are rapidly titrated with 0.5*N*-alcoholic potash. After the turning point 5 c.c. of alcoholic potash are added, the mixture is kept for 15 min. at ordinary temperature, and titrated with 0.5*N*-hydrochloric acid. Each c.c. of alcoholic potash corresponds to 77 mg. of citronellal. The results are, on the average, 1% below those obtained by Dupont and Rabaune's oximation method, which itself has a limit of error of at least 1%. The effect of refrigeration is to minimise the action of the liberated hydrochloric acid on the still unchanged citronellal, which action is accelerated by rise of temperature.

E. H. SHARPLES.

**Determination of total geraniol in Java citronella oil.** SCHIMMEL & Co. (Ber. Schimmel, 1927, 21; Chem. Zentr., 1927, II, 1519).—For the determination it is essential that acetic anhydride of higher percentage than 85% and completely dehydrated sodium carbonate be used and also that acetylation and saponification should each take at least 2 hrs. E. H. SHARPLES.

**Extension of method for determination of essential oils in drugs.** J. STAMM (Pharmacia, 1926, [5]; Chem. Zentr., 1927, II, 1519—1520).—Experiments have been carried out on the steam-distillation of known, varying amounts of essential oils with a constant quantity of water according to the author's method, and the quantity of essential oil which must be steam-distilled to give an oil yield in the oleometer similar to that of the oil yield from the corresponding drug has been established. From the results the actual amount of oil obtained from the drug under similar conditions can be corrected and the "true content" of essential oil determined. E. H. SHARPLES.

**Determination of "true content" of essential oils in drug according to Stamm's method using the butyrometer.** E. JÄGERHORN (Pharmacia, 1926, [5]; Chem. Zentr., 1927, II, 1520).—Gerber's butyrometer without grooves is used instead of Stamm's oleometer. The loss of carbon tetrachloride is an amount equal to that represented by one graduation

mark, and is added at the end. A 5 g. sample of the powdered drug is used. *Fructus foeniculi*, and *herba majoranae* and *caryophylli* gave larger yields of oil than those recorded in the literature; *fructus anisi* and *carvi* gave smaller yields. E. H. SHARPLES.

## XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Photogalvanic cell. IMORI and TAKEBE.—See XI.

## XXII.—EXPLOSIVES; MATCHES.

Nitration of glycerin. A. N. MASCHKIN (Ukraine Chem. J., 1928, 3 [Sci.], 59—113).—An examination of the results obtained by Nathan and Rintoul (J.S.C.I., 1908, 27, 193) leads to the conclusion that nitroglycerin is least soluble in an acid mixture of the composition  $2\text{HNO}_3 + 5(\text{H}_2\text{SO}_4, \text{H}_2\text{O})$ ; if 92 pts. of pure glycerin are taken, the use of 841 pts. of a nitrating mixture containing 54.5%  $\text{HNO}_3$ , 42.4%  $\text{H}_2\text{SO}_4$ , and 3.4%  $\text{H}_2\text{O}$  should theoretically give a 227.6% yield. Better yields (i.e., 235.1%) should be given by reducing the quantity of acid to 558.6 pts. containing 44%  $\text{HNO}_3$  and 55.9%  $\text{H}_2\text{SO}_4$ , and still higher yields (236.2%) by taking 520.8 pts. of a mixture consisting of 43.4%  $\text{HNO}_3$  and 56.6%  $\text{H}_2\text{SO}_4$ . An acid mixture yielding a spent acid of low nitric acid content (5%) contains 41.2%  $\text{HNO}_3$  and 58.6%  $\text{H}_2\text{SO}_4$ , and gives a yield of 232.8% of nitroglycerin, the glycerin and nitrating mixture being taken in the proportions 1:5.4. Further confirmation of the theory that the best yields of nitroglycerin are obtained when the spent acid contains exclusively the monohydrate of sulphuric acid is afforded by the work of Soddy (Arms and Explosives, 1911, No. 222) and of Hofwimmer (B., 1911, 1333). A phase diagram constructed on the basis of results published by the above authors fully supports the contention that minimum solubility occurs along the line connecting pure nitric acid with sulphuric acid monohydrate.

R. TRUSZKOWSKI.

Determination of the stability of smokeless powder. M. TARLÉ (Bull. Chem. Soc. Japan, 1928, 3, 123—127).—Sources of error in the various methods used to determine the stability of smokeless powder are discussed. It is concluded that no satisfactory quantitative method is yet available.

C. J. SMITHELLS.

## XXIII.—SANITATION; WATER PURIFICATION.

Availability of nitrate oxygen in filter effluents. O. M. URBAIN (Ind. Eng. Chem., 1928, 20, 634—635).—When sewage is diluted with aerated water containing nitrates, or, alternatively, a filter effluent containing nitrates is discharged into an aerated stream, the oxygen of the nitrate present is not available for purification purposes until the supply of dissolved oxygen is exhausted. The rate of consumption of oxygen from nitrates is slower than that of the oxygen in solution.

C. JEPSON.

Calcium-sodium ratio of certain [river] waters. R. A. HART (J. Amer. Ceram. Soc., 1928, 11, 314—316).—Under certain conditions, the removal of soluble materials from alkaline clay soils is rendered difficult

owing to the fact that the soil gradually becomes impermeable to water. This phenomenon is caused by the presence of sodium and potassium salts, and is prevented by calcium and magnesium salts in the soil or leaching water or in both. Clays deposited by water having a low calcium-sodium ratio have a greater density than similar clays deposited in water with a high ratio. A calcium-sodium ratio unfavourable to agriculture is favourable to ceramics. The tempering of clays with water having a low calcium-sodium ratio is suggested in order to produce a body of greater density.

F. SALT.

Interference of *Clostridium Welchii* with *B. coli* tests in water analysis. J. F. NORTON and M. BARNES (J. Amer. Water Works' Assoc., 1928, 19, 729—730).—Spores of *Clostridium Welchii* when present with *B. coli* in lactose broth cause a rapid production of acid and gas. When the acidity reaches  $p_{\text{H}}$  4.2—4.3 in 24 hrs. the recovery of colon bacilli is uncertain, and with this acidity at the end of 48 hrs. these organisms are never viable. A possible interference in routine water examination is therefore indicated. C. JEPSON.

Comparative colon-aerogenes indices of water and sewage. R. E. NOBLE (J. Amer. Water Works' Assoc., 1928, 19, 733—746).—A comparative test of the cyanide-citrate pour-plate medium (cf. A., 1928, 318) and the standard lactose broth method involving 1051 samples of water of varying sanitary quality confirmed the opinion that the standard fermentation method was the less accurate. It was found that 76.7% of the samples examined by the plate method gave indices which equalled or exceeded those obtained by the broth method, 22.2% gave negative results with both tests, 13.4% were negative by the broth method and positive by the plate method, and 9.3% were negative by the plate method, but positive by the broth test. A further test in which a stored sample of polluted river water was used for the comparison on 37 successive days showed a steadier change in the *B. coli* content by the plate method than by the broth method.

C. JEPSON.

## PATENTS.

Treatment of sewage and industrial waste. Purification of tannery waste. J. T. TRAVERS, Assr. to TRAVERS-LEWIS PROCESS CORP. (U.S.P. 1,672,584—7, 5.6.28. Appl., [A] 20.5.27, [B] 23.5.27, [C] 2.8.27, [D] 3.2.28).—Sewage is treated in (A) with dust from the precipitators used in cement manufacture; in (B) with solid waste from the manufacture of chlorine, chloride of lime, and caustic soda; and in (D) by adding a suitable electrolyte-producing material and increasing the hydroxyl-ion concentration so as to give all colloids a negative charge. In (C) tannery wastes from various parts of the plant are combined so as to neutralise each other as far as possible, and after removal of the suspended matter the liquor is treated with a reagent which will precipitate the colloids and liberate nascent oxygen to carry the purification process further. C. JEPSON.

Respirators. DEUTS. GASGLÜHLICHTAUER-GES. M.B.H. (B.P. 271,478, 17.5.27. Ger., 20.5.26).

Grading of materials (B.P. 290,422).—See I. Respirators (G.P. 447,425).—See VII.