

BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY

DEC. 4 and 11, 1931.*

I.—GENERAL; PLANT; MACHINERY.

Calculation of heat losses through the walls of industrial furnaces. E. MAASE (Feuerfest, 1931, 7, 97—102).—The losses are due mostly to the thermal conductivity of the material, but a certain amount of heat may be lost by gases passing through the wall. The theory of calculations is explained, and tables and graphs are presented by means of which losses due to conduction and gas permeability and the external wall temp. can be directly determined. A simple graphic method for determining the temp. curves in an insulated wall is also given. The factors on which the thermal conductivity of a refractory brick depends are summarised. F. SALT.

Passage of gas through walls of pyrometer protection tubes at high temperatures. W. F. RÖESER (Bur. Stand. J. Res., 1931, 7, 485—494).—The rate of leakage of air through the walls of tubes of porcelain, fused SiO_2 , glass, alundum, and metal when heated at various temp. not sufficiently high to cause deformation has been investigated. Sillimanite tubes are superior to the older porcelain tubes both in reactoriness and impermeability. R. CUTHILL.

Pulp dryers. M. N. SUIROMYATNIKOV (Sovet. Sakhar, 1929, 80—84).—Two types are described and illustrated.

CHEMICAL ABSTRACTS.

Capillary systems. XIII. Influence of structure of technical capillary systems on physico-chemical processes. I, II. E. MANEGOLD, R. HOFMANN, and K. SOLF (Kolloid-Z., 1931, 56, 267—295; 57, 23—39).—Measurement of the electrical resistance, velocity of dialysis, electro-osmotic phenomena, capillary rise, sieve effect, and permeability of several technical filters are described. The measurements show that the relations which have been developed for ideal capillary systems are applicable to these. E. S. HEDGES.

SiO_2 grinding.—See VIII. **Heat-treatment furnaces. Corrosion of metals by NaCl.**—See X.

PATENTS.

Open-hearth furnace. N. F. EGLER (U.S.P. 1,798,871, 31.3.31. Appl., 5.9.29).—A method of converting a regenerative gas-fired furnace into one suitable for use with other fuels is described. A burner is inserted into the gas port, the gas riser is closed by a damper, and any air supplied with the fuel is not pre-heated. The gas regenerator is used for air which passes to the air riser through by-pass passages specially made for it. B. M. VENABLES.

Rotary kiln [for low-temperature carbonisation etc.]. E. ROSER, Assr. to C. H. ELLSWORTH (U.S.P.

1,798,500, 31.3.31. Appl., 2.9.21. Ger., 1.2.19).—The kiln is externally heated and on the interior is provided with a helical rib to advance the material. The channel formed by the rib may be either wider towards the axis or crossed at intervals by partitions parallel to the axis; in the former case the hollow of the tapering rib may be open to the external heating gases. B. M. VENABLES.

Rotary-kiln cooler. F. LUTHER, Assr. to G. POLYSIUS (U.S.P. 1,797,831, 24.3.31. Appl., 28.10.26).—The cooler is an extension of the kiln and comprises an axial air space, through which the fuel supply extends, surrounded by an annular space divided into sectors in which the material is tumbled about. B. M. VENABLES.

Furnace regenerator. F. R. MCGEE (U.S.P. 1,799,856, 7.4.31. Appl., 14.6.28).—A form of regenerator brick is described, the assemblage of a number of which produces straight vertical passages connected by minor horizontal ones to equalise the flow, which desideratum is also promoted by tapering the inlet and outlet passages. B. M. VENABLES.

Heat-exchange device. F. G. CORNELL, JUN., Assr. to JENSEN CREAMERY MACHINERY CO. (U.S.P. 1,799,356, 7.4.31. Appl., 9.4.29).—In a zig-zag apparatus comprising single outer tubes surrounding groups of inner tubes, the outer tubes are permitted to slide in the cross-headers connecting them, and the inner tubes take the longitudinal bursting strain. B. M. VENABLES.

Heat exchanger. P. C. KEITH, JUN., Assr. to REFINERY ENGINEERS, INC. (U.S.P. 1,799,626, 7.4.31. Appl., 8.7.29).—A solid block of metal is formed with a number of parallel bores, and these are connected in two series of zig-zags, one for each fluid. B. M. VENABLES.

Heat exchanger. W. M. CROSS, Assr. to GASOLINE PRODUCTS CO., INC. (U.S.P. 1,799,734, 7.4.31. Appl., 17.12.24).—A reboiling unit for the base of a rectifier is arranged for zig-zag flow of the heating fluid. The header, which is provided with inlet and outlet connexions at one end of the tubes, is cellular and in one piece; at the other end a number of slidably supported headers are provided to allow for expansion. In the rectification of hydrocarbons, residual products may be used as the heating medium, in which case a secondary inlet is provided for use when the main inlet becomes choked. B. M. VENABLES.

Heat exchanger. J. B. RATHBUN, Assr. to WESTINGHOUSE ELECTRIC & MANUFACTURING CO. (U.S.P. 1,799,391, 7.4.31. Appl., 29.3.28).—In a jet heating system for circulating and heating a liquid by admixture of vapour, the mixing chamber is situated at an upper part of the

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

system and is provided with a liquid seal at the outlet for heated liquid, above which is another outlet for permanent gases which are prevented by the seal from being drawn into circulation. B. M. VENABLES.

Preparing a charge of material to be sintered. J. E. GREENAWALT (U.S.P. 1,799,163, 7.4.31. Appl., 30.4.29).—In a sintering machine, in order to obtain a bed of uniform permeability throughout the period of "blow," it is found advisable to charge the material in three layers of different grade, the coarsest being next to the grate. In some cases it may be sufficient to screen the mixture of new material, previously sintered returns, and fuel; in other cases it is necessary to screen the materials separately and place a greater proportion of coke in the top layer. B. M. VENABLES.

Drying of [continuous sheet or strip] materials. J. P. BROWN (U.S.P. 1,798,718, 31.3.31. Appl., 9.7.26).—The drying chamber is divided into sections, the transverse walls of which may be formed of the material itself (*e.g.*, paper). The drying air enters at the same end as the material and passes across the sections in turn, being reheated between each stage to a temp. slightly higher than when entering the stage before. Finally the moist air is passed over a condenser, except a part which is by-passed under control of a humidostat, and the whole is reheated and re-used. B. M. VENABLES.

Drying of articles [*e.g.*, storage-battery plates]. W. L. REINHARDT, Assr. to WILLARD STORAGE BATTERY Co. (U.S.P. 1,799,248, 7.4.31. Appl., 10.11.24. Renewed 25.11.27).—The articles are dried in a series of chambers through which a current of heated inert gas is drawn. The first of the series is dried to a predetermined content of H₂O, then removed from the circuit, and subjected to a vac.; meanwhile another chamber containing raw goods is added to the other end and the process repeated. To protect the negative plates against oxidation after removal from the vac. they may be dipped before drying in a solution which leaves a film. The drying gas may conveniently be the vapour of a volatile liquid which is immiscible with H₂O, so that it can be recovered by condensation. B. M. VENABLES.

Sealing of drying chambers and the like. R. R. JONES, Assr. to FIRESTONE TIRE & RUBBER Co. (U.S.P. 1,799,375, 7.4.31. Appl., 1.6.27).—Inlet and outlet passages for strip material passing to and from a chamber for drying or other treatment are supplied with inert gas at a pressure above that existing both inside and outside the treatment chamber; devices such as squeegee strips are provided to avoid leakage as far as possible. B. M. VENABLES.

Condenser [for use with refrigerators]. G. HILGER (U.S.P. 1,798,795, 31.3.31. Appl., 18.11.29).—In a condenser used for liquefying refrigerant by a falling stream of water, to render the lower part of the apparatus more active minor streams of the vapour are injected into the lower pipe-coils, and to avoid wasting tube surface in removal of superheat the main inlet of vapour at the top is in the form of an injector which draws cold vapour from the outlet of the condenser and mixes it with the hot arriving vapour. B. M. VENABLES.

Condenser [for use with refrigerators]. G. H. WHITE (U.S.P. 1,798,824, 31.3.31. Appl., 12.6.29).—The vapour, *e.g.*, refrigerant NH₃, is passed over the outside of a bundle of vertical tubes, the circulating water being caused to flow as quietly as possible in a film down the interior of the tubes while air is blown up them; additional means of contact between air and water is provided in the base of the apparatus, but no external cooling pond or tower is provided. B. M. VENABLES.

Crusher. R. C. NEWHOUSE, Assr. to ALLIS-CHALMERS MANUFACTURING Co. (U.S.P. 1,799,476—7, 7.4.31. Appl., [A] 15.9.22, [B] 22.12.24. Renewed [A] 22.12.27).—A high-speed gyratory crusher is provided with an electric motor above, driving the eccentric below by means of a rotating shaft within the gyrating shaft which is made hollow to accommodate it. The whole machine is flexibly suspended on slings or springs. B. M. VENABLES.

Grinding mill. N. NELSON, Assr. to BLATCHFORD CALF MEAL Co. (U.S.P. 1,799,435, 7.4.31. Appl., 26.3.28).—A centrifugal beater mill has the beaters formed alternately as transverse bars and as hammers having broad serrated faces. The air inlets near the shaft and outlets beyond the screen are adjustable. B. M. VENABLES.

Apparatus for extracting soluble substances. W. E. SANGER and O. H. WURSTER (Assee.) (U.S.P. 1,799,481, 7.4.31. Appl., 9.5.23).—The apparatus, suitable for the solvent extraction of fats and oils, comprises a rotatable jacketed digester. The treatment chamber is provided with a chordal filter diaphragm, and the jacket, adjacent the filtrate space, is fitted with a longitudinal rib stout enough to have a plugged hole formed through it, affording an alternative drain for filtrate; the rib also facilitates drainage of condensed heating steam. The apparatus is provided with the following valved connexions. Through one trunnion: a rotatable pipe leading to the filtrate space of the chamber, also a non-rotating pipe turned upwards within the chamber through which mixed vapours of H₂O and solvent are withdrawn, by vac. if desired. Through the other trunnion: an inlet for steam to the jacket opposite the rib, two outlets adjacent each side of the rib for condensate, also several injection pipes rotating with the shell and connected to a rotary valve so that only those pipes that are below the level of the pulp are supplied with treating fluid, *e.g.*, internal steam. Charging and discharging of the solid matter are effected through manholes. B. M. VENABLES.

Continuous extraction and filtration. P. L. FAUTH GES.M.B.H. (B.P. 357,172, 12.6.30. Ger., 14.6.29).—Extraction of seed and like material and filtration of the extract are effected simultaneously in a substantially horizontal rotating cylinder of which at least part of the wall is permeable, the membrane being, *e.g.*, silk impregnated against moisture. The material is caused to progress by helical blades and the solvent flows counter-current; the countercurrent effect may be emphasised by dividing the drum into a number of sections by means of constrictions. B. M. VENABLES.

Deflocculation of colloids. W. O. BORCHERT, Assr. to NEW JERSEY ZINC Co. (U.S.P. 1,799,277, 7.4.31.

Appl., 1.4.25).—Finely-divided solids, *e.g.*, a mineral pulp, are mixed with an electrolyte and with sulphite waste liquor and the colloids thus deflocculated may be removed to any desired extent by decantation.

B. M. VENABLES.

[Multiple-effect] evaporation of liquids. D. D. PEEBLES (U.S.P. 1,799,478, 7.4.31. Appl., 5.2.25).—The liquid is heated and sprayed into a number of superposed flash-evaporating chambers in series downwardly, the pressure being reduced at each stage and the liquid collected in a pool before passing to the spray next below, but not being reheated in the evaporator. The liquid is returned to the top of the series by a pump and on its way is preheated by the vapours from all stages except the lowest and finally heated by steam or other external heat.

B. M. VENABLES.

Vessels for containing acid and other liquids. H. RÖMMLER A.-G. (B.P. 357,327, 28.7.30. Ger., 29.7.29).—The vessels are constructed of panel plates of pressed artificial resins joined by grooved strips of the same material and secured by pegs, screws, etc. preferably also of the same material.

B. M. VENABLES.

Gas and liquid contact apparatus. F. H. WAGNER, Assr. to BARTLETT HAYWARD Co. (U.S.P. 1,798,822, 31.3.31. Appl., 14.9.28).—The gases enter through a central cylindrical screen and are then mixed with the liquid in a disintegrator of the intercalating-pin type, surrounding which is a centrifugal fan that, besides applying the draught, acts also as a moisture eliminator.

B. M. VENABLES.

Gas and liquid contact apparatus. S. G. STYRUD, Assr. to KOPPERS Co. (U.S.P. 1,798,563, 31.3.31. Appl., 4.4.29).—A scrubbing tower is divided into sections; at the top and between each section the descending liquid is collected and flushed intermittently on to the section below, to give a more uniform wetting with less liquor than if continuously dribbled on.

B. M. VENABLES.

Gas and liquid contact apparatus. C. M. ALEXANDER (U.S.P. 1,796,135, 10.3.31. Appl., 17.3.28).—Bubbling trays are described in which the downflows are in one vertical line, and on each tray weirs are provided to cause the liquid to flow across the centre and back by the sides.

B. M. VENABLES.

Gas cleaner. J. P. DOVEL, Assr. to G. P. DOVEL (U.S.P. 1,797,906, 24.3.31. Appl., 2.2.28).—In a cleaner (for blast furnaces etc.) of the type in which the gases come into contact with H₂O and wetted surfaces, reciprocating scrapers are provided in the valleys where the scale and sludge collect, the scrapers being dragged by a main and tail rope.

B. M. VENABLES.

Separating the constituents of gaseous mixtures. C. C. VAN NUYS and J. L. SCHLITT, Assrs. to AIR REDUCTION Co., Inc. (U.S.P. 1,799,937, 7.4.31. Appl., 12.10.27).—A large proportion of air (or other gaseous mixture) is separated into O₂ and N₂ of substantial purity by two rectifiers. The air is compressed and cooled by external means, part is liquefied by heat exchange with outgoing products, and the unliquefied part is expanded and liquefied by heat exchange with outgoing O₂ and then rectified to give pure N₂ gas, using a N₂ reflux. The liquid effluent from the first

rectifier is passed to the second, which utilises the first-mentioned portion of liquid air as reflux and yields pure liquid O₂ with some waste of gases approximating to air.

B. M. VENABLES.

Separation of gases. R. L. HASCHE, Assr. to AMER. SMELTING & REFINING Co. (U.S.P. 1,798,733, 31.3.31. 12.11.27).—In, *e.g.*, the separation of SO₂ from furnace gases, the impure moist gases are first passed through a small bed of adsorbent which is saturated with SO₂ but capable of absorbing impurities and H₂O and then through the main adsorbent which has selectivity for SO₂. The first bed, being small, may be regenerated by heat, but the larger one, being protected from impurities, will continue to function by simple change of pressure.

B. M. VENABLES.

Separation of vapours from gases by refrigeration. M. FRÄNKEL (B.P. 356,889, 28.7.30. Ger., 27.7.29. Addn. to B.P. 294,354 and 308,288; B., 1928, 697; 1930, 492).—In the process described in the prior patents, the gas is admitted to the refrigerator or direct-contact cooler at different levels at different times, utilising more of the refrigerator as the incoming gas gets warmer.

B. M. VENABLES.

Catalysing gaseous reactions. E. B. MILLER, Assr. to SILICA GEL CORP. (U.S.P. 1,799,858, 7.4.31. Appl., 21.2.25).—The catalyst is carried in suspension in the gaseous current, and the mixture is heated or cooled during the reaction by transverse heat-exchanging tubes in which the cooling medium may often be the arriving gases. After the reaction the solid pulverulent catalyst is separated by a cyclone (followed if necessary by wet methods) and their activity continuously regenerated before returning to the circuit. The process is applicable to the manufacture of H₂SO₄ and to the cracking of petroleum; in the latter case the catalyst may consist of SiO₂ gel (H₂O adsorption 21% at 30°, partial pressure 22 mm.) having an active agent containing Fe.

B. M. VENABLES.

Preparation of adsorbent [clay] material [for decolorisation of oils]. R. E. MANLEY and M. L. LANGWORTHY, Assr. to TEXAS Co. (U.S.P. 1,796,799, 17.3.31. Appl., 20.10.26).—The clay is treated on the countercurrent principle with hot 10% H₂SO₄.

A. R. POWELL.

Treatment of decolorising agents. R. C. PALMER, Assr. to NEWPORT Co. (U.S.P. 1,794,537, 3.3.31. Appl., 24.12.27).—Clay that has been used for decolorising rosin is revived by washing with petroleum naphtha, then with a 1:1 mixture of naphtha and EtOH, and again with the naphtha. EtOH is recovered by fractional distillation.

D. K. MOORE.

Thermocouples for use in measuring temperatures. BRIT. THOMSON-HOUSTON Co., LTD., Asses. of H. C. STAEBLE (B.P. 357,413, 11.11.30. U.S., 12.11.29).—A thermocouple for temp. above 2000° is constructed of TaC₅ (which will not recrystallise at high temp.) and graphite; the e.m.f. generated is about 1 millivolt per 100° difference.

B. M. VENABLES.

Colorimeter. W. L. PATTERSON, Assr. to BAUSCH & LOMB OPTICAL Co (U.S.P. 1,799,639, 7.4.31. Appl., 30.1.26).—A colorimeter of the type in which the depth

of the liquids to be compared is varied by the greater or smaller immersion of transparent plungers is provided with a device by which the scales showing the effective depth of the liquid samples may be read by the same diffused light as is used for the matching.

B. M. VENABLES.

Production of specimens or negatives for use in the microscopical observation of the surfaces of substances. GUNZE SEISHI KABUSHIKI KWAISHA (B.P. 358,378, 30.12.30. Jap., 25.10.30).—An amyl acetate solution of celluloid is applied to the surface; after solidifying, the celluloid film is stripped off, and furnishes a replica of the surface.

J. LEWKOWITSCH.

Refrigerant absorbents. FRIGIDAIRE CORP., ASSEES. of H. F. SMITH (B.P. 353,903, 29.4.30 U.S., 30.5.29).—See U.S.P. 1,791,515; B., 1931, 952.

Producing fine-bubbled foam for fire-extinguishing purposes. N. SANDOR (B.P. 357,639, 27.6.30).

Dehydrating agent. Antifreeze solution.—See VII. Tunnel kiln.—See VIII. Treatment of fumes.—See XIII.

II.—FUEL; GAS; TAR; MINERAL OILS.

Absorption and retention of hydrocarbons by solid fuels. III. B. MOORE (Fuel, 1931, 10, 436—442; cf. B., 1931, 748).—No well-defined relation could be found between the chemical composition of the fuels and their capacities for absorbing and retaining the vapours of H₂O, paraffin hydrocarbons from pentane to decane, C₆H₆, PhMe, and xylene. Coke exhibited a relatively greater absorptive capacity for H₂O vapour than for hydrocarbon vapour, whilst the reverse was true for coals. The absorptive capacity of a coal for C₆H₆, PhMe, and xylene decreased with increasing mol. wt. of the hydrocarbon; that for the paraffin hydrocarbons passed through a max. for hexane and thereafter decreased with increasing mol. wt. There was no definite relation between the retentive capacities of the fuels and the physical or chemical characteristics of the hydrocarbons absorbed.

A. B. MANNING.

Record of tests on the drying of coal. R. A. MORT (Fuel, 1931, 10, 424—435).—Details are given of a week's test on the "Universal" coal dryer. The dryer is made of cast Fe, is vertical, and uses a gravity feed from section to section. Each section contains a six-sectioned spider. The spiders are staggered in position and revolve in opposite directions in adjacent sections. The coal is heated by a countercurrent of hot gases from a gas-fired furnace. The dryer is simple to control and is economical in ground space. The principal results of the test were: capacity of the dryer 42 tons/hr.; average temp. of gases entering 420°; H₂O content of coal entering and leaving the dryer 14.2% and 9.6%, respectively; consumption of heating gas (504.5 B.Th.U./cu.ft.) 20,200 cu. ft./hr.; power requirement 0.5 h.p./ton; evaporation efficiency 60.4%; heating efficiency 86.6%.

A. B. MANNING.

Determination of the moisture content of hard coal and lignite. C. HOLTHAUS (Arch. Eisenhüttenw., 1931—2, 5, 149—162).—The results obtained by various methods are critically discussed. Drying a small pow-

dered sample at 105° yields incorrect results owing to adsorption of air, oxidation of part of the coal, and volatilisation of the more volatile hydrocarbons, but correct results may be obtained by drying a large sample of uncrushed coal overnight at 105°. The most accurate results for powdered coal are obtained by drying in vac., by distillation with xylene, by drying at 105° and absorption of the H₂O in a dehydrating agent, and by extraction of the H₂O with abs. EtOH and light petroleum followed by determination of the cryohydric point.

A. R. POWELL.

Gum resin production and dry distillation. P. BOBROV (Trud. Vyat. Nauk. Issledov. Inst. Kraev., 1929, 5, 74—80).—When heated at 245—275°, lignin gave chiefly products non-volatile in a high vac., 50% sol. in the usual org. solvents. Cellulose gave H₂O-sol. products of sweet-caustic taste; 42—45% were non-volatile. They gave reactions for carbohydrates, and were fermentable after treatment with dil. acid. The volatile matter contained much furfuraldehyde and hydroxymethylfurfuraldehyde.

Testing of solid fuels in general and splint coals in particular by vacuum distillation at increasing temperatures. L. B. DE MONGEOT (Giorn. Chim. Ind. Appl., 1931, 13, 411—413).—With a view to the classification of solid fuels, vac. distillation at temp. up to 1000°, followed by determination of the vols. and compositions of the gases obtained over successive temp. ranges, furnishes valuable information and gives indications concerning the val. of the fuel. Curves connecting the vol. of gas evolved with the temp. have their max. at 800° for anthracite and lignite, and at 600—700° for splint coal and peat.

T. H. POPE.

Evolution of gas from re-heated coke. K. BUNTE and W. LUDEWIG (Gas- u. Wasserfach, 1931, 74, 893—900, 921—925).—The usual methods of determining the volatile matter content of cokes are unsatisfactory owing to insufficient duration of heating and consequent incomplete evolution of volatile matter. The evolution of volatile matter from coke was investigated by heating powdered coke (4 g. dried at 105° and contained in a porcelain boat placed in an electrically heated Pythagoras "Compo" tube) in pure N₂ at low pressure. The evolved gas was withdrawn by a Hg pump, displaced into collecting vessels and its vol. determined, and analysed. The % of volatile matter was calc. from the amount and composition of the gas. Ten samples of coke from various sources (which are reported) were heated for 2 hr. at 1000°, 1100°, 1200°, and the amount and composition of the gas determined at intervals. The most rapid evolution of gas occurred during the first 60 min. (75% of gas evolved during first 25—50 min.) and only small amounts were evolved afterwards. The total amount of gas (*i.e.*, volatile matter content) increased with rise of temp. It is concluded that the amount of volatile matter evolved increases with time of exposure at a given temp. and with rise of temp. when the duration of heating is fixed. Evolution of gas is probably due to pyrogenic decomp. of the coke constituents. Analyses of the gas evolved indicate that rise of temp. or longer exposure to a given temp. results in increase of H₂ content of the gas. Results of analyses

of the coke before and after heat treatment are described and discussed. It is concluded that a technical method for the determination of the volatile matter content of coke can only be arbitrary. H. E. BLAYDEN.

Reducing power of blast-furnace coke and a new apparatus for its determination. M. RIEFFEL (*Chim. et Ind.*, 1931, 26, 280—288, 531—540).—The reducing power of coke is determined by measuring the CO:CO₂ ratio in the gas produced by passing a measured quantity (*e.g.*, 20 c.c.) of CO₂ through 25 c.c. of coke (1—2-mm. particles) heated at 950° in a vertical SiO₂ tube. The % CO in the gas mixture is the reducing power of the coke; for a good blast-furnace coke the min. val. is 40. Coke with a lower reducing power is hard and graphitic and is more suitable for foundry purposes, whereas coke with a higher reducing power than 75% is generally too soft for blast-furnace use.

A. R. POWELL.

Heat-treatment of hydrocarbons with special reference to gaseous hydrocarbons. A. E. DUNSTAN, E. N. HAGUE, and R. V. WHEELER (*J.S.C.I.*, 1931, 50, 313—318 T).—From a consideration of the paraffin hydrocarbons, C₂H₆ to C₆H₁₄, it is concluded that in the primary decomp. rupture of the chain can take place at any position producing an olefine and the complementary lower paraffin, or at the limit H₂. As the series is ascended the tendency for H₂ to be eliminated as a primary reaction product rapidly diminishes. With CH₄ the absence of a C-C linking causes it to differ from the C-chain paraffins and increases its stability. The suggested mechanism is: CH₃·H = CH₂· + H·H and then 2CH₂· = CH₂·CH₂ → aromatic hydrocarbons, and also CH₂·CH₂ + H₂ = CH₃·CH₃. With the olefines, ethylene, propylene, and the two unbranched butylenes, the principal primary reactions, common to all, involve the formation of either the two-C or the four-C (or both) atom members of the olefine series. If conditions are drastic, secondary reactions occur with the decomp. of butylene to give butadiene and H₂ in one case and propylene and CH₄ in the other. An important secondary change with propylene is the formation of CH₄ and C₂H₄, probably by hydrogenation of the radicals formed by scission of the C chain at the single linking. Of the two butylenes it was found that Δ^β-butylene was more stable than Δ^α-butylene and the mode of decomp. is indicated. The paraffin hydrocarbons, with the exception of CH₄, show a transition range of 700° to 750° in which the production of C₂H₄ reaches a max. Below 725° each hydrocarbon follows its own course, but at the higher temp. there is a close similarity in behaviour. All evidence serves to indicate that the common source of the aromatic hydrocarbons produced above 750° is a C₂ unsaturated hydrocarbon, and that C₂H₄, and not C₂H₂, fulfils all the necessary conditions. With both paraffins and olefines C₂H₄ would appear to be the starting point for the production of aromatic hydrocarbons. Details and tables are given of the production of liquid hydrocarbons by pyrolysis. From CH₄ the best yield of aromatic hydrocarbons (8·8%) was obtained at 1050°, whilst the hydrocarbons C₂H₆ to C₅H₁₂ produce 22—27% of aromatic liquids in the temp. range 800—900°. C₆H₁₄ at 800—850° gives a 33·8% yield. With

the olefine hydrocarbons the conversion into liquids is equiv. to 36—40% of the olefine passed in the temp. range 700—800°. The "spirit" obtained consists chiefly of C₆H₆ and some PhMe, styrene, and xylenes. The influence of pressure and dilution on pyrolysis reactions is considered.

Chemical problems in refining petroleum. I. M. D. TILITSCHEEV and K. S. KURUINDIN (*Neft. Choz.*, 1930, 1, 586—598).—Mono-substituted homologues of C₆H₆ were prepared from gasolines and kerosenes obtained by cracking, and the influence of the concentration of olefines relatively to C₆H₆, the amount and nature of the catalyst, the temp., and method of adding AlCl₃ or AlBr₃ was studied. Instead of fresh AlCl₃ or AlBr₃, sludge obtained in previous experiments can be used. Physical properties of the products are recorded. All the mono-substituted C₆H₆ homologues have *d* approx. 0·865. The higher homologues are difficult to sulphonate. CHEMICAL ABSTRACTS.

Refining of mineral oils with absorbent substances. B. SALADINI (*Atti III Cong. Naz. Chim. pura. Appl.*, 1929, 584—606; *Chem. Zentr.*, 1931, i, 2827).—C has little bleaching and scarcely any desulphurising effect. Fuller's earth has marked decolorising and desulphurising properties. SiO₂ gel has an even greater desulphurising effect, but less decolorising effect. Bauxite gives the best results. A. A. ELDRIDGE.

Gasoline fractions of representative Japanese crude petroleum. IV. [Determination of aromatic hydrocarbons.] M. MIZUTA (*J. Soc. Chem. Ind., Japan*, 1931, 34, 330—331 B; *cf. B.*, 1931, 1034).—The aromatic content of straight-run gasolines has been determined by the aniline-point method (*cf. Tizard and Marshall, J.S.C.I.*, 1921, 40, 20 T) by using the following conversion factors for calculating the content from the difference in aniline point before and after sulphonation: C₆H₆ 1·231, PhMe 1·182, xylene 1·223; and by using 97° and 120° as the cutting temp. for the C₆H₆, PhMe, and xylene fractions. The results are inaccurate with gasolines of high aromatic content. Methods of determining the aromatics by extraction with liquid SO₂ or by nitration were unsuccessful. A. B. MANNING.

Metallic constituents of crude petroleum. W. B. SHIREY (*Ind. Eng. Chem.*, 1931, 23, 1151—1153).—Analyses of a number of petroleum ashes are given. The quantity of rarer elements contained is not sufficiently high to make petroleum ash of value as a source of these metals. Ni was found in almost all the crude oil examined. V occurs in the more asphaltic crudes, but is not present in any quantity in paraffin-base crudes. A high V content is generally associated with a high Ni content. There appears to be no regularity in the amounts of other inorg. matter in petroleum ash.

T. A. SMITH.

Isolation and determination of the cyclohexane in a midcontinent petroleum. J. H. BRUUN and M. M. HICKS-BRUUN (*Bur. Stand. J. Res.*, 1931, 7, 607—615).—From an Oklahoma petroleum 0·33% of cyclohexane has been separated. R. CUTHILL.

Gumming tendencies of pure olefines in gasoline. H. A. CASSAR (*Ind. Eng. Chem.*, 1931, 23, 1132—1134).—A number of olefines and diolefines, free from peroxides,

were mixed with olefine-free gasoline and examined for gum formation under various conditions. Simple olefines in 20% concentration do not produce gum after oxidation for 4 hr. at 100° and under 100 lb. air pressure, but begin to do so after 20 hr. Diolefines give large quantities of gum when evaporated in a porcelain dish. The formation of gum is catalysed by the presence of peroxides. H_2SO_4 transforms diolefines into gum, as also does SO_2 when peroxides are present. Peroxides are decomposed by NaOH and a gasoline with gumming tendencies due to peroxides may be improved by NaOH treatment. A gasoline which does not contain peroxides may or may not be improved by treatment with alkali. CH_2O may also be used to destroy olefine peroxides. Removal of peroxides should be carried out before determination of the knock-ratings of olefines.

T. A. SMITH.

Antidetoning properties of gasolines from Baku. V. ELANSKI (Azerbaij. Neft. Choz., 1931, No. 2—3, 78—85).—The C_6H_6 -heptane equiv. does not necessarily correspond with the aromatic equiv. determined by chemical analysis. Straight-run distillates have better antidetoning qualities than cracked products, except gasolines from Binagadin crude oils.

CHEMICAL ABSTRACTS.

Testing antidetoning properties of gasolines. J. KLIGERMAN (Azerbaij. Neft. Choz., 1931, No. 2—3, 72—78).—The chemical aromatic equiv. does not correspond with the C_6H_6 -heptane (motor) equiv.

CHEMICAL ABSTRACTS.

Detonation and auto-ignition temperature of gasolines. N. KALANTAR (Azerbaij. Neft. Choz., 1931, No. 2—3, 85—91).—The auto-ignition temp. in O_2 and particularly in air depends on the detoning properties. The average b.p. is inversely proportional to the C_6H_6 equiv. Chemical analysis and d do not indicate antiknock properties. CHEMICAL ABSTRACTS.

Oils for steel treatment.—See X. **Petroleum oil sprays.**—See XVI.

PATENTS.

Production of solid fuel. TRENT PROCESS CORP. (B.P. 357,423, 24.11.30. U.S., 26.11.29).—A coal-oil amalgam is made by the process of B.P. 151,236 (B., 1921, 684 A) with a relatively light oil, e.g., gasoline, naphtha, and is then distilled to recover the oil. An oil binder is added to the hot residue, and after distillation of the more volatile constituents of the binder by the sensible heat of the residue the mixture of coal and binder is briquetted. The briquettes are finally carbonised.

A. B. MANNING.

Manufacture of [fuel] briquettes. G. KOMAREK, Assr. to KOMAREK-GREAVES & Co., G. MACPHAIL, and C. CORYELL (U.S.P. 1,796,465, 17.3.31. Appl., 25.7.29).—Petroleum coke is mixed with coke breeze, preferably low-temp. coke breeze, and briquetted. If the petroleum coke is relatively low in volatile matter content a binder may be added. If desired, the briquettes may subsequently be coked at 400—900°. A. B. MANNING.

Coking retort oven. J. BECKER, Assr. to KOPPERS Co. (U.S.P. 1,799,670, 7.4.31. Appl., 31.10.27).—The heating walls of the oven diverge slightly so as to provide vertical flues wider at the bottom than at the top, and

coking chambers relatively narrower at the bottom than at the top. The heating gases are supplied to the bottom of the flues and the waste gases withdrawn from the top. Steam-distributing channels below the chambers supply steam to the chambers through ports in the bottom thereof. The steam may be passed through superheating channels in the heating walls before being admitted to the distributing channels. By these means the coking operation in the lower part of the retort is completed before that in the upper part, and the lower part of the charge may be steamed relatively early in the coking period.

A. B. MANNING.

Recording devices for coke ovens. H. WADE. From H. KOPPERS A.-G. (B.P. 357,187, 18.6.30).—A device for recording the movements of the pusher and/or the leveller into and out of the ovens, and of the pusher mechanism along the battery, is described.

D. K. MOORE.

Carbonisation of coal by the low-temperature process. W. RUNGE, Assr. to INTERNAT. COAL CARBONIZATION Co. (U.S.P. 1,797,796, 24.3.31. Appl., 12.6.25).—Pulverised coal is carbonised by allowing it to fall through an upward current of heating gases at about 565° in a vertical retort. The upper part of the retort is cooled, e.g., by being water-jacketed, and the vapours condensed therein are returned to the carbonising zone wherein they are cracked. The coke produced falls into a chamber at the bottom of the retort.

A. B. MANNING.

Carbonising process and apparatus. TRENT PROCESS CORP. (B.P. 357,425, 24.11.30. U.S., 26.11.29).—The apparatus comprises a number of superposed, horizontal, tubular retorts connected in series and heated externally by hot combustion gases; each retort is provided with a screw conveyor. The material to be carbonised consists of pulverised coking coal, the agglomerating action of which has been reduced by the addition of a suitable proportion of hot carbonised coal. The lower tubes are water-cooled, and the steam thereby generated is passed through the carbonising zone in order to facilitate removal of the volatile products, which are withdrawn through the hollow shafts of the screw conveyors.

A. B. MANNING.

Distilling plant [for wood]. J. T. MYERS (U.S.P. 1,795,404, 10.3.31. Appl., 10.8.28).—The wood is packed into an approx. rectangular, steel-walled retort the bottom of which is inclined from front to rear. The retort is heated by furnaces arranged on either side thereof. Steam-supply pipes are arranged within the top of the retort in such a manner as to direct the steam against the heated walls. An angle pipe leading from the bottom of the rear wall of the retort has a box-like trap at the end which dips into a tank below the level of the retort. The vapours evolved are withdrawn through a conduit opening near the centre of the bottom of the retort and are passed thence to a condenser.

A. B. MANNING.

Production of coke and gas in intermittently operated oven chambers. C. STILL (B.P. 357,057, 10.2.31. Ger., 11.2.30).—The volatile distillation products are withdrawn separately from the upper gas-collecting space and from ducts formed in the interior

of the charge (cf. B.P. 354,664; B., 1931, 957), the gaseous pressure in the upper space being maintained const., *e.g.*, at 0 mm. water-gauge, whilst the pressure in the ducts is gradually reduced to at least 100 mm. water-gauge below atm., and is again raised to 0 mm. before the end of the coking process. The quality of the products is improved and the time of carbonisation reduced.

A. B. MANNING.

Production of carbon black. C. MATLOCK, Assr. to MONROE-LOUISIANA CARBON Co. (U.S.P. 1,798,614, 31.3.31. Appl., 14.3.21).—Hydrocarbon gases are burned in a furnace in a regulated supply of air forced thereto below the burners. On passing upwards in the furnace the air and gas enter a zone of hot products of combustion and burning gases. The hot gases and suspended C are withdrawn by regulated suction through a suitable outlet, are cooled, and the C is separated therefrom. The desired temp. and velocity conditions in the furnace are controlled by permitting a small, carefully regulated proportion of the hot gases to escape from the top of the furnace.

A. B. MANNING.

Catalytic manufacture of carbon black. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 357,135, 13.6.30).—Carbonaceous gases, *e.g.*, CO or hydrocarbons, are passed through heated chambers made of material that will promote the decomp., *e.g.*, Cu, and of such form that the catalyst, *e.g.*, Ni or CO, falls through the gas stream. The deposited C is separated from the catalyst by flotation, dissolution of the latter by acid, or magnetic separation.

D. K. MOORE.

Manufacture of amorphous carbon. A. L. ULLRICH (U.S.P. 1,796,815, 17.3.31. Appl., 24.4.25).—Tar is heated to liquefy it, a solvent, preferably benzol, is added, and the solution is treated with a relatively heavy hydrocarbon oil, *e.g.*, fuel oil or kerosene, in sufficient quantity to ppt. the C particles. The ppt. is washed with a solvent such as light oil and the residual C is dried.

A. B. MANNING.

Treatment of coal gas. T. A. CLAPHAM (B.P. 356,763, 3.5.30).—C₁₀H₈ and moisture are removed from the gas by cooling it, first by indirect contact with gas that has already passed through the process, and secondly by indirect contact with a cold liquid, *e.g.*, brine cooled in a refrigerator. The cooling is carried out in chambers traversed by tubes through which the cooling medium is circulated. A solvent oil is sprayed into the chambers and carries the deposited C₁₀H₈ from the apparatus with the condensed H₂O.

A. B. MANNING.

Manufacture of combustible gas. H. O. LOEBELL, Assr. to H. L. DOHERTY (U.S.P. 1,790,824, 3.2.31. Appl., 15.3.24).—A mixture of coal and coke is passed down a vertical shaft. A high-temp. zone is maintained at the mid-position by intermittent blasting with air, and between these operations steam is introduced, forming water-gas. This gas, in passing upward, distils volatile products from the descending coal. The heat in the products of the blasting is recovered. The coke and ash leaving the bottom of the shaft are quenched with steam or H₂O which rises upwards through the shaft.

D. K. MOORE.

Producing a combustible gaseous mixture free from carbon monoxide. H. KEMMER (B.P. 356,838, 21.6.30. Ger., 22.6.29).—Coal gas, water-gas, etc. are freed from CO by treating them first with steam, whereby the greater part of the CO reacts according to the equation $\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{H}_2$, and then converting the residual CO into CH₄ by interaction with H₂. The first stage is carried out in the presence of a suitable catalyst, *e.g.*, Fe containing Cr₂O₃, in conjunction with active C, or lignite coke, etc., and the second stage in the presence of a hydrogenating catalyst, *e.g.*, Ni, in conjunction with Al₂O₃, active C, etc. Before treatment in the second stage the gas is freed from H₂S.

A. B. MANNING.

Manufacture of producer gas. TRENT PROCESS CORP. (B.P. 357,424, 24.11.30. U.S., 26.11.29).—Anthracite is passed through a heating zone, wherein it is distilled, before its introduction into a gas producer, whereby the necessity for scrubbing the producer gas is obviated.

A. B. MANNING.

Water-gas process. W. J. EDMONDS, Assr. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,799,359, 7.4.31. Appl., 24.12.26).—Water-gas from a generator of the usual design is passed successively through a desulphurising tower, containing Fe or Fe₂O₃, a water-seal, a condenser, and a scrubbing tower. The gases enter the desulphurising tower at 300–650° and leave at 175–450°. The desulphurising material is revived at intervals by passing through it air, steam, and/or part of the blow gases from the generator.

A. B. MANNING.

Oil-gas generator. E. RECTOR, Assr. to RECTOR GASIFIER Co. (U.S.P. 1,799,247, 7.4.31. Appl., 22.11.26).—A generator designed for use in conjunction with an internal-combustion engine, and to operate continuously and automatically during operation of the engine, is claimed.

A. B. MANNING.

Treatment of gases [for recovery of gasoline]. H. J. NICHOLS, JUN., and E. W. LUSTER, Assrs. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,799,619, 7.4.31. Appl., 27.6.27).—Low-pressure refinery gas is compressed by the expansion of a similar high-pressure gas, and is cooled; the condensed gasoline is withdrawn, the gases are mixed at an intermediate pressure, and the residual gasoline therein is recovered, *e.g.*, by oil scrubbing. Other gases containing a volatile substance may be similarly treated.

A. B. MANNING.

Cracking of oil. R. T. POLLOCK, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,799,530, 7.4.31. Appl., 24.11.20. Renewed 24.3.27).—Preheated raw oil mixed with a definite proportion of reflux is cracked and passed into an expansion chamber. The vapours from this are fractionated and the reflux mixes with the raw oil. Throttle valves enable the system to be operated under a differential pressure.

D. K. MOORE.

Oil [cracking] treatment. PETROLEUM CONVERSION CORP. (B.P. 357,265, 24.6.30. U.S., 24.6.29).—Oil is vapourised and mixed with a carrier gas, heated to above the cracking temp. of the oil to bring about conversion thereof, and the temp. and vol. of one of the components of the mixture, *e.g.*, that of the oil vapour, are so regulated as to produce a mixture in which the % S does not exceed

a predetermined figure (1%) below which no substantial corrosion takes place. The resulting mixture is cooled to separate products suitable as motor fuel.

H. S. GARLICK.

Cracking of petroleum oils. D. G. BRANDT, Assr. to DOHERTY RES. Co. (U.S.P. 1,791,114, 3.2.31. Appl., 3.5.27).—The reflux from a dephlegmator is heated to cracking temp. in a reflux furnace, but as its velocity of circulation is too rapid to cause serious cracking, it passes into a separator. From this the liquid flows into the top and the vapour into the bottom of a cracking chamber. On the top of this is the dephlegmator, and the vapour rising through the liquid in the former is fractionated in the latter by heating coils through which the raw oil flows on its way to the bottom, or liquid part, of the separator. The vapours from the dephlegmator are condensed to give the low-boiling oils. The liquid is withdrawn from the bottom of the cracking chamber and some from the bottom of the separator, the whole being passed into the bottom of a concentrator in which it boils owing to reduction of pressure. The vapours are fractionated and then condensed, the residual liquid is discharged, and the reflux passed into a residuum furnace in which it is heated to cracking temp. and from which it passes into the separator. The uncondensed gases from the condenser receiving the vapours from the dephlegmator may be passed back into either the residuum or reflux furnace, thereby carrying more oil into the dephlegmator and giving more reflux if desired; since the deposition of C is accompanied by the formation of such gases, the deposition will be reduced according to the law of mass action.

D. K. MOORE.

Treatment [cracking] of petroleum oils. L. C. HUFF, Assr. to UNIVERSAL OIL PRODUCTS Co (U.S.P. 1,793,443, 17.2.31. Appl., 25.2.29).—The oil is heated in a furnace in which the hottest gases come in contact with the tubes containing the coldest oil, thereby prolonging their life, and then passed into a vaporising chamber from which the heavy oil is withdrawn at the bottom; the vapours leaving the top are fractionated and condensed, giving light oil, and the reflux is returned to the furnace.

D. K. MOORE.

Conversion [cracking] of petroleum oil. W. R. HOWARD, Assr. to UNIVERSAL OIL PRODUCTS Co (U.S.P. 1,791,622, 10.2.31. Appl., 4.3.27).—Oil is cracked in the main retort fitted with agitators and the vapours are returned and pass through the oil in the still before being carried to the reflux tower by the vapour pipe. The condensate in the vapour pipe is returned to a reflux still situated inside the main retort in which further cracking takes place, and the residual liquid is pumped into an auxiliary still into which also flows the reflux from the reflux tower. This still is heated and cracking occurs. The vapours and those from the reflux still pass into the main vapour pipe. The liquid left in the auxiliary still may be returned to the main retort.

D. K. MOORE.

Production of liquid hydrocarbons from solid fuels. PHYSICAL CHEM. RES. Co. (B.P. 357,206, 30.5.30. Belg., 4.6.29).—Coal is passed through an apparatus wherein it is subjected successively to distillation at

about 500°, distillation at about 900°, and combustion in a furnace which acts as a producer giving water-gas. The gases obtained in the three stages are mixed together, H₂ is obtained by the decomp. of steam added thereto, and the mixture is submitted, at least partly, to the action of a high-potential electrostatic field, and, at least partly, to ultra-violet rays. The liquid hydrocarbons thereby produced are condensed.

A. B. MANNING.

Production of liquid, in particular aromatic, hydrocarbons. J. Y. JOHNSON. From I. G. FARBERIND. A.-G. (B.P. 357,170, 10.6.30).—Gaseous paraffin hydrocarbons, in particular CH₄ or gases containing more than 80% of CH₄, are subjected to thermal treatment at 700—1200° in the presence of a catalyst consisting of free Si.

A. B. MANNING.

Refining of hydrocarbon oils with metal salts. A. LACHMANN, Assr. to RICHFIELD OIL Co. OF CALIFORNIA (U.S.P. 1,826,139 and 1,826,142—7, 8.5.29).—The process described in B.P. 353,053 (B., 1931, 915) is carried out with aq. solutions of salts of Cu, Fe, Cr, Mn, Al, Ni, and Co, respectively.

Treatment of light hydrocarbons to reduce the risk of ignition from spark formation. W. KRITCHEVSKY and E. MORRILL (B.P. 356,717, 6.6.30. U.S., 20.6.29).—A small proportion of a compound of the type NXR₃Y is added to the hydrocarbon, where R is H, an alkyl group, OH, or a substituted alkyl group, X is Ph, CH₂Ph, an alkyl or substituted alkyl group, and Y is a fatty acid residue. NEt₃ oleate, NH₃Et stearate, triethanol-ammonium oleate, etc. may be used. It is convenient to add them in the form of a solution in Pr^oOH etc. Their addition increases the electrical conductivity of the hydrocarbon and so prevents the formation of dangerous charges of static electricity.

A. B. MANNING.

Liquid fuel. J. L. WHITEMAN (B.P. 357,453, 31.12.30).—The fuel comprises a crude oil or oils, e.g., petroleum, shale oil, and oils from coal distillation, and at least such proportions of one or more of the lower monohydric aliphatic alcohols, e.g., MeOH, EtOH, that the tar and other normally insol. constituents of the crude oil, e.g., wax, are dissolved or held in suspension. Small quantities of petrol, benzol, etc. may be present.

H. S. GARLICK.

Colouring of gasoline or other petroleum distillates. A. L. MOND. From PATENT FUELS & COLOR CORP. (B.P. 357,179, 17.6.30).—A stabilised solution of an org. dye that normally changes colour or separates out from gasoline or other petroleum distillate on storing is prepared by mixing with such dye a H₂O-insol. soap of at least one of the metals Al, Mg, Ca, Zn, e.g., Al stearate, dissolving the mixture in benzol or other blending agent, and adding this solution to the gasoline etc. Several suitable dyes are mentioned.

H. S. GARLICK.

Mixing material to be briquetted with a liquid binding medium [with a rotary conveying pump]. E. KLEINSCHMIDT (B.P. 357,863, 29.11.30. Ger., 18.12.29. Addn. to B.P. 322,220).

Devices for moulding coking materials. G. HILGER (B.P. 357,591, 25.6.30).

Apparatus for charging horizontal coke ovens with rammed coal cakes. C. STILL (B.P. 358,330, 11.11.30. Ger., 16.11.29).

Process and means for discharging retort ovens. "INTERTRUST" COMP. GÉN. DE DISTILLATION ET COKÉFACTION À BASSE TEMP. ET MINÈRE SOC. ANON., Assees. of INTERNAT. HOLDING DE DISTILLATION ET COKÉFACTION À BASSE TEMP. ET MINÈRE (HOLCOBAMI) (B.P. 358,385, 12.1.31. Belg., 24.1.30).

Burner for pulverulent or gaseous fuels. ALLGEM. ELEKTRICITÄTS-GES. (B.P. 358,092, 2.7.30. Ger., 2.7.29. Addn. to B.P. 304,142).

Construction of burners for gas-fired ovens or kilns for use in manufacture of tiles, pottery, and other ware. H. STEELE (B.P. 358,292, 15.10.30).

Apparatus for burning liquid fuels. F. WATSON. FROM AKTIEBOLAGET BENZO-GAZ (B.P. 357,689, 22.7.30).

Kiln for low-temp. carbonisation. Heat exchanger [for stills]. Catalysing gaseous reactions. Clay for decolorisation of oils.—See I. H_2 .—See VII. Graphite crucibles.—See VIII. Bituminous concrete. Covering for road surfaces.—See IX. Sand moulds. Steel alloy [for oil cracking].—See X. Dielectric material. Carrying out chemical reactions.—See XI. Resin from coal.—See XIII. Explosive gas mixtures.—See XXII.

III.—ORGANIC INTERMEDIATES.

Quantitative study of the preparations of guanidine nitrate and nitroguanidine. G. B. L. SMITH, V. J. SABETTA, and O. F. STEINBACH, JUN. (Ind. Eng. Chem., 1931, 23, 1124—1129).—Fusion of dicyanodiamide and NH_4NO_3 at 162—165° for 1 hr. results in max. conversion into guanidine nitrate, m.p. 217° (corr.), which may be separated from the crude fusion melt in 86% yield by crystallisation from H_2O at 80° followed by hot MeOH. Alteration of these conditions leads to decreased yields of product and contamination with amorphous material. Pure guanidine nitrate, ground to uniform fineness, added to 3 pts. by wt. of conc. H_2SO_4 below 0° gives a 92% yield of nitroguanidine. The reaction must not be prolonged more than 1 hr., otherwise hydrolysis proceeds more rapidly than nitration. F. R. SHAW.

Mechanism of catalytic hydrogenation of phenol under high pressure. S. ANDO (J. Soc. Chem. Ind., Japan, 1931, 34, 320—322 B).—With a $PhOH:5H_2$ mixture and an initial pressure of 117 atm. the principal product was cyclohexanol when the max. temp. was 260°, and cyclohexane when the max. temp. was 470°. With a $PhOH:2H_2$ mixture, an initial pressure of 48 atm., and a max. temp. of 260°, the principal product was cyclohexanone. From these results and a study of the hydrogenation of cyclohexanol etc. it is concluded that the reactions occur in the order: $PhOH + 2H_2 \rightarrow C_6H_{10}O + H_2 \rightarrow C_6H_{11}OH \rightarrow C_6H_{10}$ (cyclohexene) + $H_2 \rightarrow C_6H_{12}$. In the absence of H_2 the reaction $C_6H_{11}OH \rightarrow C_6H_{10}O + H_2$ tends to occur. A marked fluctuation in the temp.-pressure curve, which occurs at about 335° in the experiments with $PhOH$, even in N_2 , is

attributed to a physical change associated with the crit. phenomena of the liquids in the autoclave.

A. B. MANNING.

Catalytic oxidation of *p*-cymene in the vapour phase. C. E. SENSEMAN and J. J. STUBBS (Ind. Eng. Chem., 1931, 23, 1129—1131).—Oxidation of *p*-cymene with air in presence of V_2O_5 gives H_2O , CO_2 , CH_2O , HCO_2H , *p*-toluic and terephthalic acids. The optimum conditions for the production of *p*-toluic acid are: temp. 375°; space velocity 300 (litres of air used per hr. per litre of catalyst space), with 3—6 times the theoretical amount of air. Higher yields of acids are obtained through the use of V_2O_5 deposited on porcelain than by using granular fused oxide. Sn vanadate and finely-divided MnO_2 are less efficient. A method is given for the separation and determination of *p*-toluic acid from any H_2O -sol. acid. F. R. SHAW.

cycloHexane from petroleum.—See II. Derivatives of α -pinene.—See XIII. Et_2O , $EtOH$, $CHCl_3$, and CS_2 as bactericides.—See XIX. Acetylsalicylic acid solutions and derivatives.—See XX. Saponins.—See XXIII.

PATENTS.

Production of formaldehyde from methane and carbon dioxide. GUTEHOFFNUNGSHÜTTE OBERHAUSEN A.-G. (B.P. 353,076, 23.4.30. Ger., 29.4.29).—A mixture of CH_4 and an equal or greater vol. of CO_2 , preferably preheated, is passed one or more times between the plates of a condenser in a high-frequency circuit of high voltage, e.g., frequency 1.5×10^6 and voltage 80,000, with or without catalyst ($MgCO_3$); the yield is 150—210 g. of CH_2O per cu. m. of CH_4 at a gas speed of 1.5 cm./sec. C. HOLLINS.

Production of acetaldehyde [from alcohol]. K. WIESLER, A. M. PEAKE, and BRIT. INDUSTRIAL SOLVENTS, LTD. (B.P. 353,071, 17.4.30).— $EtOH$, steam, and air (etc.) are passed over Cu at 420—240°, Ag at 450—500°, or $AgVO_3$ or $Cu(NO_3)_2$ at 360—400°. The reaction proceeds without further supply of heat, and the temp. is regulated by the steam present. Suitable apparatus is figured. C. HOLLINS.

Manufacture of acetic and other organic acid anhydrides. U.S. INDUSTRIAL ALCOHOL CO. (B.P. 353,381, 13.3.31. U.S., 28.5.30).—The production of Ac_2O from $NaOAc$ or $Ca(OAc)_2$ and SO_2Cl_2 or SO_2 and Cl_2 is effected in liquid SO_2 (2—4 pts. for 1 pt. of acetate) at 0—20°; the solution of Ac_2O in SO_2 is filtered readily and fractionated. C. HOLLINS.

Concentration of acetic and other lower aliphatic acids. CELLULOSE ACETATE SILK CO., LTD., and D. HAYES (B.P. 352,585, 24.4.30).—The dil. acid is distilled with CH_2Cl_2 , the residue being 99% acid. The CH_2Cl_2 layer of the distillate may be returned to the fractionating column. C. HOLLINS.

Manufacture of alkyl chlorides and/or bromides from olefines or mixtures containing olefines. E. H. STRANGE and T. KANE (B.P. 353,032, 20.1. and 22.5.30).—The addition of HCl or HBr to olefines below C_7 is effected in presence of adsorbent materials, such as active C, active SiO_2 , "glauconil," or kieselguhr. The olefines may be diluted with paraffins, and the reactants

are preferably dried. *E.g.*, propylene (2 c.c. per g. of active C) and HCl are passed over active C at 70°, Pr²Cl being recovered by heating the adsorbent to 150°; C₂H₄ and HCl combine best under pressure.

C. HOLLINS.

Grinding of organic peroxides. N.V. INDUSTRIEEL MAATS. v./H. NOURY & VAN DER LANDE (B.P. 358,349, 25.11.30. Holl., 13.12.29).—The (Bz) peroxide for treatment of flour etc. is ground in the presence of a non-reacting, hygroscopic solid, *e.g.*, CaHPO₄, Ca₃(PO₄)₂, or CaSO₄·2H₂O.

L. A. COLES.

Continuous production of esters of ethyl alcohol. HOLZVERKOHLUNGS IND. A.-G. (B.P. 352,647, 22.5.30. Ger., 23.7.29).—The vapours of aq. EtOH distilled from the fermentation mash are mixed with acid vapour (*e.g.*, aq. AcOH) in a column where esterification takes place and the ester is separated, EtOH excess being returned to the system. Suitable apparatus is described.

C. HOLLINS.

Production of trialkyl phosphates. W. J. BANISTER, ASSR. to COMMERCIAL SOLVENTS CORP. (U.S.P. 1,799,349, 7.4.31. Appl., 18.11.29).—Al butoxide produced by the interaction of Al and BuOH in the presence of HgCl₂ is dissolved in C₆H₆ and the solution treated with a solution of POCl₃ in C₆H₆ at 5–8°. When reaction ceases the product is treated with ice and the Bu ester solution separated is washed free from AlCl₃ with H₂O, then with dil. NaOH solution to remove HCl, and finally with H₂O. The C₆H₆ is separated by distillation and the ester purified by distillation under 15 mm. (b.p. 170–174°).

A. R. POWELL.

Extraction of ethylene glycol or its homologues. CHEM. FABR. KALK G.M.B.H., and H. OEHME (B.P. 352,651, 24.5.30).—The aq. glycol-CaCl₂ solution from ethylene chlorohydrin and CaO is evaporated in vac. to 18–20% glycol and 40–45% CaCl₂ and this liquor is distilled at 250–400° in vac. with continuous stirring, or the liquor passes through a tubular vac. evaporator with a final temp. of 280–320°, anhyd. CaCl₂ being recovered and the distillate (25–35% glycol) rectified.

C. HOLLINS.

Manufacture [separation] of ethylidene diacetate. COURTAULDS, LTD., and J. BROWN (B.P. 353,318, 20.9.30).—The crude product from C₂H₂ and AcOH is agitated with an aq. salt solution (*e.g.*, NaOAc) of *d* greater than that of ethylidene diacetate, and the upper layer is separated and dried over anhyd. NaOAc. C. HOLLINS.

Production of hexamethylenetetramine from methane. GUTEHOFFENUNGSHÜTTE OBERHAUSEN A.-G. (B.P. 352,978, 7.1.30. Ger., 7.1.29).—In the process of B.P. 343,461 (B., 1931, 621) when N₂ is present, hexamethylenetetramine is formed. *E.g.*, CH₄ is led with 5 pts. of air at 40 cm./sec. through a tube between Cu electrodes and an intermediate electrode of Ag-Cu alloy exposed to a field of frequency 1 × 10⁶ and voltage 500,000; 1 cu. m. of CH₄ gives 65 g. of CH₂O and 1.5 g. of hexamethylenetetramine.

C. HOLLINS.

Manufacture of [diaryl]formamidines. IMPERIAL CHEM. INDUSTRIES, LTD., T. BIRCHALL, and E. H. RODD (B.P. 353,138, 16.5.30).—HCO₂H and an arylamine (NH₂Ph) in excess are refluxed in presence of H₃BO₃ or a borate and/or Fe.

C. HOLLINS.

[Manufacture of] wetting, cleansing, foaming, and dispersing agents. H. T. BÖHME A.-G. (B.P. 353,232, 9.7.30. Ger., 21.9.29).—Unsaturated or hydroxylated primary amines above C₈ are sulphonated either with conc. H₂SO₄ at 0° to give esters, or more energetically (*e.g.*, with ClSO₃H or oleum in excess) to give true sulphonic acids. Examples are octadecenylamine and hydroxyoctadecylamine (from olein alcohol hydrobromide).

C. HOLLINS.

Production of finely-divided phenolphthalein and compositions containing the same. E. B. PUTT (B.P. 352,934, 4.4.30).—Phenolphthalein is dissolved in alkali and precipitated by acid (AcOH) in presence of colloid (acacia) sufficient to delay precipitation without gelling. A definite proportion of phenolphthalein by-products (*e.g.*, 1- and 2-hydroxyanthraquinones, fluoran, etc.) is preferably added, the mixture being an effective laxative.

C. HOLLINS.

Manufacture of 6'-chloro-6-methyl-1 : 2 : 3 : 4-tetrahydronaphthalene and 1 : 2 : 3 : 4-tetrahydro-6-naphthaldehyde [ar-tetrahydro-β-naphthaldehyde]. I. G. FARBENIND. A.-G. (B.P. 353,260, 29.7.30. Ger., 29.7.29. Addn. to B.P. 337,289; B., 1931, 149).—Tetrahydronaphthalene gives with CH₂O and HCl the 6-chloromethyl compound, b.p. 139–141°/11 mm., which is oxidised smoothly by Na₂Cr₂O₇ and NaOH to ar-tetrahydro-β-naphthaldehyde, b.p. 142–143°/11 mm. (semicarbazone, m.p. 222–223°).

C. HOLLINS.

Manufacture of [diphthaloyl]naphthalene derivatives. I. G. FARBENIND. A.-G. (B.P. 353,113, 5.5.30. Ger., 3.5.29).—1 : 5-Di-(*o*-cyanobenzoyl)naphthalene, m.p. 257°, and its halogen derivatives, *e.g.*, 1 : 5-di-(*p*-chloro-*o*-cyanobenzoyl)naphthalene, obtainable from the corresponding *o*-bromobenzoyl compounds and Cu₂(CN)₂, are cyclised by heating in H₂SO₄ or with other acid condensing agents to give 1 : 2 : 5 : 6-diphthaloylnaphthalene; the products may be vatted.

C. HOLLINS.

Manufacture of hydroaromatic carboxylic acids. SCHERING-KAHLBAUM A.-G. (B.P. 353,373, 9.1.31. Ger., 11.1.30).—An (alkali) aromatic carboxylate is hydrogenated in aq. solution in presence of Ni. *trans*-Hexahydrophthalic acid, m.p. 213–215°, tetrahydronaphthalic acid, m.p. 184–187°, and hydronaphthylcyclohexylacetic acids (from naphthoylebenzoic acid) are described.

C. HOLLINS.

Liquid hydrocarbons.—See II. **Higher fatty acids esters.**—See V. **Purifying acids [AcOH].**—See VII. **Carrying out chemical reactions.**—See XI. **Fatty acid derivatives.**—See XII.

IV.—DYESTUFFS.

PATENTS.

Manufacture of vat dyes [from naphthalene-1 : 4 : 5 : 8-tetracarboxylic acid]. I. G. FARBENIND. A.-G. (B.P. 353,124, 9.5.30. Ger., 10.5.29. Addn. to B.P. 341,357; B., 1931, 386).—The mixture of vat dyes from naphthalenetetracarboxylic acid and *o*-diamines is separated by crystallising the mixed salts, *e.g.*, hydrochlorides, from an org. solvent, *e.g.*, chloroacetic acid, at 70–80°. Preferably the dye mixture

is dissolved in molten chloroacetic acid and HCl or H_2SO_4 is added, whereupon the less sol. salt at once separates.
C. HOLLINS.

Manufacture of substantive-dyeing disazo dyes containing copper. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 352,956, 14.4.30).—Dianisidine or diphenetidine is tetrazotised and coupled with 1 mol. of J-acid (or a derivative) and 1 mol. of a naphtholdisulphonic acid (or a nuclear halogeno- or alkoxy-derivative) and the dye is boiled with aq. $CuSO_4$ until no further change in dyed shade is produced, the methoxy- or ethoxy-groups being thereby hydrolysed. Examples are Cu compounds from: dianisidine \rightarrow 1:3:6-naphtholdisulphonic acid and *p*-anisyl-J-acid (blue on cotton, silk, and viscose silk); dianisidine \rightarrow 1-hydroxy-8-ethoxynaphthalene-3:6-disulphonic acid and phenyl-J-acid (blue).
C. HOLLINS.

$C_{10}H_8$ derivatives.—See III. Printing inks.—See XIII.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Examination and commercial analysis of cotton cloths. R. H. KAY (Analyst, 1931, 56, 647—652).—The methods in use for the examination and analysis of cotton cloths are described fully, together with certain modifications which enable the results to be obtained more rapidly.
T. McLACHLAN.

Preservation of textile fish nets. A. C. ROBERTSON (Ind. Eng. Chem., 1931, 23, 1093—1098).—Deterioration of nets is largely due to bacterial action, and may be lessened by washing off most of the contamination and drying the net thoroughly. Differences in the physical requirements of the various types of nets necessitate different kinds of preservatives, but a 25% solution of Cu resinate in water-gas tar oil for flexible, and a paint dip containing 5½% of finely-divided Cu_2O for the stiffer trap and pound, nets are the most satisfactory. Crystal-violet, malachite-green, and some other $CHPh_3$ dyes inhibit bacterial growth in cultures isolated from nets, but must be suitably mordanted to render them insol. Greater attention should be paid to this use of dyes because the dyed thread is as light and flexible as the original yarn and may prove very valuable in the preparation of gill nets.
B. P. RIDGE.

Jute-lignin. I. Methods of isolation. P. B. SARKAR (J. Indian Chem. Soc., 1931, 8, 397—405).—The following known methods were used: (a) 42% HCl at room temp., (b) 4% NaOH under pressure at 185°, (c) 72% H_2SO_4 at room temp., (d) 2% aq.-alcoholic NaOH at room temp., and (e) HCl (d 1.19) and P_2O_5 ; method (a) was the most satisfactory.
H. BURTON.

Chemical investigations of bamboo. IV. Bamboo cellulose. S. OGURI and M. NARA (J. Soc. Chem. Ind., Japan, 1931, 34, 328—329 B. Cf. B., 1931, 1005).—The proportions of residual cellulose obtained after treatment with NaOH and CS_2 were found to diminish with increase in concentration of the alkali used, and are generally lower in the case of bamboo than of cotton cellulose, showing that the former has the greater chemical affinity for alkali.
F. R. ENNOS.

Industrial utilisation of cellulose formate. G. Tocco (Giorn. Chim. Ind. Appl., 1931, 13, 414—418).—Unlike cellulose acetate, the formate (B., 1931, 876) may be dyed by means of the same dyes as cellulose itself. Dry-spinning of HCO_2H solutions of cellulose diformate yields pellicles of pure cellulose of excellent mechanical properties. Owing to the relatively high b.p. of HCO_2H , it is convenient to effect the spinning in a vac., and a machine devised for this purpose is described. This spinning of the HCO_2H solution renders possible incorporation of protein substances in the cellulose, perfectly transparent solid solutions being thus formed; the presence of casein confers marked plasticity on the films and diminishes the inflammability. The pure cellulose films regenerated from cellulose formate are stronger than those of cellophane and far less sensitive to the action of H_2O . They are, moreover, highly transparent and only faintly coloured, and do not require to be glycerined. The manufacture is economical, the cellulose being recovered quantitatively and the only losses being those of acid and catalyst. Films 1 mm. or more thick are obtainable, whereas those of cellophane, obtained by coagulation, scarcely exceed 0.4 mm. The constructional material of the plant used presents difficulties, owing to corrosion troubles.
T. H. POPE.

State of solution of cellulose derivatives. R. O. HERZOG and B. LANGE (Proc. World Eng. Congr., 1929, 31, 501—508; cf. A., 1929, 505).—Solutions of acetylated and methylated cellulose in $CHCl_3$ and CCl_4 were examined in Tyndall light and the degree of depolarisation was measured. Depolarisation is dependent on concentration, the effect on dilution being masked by change in particle size. The influence of solvent and temp. is considerable.
T. T. POTTS.

Cellulose acetate. VI. Analysis and some physico-chemical properties of the acetylation bath. VII. Acetylation of cellulose. VIII. Ripening of cellulose acetate. K. ATSUKI and N. ISHII (J. Soc. Chem. Ind., Japan, 1931, 34, 331—335 B, 335—339 B).—VI. The Ac_2O content of the acetylation bath was determined by measuring the rise of temp. observed during the reaction with $PhNH_2$, H_2SO_4 and $AcOH$ being determined in the usual way. Measurements of conductivity, sp. gr., viscosity, surface tension, and f.-p. depression of mixtures of two or more components of the bath show that H_2SO_4 forms a compound with Ac_2O which can dehydrate and combine with org. compounds, and that Ac_2O forms mol. associations in $AcOH$, the degree of association being higher in presence of H_2SO_4 .

VII. The velocity of acetylation of cellulose after the fibres are disintegrated is given by the formula $K = [2 \cdot 3026 / (A - B)t] \log [(A - x)B / (B - x)A]$, where A and B are the molar nos. of cellulose and Ac_2O , respectively, t is the reaction time, and x is the equiv. of Ac_2O consumed during acetylation. At 30° $K = 0.0095$. The function of the H_2SO_4 is considered to be that of a catalyst in the colloidal solution.

VIII. The hydrolysis of cellulose triacetate and degradation of cellulose which occur during the ripening process are most marked in a bath containing Ac_2O in presence of $AcOH$ and H_2SO_4 , only moderate in one

with traces of Ac_2O or H_2O , and very slight in a bath containing excess of H_2O . H_2SO_4 is essential to ripening, its activity as a catalyst depending on the ratio $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$. F. R. ENNOS.

Comparison of the properties of various cellulose acetates and the artificial silks made therefrom. F. OHL (Textilber., 1931, 12, 647—651).—Four technical cellulose acetates, viz., (A) Zellit L (I.G.), and the COMe_2 -sol. products made by (B) Ver. f. chem. Ind., (C) Wacker Ges.m.b.H., and (D) Soc. Fabr. Soie "Rhodiaseta" were investigated; their AcOH and H_2SO_4 contents were 53.97, 54.82, 53.20, and 53.80%, and 0.092, 0.019, 0.022, and 0.098%, respectively. When heated, A and D commence to yellow at 190° and melt and carbonise just above 200° , whereas B and C yellow at 210° and carbonise at 240° , this behaviour being in agreement with their lower content of H_2SO_4 . In COMe_2 solution at 20° , B had the highest viscosity, and this decreased least with rise of temp. to 50° and also on being kept for 7 days. Of the artificial silk threads spun from COMe_2 solutions of A, B, C, and D, the threads from B had the greatest tensile strength and suffered the smallest % loss of strength and lustre when wetted and when boiled with H_2O ; they also had the most desirable cross-section. When boiled in H_2O , threads from A and D lost considerable lustre and became slightly and very woolly, respectively, those from B lost but little lustre and became slightly woolly, whilst those from C lost much lustre and became very woolly. Cellulose acetate B yielded the most satisfactory silk, and it is concluded that for production of the highest quality of silk the cellulose acetate should be uniform in structure, have small H_2SO_4 and high AcOH contents, and yield COMe_2 solutions having a high viscosity which decreases but little with increase of temp. and during storage. A. J. HALL.

Shape of cross-section of viscose silk [as affected by conditions of spinning]. A. JÄGER (Kunstseide, 1931, 13, 325—328, 352—356).—The composition (e.g., contents of cellulose, NaOH , and CS_2) and viscosity of a viscose solution have much less influence on the shape of the cross-section of viscose filaments spun from it than has its ripeness or the composition of the spinning (coagulating) bath; this solution largely affects the cross-section of cellulose acetate silk. With a viscose solution (NH_4Cl ripeness = 14.2) and a spinning bath containing 100—200 g. H_2SO_4 and 220—440 g. Na_2SO_4 per litre at 45° the resulting circular cross-sections become more ribbon-like as the concentration of both H_2SO_4 and Na_2SO_4 , or Na_2SO_4 alone, is increased; with increase of H_2SO_4 the cross-sections become kidney-shaped. With a ripier viscose solution (NH_4Cl ripeness = 9.9) the cross-sections also become ribbon-like with increase of H_2SO_4 in the spinning bath, and the results obtained show that Bronnert's experiments (B., 1922, 540 A) must have been carried out with fresh (unripe) viscose solutions. The addition of MgSO_4 and particularly of ZnSO_4 to the spinning bath confers softness of handle on the resulting silk; the presence of $(\text{NH}_4)_2\text{SO}_4$ favours a circular cross-section. Salts of Al, Fe, Cr, Ni, Mn, and Cu have an effect similar to, but much

smaller than, that of Mg and Zn salts. The temp. of the spinning bath exerts a comparatively small effect on the shape of the cross-section of the silk. The cross-section of a viscose silk filament is largely determined by the conditions existing at the point of its extrusion from the spinning nozzle, so that although stretching of the silk induces the ribbon-like cross-section to curl and thus resemble a circular section, this effect is only appreciable when the stretching is applied close to the spinning nozzle. Cross-sections of viscose filaments are conveniently prepared by coating a bundle of filaments with Peru glue and then embedding in paraffin wax before cutting. A. J. HALL.

Making pulp for Japanese paper by use of chlorine. S. OCHI, I. FUJIMOTO, and H. MURASUGI (Proc. World Eng. Congr., 1929, 31, 515—521).—Chlorination followed by alkaline treatment of a number of fibrous materials indigenous to Japan gives good yields of satisfactory pulps which may be used for the manufacture of papers having the usual Japanese characteristics. Coniferous woods are unsuitable.

T. T. POTTS.

Bleaching of sulphite pulp with chlorine and calcium hypochlorite. H. RAUCHBERG (Papier-Fabr., 1931, 29, 490—497, 516—524, 535—541).—Parallel bleaching experiments have been carried out on sulphite wood pulps using Cl_2 and $\text{Ca}(\text{OCl})_2$, respectively. For regular grades of pulp not requiring high freedom from incrustants, bleaching with Cl_2 is advantageous. The reaction is rapid, 62% of the bleaching being complete in 10—20 sec. Above the optimal Cl_2 consumption the reaction becomes slow and uneconomical, hypochlorite bleaching being more efficient in this range. Cl_2 acts equally in chlorination and oxidation of incrustants, in distinction to hypochlorite bleaching, sol. chlorination products being formed. The yield from Cl_2 bleaching is the lower. The greater amount of washing required by Cl_2 -bleached pulp is a disadvantage and is the cause of slight losses. An extensive bibliography is given.

T. T. POTTS.

Determination of lignin in wood pulp. A. NOLL and F. HÖLDER (Papier-Fabr., 1931, 29, 485—490).—A detailed account is given of the study of the effect of state of division of fibre, addition of EtOH and/or NPhMe_2 , and concentration of H_2SO_4 on the purity and yield of lignin obtained by acid hydrolysis of wood pulps, resulting in the formulation of a rapid method previously described (B., 1931, 1005). T. T. POTTS.

Strength testing of wood pulps. W. NIPPE (Papier-Fabr., 1931, 29, 418—430).—Existing methods for determining the strength of wood pulps are critically examined, with particular reference to the individual properties of pulp emphasised by each method. No single method yields a complete measure of the strength of the original fibre, and an analysis of the factors involved has been attempted by means of the examination of given pulps by 3 different methods, the resulting range of tensile strengths being different for each method. The measurement of strength of individual fibres has been found impracticable as a means of pulp-strength testing. Degree of beating, swelling, orientation, and felting are examined as decisive factors in the

3 methods employed, and in the absence of better technique the method of Wenzl, consisting of plotting strength with time of beating, is held to be the most complete.

T. T. POTTS.

Evaporation of [sulphite- and sulphate-]pulp-mill waste liquors. F. A. OETKEN (Papier-Fabr., 1931, 29, 545—549).—Recent methods are discussed, with particular reference to the avoidance of a ppt. of CaSO_4 . In the Siemens process, d.c. of 5—10 volts is supplied to the evaporator so that the + terminal is connected to 2 electrodes placed in the liquor stream, the — terminal and the metal of the plant being earthed. The Agfil process employs interrupted current of 0.1—2 volts generated by a thermal battery, the arrangement of the circuit being similar to that of the Siemens except that a slight leakage current is allowed to pass from the + terminal over the metal work to earth. It is claimed that formation of CaSO_4 scale is avoided in differing degree by the above processes, depending on local conditions. The Lurgi system depends on the formation of "metastable supersaturated" solutions of CaSO_4 in the evaporator, with rapid crystallisation at suitable points in the liquor stream. The process is claimed to be efficient and economical, details of cost tests being given.

T. T. POTTS.

Testing of paper half-stuffs for strength. W. WIRTH (Papier-Fabr., 1931, 29, 524—526).—Wood half-stuffs made into sheets and examined by Humm's method for "punching length" (B., 1930, 609) do not give concordant results, but produce in some cases the opposite of the effect claimed. "Punching length" is independent of degree of beating, but may be a measure of individual fibre strength.

T. T. POTTS.

Accelerated ageing test for paper. R. H. RASCH (Bur. Stand. J. Res., 1931, 7, 465—475).—Determination of the strength and various chemical properties of a variety of bond and ledger papers has shown that, in general, a high Cu no. is associated with a low α -cellulose content, and *vice versa*, and that a permanent paper is characterised by a low Cu no. and a high α -cellulose content. When the papers were arranged in order of stability, as deduced from the effects of heating for 72 hr. at 100° on the strength and α -cellulose content, the result apparently corresponded with that which would have been expected from observations on natural ageing. Ageing by heating at 60° for 860 hr. and by exposure to sunlight also gave the same order of stability.

R. CUTHILL.

Permanence of current commercial book papers. J. O. BURTON (Bur. Stand. J. Res., 1931, 7, 429—439).—Determination of the resistance of various book papers to ageing caused by heating at 100° for 72 hr. has shown that the permanence of a paper depends primarily on its chemical purity, and has little relation to the source or initial quality of the fibre. If the acid content is greater than the equiv. of 0.1% SO_3 , both the α -cellulose content and the strength, as measured by the folding-endurance, diminish considerably as a result of the ageing.

R. CUTHILL.

Wallboard etc.—See IX. **Rancidity and porous packings.**—See XII. **Acid caseins [for paper].**—See XIX.

PATENTS.

Manufacture of aralkyl ethers of cellulose. IMPERIAL CHEM. INDUSTRIES, LTD., D. TRAILL, and A. S. LEVESLEY (B.P. 352,999, 16.4.30).—A cellulose aralkyl (*e.g.*, CH_2Ph) ether of uniform low viscosity substantially free from highly degraded products is produced by heating a high-viscosity ether with dil. acid (HCl) under pressure (20—50 lb./sq. in.); a wetting agent (oleic acid, glycerol) may be added and a short pretreatment with a swelling agent (aromatic hydrocarbons) given.

C. HOLLINS.

Purification of cellulose esters. F. OLSEN (U.S.P. 1,798,270, 31.3.31. Appl., 1.3.29).—The ester, which contains <1% of acid, is pulped in a beating machine, boiled for about 8 hr. in H_2O of approx. 0.25% acidity, and then subjected to alternate boils and washes with fresh H_2O for approx. 12 hr.

B. P. RIDGE.

Manufacture of higher fatty acid esters of polymeric carbohydrates [*e.g.*, cellulose]. I. G. FARBENIND. A.-G. (B.P. 353,193, 19.6.30. Ger., 4.7.29).—The acylation of cellulose, starch, etc. is affected with acyl halides at 80—100° in presence of <1 equiv. of pyridine or other *tert.* base. The process is especially suitable for the prep. of monoacyl derivatives, the solubility of which is favourably influenced by the acyl halide more than by *tert.* base halide. In the examples, chlorides of coconut oil, stearic and lauric acids are used.

C. HOLLINS.

Apparatus for the washing and after-treatment of spinning cakes [of artificial silk]. VEREIN. GLANZSTOFF FABR. A.-G. (B.P. 357,470, 13.2.31. Ger., 18.8.30).—Means are described for the automatic mechanical transfer of the cakes, threaded on carrying bars, from the sprinkling to the immersion machine in which washing and after-treatment are carried out.

F. R. ENNOS.

Manufacture of films and the like from cellulose acetate solutions. W. H. PEASE (B.P. 357,079, 15.5.30).—A solution of cellulose acetate in 5—9 pts. of Me Et ketone, together with a plasticiser (ZnCl_2 , oils, fats, or waxes) and, if desired, additional materials such as fireproofing, colouring, or metallising materials, is allowed to evaporate in a closed chamber at 30—75° with a humidity of 50—95%, the outer room temp. being 20—40°.

F. R. ENNOS.

Treatment of ligneous vegetable materials. K. G. BERGSTRÖM and A. F. ZENNSTRÖM (B.P. 357,329, 29.7.30. Finl., 18.9.29).—Before digestion by ordinary processes, the raw material, *e.g.*, wood, is treated for 6—24 hr. at 15—20° with aq. NaOH or Na_2CO_3 (*d* 1.007—1.014) to remove AcOH, which latter is recovered. Woods rich in turpentine and resin are further treated first with steam to separate the turpentine, and then with a hot alkaline liquor, *e.g.*, the acetate liquor previously obtained (with addition of a further quantity of alkali), to remove resins.

D. J. NORMAN.

Opening and preparing artificial staple fibres. M. F. THOMA (U.S.P. 1,799,399, 7.4.31. Appl., 27.12.26).—The masses are treated at moderate temp. in a bath of H_2O containing an oil soap with a trace of H_2SO_4 in it, glycerin, NaOH, and pinol, whereby the fibres are loosened, crinkled, softened, and rendered more lustrous.

Alternatively, sulphonated oils, oleic acid, etc. may be used as softeners instead of glycerin. B. P. RIDGE.

System for cooking fibrous material. T. L. DUNBAR (U.S.P. 1,798,525, 31.3.31. Appl., 1.8.29).—Hot relief gases from digesters are discharged into a mixing chamber into which cold acid liquor is fed continuously, so that the latter is preconditioned and preheated. The liquor is then withdrawn, forced into an accumulator maintained at superatm. pressure, and used to precook fibrous material. B. P. RIDGE.

Manufacture of resistant pulp for papermaking. J. D. RUE, Assr. to CHAMPION FIBRE Co. (U.S.P. 1,798,987, 31.3.31. Appl., 1.9.28).—Partly bleached, raw, alkaline wood pulp is thickened, digested with a caustic alkaline solution, the pulp is separated, part of the residual alkaline solution conc., the remainder mixed with part of the conc. solution with addition of more NaOH, and re-used as alkaline digesting liquid. The remainder of the conc. liquor is used as cooking liquid in the prep. of more alkaline wood pulp for a further cycle of operations. B. P. RIDGE.

Sizing of papermaking fibres. J. A. DE CEW, Assr. to PROCESS ENGINEERS, INC. (U.S.P. 1,799,216, 7.4.31. Appl., 15.11.28).—Streams of dil. solutions of size and alum are either allowed to mix with each other just before entering a stream of pulp stock, or are added along with the stock as it enters the Jordan engine or other rapid mixer. B. P. RIDGE.

[Treatment of residual waste liquors from] production of chemical pulp. L. BRADLEY and E. P. MCKEEFE, Assrs. to BRADLEY-MCKEEFE CORP. (U.S.P. 1,797,678, 24.3.31. Appl., 2.9.26).—The conc. liquors resulting from the digestion of cellulose material, which contain most of their Na either as sulphite or as S-free compounds, are subjected to a furnacing treatment under reducing conditions, thereby forming a product containing mainly Na_2CO_3 and Na_2S . This is then causticised or sulphited in order to give caustic or sulphite cooking liquors. B. P. RIDGE.

Panels or backings for oil paintings. H. WADE. From BAKELITE CORP. (B.P. 357,204, 20.5.30).—A fibrous base, e.g., pulpboard or superimposed sheets of paper or fabric, is impregnated with a reactive synthetic resin and subjected to heat and pressure.

D. J. NORMAN.

Production of slabs from fibrous material. E. PLETSCHER (B.P. 357,168, 14.4.30. Switz., 14.4.29).—Wood wool is moistened (dipped into H_2O) and covered with a thin layer of dry hydraulic cement and/or gypsum. The mass is then stirred and left to harden in a mould under moderate pressure. D. J. NORMAN.

Manufacture of [high-twist] (A) crêpe yarns and fabrics, (B) textile materials. BRIT. CELANESE, LTD., W. A. DICKIE, and R. W. MONCRIEFF (B.P. 357,576—7, 24.5.30).

Machines for spinning artificial silk. C. HAMEL A.-G., and E. HAMEL (B.P. 358,045, 27.6.30).

Production of [lengths of] artificial filaments and the like [to be cut up into staple fibre]. BRIT. CELANESE, LTD., and W. I. TAYLOR (B.P. 357,565, 16.6.30).

Apparatus [electrically-insulated acid-proof vat and rollers] for manufacture of films or webs from cellulose products. E. BLEIBLER (B.P. 357,820, 24.10.30. Ger., 26.10.29).

Drying of sheets [of paper].—See I. S product. —See VII. Laminated glass. Preventing moisture condensation on glass.—See VIII. Nitro-cellulose solutions.—See XIII. Floor-covering material.—See XIV.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Solid-solution theory of dyeing. W. D. BANCROFT and J. W. ACKERMAN (Proc. Nat. Acad. Sci., 1931, 17, 480—482).—The adsorption of Na alizarate by various hydrous oxides is studied, and it is shown that Witt's theory of solid solutions in dyeing loses its only support if it is assumed that textiles and mordants can act as ionising adsorbents. A. J. MEE.

Preservation of fish nets. Cellulose formate. Bleaching of sulphite pulp.—See V. Dyed leather and dermatitis.—See XV.

PATENTS.

Manufacture of fabrics exhibiting crêpe effects. BRIT. CELANESE, LTD., W. A. DICKIE, and R. W. MONCRIEFF (B.P. 357,084, 7.5.30).—Fabrics containing highly twisted crêpe threads with filaments made from an org. derivative of cellulose are padded, locally if desired, with liquids or solutions which exert a dehydrating action on the cellulose derivative, e.g., abs. EtOH, conc. aq. solutions of CaCl_2 , ZnCl_2 , NaOAc, NaH_2PO_4 , NH_2Me , HCl, etc., and after keeping for, e.g., $\frac{1}{2}$ hr. when abs. EtOH is used or $\frac{1}{2}$ —2 hr. when 30% aq. CaCl_2 is used, are washed and dried without tension. Alternatively, the threads may be treated with these dehydrating liquors before weaving or even before twisting, the woven fabric made therefrom being subsequently washed with H_2O . D. J. NORMAN.

[Manufacture of crêped] textile materials. BRIT. CELANESE, LTD., H. DREYFUS, W. A. DICKIE, and C. W. NORTH (B.P. 357,169, 16.5.30).—Threads composed of org. derivatives of cellulose are coated either with a layer of cellulose, e.g., by surface hydrolysis, or by coagulation of viscose or cuprammonium solutions thereon, or with a cellulose ester or ether in which the esterifying or etherifying radicals contain OH or CO_2H groups, e.g., cellulose acetate tartrate, and, after highly twisting and weaving with other fibres, the resulting fabric is scoured with water or soap solution to cause swelling of the coating. F. R. ENNOS.

[Rendering] textiles [water-repellent]. A. NATHANSOHN (B.P. 356,878, 18.7.30. Ger., 14.9.29).—Textiles esterified as described in B.P. 355,256 (B., 1931, 1047) are heated for up to 24 hr. at not above 120° either during or after the drying process, whereby an increased degree of H_2O -repellency is obtained.

A. J. HALL.

Manufacture of preparations for treatment of textiles. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,989, 9.4.30).—Sulphuric esters of cetyl and other alcohols above C_8 or their salts are mixed with Na, K, Mg, NH_4 , or amine H_2O -sol. salts of acids

stronger than H_2CO_3 , e.g., Na_2SO_4 , NaOAc , Na_3PO_4 , Na_2SiO_3 , MgSO_4 , or NaHSO_4 . Improved scouring effects (etc.) are obtained. C. HOLLINS.

Colouring gasoline etc.—See II. Wetting etc. agents.—See III. Cleansing agent. S product.—See VII. Fatty acid derivatives.—See XII.

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

Poisoning of platinum catalysts for oxidation of ammonia. J. Y. YEE and P. H. EMMETT (Ind. Eng. Chem., 1931, 23, 1090—1092).—In these experiments an 80-mesh Pt gauze at 800—900° was used, giving a normal conversion of 90—92%. Up to 0.4% addition of C_2H_2 was without effect, 0.02 p.p.m. of PH_3 shows a definite poisoning effect, and with 0.2 p.p.m. PH_3 this effect permanently damages the gauze. Only traces of NH_3 were found in the converted gases. The alleged protective effect of adding 0.07% H_2S , which results in an increase of 3—4% in the conversion efficiency, is also found with unpoisoned gauzes in absence of PH_3 . The increase is more than can be accounted for by the oxidation of the H_2S , and remains unexplained.

C. IRWIN.

Salt industry of Rio. M. DA SILVA PINTO and R. R. FILHO (Bol. Serv. Geol. Min. Brasil, 1930, No. 52, 143 pp.).—A fully detailed account, with, especially, a description of the application of phase-rule principles to the isolation and purification of the crude salt, some specimens of which contain only about 85% NaCl . Details are given also of the Duflos process of sterilisation, which consists in heating the salt at 200°, whereby in addition the MgCl_2 present is converted into insol. and non-hygroscopic $\text{Mg}(\text{OH})\text{Cl}$, and of the del Vecchio process of sterilisation by electrolysis at a voltage at which only the MgCl_2 is decomp. The working up of by-products is described, and the commercial and economic aspects of the industry are discussed.

H. F. GILLBE.

Composition of mechanical separates from ground phosphate rock. W. L. HILL, H. L. MARSHALL, and K. D. JACOB (Ind. Eng. Chem., 1931, 23, 1120—1124).—Samples of American rock phosphate were ground to pass 100-mesh and then classified according to particle size: (1) above 50 μ , (2) 5—50 μ , (3) below 5 μ . With Florida phosphates the SiO_2 was found to be conc. in class (1), but with Western phosphates in classes (2) and (3). Fe and Al were found to be conc. in classes (2) and (3), whilst Ca and P were higher in classes (2) and (3) with Florida rock and in class (1) with Western rock. F remained uniform in relation to P content, the samples containing no CaF_2 as such. There was in most cases a small progressive increase in citrate-sol. phosphate as particle size decreased.

C. IRWIN.

Continuous precipitation of phosphoric acid extracts with milk of lime. L. V. VLADIMIROV (Udobr. Urozhai, 1930, 2, 922—926).—An apparatus is described. The use of high-grade CaO shortens the reaction time.

CHEMICAL ABSTRACTS.

Production of soluble phosphates from Chuvash phosphate rock. S. I. VOLFKOVICH and A. P. METAL-

NIKOV (Udobr. Urozhai, 1931, 3, 61—64).—Phosphate rock (21—22% P_2O_5) of high carbonate and sesquioxide content (100 pts.) was heated with Na_2CO_3 (25 pts.) at 1000—1100°, when 96% of the P_2O_5 became sol. in citric acid.

CHEMICAL ABSTRACTS.

Silico-superphosphate. A. HOCK (Superphosphat, 1931, 7, 174—176).—Admixture of 4% of kiesulguhr with superphosphate increases its efficiency on light soils and also improves the ease of distribution. The product gives better results than mixtures of superphosphate with basic slag.

A. G. POLLARD.

Preparation of manganese dioxide. III. Comparison of properties of samples of different origin. Y. KATO and T. MATSUHASHI (J. Soc. Chem. Ind., Japan, 1931, 34, 312—314 B; cf. A., 1930, 308).—Various samples of MnO_2 were compared as to (1) catalytic effect in the thermal decomp. of KClO_3 , measured by temp. rise when heated with a const. electric current; (2) oxidation potential in NH_4Cl solution; (3) O_2 vapour tension, using MnO_2 dried at 110°; (4) X-ray photography. The capacities of MnO_2 dry batteries charged with different samples were compared. The samples fell into two groups of high and low activity.

C. IRWIN.

Chemical treatment of low-grade chromites. F. F. WOLF and E. N. PINAEVSKAIA (J. Chem. Ind. Russ., 1931, 8, 949—955).—Saranov chromite, containing about 13% Cr_2O_3 , is heated at 1100° with Na_2CO_3 and dolomite (proportions 1:0.8:0.8) and the product is extracted with H_2O , when 98% of Cr and 75% of Al present is obtained in the extract, which is neutralised to ppt. $\text{Al}(\text{OH})_3$. The calcined ppt. contains 83.2% Al_2O_3 , 0.17% Cr_2O_3 , 1.4% SiO_2 , 0.15% SO_3 , and 13.64% Na_2O ; Fe, Mg, and Ca are absent, so that the product is suitable for the prep. of pure Al salts. The filtrate is worked up for Cr salts in the usual way.

R. TRUSZKOWSKI.

Processes for decomposing ferrous titanate. I. Y. KATO and T. MURAKAMI (J. Soc. Chem. Ind., Japan, 1931, 34, 310—311 B).—A résumé of published processes for the dissolution of ilmenite. These fall into 4 classes: (1) those in which both Fe and Ti are dissolved, (2) those in which Fe alone is dissolved after alkali fusion, (3) volatilisation of the chlorides, (4) reduction of Fe with CO.

C. IRWIN.

Analysis of aluminosilicates. E. DELFELD (Bull. Soc. chim. Belg., 1931, 40, 427—436).—Various methods are reviewed, and details are given of the most satisfactory procedure for the determination of SiO_2 , Al_2O_3 , Fe_2O_3 , CaO and MgO , alkalis, and TiO_2 . The ordinary method based on fusion with Na_2CO_3 — K_2CO_3 is said to be sufficiently accurate for all industrial analyses.

H. F. GILLBE.

Commercial possibilities of metallic peroxides as a source of hydrogen peroxide. L. W. BLUNDELL (Trans. Inst. Chem. Eng., 1930, 8, 191—201).—A plant is described which is capable of giving a daily output of 200 gals. of 12-vol. H_2O_2 , using BaO_2 and H_3PO_4 , with recovery of the latter. This acid is preferred owing to its stabilising effect on the product and the ease of filtration of its Ba salt. The purity of the raw materials and the fine grinding of the BaO_2 are

important. On the top floor are storage-bin hoppers and mill for BaO_2 , on the next the mixers and acid tanks, and on the ground floor filter-presses etc. The mixers in which BaO_2 is hydrated are of cast Fe with heavy cast-Fe blades, the reaction vessels being of pitch-pine and having two concentric panels rotating in opposite directions. A wooden frame-press is used for $\text{Ba}_3(\text{PO}_4)_2$ filtration. Al is the only metal suitable for contact with H_2O_2 solutions as almost all others catalyse decomp. The $\text{Ba}_3(\text{PO}_4)_2$ is digested with H_2SO_4 in an enamelled cast-Fe jacketed pan, settled, and the clear liquor is siphoned off and conc. in a similar pan. The main reaction vessel is kept at 10 – 15° (by cooling coils) during the working of a batch of BaO_2 . The BaO_2 is fed in as a cream which must be quite free from grit. The neutralisation of the filter-pressed H_2O_2 solution is effected with $\text{Ba}(\text{OH})_2$ and H_2SO_4 and the liquor is again filter-pressed. NH_4AcPh may be added as a stabiliser. Outlay and working costs are estimated.

C. IRWIN.

Thermal decomposition of hydrogen sulphide.

Decomposition by the electric arc in presence or absence of carbon dioxide. P. FERRERO and J. CORBAZ (Helv. Chim. Acta, 1931, 14, 912–935).—The decomp. of a stream of H_2S by the electric arc has been studied from the viewpoint of technical requirements. Electrodes of Pt or Cu only are admissible. With pure H_2S the yield of S was 50–60% according to the speed of flow, the energy yield only 28%. Dilution with N_2 (25% H_2S) increased the chemical yield considerably and diminished the energy yield slightly. In presence of CO_2 (70%) the decomp. of H_2S was nearly complete, but the energy yield still low. It is concluded that the conditions which would make the process of commercial value are not realisable in practice. F. L. USHER.

Fe oxide pigments.—See XIII. **Roasting phosphorites for plants.**—See XVI.

PATENTS.

Purification of solutions [acids] by electrolytic means. I. G. FARBEIND. A.-G. (B.P. 357,630, 26.6.30. Ger., 28.6.29).—As or Hg are removed from H_3PO_4 , H_2SO_4 , or AcOH by passing the acid slowly through a trough containing a series of transverse gauze cathodes between which are disposed strip or wire anodes; between these and the cathodes is passed a current at 2–3 volts. In the case of H_3PO_4 Cu-gauze cathodes and Pt-wire anodes are used, the As_2O_3 being reduced to finely-divided As and subsequently removed by filtration. A. R. POWELL.

Production of salts of hydrofluosilicic acid. M. BUCHNER, Assec. of F. HILDERBRANDT (B.P. 357,922, 23.2.31. Ger., 24.2.30).—A fluoride is mixed with, or suspended in, a solution containing 30 wt.-% or upwards of H_2SiF_6 , and into the mixture is introduced SiF_4 , the reaction being effected with heat or under pressure, if desired. The function of the H_2SiF_6 is partly catalytic. W. J. WRIGHT.

Production of hydrocyanic acid. GES. F. KOHLENTSCH. M.B.H. (B.P. 356,724, 22.5.30. Ger., 7.6.29. Addn. to B.P. 356,190; B., 1931, 1009).—The N values of the reaction gases (obtained by way of the modified Raschen

process) are used for the manufacture of the HNO_3 required in the production of HCN from NH_4CNS . The residual reaction solution is neutralised with NH_3 to produce fertilising materials. F. YEATES.

Treatment of brine. W. R. COLLINGS, Assr. to DOW CHEM. CO. (U.S.P. 1,796,920, 17.3.31. Appl., 12.9.28).—Brine containing MgCl_2 and CaCl_2 is evaporated to obtain NaCl crystals and a solution containing about 33% CaCl_2 and 11% MgCl_2 , which is further evaporated to yield crystals of tachydrite and a mother-liquor containing 53% CaCl_2 and 5% MgCl_2 . This liquor is treated with $\text{Ca}(\text{OH})_2$ to separate the Mg as $\text{Mg}(\text{OH})_2$, leaving a pure CaCl_2 solution. The tachydrite is dissolved in boiling H_2O and the solution cooled to 30° to separate $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ and leave a CaCl_2 mother-liquor (*d* 1.24), which is returned to the tachydrite crystalliser. A. R. POWELL.

Obtaining sodium sulphate from natural deposits. A. T. W. WARNKEN, Assr. to E. JOHNSON (U.S.P. 1,798,993, 31.3.31. Appl., 4.10.29).—Natural beds of Na_2SO_4 are leached with shallow streams of H_2O during the day, the leach liquors accumulating in a reservoir in the bed in which $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystallises during the night. A. R. POWELL.

Leaching of phosphate rock. KUNSTDÜNGER-PATENT-VERWERTUNGS-A.-G. (B.P. 357,580, 23.6.30. Swed., 11.7.29).—A liquor containing H_3PO_4 and, if desired, NH_4 phosphates, produced, e.g., by treating phosphate rock with H_2SO_4 and $(\text{NH}_4)_2\text{SO}_4$, is added during the treatment of phosphate rock with HNO_3 , and the Ca is precipitated by the addition of K_2SO_4 , part of it being added during, and the rest after, the completion of the main reaction. Some of the final solution, after removal of the CaSO_4 and part of the KNO_3 as described in B.P. 338,079 (B., 1931, 61), may also be added in the initial stage. L. A. COLES.

Treatment of phosphate rock. ODDA SMELTEVERK A./S., and E. JOHNSON (B.P. 357,814, 21.10.30. Norw., 28.10.29).— $\text{Ca}(\text{NO}_3)_2$ is crystallised without removal of insol. impurities from the liquor obtained by treating phosphate rock with HNO_3 , and the crystals are removed on a wide-mesh filter or wire screen so that some of the insol. material passes through. The insol. material is removed separately from the mother-liquor and, after dissolution, from the $\text{Ca}(\text{NO}_3)_2$ by filtration or centrifuging. Dil. waste liquors obtained during the process are used for irrigation in a plant for manufacturing the HNO_3 for use in the process. L. A. COLES.

Preparation of a cleansing agent [containing trisodium phosphate]. I. G. FARBEIND. A.-G. (B.P. 357,533, 12.6.30. Ger., 15.7.29).—Siliceous phosphorus, obtained in the electrothermal prep. of P, is heated to redness with Na_2CO_3 ; the product is then leached with H_2O and the solution evaporated to dryness. [Stat. ref.] W. J. WRIGHT.

Preparation of detergents. C. A. JENSEN. From ELECTRIC SMELTING & ALUMINUM CO. (B.P. 357,224, 18.6.30).— $\frac{3}{4}$ – $1\frac{1}{2}$ mol. of alkali carbonate is fused with 1 mol. of SiO_2 ; sufficient alkali chloride may be added to remove impurities containing Fe or Al.

E. LEWKOWITSCH.

Manufacture of potassium phosphate. R. D. PIKE (U.S.P. 1,799,479, 7.4.31. Appl., 18.6.28).—A mixture of KCl (220 pts.), H_3PO_4 containing 45% P_2O_5 (158 pts.), and H_2SO_4 (114 pts., d 1.7) is heated first at 770° in a rotary furnace until HCl ceases to be evolved, and then, after addition of coal (66 pts.), at 850° until SO_2 is expelled. The resulting clinker is dissolved in H_2O , the insol. mud removed, and the solution treated with H_3PO_4 to give KH_2PO_4 , which is crystallised.

A. R. POWELL.

Manufacture of alkaline-earth oxides. I. G. FARBENIND. A.-G. (B.P. 357,795, 1.10.30. Ger., 1.10.29).— $BaCO_3$ or $SrCO_3$ is mixed with about 6% of free C (e.g., soot), or of substances containing it, and heated in a rotary furnace at above 700° in an atm. of H_2 .

H. ROYAL-DAWSON.

Manufacture of barium hydroxide. F. RÜSBERG and G. CLAUSS, Assrs. to RHENANIA-KUNHEIM VER. CHEM. FABR. A.-G. (U.S.P. 1,799,989, 7.4.31. Appl., 24.5.28. Ger., 22.6.27).— Ba_2SiO_4 produced by heating $BaSO_4$ and SiO_2 in steam is ground with H_2O in a ball-mill until reduced to an almost colloidal suspension and then boiled under reflux until the Ba_2SiO_4 is hydrolysed and the residue settles readily. The solution contains 32–34% of $Ba(OH)_2 \cdot 8H_2O$, which separates on cooling.

A. R. POWELL.

Production of anhydrous calcium sulphate. C. B. DURGIN, A. B. GERBER, and P. LOGUE, Assrs. to SWANN RES. INC. (U.S.P. 1,783,417, 2.12.30. Appl., 21.1.26).—To prevent discoloration of $CaSO_4$ during dehydration, 1–5% of $CaHPO_4$ is added to gypsum and the mixture calcined at 760° .

A. R. POWELL.

Production of bleaching powder. I. G. FARBENIND. A.-G. (B.P. 357,933, 14.3.31. Ger., 14.3.30).—About 3–7% of a vaporisable liquid, e.g., CCl_4 , $CHCl_3$, or a mixture of these, which is inert towards Cl_2 , $Ca(OH)_2$, or $CaOCl_2$, is added to the $Ca(OH)_2$ before chlorination, so as to restrict rise of temp. and formation of lumps, the inert liquid being subsequently expelled by heating in vac.

W. J. WRIGHT.

Production of dry, high-grade calcium hypochlorite. I. G. FARBENIND. A.-G. (B.P. 357,798, 6.10.30. Ger., 28.10.29).— $Ca(OCl)_2$ solution with a low $CaCl_2$ concentration is rendered slightly alkaline by addition of NaOH and then rapidly evaporated to dryness by spraying in a current of hot air. The evaporation may be conducted in two stages, incompletely anhyd. crystals being produced first and these being subsequently dehydrated.

W. J. WRIGHT.

Manufacture of calcium magnesium chloride. W. R. COLLINGS and J. J. SHAFER, Assrs. to DOW CHEM. CO. (U.S.P. 1,796,885–6, 17.3.31. Appl., 4.11.29).—(A) A solution containing $MgCl_2$ and $CaCl_2$ in a ratio $< 2:1$ is added to a mother-liquor saturated with tachydrate and $CaCl_2 \cdot 2H_2O$ and the solution is evaporated at 45–93°, whereby a crystal meal consisting of a mixture of $CaCl_2 \cdot 2MgCl_2 \cdot 12H_2O$, $MgCl_2 \cdot 2CaCl_2 \cdot 6H_2O$, and $CaCl_2 \cdot 2H_2O$ is obtained. (B) A solution containing $MgCl_2$ and $CaCl_2$ in a ratio of 0.5–0.1 is added to a mother-liquor saturated with $MgCl_2 \cdot 2CaCl_2 \cdot 6H_2O$ and $CaCl_2 \cdot 2H_2O$ and the mixture is evaporated at 152–177°, whereby a mixture of

$MgCl_2 \cdot 2CaCl_2 \cdot 6H_2O$ and $CaCl_2 \cdot 2H_2O$ is obtained as a non-caking crystal meal. (Cf. U.S.P. 1,738,492; B., 1930, 373.)

A. R. POWELL.

Preparation of a dehydrating agent [barium magnesium perchlorate]. G. F. SMITH (U.S.P. 1,798,175, 31.3.31. Appl., 13.9.26).—A solution containing $Mg(ClO_4)_2$ and a larger quantity of $Ba(ClO_4)_2$ is evaporated and the salt mixture dried at 300° to form a granular, porous dehydrating agent. Alternatively, $Ba(ClO_4)_2$ sprayed with a solution of $Mg(ClO_4)_2$, or a mixture of $Ba(ClO_4)_2 \cdot 3H_2O$ and $Mg(ClO_4)_2 \cdot 6H_2O$ crystals, is heated at 250–300°.

A. R. POWELL.

Manufacture of chlorides of the alkaline-earths from their sulphates. T. LICHTENBERGER and L. KAISER (U.S.P. 1,798,091, 24.3.31. Appl., 9.2.27. Ger., 27.10.25).—The alkaline-earth sulphate is introduced together with powdered coke into a fused bath of the corresponding chloride, and a current of Cl_2 is passed through the mixture, followed at the end of the reaction by HCl gas to convert any oxide into chloride. The S_2Cl_2 produced in the reaction may be hydrolysed by introducing steam into the reaction vessels.

A. R. POWELL.

Manufacture of cyanamides of the alkaline-earth metals. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 358,276, 6.10.30).—An alkaline-earth or Mg oxide or carbonate is treated at 300–900° (preferably 350–600°) with $(CN)_2$ or a mixture of it with, e.g., N_2 , H_2 , CO, or NH_3 , to effect the reaction: $XO + (CN)_2 = XCN_2 + CO$, or $XCO_3 + (CN)_2 = XCN_2 + CO + CO_2$.

L. A. COLES.

Stable alkaline ferric [hydroxide] solution. W. J. HUFF, D. L. JACOBSON, and W. H. HILL, Assrs. to KOPPERS CO (U.S.P. 1,786,490, 30.12.30. Appl., 17.7.24).—A solution of invert sugar or of dextrose is heated with Na_2CO_3 to boiling for a few min. and is then cooled rapidly, treated with a solution of $FeSO_4$, and oxidised with a current of air until the $Fe(OH)_2$ first precipitated redissolves as colloidal $Fe(OH)_3$.

A. R. POWELL.

Precipitation of aluminium fluoride. J. E. MORROW, Assr. to ALUMINUM CO. OF AMERICA (U.S.P. 1,797,994, 24.3.31. Appl., 20.9.28).—Dil. AlF_3 solutions, obtained by decomp. of kaolin, bauxite, or clay with HF or H_2SiF_6 , are heated at 90–95° with a small quantity (e.g., 1%) of finely-divided dry AlF_3 for several hr., whereby 80–90% of the contained AlF_3 is precipitated in a granular form.

A. R. POWELL.

Treatment of greensand. A. LAMBERT, Assr. to COSMIC ARTS, INC. (U.S.P. 1,797,002, 17.3.31. Appl., 28.11.24).—Greensand is decomposed with HCl, H_2SO_4 , or HNO_3 and, after removal of the SiO_2 , the solution is neutralised with Na_2CO_3 , the $(Fe,Al)(OH)_3$ removed, and the Na precipitated with NH_3 and CO_2 , leaving a solution from which a mixed NH_3 -K fertiliser is obtained by evaporation.

A. R. POWELL.

Production of substantially pure chemical compounds [oxides and anhydrous chlorides] or metals. A. S. BURMAN and I. RENNERFELT (B.P. 358,000, 20.6.30. Swed., 25.6.29).—Solutions containing metal chlorides obtained by dissolving crude material in aq. HCl are evaporated to dryness in the presence of

a sol. org. compound, *e.g.*, a sugar, and the residual mass is calcined to expel HCl and to yield a porous mixture of C and a metal oxide. *E.g.*, in the prep. of pure Al_2O_3 from bauxite or clay, the porous mixture is heated to redness in a reducing atm., Fe etc. being removed by extraction with aq. HCl or by treatment with Cl_2 .

L. A. COLES.

Treatment of [recovery of light silica from] siliceous materials. P. SPENCE & SONS, LTD., and A. KIRKHAM (B.P. 357,993, 28.3.30).—Siliceous residues obtained, *e.g.*, in the extraction of clays, bauxite, etc. with acids are dissolved at 90–100° in Na_2CO_3 solution, *d* 1.20–1.28, in quantities such that $\text{SiO}_2 : \text{Na}_2\text{CO}_3 = 1 : 5$; after removal of insol. material, which contains TiO_2 , the solution is cooled rapidly to yield a flocculent ppt. of hydrated SiO_2 which is washed with H_2O and dil. mineral acids, dried, and sieved.

L. A. COLES.

Production of titanium dioxide. J. BLUMENFELD, Assr. to COMMERCIAL PIGMENTS CORP. (U.S.P. 1,795,467, 10.3.31. Appl., 2.2.28).—Ilmenite is heated with conc. H_2SO_4 , the sulphates are dissolved in H_2O , and the solution is reduced with scrap Fe. The reduced solution is then evaporated to remove the greater part of the Fe as $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, leaving a solution containing about 200 g. of TiO_2 , 20–25 g. of Fe⁺⁺, and 500–550 g. of H_2SO_4 per litre. The boiling solution is then added slowly with vigorous agitation to an equal vol. of boiling H_2O and boiling is continued for some hr. until 90–95% of the TiO_2 is precipitated in a dense flocculent form.

A. R. POWELL.

Production of titanium compositions [colloidal titanium dioxide]. C. DE ROHDEN, Assr. to COMMERCIAL PIGMENTS CORP. (U.S.P. 1,797,760, 24.3.31. Appl., 10.2.28).— $\text{Ti}(\text{OH})_4$, produced by hydrolysis of $\text{Ti}(\text{SO}_4)_2$ solutions, is washed and treated with aq. NH_3 to neutralise adsorbed acid, then thoroughly washed to remove salts. The resulting $\text{Ti}(\text{OH})_4$ is peptised by treatment with 35% aq. NH_3 . A colloidal TiO_2 may also be prepared by grinding calcined TiO_2 with 1–2% aq. NH_3 .

A. R. POWELL.

Recovery of titanium from its ores. O. T. COFFELT (U.S.P. 1,795,361, 10.3.31. Appl., 5.7.28).—Finely-ground ilmenite is digested with 75–90% H_2SO_4 and the resulting Ti and Fe sulphates are dissolved in H_2O . The solution is reduced with Fe or Zn until part of the Ti^{IV} is reduced to violet Ti^{III} , diluted with H_2O , and boiled with NH_4Cl equal in wt. to the Ti present. The resulting ppt. of hydrated TiO_2 settles well and is readily freed from Fe by washing with hot H_2O .

A. R. POWELL.

Extraction of zirconia from ores. C. O. TERWILIGER, Assr. to WARD LEONARD ELECTRIC CO. (U.S.P. 1,796,170, 10.3.31. Appl., 18.5.29).—Baddeleyite is ground at 120° with H_2SO_4 (*d* 1.45) until it passes 350-mesh, whereby most of the sol. basic impurities are dissolved. The residual ZrO_2 is washed by decantation, boiled with HCl (*d* 1.14), again washed, boiled with HCl and Cl_2 , washed, and digested with 48% HF and a little H_2SO_4 at 110° until the SiO_2 is expelled; the insol. ZrO_2 is washed free from acid and ignited to expel SO_3 .

A. R. POWELL.

Non-corroding composition [antifreeze solution]. J. W. ORELUP and O. I. LEE (U.S.P. 1,795,883, 10.3.31.

Appl., 29.10.25).—An antifreeze solution for the radiators of internal-combustion engines comprises a 38% solution of CaCl_2 in which is dispersed 0.04–0.05% of a mixture of 50% V_2O_5 , 30% U Th hydroxides, and 20% ZrO_2 .

A. R. POWELL.

Manufacture of monoxanthogens [monosulphur-dicarbothionates]. G. S. WHITBY, Assr. to ROESSLER & HASSLACHER CHEM. CO. (U.S.P. 1,796,972, 17.3.31. Appl., 17.5.28).—By the process already described by Whitby and Greenburg (A., 1930, 320), secondary alkyl monosulphurdicarbothionates (especially the Pr^{Et}_2 compound) are claimed.

A. R. POWELL.

Preparation of lead tetra-alkyl. H. W. DAUDT, Assr. to E. I. DU PONT DE NEMOURS & CO. (U.S.P. 1,798,593, 31.3.31. Appl., 20.1.27).—A suspension of PbCl_2 and Mg turnings in anhyd. Et_2O with MeI or I as a catalyst is treated with an excess of EtCl for 12 hr. at 28–40° under reflux. The product is treated with H_2O and neutralised with NaOH; the Et_2O is removed by distillation and the PbEt_4 recovered by steam-distillation.

A. R. POWELL.

Production of hydrogen. J. S. BEEKLEY, Assr. to DU PONT AMMONIA CORP. (U.S.P. 1,799,452, 7.4.31. Appl., 27.7.28).—A mixture of steam and CH_4 in the ratio 11 : 1–29 : 1 is passed at 350–400° under 20 atm. over a catalyst comprising MgO impregnated with NiO or a mixture of MgO and pumice impregnated with NiO, Ce_2O_3 , and Al_2O_3 . Since the CO_2 produced in the reaction is absorbed by the MgO, the catalyst must be regenerated occasionally by calcining it to expel CO_2 .

A. R. POWELL.

Manufacture of a sulphur product. C. ELLIS, Assr. to ELLIS-FOSTER CO. (U.S.P. 1,795,364, 10.3.31. Appl., 24.11.24).—A colloidal dispersion of S is obtained by grinding 90–95 pts. of S with 10–5 pts. of bentonite and 1 pt. of $\text{Ca}(\text{OH})_2$ in 600 pts. of H_2O . The product may be dried at a temp. below that at which S sinters and is then suitable for incorporation into rubber mixes, for the manufacture of moulded articles, and for water-proofing felt or paper.

A. R. POWELL.

Containers for acids. Separating mixed gases. Catalysing gaseous reactions.—See I. **Grinding org. peroxides. Trialkyl phosphates.**—See III. **Zn-bearing material. Salt bath for Ag. Cu extraction.**—See X. **Electrolysis of H_2O . Carrying out chemical reactions.**—See XI. **Fertilisers.**—See XVI. **Explosives containing $\text{Ca}(\text{NO}_3)_2$.**—See XXII.

VIII.—GLASS; CERAMICS.

Chemical-resisting glass for laboratory vessels. I. J. KITAIGORODSKI and S. M. KUROVSKI (Trans. State Inst. Test. Building Mat., Moscow, 1930, No. 31, 3–43).—Glasses having the composition SiO_2 74, 74; B_2O_3 5.5, 3; Al_2O_3 3, 3; CaO-MgO 10, 10; Na_2O 7.5, 10, or sand 71.3, 71.3; kaolin 7.7, 7.7; dolomite 19.65, 19.65; H_3BO_3 9.8, 5.35; soda 13.12, 18.7; salt-petre 4.0, 4.0 (temp. 1350°) were resistant to chemical attack and change of temp.

CHEMICAL ABSTRACTS.

Solubility of glasses in water in relation to their composition. S. MORIYASU (J. Soc. Chem. Ind., Japan, 1931, 34, 314–317 B).—Knapp's formula (B.,

1927, 12) for the solubility of Pb glass disagrees with Tabata's experimental results. It was found that, using glass grains of 0.25—0.40 mm. diam. heated in H₂O for 1 hr. at 99° followed by conductometric titration, fairly concordant results were easily obtained. A series of tests by the same method were made in Na₂O—CaO glasses containing 3—17% CaO and 65—75% SiO₂, and the results are expressed as "isokals" (composition curves of glasses of equal solubility). A relationship between composition and *d* is also worked out.

C. IRWIN.

Silica grinding. R. L. CAWOOD (Trans. Ceram. Soc., 1931, 30, 295—300).—A grinding unit, consisting of a Patterson 8ft. by 10 ft. continuous-charge and -discharge ball-mill in conjunction with a 14-ft. centrifugal air separator, as installed at the Potters' Mining & Milling Co., U.S.A., is described. The capacity is 40 tons per day (99% passing 200-mesh) at a power cost of 3s. 4d. per ton compared with 8s. per ton in the old plant. The labour and maintenance costs are reduced by half, and there is complete elimination of dust. J. A. SUGDEN.

Effect of smelter atmospheres on the quality of dry-process enamels for cast iron. A. I. ANDREWS and H. W. ALEXANDER (Univ. Ill. Eng. Exp. Sta. Bull. 1931, No. 227, 16 pp.).—Reducing atm. were deleterious to all enamels except leadless Sn enamel, causing formation of metallic beads and loss of opacity. Reducing atm. with high SO₂ content were deleterious to all enamels. CHEMICAL ABSTRACTS.

Preparation of "brilliant gold" and "silver" [lustres]. V. E. TISCHTSCHENKO and S. A. SMIRNOV (J. Appl. Chem., Russia, 1930, 3, 1041—1054).—"Brilliant gold" for ceramic use is prepared by a modification of the Chemnitz method. The prep. of "brilliant silver" (Pd, not Ag) is described. CHEMICAL ABSTRACTS.

Influence of iron oxide on the sintering and some technically important properties of steel-works' dolomite. O. KRAUSE and H. GUHR (Feuerfest, 1931, 7, 129—136).—The porosity of dolomite bricks with <5% FeO begins to decrease after firing above 1200°, whereas that of bricks made from dolomite with 9% FeO commences to decrease above 1000°. The *d* rises almost linearly with the burning temp., except for a pronounced break at 600—800°, up to 1000°, after which it remains const. The compression strength of dolomite bricks is considerably increased by addition of FeCO₃ to the mixture and the burning temp. at which max. strength is reached is appreciably lowered; thus for dolomite with 1% FeO firing at 1450° produces max. strength, whereas a greater strength is obtained at 1050° with dolomite containing 9% FeO. The softening point under load decreases almost linearly with increase in FeO from 1210° with 4% to 1050° with 25% FeO. Irrespective of the Fe content, all dolomite bricks have a large plastic range. Heating curves of dolomite show two breaks, viz., at 630—660° and 740—820°, whereas lines in the X-ray spectra corresponding with MgO and CaO appear only above 800° and 1000° respectively, although pure MgCO₃ shows lines of MgO above 500°. At above 1000° burnt dolomite containing FeO gives a spectrogram containing lines due to a ferrite which would seem to be formed by a reaction in the solid state;

as Mg and Ca ferrites melt at about 1200°, the formation of these compounds explains the lowering of the sintering temp. produced by FeO. A. R. POWELL.

Suitability of various refractory materials for lead-refining furnaces. E. R. THEWS (Feuerfest, 1931, 7, 84—86).—The special requirements of Pb-refining furnaces, in particular the action of the molten Pb and hot Sb slags on the refractories, are briefly outlined. Short descriptions are given of the properties of a number of refractories, the use of which, however, is limited by their high price. A comparison is made between high-grade fireclay and magnesite bricks, and preference is given to the former on account both of their technological properties and low cost. F. SALT.

Electrical resistivity of refractory materials at elevated temperatures. H. M. KRANER (Ind. Eng. Chem., 1931, 23, 1098—1102).—Discordant results in reported values for the resistances of ceramic furnace linings are due to variations in chemical composition, fire treatment, grain size, etc. All ceramic materials contain a glass bond, the conductivity of which is determined by the mobility of the ions and the viscosity of the melt. The resistance therefore increases with ionic size, and a K glass is more resistant than a Na glass. Al increases viscosity and resistance. The variations in composition of the systems Al₂O₃—SiO₂ and MgO—Al₂O₃—SiO₂ with variations in heat-treatment are discussed. MgO is used in preference to alkalis as a flux for high-temp. ceramic materials. Resistances are given for porcelain, clay-quartz mixtures, etc. over the range 0—600° and for an unfired mixture of clay, corundum, and zircon. These indicate the very serious effect of the presence of combined H₂O. The effect of a 5% bentonite bond in reducing the resistance of zircon is shown. C. IRWIN.

Heat losses through furnace walls. Pyrometer-tube walls.—See I. Analysis of aluminosilicates.—See VII.

PATENTS.

Manufacture of laminated glass. F. B. DEHN. From LIBBEY—OWENS—FORD GLASS CO. (B.P. 358,149, 11.7.30).—A solution of dry gelatin in a polyglycol (ethylene glycol) and a polyhydric alcohol (glycerol), containing, if desired, a little CaCl₂, BaCl₂, MnCl₂, or CeCl₃, prepared by agitation of the constituents at 90—100°, is used as adhesive for combining glass and cellulose sheets at raised temp. and pressure.

L. A. COLES.

Preventing the condensation of moisture on glass windows and the like. G. SCHWARTZ (B.P. 357,892, 30.12.20. Switz., 24.11.30).—The surface of the glass is covered with a transparent layer of regenerated cellulose. H. ROYAL-DAWSON.

Tunnel kiln and process of heating ceramic articles. I. HARTER, A. M. KOHLER, and F. H. NORTON, Assrs. to BABCOCK & WILCOX Co. (U.S.P. 1,799,296, 7.4.31. Appl., 31.12.26).—The kiln is operated in three zones for cooling, firing, and preheating, respectively, and a gradual drop in pressure is maintained from the first to the last zone, i.e., countercurrent to the goods. The fuel is admitted to a raised combustion and reverberatory chamber above the middle zone. The trucks

for the goods are not provided with wheels, but slide on metallic rails, and the goods are placed on them in such a manner that there is a gas passage on two sides of each article. In the preheating zone the gases are caused to flow with sufficient speed to prevent laminar flow, *i.e.*, above an average of 15 ft./sec. A temp. of 1538° is exceeded in the firing zone. B. M. VENABLES.

Manufacture of refractory articles [graphite crucibles]. CARBORUNDUM Co., LTD. From F. J. TONE (B.P. 357,611, 27.5.30).—A mix containing flake graphite or similar material is shaped under hydraulic pressure in a mould inverted to impart max. strength to the upper portions, and the mould is jolted to cause the particles to lie in planes at right angles to the side walls, thereby increasing the thermal conductivity in that direction. L. A. COLES.

[Sealing-in] Ni alloys [for glass].—See X.

IX.—BUILDING MATERIALS.

Colloidal hardening and the hardening of cement. H. KÜHL [with F. THILO, C. GOTTFRIED, and W. BÜSSEM] (Z. physikal. Chem., Bodenst. Festb., 1931, 126—130).—Various specimens of cement, after curing for 4 weeks, showed no trace of cryst. structure when examined microscopically or by means of X-rays. The hardening of cement must therefore be a colloidal process.

H. F. GILBE.

Chemical examination of damp brickwork. G. SCHMIDT (Chem.-Ztg., 1931, 55, 558—559).—Samples of brickwork from a damp building were examined for H₂O content, H₂O absorption, chemical composition, etc. Bricks from damp portions of the walls contained Cl', N₂O₅, and CaO, whereas the dry bricks contained only traces of these. The H₂O absorption was proportional to the Cl' content. Bricks from old stables had been used in building the house in question.

F. SALT.

Distribution of ether extractive in slash pine [Pinus caribæa]. E. F. KURTH and E. C. SHERRARD (Ind. Eng. Chem., 1931, 23, 1156—1159).—In all cases the percentage of oil and extract increases from the bark to the centre of the tree. It also decreases with increasing height at the centre of the trunk, but at the outside this decrease is small. The acid val. increases with the age of the wood and is highest for the centre of the butt log, whilst the reverse obtains for sap. val. The amount of unsaponifiable matter varies with the acid val.; it is greatest at the centre of the trunk and decreases with increasing height. Trees of rapid growth have more extractable matter than those of slow growth. The extract from the outer rings is a yellow liquid, whilst that from the centre is solid. The difference between the extracts from the sap- and heart-woods, respectively, may be caused by a greater dilution of the resin acids in the former by esters. B. P. RIDGE.

Manufacture of wallboard and [heat]-insulating sheets from wood and pulp wastes. K. WEILER (Papier-Fabr., 1931, 29, 549—554).—A detailed account is given of current American practice in the manufacture of such products in continuous lengths. Diagrams of machinery and details of physical properties of the boards are given. T. T. POTTS.

PATENTS.

Production of material more particularly for building and street-construction purposes. ALUMINUMERZ BERGBAU U. IND., A.-G. (B.P. 357,293, 2.7.30. Addn. to B.P. 356,797; B., 1931, 1052).—The bauxite may be pretreated by drying, calcining, sintering, or fusing, and further substances, *e.g.*, bauxite cement, clay, limestone, trass, SiO₂, dolomite, may be added to the mixture. L. A. COLES.

Bituminous concrete. E. R. TAYLOR (B.P. 357,282, 1.7.30).—A mineral aggregate is mixed with a fine filler containing sufficient calcined gypsum or plaster of Paris to combine with H₂O in the aggregate, and a suitable quantity of "cut-back" bitumen is then stirred in. L. A. COLES.

Material for covering bituminous road surfaces. O. DÖNIG (B.P. 357,699, 26.7.30. Ger., 27.7.29).—Fragments of stone, blast-furnace slag, or gravel are impregnated with 4—5 pts. per 10³ of bituminous material. L. A. COLES.

Heat-insulating walls. F. FÖRSTER and R. KRAFFT (B.P. 357,356, 2.9.30).—A wooden framework supports outer and inner metallic plates, also a number of intermediate plates which may also be of metal.

B. M. VENABLES.

Manufacture of road-building materials. S. S. SADTLER (B.P. 357,603, 22.5.30. U.S., 28.5.29).—See U.S.P. 1,758,913; B., 1931, 679.

Manufacture of artificial stone or concrete blocks, slabs, panels, etc. for use in building. F. T. WALKER (B.P. 358,047, 1.7.30).

Rotary-kiln cooler.—See I. **Fibrous slabs.**—See V. **Rubber floor-covering.**—See XIV.

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

Reduction characteristics of some iron ores. J. KLÄRDING (Arch. Eisenhüttenw., 1931—2, 5, 129—138).—Various finely-powdered Fe ores were heated at 900° in vac., definite quantities of CO then admitted into the apparatus, and the compositions of the solid and gaseous phases determined and compared graphically with the results obtained with pure Fe₂O₃. The rate of reduction of the Fe oxides in the ores was appreciably retarded by the presence of impurities which combined with the FeO formed in the first stage of the reduction; microscopical examination of partly reduced products revealed the presence of several Fe silicates. The reducibility of Fe ores is a function of the proportion of normally reducible Fe present to the total Fe content of the ore.

A. R. POWELL.

Reduction of iron ore. III. B. STÅLHANE and T. MALMBERG (Jernkontorets Ann., 1930, 609—622; Chem. Zentr., 1931, i, 2800; cf. B., 1931, 203).—Reduction with H₂ or H₂-CO mixtures is more rapid than that with CO. The rate is markedly reduced by the presence of CO₂ or H₂O in the gas; the reduction in the rate falls with increasing H₂ content. A. A. ELDRIDGE.

Problems in the development of furnace construction and operation, with especial reference to

heat-treatment furnaces. A. SCHACK (Arch. Eisenhüttenw., 1931—2, 5, 193—208).—The sources of heat loss in steel-treating furnaces are discussed and methods are indicated for the more economical operation of these furnaces and for improvements in their construction.

A. R. POWELL.

Mathematical treatment of the mechanism of cooling and solidification of liquid metals. I, II. C. SCHWARZ (Arch. Eisenhüttenw., 1931—2, 5, 139—148, 177—186).—I. The effects of overheating, casting temp., mould temp., m.p. of metal, and thermal properties of mould material on the rate of solidification and cooling of cast metal, especially Fe and steel, are shown graphically and mathematical expressions are derived by the use of which these effects can be calc. for certain conditions.

II. Mathematical expressions are deduced for the rate of cooling of large Fe and steel castings and the effects thereon of mould dressings and of the air space which forms when the casting shrinks away from the sides of the mould. The temp. distribution during cooling in various types of mould is shown graphically.

A. R. POWELL.

Heat-treatment fundamentals of plain and alloy cast iron. F. B. COYLE (Metals and Alloys, 1931, 2, 120—131).—Prolonged annealing of cast Fe at 450—650° causes decomp. of eutectoid cementite into ferrite and graphite, a process which is favoured by a high Si and retarded by a high Cr content. Si raises the Ac and Ar crit. ranges by 30° for each 1% Si, whereas each 1% Ni lowers these ranges by 22°, and each 1% Cr raises them by 66°. The effect of Ni is augmented by V, but Mo has the reverse effect. Low-Si cast Fe responds to heat treatment better than that with a high Si content, but Ni-Cr alloys with low Si and C contents develop max. hardness when quenched in oil from 30° above the crit. point. Recent work on the heat-treatment of cast Fe is reviewed in detail. A. R. POWELL.

Oils for use in the heat-treatment [of steel]. K. KREKELER and F. RAPATZ (Arch. Eisenhüttenw., 1931—2, 5, 173—176).—A satisfactory oil for quenching steel in the hardening process must be capable of cooling the metal at a rate greater than the crit. velocity, must have a high flash point, must drain well from the articles when they are removed from the bath, and must be resistant to the chemical action of the hot Fe scale, i.e., resistant to oxidation. Mineral oils appear to be superior in these respects to vegetable oils. For tempering baths the oil should have a flash point above 300°, a low asphalt content, and only a small tendency to form asphaltic compounds during use.

A. R. POWELL.

Oil as a carburising medium [for steels]. A. J. LINDBERG (Metals and Alloys, 1931, 2, 106—109).—An electrically heated retort for carburising small steel articles comprises a heating chamber with its elements divided into several control zones each independently connected to a magnetic switch and automatic control pyrometer so that just the correct amount of heat is generated in each zone to hold the temp. of the retort adjacent to it at the desired value. The retort is closed with an insulated cover sealed with an asbestos gasket and supporting a motor which operates a fan

in the top of the retort. This fan sucks the vaporised oil up the centre of the retort and discharges it horizontally through a jet in the top of the retort where it is burned. The oil is placed in a lubricating cup and dripped into the fan discharge, which throws it against the side of the retort, where it is vaporised; the rate of drip is so regulated that the flame at the jet is of a greenish-golden colour free from a yellow tip and smokiness. After carbonising for the desired time, the oil drip is stopped and the furnace held at a const. temp. for 1—2 hr. to permit diffusion of the hyper-eutectoid case. The basket containing the charge can then be quenched directly from the furnace to obtain grain refinement, or the whole retort may be removed from the furnace and allowed to cool slowly so as to obtain a bright surface on the articles.

A. R. POWELL.

Microstructure of pearlite. H. E. PUBLOW and C. HEATH (Metals and Alloys, 1931, 2, 155—157).—Evidence based on the microstructure of variously heat-treated steels is adduced to show that pearlite may consist of small grains of ferrite and cementite rather than of a large grain of ferrite with cementite particles embedded in it.

A. R. POWELL.

Growth of cast iron under tension. E. PIVOVARSKY and O. BORNHOFEN (Arch. Eisenhüttenw., 1931—2, 5, 163—166).—As a result of numerous tests on different types of cast Fe it is recommended that, in carrying out accelerated tests on the rate of growth, the specimen should be heated twice for 10 hr. at 650° under a load of 1 kg./sq. mm. with fairly free access of air. When the test is made in vac. with cast Fe, annealed to a ferritic structure, the vol. changes which occur are practically independent of the composition and are of the same order of magnitude as those observed with steel. In tests made below 500° cast Fe undergoes a static elongation which is quite independent of the tendency of the metal to grow, but the vol. changes which occur above 500° are characteristic of this tendency.

A. R. POWELL.

Classification of [iron] castings. J. NAVARRO (Anal. Fís. Quím., 1931, 29, 443—452).—The difficulties of applying a quant. treatment to the mechanical properties of cast Fe are discussed. Since the ratio of flexure, f , to breaking strength, s , bears some relation to the fineness of the segregated graphite it has been determined as a function of the hardness for a number of different sized cast-Fe bars. The results show that for an average casting the hardness (Δ) = $2.65(S/f^{0.4})$. The merits of a given casting may be estimated by the extent to which its properties deviate from this equation. The variation of S/f with the nature of the segregated graphite has been studied experimentally.

H. F. GILLBE.

Comparative tests on natural and artificial (Aston) wrought iron. W. VON GUTMANN and H. ESSER (Stahl u. Eisen, 1931, 51, 1193—1197).—The composition and structure of Aston Fe are similar to those of natural wrought Fe except that the former has the slightly higher S content; both metals behave similarly in the red-shortness and weldability tests, but Aston Fe gives the higher notched-bar impact figures and is less sensitive to ageing than wrought Fe, Armco

Fe, and Krupp's soft Fe, although it is not quite so resistant to corrosion and has a slightly lower tensile strength.

A. R. POWELL.

Aqueous solutions of ethylene glycol, glycerin, and sodium silicate as quenching media for steels. T. E. HAMILL (Bur. Stand. J. Res., 1931, 7, 555—571).—Surface- and centre-cooling curves have been obtained and hardness determinations made with cylinders of 1% C steel quenched from 875° in aq. solutions of the above-named compounds. It is not possible to achieve satisfactory cooling at rates intermediate between the rate for H₂O and that for oil by means of aq. glycerin or glycol. Na silicate solutions may, however, be used, and have the advantage that moderate variations in the temp. of the quenching medium do not greatly affect the properties of the quenched steel. It may be necessary to add NaOH to Na silicate solutions to prevent deposition of solid on keeping. Quenching experiments were also made with "stepped" steel bars in order to investigate the relation between the hardness and microstructures produced by various quenching media. R. CUTHILL.

Thermomagnetic investigation of tempering of quenched 0.75% carbon steel. G. A. ELLINGER (Bur. Stand. J. Res., 1931, 7, 441—451).—On heating a quenched 0.75% C steel an increase in magnetisation at once resulted, probably in consequence of stress release caused by the separation of C from supersaturated solid solution in α -Fe. When the temp. was maintained at 200° until the magnetisation had become const., on raising the temp. again an increase in magnetisation occurred at about 235°, this apparently corresponding with the decomp. of austenite. As the temp. rose to 300°, however, the magnetisation diminished. After the specimen had been kept at 300° until the magnetisation had become const., raising the temp. to 700° produced no further change. It is probable that between 200° and 300° the C which had separated was forming Fe₃C, combination being complete when the magnetisation at 300° had become steady, for, on cooling, the A0 transformation, which was absent on the heating curve, appeared. R. CUTHILL.

Detection of internal stresses [in steel]. F. WEVER and H. MÖLLER (Arch. Eisenhüttenw., 1931—2, 5, 215—218).—A method for measuring the internal stresses in worked steels with an accuracy of ± 5 kg./sq. mm. by means of X-ray examination and comparison with an Au standard is described. A. R. POWELL.

Effect of surface decarburisation on fatigue properties of steel. C. R. AUSTIN (Metals and Alloys, 1931, 2, 117—119).—The endurance limit of mild steel is reduced by about 20% by annealing in H₂ for 40 min. at 760° to decarburise the metal to a depth of 0.01 in.

A. R. POWELL.

Influence of corrosion on fatigue of notched [nickel-steel] specimens. T. S. FULLER (Min. and Met., 1931, 12, 446).—The endurance limit of a heat-treated 3.5% Ni steel without a notch was 58,000 lb./sq. in., and with a 45° notch, 0.035 in. deep with a 0.01 in. radius at the bottom, 32,000 lb./sq. in. Exposure of both specimens to an atm. of wet steam and air for 1 week reduced these vals. to 31,000 and

27,000 lb./sq. in., respectively, whereas the endurance limit of a Cr-plated notched specimen after similar exposure remained at 32,000 lb./sq. in. These results illustrate the deleterious effects of corrosion in conjunction with localised stress and the value of Cr-plating as a protection for steel members subject to alternating stresses under corrosive conditions.

A. R. POWELL.

Causes and avoidance of tool-steel failures. W. H. WILLS (Metals and Alloys, 1931, 2, 112—116).—Examples of failures of various tools made from hardened steels are illustrated and discussed; most of the failures were caused by rapid heating resulting in non-uniformity of the parts at the quenching temp., overheating or underheating in the heat-treatment, incorrect furnace atm. leading to decarburisation and the formation of soft spots, or incorrect tempering temp.

A. R. POWELL.

Effect of nitrogen on steel. F. W. SCOTT (Ind. Eng. Chem., 1931, 23, 1036—1051).—N increases the tensile strength, elastic limit, and Brinell hardness, but lowers the elongation and reduction in area, of mild steel; annealing of nitrated sheets causes no loss of N, does not produce blisters, and removes the deleterious effect of N on the drawing properties of the steel. The quality of galvanised steel sheets is not affected by the presence of up to 0.024% N, but the physical properties of the metal are affected in a similar manner to the effect produced by P, the effect of N being equal to that of four times as much P. The effect of N on the ductility of steel increases with increase in the C content; and as the tendency for N to segregate is greater than that of P, even a small amount of N in steel may produce very undesirable results. The N content of finished steel is fairly const., varying between 0.0032 and 0.0060% (average 0.0045%); low-C steels retain less N than do high-C steels which have been recarburised and deoxidised before casting. In refining a steel in the furnace the N is removed simultaneously with, and at about the same rate as, the P. The N content of pig Fe varies from 0.0032 to 0.0129%, and is the greater the higher is the temp. at which the blast furnace is operated.

A. R. POWELL.

Resistance to wear of carbon steels. S. J. ROSENBERG (Bur. Stand. J. Res., 1931, 7, 419—428).—The wear-resistance of annealed steels, as measured by the Amsler machine, was considerably less than that of hardened steels and unaffected by variations in the C content. The wear-resistance of hardened steels, on the other hand, increased rapidly with increase in the C content up to about 0.6%, further increase in the amount of C having relatively little effect. Tempering a hardened steel reduced its wear-resistance. The wear of low-C normalised steels was greater than that of annealed steels of similar C content, but with increasing C content the wear-resistance rapidly increased, ultimately approximating to that of a hardened steel. Wearing was accompanied by a considerable distortion in structure near the worn surface. A martensitic-troostitic matrix resisted wear best, and lamellar pearlite was also very resistant. The wear-resistance was reduced by the presence of granular pearlite, or spheroids of free ferrite or free Fe₃C. R. CUTHILL.

Reduction of non-metallic inclusions in steel by the addition of zirconium. W. ZIELER (Arch. Eisenhüttenw., 1931—2, 5, 167—172).—Owing to the high affinity of Zr for O_2 , N_2 , and S, the addition of a small quantity of Zr, *e.g.*, 0.15%, to molten steel in the ladle results in a considerable decrease in the non-metallic inclusions present. The deoxidising action of Zr is stronger than that of Si and its desulphurising action is greater than that of Mn. ZrS_2 in steel does not cause brittleness, since it usually occurs as oval spots which are quite plastic in the rolling process. The S content of steels containing Zr cannot be determined by the evolution method since ZrS_2 is not decomposed by 1:1 HCl. A. R. POWELL.

Corrosion of metals: theory and experiments. II. Dissolution of metals. W. PALMER [with H. SUNDBERG, B. HANNER, O. PERSSON, G. KARLSSON, T. WILNER, E. BERG, and H. FANT] (Handl. Ing. Vetenskaps-Akad., Stockholm, 1931, no. 108, 198 pp.; cf. B., 1929, 921).—The dissolution of malleable cast Fe in acids is preceded by a long period of induction, after which it follows the course previously described for pig Fe, but at a slower rate owing to the smaller number of graphite inclusions; corrosion is most pronounced around the graphite inclusions, thus confirming the local-element theory of corrosion. The behaviour of soft Fe with about 0.1% C in acids at 25—50° is similar as regards effect of temp. and of concentration of acid to that of pig Fe; this is explained on the assumption that cementite acts as a cathode to anodic ferrite. The effect of cold-rolling in increasing the velocity of dissolution of Fe is attributed to the presence of fissures, which offer a greater surface to attack, and to further increase of this surface by enlargement of the fissures due to release of internal stresses along the corroded surfaces. Annealing after cold-working reduces the rate of dissolution to one fifth that of the hard wire; annealing in H_2 still further reduces this rate owing to removal of the C, wire with 0.01—0.02% C dissolving in *N*-HCl at only one fiftieth the rate of hard-drawn wire with 0.1% C. Electrolytic Fe wire dissolves at one twelfth the rate of soft Fe wire. Experiments with Al and Zn of varying degrees of purity show that the nearer the metal approaches to abs. purity the slower is the rate of dissolution in acids, hence it appears that an absolutely chemically pure metal with a perfectly homogeneous surface should not be dissolved at all by acids, as the e.m.f. at all points of the surface is the same. Measurements of the electrical conductivity of mixtures of $ZnSO_4$ and H_2SO_4 show that isohydric solutions of two electrolytes with a common ion can be obtained only if the no. of the non-common ions in the mol. of each of the electrolytes is unity, and that the condition that two solutions of such electrolytes may be isohydric is that the concentration of the common ion in each solution is identical. Mathematical treatment of the effect of size and distribution of the impurities in metals on their rate of dissolution in acids indicates that the more finely distributed are these cathodic particles over the surface of the metal the smaller is the total resistance capacity of the local elements and the greater is the rate of dissolution of the metal; the local currents are concentrated at the actual boundaries between the

main metal and the particles of impurities, and this accounts for the severe pitting which occurs at areas surrounding the impurities. The method of determining the relative resistance to corrosion of various types of Fe by measuring the loss in wt. in acids during a definite time is adversely criticised, as the rate varies from time to time according to the physical conditions and chemical composition, increasing with lapse of time with some types of Fe and decreasing with others. When a metal is dissolved in the presence of a depolariser the action proceeds according to the diffusion theory only when the test pieces have been previously etched; this implies the occurrence of a period of induction, and hence that the activity of local elements is the primary factor in this case also. From theoretical considerations it is pointed out that the dissolution potential of a metal dissolved in Hg must be identical with that of the metal in a pure solid form, and hence that no period of induction should occur, dissolution being due to the activity of at. or mol. galvanic elements the resistance capacity of which must be small. From this it follows, firstly, that with const. e.m.f. and const. conductivity of the solution the rate of dissolution of a metal from a homogeneous liquid amalgam is proportional to its concentration: this is true for dil. Ca amalgams; and secondly, that if the amalgam contains an excess of metal or intermetallic compound over that sol. in the Hg to a homogeneous phase the rate of dissolution remains const. until the solid phase disappears, and then decreases proportionately to the decrease in concentration of the amalgam: this applies to saturated Ba amalgam. The theories of Centnerszwer and his collaborators on the mechanism of dissolution of metals are adversely criticised and his results are shown to be capable of a simpler explanation based on the theory of local galvanic elements.

A. R. POWELL.

Corrosion rates of steel and composition of corrosion products formed in oxygenated water as affected by velocity. B. E. ROETHELI and R. H. BROWN (Ind. Eng. Chem., 1931, 23, 1010—1012).—The rate of corrosion of rotated specimens of steel in oxygenated H_2O is dependent on the velocity of rotation, which affects the thickness of the liquid film and the type of corrosion product formed. At low speeds of rotation for concentrations of O_2 usually met with, the steel becomes coated with a granular non-resistant film of a magnetic oxide of Fe, whereas at higher speeds the metal becomes covered with a protective film of gelatinous $Fe(OH)_3$, and hence the rate of corrosion decreases. At low velocities the rate of corrosion is governed by the resistance offered by the liquid film to the transfer of O_2 , but at high velocities it is controlled by the resistance of the corrosion product. As the rotational velocity is increased, the rate of corrosion increases to a max. because of a reduction in the thickness of the liquid film, then decreases to a very low val. owing to the resistance of the $Fe(OH)_3$ to the transfer of O_2 , and finally rises again to a high val. at high velocities owing to the breakdown of the oxide film by mechanical erosion.

A. R. POWELL.

Effect of oxygen concentration on corrosion rates of steel and composition of corrosion products

formed in oxygenated water. G. L. COX and B. E. ROETHELI (Ind. Eng. Chem., 1931, 2, 1012—1016).—The rate of corrosion of steel in H_2O containing O_2 is a linear function of the O_2 concentration up to 5.5 c.c./litre, but with higher concentrations the rate gradually decreases with increasing O_2 owing to an increase in the resistance of the film of corrosion product to the transfer of O_2 to the metal surface. At low O_2 concentrations the surface is coated with a film of a porous, black, magnetic oxide, whereas at higher concentrations red, gelatinous $Fe(OH)_3$ is formed owing to the rapid rate of oxidation of Fe^{2+} ions, which prevents the precipitation of $Fe(OH)_2$ (cf. preceding abstract).

A. R. POWELL.

Methods of formation of [iron] rust. G. CHAUDRON (Chim. et Ind., 1931, 26, 273—279).—The modern electrochemical theory of the rusting of Fe is discussed with reference to recent work of Evans, Maass and Herzog, and Chaudron, and its use in indicating suitable methods of protecting Fe from rusting is pointed out.

A. R. POWELL.

Prevention of corrosion of metals by sodium dichromate as affected by salt concentrations and temperature. B. E. ROETHELI and G. L. COX (Ind. Eng. Chem., 1931, 23, 1084—1090).—The protective action of chromates on metals exposed to corrosive salts is used in refrigerating plants, but no definite information has been available as to the proportion of chromate required to be added to the brine. Corrosion rates on different metals of NaCl solutions with additions of chromate were determined, the specimen being rotated and the solution aerated. With Fe a min. chromate concentration is necessary for protection, which min. increases with temp. and NaCl concentration. With Zn pitting is very prevalent and protection effective only with dil. NaCl solutions and at 20°. Cu and brass are easily protected, but in the case of Al the presence of chromate seems to promote pitting. The protection of Pb is slight and variable. These differences are, no doubt, due to variations in the structure of the protective film.

C. IRWIN.

Soil-corrosion studies. Non-ferrous metals and alloys, metallic coatings, and specially prepared ferrous pipes removed in 1930. K. H. LOGAN (Bur. Stand. J. Res., 1931, 7, 585—605).—The results of the examination of specimens of a variety of non-ferrous materials and metal-protective coatings after having been buried in various types of soils for 4—6 years are described. To secure the max. resistance to corrosion the material used must be chosen to suit the soil with which it is to be in contact; no one material is best for all soil conditions. In nearly all soils Cu and alloys high in Cu exhibit a high degree of resistance to corrosion, and Pb is attacked less readily than Fe or steel. All the metallic coatings examined afforded protection to the material beneath.

R. CUTHILL.

Age-hardening of copper-titanium alloys. E. E. SCHUMACHER and W. C. ELLIS (Metals and Alloys, 1931, 2, 111).—The Rockwell B hardness of Cu with 2.03% Ti after quenching from 875° is 37; on ageing at 500° it rises steeply to 89 in 2 hr., then slowly falls to 82 in a further 8 hr. At 400° the hardness rises to 79 in 1 hr.,

then slowly increases to 84 in the following 8 hr.; ageing at 200° produces only a very slow increase in hardness. The alloy with max. age-hardness has a tensile strength of 92,000 lb./sq. in. with an elongation of 10% and an electrical resistivity of 10.5 microhms/cm. at 20°. Alloys with 0.67 and 0.93% Ti also harden on ageing at 400° after quenching from 875°, but the max. hardness is only 15 and 36 on the Rockwell B scale, respectively.

A. R. POWELL.

Causes of fire and explosion in aluminium-bronze factories. RITTER, BOLLÉ, FINGER, FRICKE, VOM BERG, SCHNEIDER, and GLIWITZKY (Jahresber. Chem.-tech. Reichsanst., 1930, 8, 207—214; Chem. Zentr., 1931, i, 2792).—The danger is diminished by retarding oxidation by control of the O_2 supply or cooling by the use of a large excess of air; working in an atmosphere of N_2 produces an explosively oxidisable bronze. The ignitability depends largely on the extent of the surface.

A. A. ELDRIDGE.

Quantitative spectral analysis of alloys. H. TÖPELMANN and W. SCHUHKNIGHT (Z. anal. Chem., 1931, 86, 160—174).—Experimental details are given.

E. S. HEDGES.

Electrolytic refining of copper, using complex salts of cuprous chloride. VII. Behaviour of antimony. S. MAKISHIMA and N. KAMEYAMA (J. Soc. Chem. Ind., Japan, 1931, 34, 324—325 B; cf. B., 1930, 772).—To an electrolyte of Cu alkali-metal chloride 100 mg. of Sb per 1 kg. of Cu anode was added and the current passed for 30 hr. at about 0.3 volt. The cathode was found to contain 0.00024% Sb only, or in presence of K H tartrate 0.00002% Sb. It is therefore probable that in this process contamination of Cu with Sb, if present in the anode, is practically prevented.

C. IRWIN.

Influence of acidity of electrolyte on structure and hardness of electrodeposited nickel. D. J. MACNAUGHTAN and R. A. F. HAMMOND (Trans. Faraday Soc., 1931, 27, 633—648).—In the electrodeposition of Ni from buffered aq. $NiSO_4$, the hardness of the deposit increases as the p_H is increased, the rate of increase becoming much more rapid, however, above a certain crit. p_H , which depends on the buffer present. For the production of a hard deposit, free from cracks, a solution buffered with $(NH_4)_2SO_4$ is most suitable (cf. B., 1928, 644), whereas by using H_3BO_3 , or H_2BO_3 and NaF as buffer and working below the crit. p_H satisfactory soft deposits are obtained. The structure of the deposit has no direct relation to the strength of the electric field at the cathode face, and is only slightly influenced by the amount of H_2 discharged. It is probable, however, that the co-deposition of $Ni(OH)_2$ or a basic salt may vitally influence the character of the Ni deposit.

R. CUTHILL.

Throwing power of plating solutions, with particular reference to certain zinc-plating solutions. B. K. BRAUND (Trans. Faraday Soc., 1931, 27, 661—674).—Their throwing power has been determined by Haring and Blum's method (B., 1923, 556 A), a correction for variations in conductivity due to uneven temp. in the bath being found, in general, to be necessary. The throwing power varies with the material of

the cathode, and with a mild-steel cathode depends to a considerable extent on the method of prep.

R. CUTHILL.

Protection of metals by metal films. E. S. HEDGES (Chem. & Ind., 1931, 768—772).—A review.

Industrial steels and alloys. Recent developments. I. Steels for strength, corrosion, and machining. II. Steels, alloys, and cast irons for heat-resistance. J. W. DONALDSON (Chem. & Ind., 1931, 787—793, 838—845).

[Historical review of] development of the cyanide process. G. H. CLEVINGER (Trans. Amer. Electrochem. Soc., 1931, 60, 79—87).

Pyrometer-tube walls.—See I. **Blast-furnace coke.**—See II. **Pt catalyst for NH₃ oxidation.**—See VII. **Enamels for cast Fe. Au and "Ag" lustres. Steelworks' dolomite. Refractories for Pb-refining furnaces.**—See VIII.

PATENTS.

Ore classifier. A. L. MOND. From COLORADO IRON WORKS Co. (B.P. 357,159, 11.6.30).—In the type in which ore pulp is fed through an inclined trough which is fitted with a rotary spiral agitator and conveyor, one end of which is submerged partly in the liquid, means for raising or lowering this end are provided so as to obviate digging out the tank when operations are interrupted.

C. A. KING.

Concentration of [sulphide and phosphate] ores. R. B. MARTIN (U.S.P. 1,797,356, 24.3.31. Appl., 23.9.29).—The moist ore is tumbled in a revolving cylinder with selective agents to coat the mineral particles and is then subjected to gravity or flotation concentration. *E.g.*, a phosphate ore is ground to pass 48-mesh and the slime removed by classification; the moist sandy portion is agitated with a sol. soap and Na₂SiO₃, crude oil is added, and the mixture passed over Wilfley tables, whereby the gangue passes off in the usual concentrate launder and the phosphate collects in the usual tailings launder in the form of oily flocculent aggregates.

A. R. POWELL.

Treatment of iron ores. COMSTOCK & WESCOTT, INC., Assees. of E. W. WESCOTT (B.P. 355,235, 17.2.30. U.S., 24.10.29. Addn. to B.P. 306,107; B., 1930, 106).—Sulphide Fe ores are heated in the vapours of FeCl₃ obtained from a later stage of the process, whereby the Fe is converted into FeCl₂ with elimination of S. The FeCl₂ is chlorinated to FeCl₃, part of which is returned as vapour to the first stage of the process and the remainder burned with air to yield Fe₂O₃ and dil. Cl₂ for the chlorination stage.

A. R. POWELL.

[Metal-casting] sand moulds. B. F. WALLACE (B.P. 357,126, 12.5.30).—A pulverised carbonaceous base, *e.g.*, graphite impregnated with a pitch-like residual product of b.p. > 250°, from the distillation of a hydrocarbon, is dusted on to a pattern which is then rammed round with sand to form a mould.

C. A. KING.

Heat-treatment of metal articles. W. BECK, Assr. to DEUTS. GOLD- U. SILBER-SCHNEIDANSTALT VORM. ROESSLER (U.S.P. 1,799,945, 7.4.31. Appl., 19.5.28. Ger., 20.5.27).—The articles are heated at 500° in a

bath of fused KOH or NaOH to which is added sufficient finely-divided C to prevent surface oxidation.

A. R. POWELL.

[Heat-]treatment of chromium-nickel-iron-carbon alloys. F. KRUPP A.-G. (B.P. 357,254, 21.6.30. Ger., 24.6.29).—The endurance limit for reversed bending stresses and the yield point of steels with 6—40% Cr, 40—4% Ni, and <1% C are improved by quenching from 500—950°, preferably from 850—900°.

A. R. POWELL.

[Copper] coating of [iron or steel] wire. R. M. HUGHES. From JOHNSON STEEL & WIRE Co., INC. (B.P. 355,463, 17.7.30).—Fe wire is passed continuously through a solution of CuSO₄ at 5—10°, the liquid being agitated by a stream of finely-divided air bubbles, thence through a washing tank, and finally through a bed of hot sand which dries and burnishes the Cu deposit.

A. R. POWELL.

Coating of metals [iron with chromium]. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of G. H. HOWE (B.P. 354,887, 27.5.30. U.S., 28.5.29).—Fe articles are coated with a layer of Cr-Fe alloy by heating in a closed electric-resistance furnace in contact with a powdered mixture of 85% Cr, 10% Zn, and 5% Al at a temp. above the volatilisation point of Zn, *e.g.*, at 925°.

A. R. POWELL.

Metallising articles of organic origin. K. RICHTER (B.P. 355,848, 6.6.30).—The articles are treated in vac. with the vapour of Zn or Cd.

A. R. POWELL.

Case-hardening composition. E. C. MOFFETT, Assr. to AMER. CYANAMID Co. (U.S.P. 1,796,800, 17.3.31. Appl., 30.7.27).—A case-hardening bath comprises a fused 2 : 1 mixture of CaCl₂ and NaCl to which is added from time to time as required a small proportion of Ca(CN)₂.

A. R. POWELL.

[Refining agent for] manufacture of metals and alloys. MAY & BAKER, LTD., and G. S. HIGGINSON (B.P. 357,539 and 357,540, 19.6.30).—In casting metals and alloys the structure is refined and gases are eliminated by treating the molten metal with (A) KI or BaI₂ either in the ladle or as a mould dressing, or (B) a cartridge containing KI or BaI₂ with or without a flux.

A. R. POWELL.

Manufacture of steel. F. F. McINTOSH, Assr. to CRUCIBLE STEEL Co. OF AMERICA (U.S.P. 1,797,728, 24.3.31. Appl., 6.5.29).—A small quantity of MoS₂ is added to the finished steel in the ladle.

A. R. POWELL.

Steel alloy insensible to hot gases and vapours. B. STRAUSS, Assr. to F. KRUPP A.-G. (U.S.P. 1,787,403, 30.12.30. Appl., 5.4.29. Ger., 21.9.28).—Vessels for cracking petroleum are made of a steel alloy containing 0.1—0.2 (0.15)% C, 5—12 (6)% Cr, 0.2—5.5 (0.3)% V, and 0.5—2.0 (2)% Ni, which has been heated above Ac₃, quenched, and tempered at 600—650°.

A. R. POWELL.

Alloy steel containing nickel, silicon, and copper. P. A. E. ARMSTRONG and R. P. DE VRIES, Assrs. to LUDLEM STEEL Co. (U.S.P. 1,799,273, 7.4.31. Appl., 5.7.28).—Steel resistant to corrosion and to scaling at high temp. contains 5—40 (37)% Ni, 2—7 (4)% Si, 0.5—15 (12)% Cu, and 0.05—1.5 (0.3)% C.

A. R. POWELL.

[Nickel-cobalt steel] alloys. ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Asses. of H. SCOTT (B.P. 357,665, 7.7.30. U.S., 5.7.29).—A leading-in wire for sealing into glass is made from an Fe alloy containing 15–30 (23.7)% Ni, 20–40 (21.9)% Co, <0.5 (0.2)% Mn, <0.3% C, and 0.1% Si. A. R. POWELL.

Roasting of ores containing iron and copper sulphides. H. K. A. LASSEN (B.P. 355,664, 19.5.30).—Sulphide ores containing Cu pyrites in association with Ag minerals and/or molybdenite are roasted with agitation with a regulated supply of air at 430–470°, whereby the Fe sulphides are converted into Fe₃O₄ with which the Cu is associated. Magnetic separation of the roasted material affords a magnetic Fe-Cu product and a non-magnetic Ag-Mo product. A. R. POWELL.

Refining of copper. J. LEEMANS, and SOC. GÉN. MÉTALLURG. DE HOBOKEN (B.P. 356,077, 8.1.31).—Black Cu is refined by melting it with refinery slag containing 30–40% Cu as oxide and silicate sufficient to remove the Fe and S from the Cu. Very impure Cu is smelted in a cupola with the slag and the resulting Cu is further purified by bessemerisation. A. R. POWELL.

Recovery of metallic elements and alloys. [Treatment of scrap brass etc.] H. M. BURKEY and D. L. OGDEN, Asses. to AMER. METAL CO., LTD. (U.S.P. 1,785,247, 16.12.30. Appl., 15.8.28).—The scrap is first heated at a low temp. to remove most of the Sn-Pb solder by liquation, then smelted in a cupola under such conditions that the greater part of the Pb, Zn, and Sn is removed as fume and a crude Cu is obtained. The latter is blown in a converter to eliminate Fe and to volatilise the remainder of the Pb, Zn, and Sn. The Cu is finally purified by electrolysis and the fume extracted with aq. NH₃ to remove Zn, which is recovered as oxide. The residual fume is smelted to obtain a Sn-Pb alloy which, together with the solder runnings, is refined by electrolysis. A. R. POWELL.

Treatment of zinc-bearing material. (A) W. C. HOOEY, (B) W. O. BORCHERDT, Asses. to NEW JERSEY ZINC Co. (U.S.P. 1,799,166 and 1,799,278, [A, B] 7.4.31. Appl., [A] 26.12.28, [B] 8.12.28).—(A) CaCO₃ and MgCO₃ are removed from ZnS concentrates by agitating the material in a series of tanks with dil. H₂SO₄ on the countercurrent principle. The CaSO₄.2H₂O formed is separated from the blende by means of classifiers. (B) Blende contaminated with CaCO₃ and/or MgCO₃ is treated with sufficient H₂SO₄ to convert the carbonates into sulphates (in a finely-divided form) which are readily washed away from the Zn mineral. A. R. POWELL.

Treatment of zinciferous materials for removal of cadmium or cadmium together with lead. NEW JERSEY ZINC Co., Asses. of H. M. CYR and R. K. WARING (B.P. 355,840, 4.6.30. U.S., 15.10.29).—Roasted Zn ore is mixed with about 5% of anthracite powder and a solution of ZnCl₂ sufficient to chloridise all the Cd and Pb, and the moist mixture is sintered in a Dwight-Lloyd machine, whereby the Cd and Pb are volatilised as chlorides and a sinter containing <0.0025% Cd and 0.1% Pb is obtained from which a high-grade Zn is produced by the usual smelting operation. A. R. POWELL.

Treatment of magnesium. E. C. BURDICK, Assr. to DOW CHEM. Co. (U.S.P. 1,795,473, 10.3.31. Appl., 10.11.26).—Mg articles are cleaned and given a bright, lustrous surface by immersion in 10–30 (25%) H₂SO₄. A. R. POWELL.

Production of magnesium alloys. C. ARNOLD. From DOW CHEM. Co. (B.P. 354,744, 11.3.30).—Mg alloys containing Mn, Ce, Be, V, Mo, or Ni are obtained by addition of the corresponding chloride to the fused MgCl₂ bath, from which the Mg is produced by electrolysis. A. R. POWELL.

Protection of magnesium and its alloys from attack by hot baths of saline melts. I. G. FARBENIND. A.-G. (B.P. 357,428, 26.11.30. Ger., 11.12.29).—In the heat-treatment of Mg or its light alloys in fused nitrate baths, addition of 1–2% of an alkali chromate, dichromate, or fluoride to the fused salt prevents corrosion of the metal. A. R. POWELL.

Increasing the resistance to corrosion of objects made from alloys of magnesium with manganese. I. G. FARBENIND. A.-G. (B.P. 355,920, 5.8.30. Ger., 23.8.29).—Mg alloys containing 0.5–2.5% Mn are hot-worked above 410–480°, preferably at 470–500°, maintained at this temp. for 2–48 hr., and allowed to cool in the air. A. R. POWELL.

Manufacture of aluminium and its alloys. T. R. HAGLUND (B.P. 355,792, 22.5.30).—A mixture of a W alloy or compound with Al₂O₃ or bauxite which has been subjected to an electrothermal smelting to remove Fe and part or all of the Si and Ti is smelted in an electric furnace with carbonaceous reducing agents to give an alloy containing 50–90% Al and >10% W. Liquation of this alloy affords Al containing <0.07% W and a W-Al alloy which may be returned to the smelting operation. Al may also be recovered from the alloy by electrolytic refining in a molten fluoride bath or by distillation in vac. A. R. POWELL.

Aluminium alloys. H. W. CLARKE and L. AITCHISON (B.P. 357,800 and 357,805, [A] 8.10.30, [B] 13.10.30).—The alloys comprise Al with (A) 1.5–3 (2)% Cu, 0.5–2.5 (1.5)% Ni, 0.5–2.5 (1.4)% Fe, 0.5–2 (0.75)% Mg, and 0.25–1 (0.5)% Si, or (B) 0.5–5 (0.83)% Mn, 0.5–1.5 (0.94)% Si, 0.3–1.25 (0.78)% Mg, and 0.3–2 (1.03)% Sb, heat-treated by quenching from 510° and ageing at 150–175°. A. R. POWELL.

Aluminium-base alloy. T. W. BOSSERT and J. A. NOCK, JUN., Asses. to ALUMINUM Co. OF AMERICA (U.S.P. 1,797,851, 24.3.31. Appl., 5.6.30).—An alloy containing at least 95% Al with 1–1.5% Mn and 0.5–1.5% Mg is claimed. A. R. POWELL.

Plastic heat-treated aluminium alloy. N. V. HYBINETTE, Assr. to HYBINETTE PATENTS CORP. (U.S.P. 1,785,774, 23.12.30. Appl., 18.5.29).—The alloy comprises Al with 0.5–1 (0.5)% Zn, 0.5–1 (0.75)% Mg, 0.05–0.15 (0.1)% Cd, and <0.25% Cu, Ni, Co, Mn, Cr, Mo, or W (0.2% Cu). After suitable heat-treatment the alloy is not subject to intercryst. corrosion. A. R. POWELL.

Recovery of tungsten from ores. C. V. IREDELL, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,796,026, 10.3.31. Appl., 28.5.29).—The ore is digested with

NaOH solution and the insol. material removed by filtration. The filtrate is neutralised with HCl until it contains 0.3—0.7% of free alkalinity, then diluted with warm H_2O to 150 g. of Na_2WO_4 per litre, and treated with $CaCl_2$ solution (*d* 1.175) in a fine stream, whereby $CaWO_4 \cdot H_2O$ is precipitated. This is converted into WO_3 in the usual way by boiling with HCl.

A. R. POWELL.

Manufacture of refractory metals, e.g., tungsten. GEN. ELECTRIC CO., LTD., and C. J. SMITHELLS (B.P. 354,785, 10.5.30).—A bar of W sintered in H_2 in the usual way is heated in A. at 3000° for 3—5 min. with a boat containing Na disposed about 1 cm. away from the bar so as to provide an envelope of Na vapour around the bar, which is thereby effectively deoxidised.

A. R. POWELL.

Improvement of cobalt-tungsten alloys. VEREIN. STAHLWERKE A.-G. (B.P. 356,089, 28.2.31. Ger., 4.7.30).—Co alloys with 5—50% W are quenched from above 1000° and aged at 500 — 900° ; e.g., the 60:40 Co-W alloy, quenched from 1300° and aged at 800° , has a Brinell hardness of 660.

A. R. POWELL.

Production of hard [cobalt-chromium-tungsten] alloys. VEREIN. STAHLWERKE A.-G. (B.P. 355,782, 25.3.30. Ger., 26.3.29).—Alloys of Co and Cr with 10—40% W and 2—5 (3)% C are cooled slowly after casting, then reheated at 700° until 10—60% of the total C is liberated as finely-dispersed graphite, and again allowed to cool slowly. Part of the Co may be replaced by Ni and part of the W by Mo.

A. R. POWELL.

Recovery of cobalt or its compounds [from mattes]. E. A. A. GRÖNWALL (B.P. 357,366, 16.9.30. Swed., 17.9.29).—Cu matte obtained in the usual way from cobaltiferous Cu pyrites is bessemerised until all or most of the Fe has been slagged and removed. Blowing is then continued with addition of SiO_2 to slag off the Co and the resulting Co silicate is crushed and leached with H_2SO_4 to extract Co, smelted with more Cu pyrites to obtain a Co-rich matte, or roasted with pyrites and NaCl to obtain sol. Co salts. Reduction of the slag in an electric furnace affords a crude metal from which pure Co may be recovered by wet methods.

A. R. POWELL.

Salt bath for annealing metal [silver] articles. E. FAHLÄNDER (B.P. 357,538, 19.6.30).—The bath comprises a mixture of NaCl, K_2SO_4 , and K_2CO_3 and/or Na_2CO_3 , with or without small quantities of $Na_2B_4O_7$, $MgCO_3$, $CaCO_3$, and $NaNO_3$, the mixture having a m.p. $< 600^\circ$.

A. R. POWELL.

[Palladium] alloy. H. KLAUSMANN and H. R. KIEFE, Assrs. to BAKER & CO., INC. (U.S.P. 1,797,236, 24.3.31. Appl., 3.5.30).—The alloy contains 75—98 (95)% Pd, 24—1 (3)% Rh, and the rest (2%) Ru.

A. R. POWELL.

Welding composition. J. A. HEALY (U.S.P. 1,796,329, 17.3.31. Appl., 16.9.29).—WC tips are brazed on to steel shanks by the use of a powdered mixture of 30% of fused $Na_2B_4O_7$, 60% of ferromanganese, and 10% of ferro-silicon, to which is added 20—100% of high-speed steel filings.

A. R. POWELL.

[Inhibitor for] the pickling of metals and like processes. IMPERIAL CHEM. INDUSTRIES, LTD. (B.P.

357,387, 8.10.30. U.S., 9.10.29).—Thioglycollic acid, or its salts, esters, or other derivatives in combination with a protective colloid or foaming agent is claimed.

A. R. POWELL.

Copper extraction process. W. E. GREENAWALT (U.S.P. 1,798,255, 31.3.31. Appl., 6.1.27. Renewed 18.8.30).—Cu sulphide concentrates are separated by gravity or flotation into a rich product containing 50—60% Cu and a poor product containing $< 10\%$ Cu. The former is smelted to produce a rich matte, part of which is converted into crude Cu for anodes and the remainder roasted and extracted with H_2SO_4 to give a $CuSO_4$ solution for electrolysis. The spent electrolyte from the Cu refining is returned to the leaching tanks. The poor product from flotation is roasted and leached with H_2SO_4 separately, and the leach liquor is purified by digestion with part of the CuO obtained in roasting the matte. The purified liquor is passed to the electrolytic tanks. The insol. residues from the process are smelted for the recovery of Au and Ag.

A. R. POWELL.

Production of metallic tantalum. C. W. BALKE, Assr. to FANSTEEL PRODUCTS CO., INC. (U.S.P. 1,799,403, 7.4.31. Appl., 20.8.23).—A fused mixture of K_2TaF_7 and Ta_2O_5 is electrolysed in an Fe pot with a graphite anode. When the mass contains 15% Ta it is cooled, crushed, and the Ta recovered by concentration on Wilfley tables.

A. R. POWELL.

Detinning [of scrap tinplate]. E. KARDOS (U.S.P. 1,798,607, 31.3.31. Appl., 30.8.28).—The scrap is leached with NaOH into which are passed nitrous gases produced by the catalytic oxidation of NH_3 . When the solution contains 5—6% Sn and the nitrites have all been decomposed it is electrolysed to recover Sn and the spent electrolyte is returned to the leaching tanks.

A. R. POWELL.

Plating of metal articles. F. B. DEHN, From MAJOR ENG. CORP. (B.P. 354,706, 17.2.30).—The anode comprises pulverulent metal at the bottom of the tank, and the cathodes are arranged so as to be movable through the tank, during which movement part of the anode metal is disseminated throughout the electrolyte so as to effect depolarisation and burnishing of the cathodes.

A. R. POWELL.

[Nickel-]plating process. W. J. WRIGHTON and E. D. TILLYER, Assrs. to AMER. OPTICAL CO. (U.S.P. 1,797,254, 24.3.31. Appl., 2.4.28).—Articles made of Ni wire, e.g., spectacle frames, are finished with a heavy coating of Ni from any of the ordinary plating baths.

A. R. POWELL.

Chromium plating. L. R. WESTBROOK, Assr. to GRASSELLI CHEM. CO. (U.S.P. 1,795,459, 10.3.31. Appl., 23.2.28).—An alkali molybdate or vanadate is added to the usual Cr-plating bath.

A. R. POWELL.

Treating [finishing] cadmium-plated goods. L. MELLERSH-JACKSON, From C. T. NEAL (B.P. 357,887, 23.12.30).—The articles are dipped into dil. HNO_3 (1 oz. per gal.) immediately after removal from the plating bath, rinsed thoroughly, and dried, to produce a lustrous finish.

A. R. POWELL.

Coating and colouring metals. A. PACZ (U.S.P. 1,798,218, 31.3.31. Appl., 23.3.25).—Articles of steel, Fe, Sn, Pb, Al, Zn, Cd, or Mg are covered with a lustrous,

black, protective coating by immersion in a solution containing $(\text{NH}_4)_2\text{MoO}_4$ and $(\text{NH}_4)_2\text{C}_2\text{O}_4$, with or without contact with a Zn anode. A. R. POWELL.

Purification of zinc ore. O. GERLACH (B.P. 358,039, 27.5.30).—See U.S.P. 1,773,991; B., 1931, 448.

Sintering of material. Deflocculation of colloids. Gas cleaner.—See I. **Non-corroding solution. Ti from ores.**—See VII. **Metal-melting furnace. Brazing furnace. Electroplating anodes. Welding rod.**—See XI. **Rubber[metal] adhesive. Moulds for rubber.**—See XIV.

XI.—ELECTROTECHNICS.

Electrical insulation with special reference to the applications of synthetic resins. W. D. OWEN and A. M. THOMAS (J. Oil Col. Chem. Assoc., 1931, 14, 290—305).—Chemical aspects of electrical insulation problems are discussed, the nature of true and pseudo-dielectrics being indicated. $\text{PhOH-CH}_2\text{O}$ resins and other synthetic resins used in the electrical industry are summarised, the nature, sources of raw materials, and theories of resinification receiving attention. The electrical, chemical, and physical properties required for electrical insulation and standard methods of testing for these are detailed. S. S. WOOLF.

Evaporation of pulp-mill waste liquors.—See V. **NaCl industry of Rio. MnO_2 . Decomposition of H_2S .**—See VII. **Resistivity of refractories.**—See VIII. **Carburising steels. Cu. Ni-plate. Zn-plate.**—See X. **Fe oxide pigments.**—See XIII. **Electric currents and fermentation.**—See XVIII. **Determining H_2O in wheat.**—See XIX.

PATENTS.

[Electric metal-melting] furnace. M. UNGER, Ass. to GEN. ELECTRIC Co. (U.S.P. 1,800,034, 7.4.31. Appl., 18.4.30).—Powdered or granular material, e.g., MgO , is packed round the heated crucible, and is agitated when being packed. J. S. G. THOMAS.

[Electric] furnace [for high-temperature brazing]. F. C. KELLEY, Ass. to GEN. ELECTRIC Co. (U.S.P. 1,799,102, 31.3.31. Appl., 13.8.29).—The furnace is heated to a temp. just short of the softening point of the materials of construction by known means, e.g., an electric resistance coil. The charge is first heated to nearly that temp. by heat from the furnace, and then the junction alone (e.g., a W filament and terminal rod) is further heated by a high-frequency field emanating from a coil round the outside of the furnace. B. M. VENABLES.

[Preventing the formation of crust in] electric batteries having an ammonium chloride electrolyte. SOC. ANON. LE CARBONE (B.P. 357,890, 29.12.30. Fr., 19.11.30).—Wicks are arranged to cause continuous circulation of the electrolyte. J. S. G. THOMAS.

Electrolytic cells. J. W. THOMPSON, J. W. HINCHLEY, and L. H. BAMTON (B.P. 356,241, 2.6.30).—A counterpoised vessel containing electrolyte can be raised or lowered within a frame supporting stationary C or graphite electrodes. J. S. G. THOMAS.

Electrolysers [for decomposing water etc. under pressure]. J. E. NOEGGERATH (B.P. 358,191, 11.8.30).—

Radially extending tension members are arranged within the electrolyser to take up stresses due to pressure on the walls of the vessel. J. S. G. THOMAS.

[Soluble electroplating] anodes. UDYLLITE PROCESS Co., Asses. of J. O. WAGNER and A. S. ASCHER (B.P. 357,977, 30.6.30. U.S., 20.2.30).—Large balls of the metal to be deposited fill substantially the cross-section of a long, narrow, hollow cage of foraminous material and descend under gravity as they dissolve. J. S. G. THOMAS.

Manufacture of electrodes for positive-column, luminous, gaseous conduction tubes. W. W. TRIGGS. From Q. R. S. DE VRY CORP. (B.P. 357,516, 19.5.30).—A small-bored, tubular, cylindrical body, e.g., of Ni, is coated internally with BaC_2 [made from a paste of $\text{Ba}(\text{OH})_2$ and C] and externally with a mixture of NiO_2 (1 pt.), sealing glass (1 pt.), and powdered SiO_2 (4 pts.) in EtOH and heated slowly. J. S. G. THOMAS.

Low-temperature emissive cathodes for electric-discharge devices. STANDARD TELEPHONES & CABLES, LTD., and W. E. BENHAM (B.P. 357,632, 26.6.30).—A core consisting of an alloy containing equal parts of W and Mo is coated with oxide by heating. J. S. G. THOMAS.

[Support of cathode in] electron-discharge tubes or thermionic valves. N. V. PHILIPS' GLOEILAMPEN-FABR. (B.P. 357,444, 18.12.30. Holl., 19.7.30).—The cathode is soldered, preferably with Ag_2O mixed with H_2O , to supporting members which do not conduct current to the cathode. J. S. G. THOMAS.

Introduction of mercury into [electric-]discharge tubes. ALLGEM. ELEKTRICITÄTS-GES. (B.P. 358,200, 14.8.30. Ger., 21.8.29).—A mixture of Hg sulphide and a reducing agent, e.g., Fe, Ni, and, if desired, Mg, is heated inside the tube. J. S. G. THOMAS.

Dielectric materials. STANDARD TELEPHONES & CABLES, LTD., M. C. FIELD, W. E. HUGH, and L. G. B. PARSONS (B.P. 357,624, 20.6.30).—A dielectric composed of rubber, preferably *Hevea* pale crêpe rubber freed from protein and resinous matters and H_2O -sol. constituents, 40—80% of a synthetic hydrocarbon polymeride, preferably polystyrene, and up to 20% of a hydrocarbon wax is claimed. J. S. G. THOMAS.

Electrical insulators. S. JUST (B.P. 357,510, 14.4.30. Hung., 16.9.29).—A compressed mixture of colloidal BN with a small proportion of binder, e.g., hydrated silicic acid, is heated slowly and then baked at a very high temp. Various other inorg. or org. materials, e.g., glass, asbestos, bakelite, paraffin, resin-lac, may be added to the mixture. J. S. G. THOMAS.

[Inorganic] electrical insulation. BRIT. THOMSON-HOUSTON Co., LTD., Asses. of C. DANSTZEN (B.P. 358,285, 10.10.30. U.S., 11.10.29).—A coating of ZnF_2 is deposited electrolytically on a conductor of Zn or coated with Zn. J. S. G. THOMAS.

Weld-rod for electric-arc welding. A. F. BURGESS. From A. O. SMITH CORP. (B.P. 357,512, 22.4.30).—A steel, alloy steel, or low-C Fe welding rod (diam. > 0.25 in.) covered with carbohydrate material, e.g., a mixture of wood flour (15%), Na silicate (70.6%),

kaolin (9.4%), and SiO₂ flour (4.7%), is supplied with a current of 500—2000 amp. at 35—55 volts.

J. S. G. THOMAS.

Carrying out chemical reactions. INST. F. PHYSIKAL. GRUNDLAGEN DER MEDIZIN (B.P. 357,534, 17.6.30. Ger., 26.6.29).—The reactions are effected by d.c. glow discharges between unequally curved electrodes arranged in a chamber so that the cathode-fall space is approx. equal to the space between the electrodes. Examples are: the synthesis of NH₃, and manufacture of C₂H₂ from CH₄ or from a hydrocarbon mixture containing CH₄, with or without additional H₂. Diacetylene is among the final products in this latter case.

J. S. G. THOMAS.

Kerr and similar electro-optical cells. MARCONI'S WIRELESS TELEGRAPH Co., LTD., Assees. of S. BLOOMENTHAL (B.P. 358,368, 12.12.30. U.S., 12.12.29).

[Miniature dry-cell] electric batteries. BURGESS BATTERY Co., Assees. of W. B. SCHULTE and J. S. ZOOK (B.P. 357,561, 20.5.30. U.S., 30.7.29).

[Plate, separator, container, and venting system for] electric storage cells and batteries. S. A. POLLOCK (B.P. 357,504—7, 18.3.30).

Drying of storage-battery plates.—See I. **Liquid hydrocarbons.**—See II. CH₂O from CH₄ and CO₂. **Hexamethylenetetramine.**—See III. **Purifying acids.**—See VII. **Ni-Co [sealing-in] alloys.** **Roasting of sulphide ores.** **Scrap brass.** **Mg alloys.** **Al and its alloys.** **Cu extraction.** **Ta.** **Sn-plate.** **Plating metal articles.** **Ni,** **Cr,** and **Cd-plate.** **Coating etc. metals.**—See X.

XII.—FATS; OILS; WAXES.

Characterisation and determination of oils and fats. J. K. CHOWDHURY and S. M. DAS-GUPTA (J. Indian Chem. Soc., 1931, 8, 423—432).—Oils and fats can be characterised by treatment with KMnO₄ in dry pyridine; the temp. (*T*) at which CO₂ evolution begins and the amount of CO₂ evolved (g. per 100 g. of oil = CO₂ val.) are consts. (within narrow limits) for individual oils. The value of *T* for a particular oil is unaffected by the presence of other oils, but free acid lowers *T* and increases the CO₂ val. Adulterants can be detected and determined from the CO₂ and acid vals. and *T*. Mixtures of 2 oils are determined from the CO₂ val. and *T*, whilst mixtures of 3 oils can be determined similarly or, if the constituent oils are known, from the CO₂ and I vals. Numerous examples are given. Treatment of drying oils with KMnO₄ in pyridine gives a very viscous product; semi-drying oils become partly viscous, whilst non-drying oils remain mobile.

H. BURTON.

Analysis of oils and fats, particularly butter. S. FACHINI and G. DORTA (Atti III Cong. Naz. Chim. pura Appl., 1929, 683—687; Chem. Zentr., 1931, i, 2815).—By precipitation of the K salts in COMe₂ of suitable concentration, octoic, deoic, oleic, and linoleic acids are separated from lauric, myristic, palmitic, and stearic acids. The separation may be used for the analysis of olive oil and butter. A. A. ELDRIDGE.

Hydrogenation standardises quality of lard. M. H. GWYNN and A. P. LEE (Oil and Fat Ind.,

1931, 8, 385, 387).—A small degree of hydrogenation (with deacidification and deodorisation) improves the consistency and keeping properties of lard; the Bolton-Lush continuous process is suitable and shows considerable selective hydrogenation of the linoleic acid present.

E. LEWKOWITSCH.

Kreis [rancidity] reaction [for rancid fats]. K. TÄUFEL, P. SADLER, and F. K. RUSOW (Z. angew. Chem., 1931, 44, 873—875).—Since the epihydrinaldehyde is present in rancid fat in the free state to only a small extent, but is liberated by acid, the method of carrying out the phloroglucinol reaction has been modified. The fat is mixed in a test-tube with conc. HCl and a plug of white cotton wool, moistened with 1% ethereal phloroglucinol and 2% HCl, is pushed a little way down the tube. On careful shaking, without wetting the cotton wool, and if necessary warming at 60°, the characteristic red colour appears on the cotton wool. The limit of sensitivity is about 0.9 microg. of epihydrinaldehyde.

H. F. GILBE.

Effect of ultra-violet irradiation on the free sterols of lanoline. A. BERNHARD and I. J. DREKTER (J. Biol. Chem., 1931, 93, 1—3).—The free sterols precipitable by digitonin and expressed as cholesterol in a sample of anhyd. lanoline increased from 0.93% to 5.37% on irradiation, the max. being attained in about 1 hr.

F. O. HOWITT.

Chemical composition of certain oils. W. HUMNICKI (Rocz. Chem., 1931, 11, 678—682).—The sp. gr., sap. val. and I val., and N, P, and lecithin contents of plum-seed oil, rye-embryo oil, refined and crude cod-liver oil, and calf and swine-liver oils are given. FeCl₃ may be used in place of HgCl₂ in determining the I val.

R. TRUSZKOWSKI.

Composition of Philippine peanut oil. A. O. CRUZ and A. P. WEST (Philippine J. Sci., 1931, 46, 199—207).—Philippine peanuts (Valencia variety) yielded 40% of an oil (purified) which was similar to American peanut oil (cf. B., 1921, 740 A), but contains rather more linoleic and palmitic acids, having: I val. (Hanus) 101.3, saturated acids (corr.) 17.12%, unsaturated acids (corr.) 77.89% (I val. 125). The composition of the oil was determined as: acids (%): palmitic 8.14, stearic 3.43, arachidic 3.25, lignoceric 2.3, oleic 51.54, linoleic 25.88, and unsaponifiable matter 0.29%.

E. LEWKOWITSCH.

Forming and pressing cakes in the oil mill. J. G. GIBSON (Oil and Fat Ind., 1931, 8, 383—394, 397).—Analyses of badly prepared press-cakes illustrate the importance of care and uniformity in forming and wrapping the meal.

E. LEWKOWITSCH.

Relation of the effect of rubber anti-ageing agents on the oxidation of drying oil, and of the anti-oxidising properties of organic compounds to their structure. V. TANAKA and S. NAKAMURA (J. Rubber Soc. Japan, 1930, 2, 176—186).—The comparative rates of oxidation of linseed oil in presence of various org. antioxidising agents are recorded. The titration acidity was nearly parallel with the increase in wt. The antioxidising agent does not act by formation of a protective film. The action is due to the presence of (1) antioxidant groups Ph, C₁₀H₇, N·NH₂,

CN, (2) auxoantioxygenophores NH_2 , OH, Alk, OMe, CO_2H , (3) oxygenophores Cl, NO_2 .

CHEMICAL ABSTRACTS.

Rancidity and porous packings.—See XIX. **Grease and oils from sewage. Sapocresols.**—See XXIII.

PATENTS.

Production of emulsifying agents and of emulsions prepared therewith. M. BURAK (B.P. 357,128, 5.6.30. Ger., 7.6.29).—Olein is added to a mixture of soap (or substitutes, e.g., salts of sulpho- or hydro-aromatic acids) and cyclohexanol or its homologues (wt. more than 8% of the org. components). Clear emulsions in H_2O with hydrocarbons etc. are obtained.

E. LEWKOWITSCH.

Manufacture of sulphonated fatty acid derivatives. IMPERIAL CHEM. INDUSTRIES, LTD., A. J. HALLWOOD, and R. P. MCGLYNN (B.P. 357,670, 10.7.30).—An acylated, unsaturated hydroxy-fatty acid (oil), e.g., acetylated castor oil, is sulphonated, preferably with oleum. The products are wetting-out and emulsifying agents.

E. LEWKOWITSCH.

Esterification of fatty acids and mixtures containing fatty acids. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 352,935, 5.4.30).—To prevent preferential esterification of the "normal" portion of a "pathological" fatty acid mixture, such as sanza olive oil, sulphur olive oil, train oil, etc., excess of alcohol (glycerol) is first used and excess of "normal" fatty acid is then added to esterify the remaining OH groups. The unesterified acid is recovered by extraction and added to the next batch.

C. HOLLINS.

Extractor for sol. substances. Continuous extraction and filtration.—See I. **Wetting etc. agents.**—See III. **Detergents.**—See VII. **Treatment of [oily] fumes.**—See XIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Polish turpentine. S. KRAUZE (Diss., Univ. Warsaw, 1931, 51 pp.).—Bialowieza forest turpentine was fractionated. Purification is effected with H_3PO_4 , not H_2SO_4 , and by boiling with Na for 1 hr. The I val. of the crude turpentine is 315–355. The low-boiling fractions contain *d*- and *dl*- α -pinene; β -pinene was not found, but isopinene is probably present, together with Δ^3 - and Δ^4 -carene.

CHEMICAL ABSTRACTS.

Composition of Spanish turpentine from *Pinus pinaster*. Derivatives of α -pinene. M. S. ROMERO (Anal. Fis. Quím., 1931, 29, 431–442).—Spanish turpentine from *P. pinaster* has been fractionally distilled under 14–22 mm., and $[\alpha]_{5780}$, $[\alpha]_{5461}$, n^{15} , and d^{15} were determined for each of 23 fractions. The composition deduced from the results is: active α -pinene 56.1%, inactive α -pinene 8.9%, β -pinene 18.9%, tail fraction 16.0%. Modifications in the prep. of α -pinene nitroschloride and of terpenyl acetate are described.

R. K. CALLOW.

Precipitated iron oxide [pigments]. A. FOULON (Farbe u. Lack, 1931, 450, 460).—The development of artificial Fe oxide pigments is traced from earlier unsuccessful products prepared from FeCl_3 and $\text{Ca}(\text{OH})_2$

to the modern Mars yellow type, e.g., "Neutralin," prepared from FeCl_2 or FeSO_4 and CaCO_3 with subsequent oxidation in the presence, if desired, of a catalyst, e.g., ZnSO_4 , and the iron-reds prepared from basic FeSO_4 . The control of the tone of these products is briefly discussed. Other pigments of this class are the "Veralu reds," by-products of the manufacture of Al_2O_3 from bauxite, a typical pigment consisting of 10% of TiO_2 , 60–65% of Fe_2O_3 , and the remainder Ca Al silicates, and Fe oxide blacks obtained by action of aq. NH_3 on FeSO_4 - $\text{Fe}_2(\text{SO}_4)_3$ mixtures. The most recent development in this field is the electrolytic method based on anodic oxidation of Fe; patents are reviewed.

S. S. WOOLF.

Colorimetric determination of iron in titanium pigments. K. HEISE (Farbe u. Lack, 1931, 464).—The amyl alcohol-Et₂O (5:1) mixture used normally in the colorimetric determination of Fe with KCNS is unsuitable for use in determining traces of Fe in TiO_2 pigments, since such compounds as $\text{K}_2\text{Ti}(\text{CNS})_4 \cdot \text{H}_2\text{O}$ and $\text{K}_3\text{Ti}(\text{CNS})_6 \cdot 6\text{H}_2\text{O}$ are formed which give an intense yellow coloration in amyl alcohol, masking the iron-red colour to be measured. The use of pure, EtOH-free Et₂O gives satisfactory results.

S. S. WOOLF.

Dispersion of pigments. H. HEBBERLING (Farbe u. Lack, 1931, 441–442).—The behaviour of a mixed pigment is a function of the degree of dispersion of each component; thus commercial "zinc greens," which show appreciable variations among themselves, are mixtures of a relatively coarse Zn chromate with a colloidal iron-blue (partly adsorbed) and BaSO_4 as extender, the packing of such a system greatly influencing its opacity, tone, etc. as a paint pigment. The "extending" of white-lead with BaSO_4 does not necessarily involve poorer durability, as a structure may be set up improving the hardening-through of the film. The use of CaCO_3 is also mentioned in this connexion, but its use is limited regionally. The diminution of the staining power of lithopone with falling ZnS content is also discussed and illustrated.

S. S. WOOLF.

Gum resin.—See II. **Et₂O extractive of slash pine.**—See IX. **Electrical insulation.**—See XI. **Extracts from conifers.**—See XX.

PATENTS.

Removal of paint, varnish, and the like. J. LEWY (B.P. 357,184, 18.6.30. Ger., 20.6.29).—Compositions of CH_2Cl_2 (90 pts.), acetylcellulose (5 pts.), stearin or a fat of similar effect (5 pts.), in the absence of an alcohol or an ether, are claimed.

S. S. WOOLF.

Producing and clearing printing inks. H. ZIMMER (B.P. 357,150, 16.6.30. Ger., 27.7.29).— H_2O -sol. coal-tar dyes are introduced into the oil base of printing inks, which have first been partly saponified by alkali. In addition to H_2O -sol. dyes, ppts. of these in paste form, with or without a substratum, and oil-sol. dyes may be incorporated.

S. S. WOOLF.

Production of solutions of nitrocelluloses. U.S. INDUSTRIAL ALCOHOL Co. (B.P. 357,227, 18.6.30. U.S., 23.7.29).—Mixtures of acetals (30–70%), obtained by condensing MeCHO with an aliphatic monohydric

alcohol, *e.g.*, diethyl acetal, and one or more (preferably anhyd.) alcohols (70–30%), *e.g.*, EtOH, are used as nitrocellulose solvents. S. S. WOOLF.

Reducing the viscosity of nitrocellulose solutions. W. C. WILSON, Assr. to J. S. STOKES (U.S.P. 1,795,918, 10.3.31. Appl., 11.9.26).—PhOH condensation resins, such as Durite resins (PhOH–furfuraldehyde, preferably including an active methylene compound), are added to viscous solutions of ordinary nitrocellulose; the η is further reduced on keeping or by heating under reflux. E. LEWKOWITSCH.

Coating compositions. IMPERIAL CHEM. INDUSTRIES, LTD., D. TRAILL, and A. S. LEVESLEY (B.P. 357,123, 16.4.30).—A high-viscosity cellulose ether (Et or CH₂Ph ether) is converted, *e.g.*, by heating under pressure with dil. acid, into an ungraded ether of low viscosity, *e.g.*, 0.1–5.0 c.g.s. units in 10% solution in PhMe–industrial spirit (4:1). This is incorporated with plasticiser and solvent and, if desired, diluent, resin, and pigment. [Stat. ref.] S. S. WOOLF.

Marking or decorating articles of thermoplastic materials. CELLULOID CORP. (B.P. 357,457, 12.1.31. U.S., 11.1.30).—Decorative “characters,” *e.g.*, of cellulose acetate, are applied to thermoplastic articles of the same material, the characters having lower plasticity (according to the amount of plasticiser used) than the articles and thus welding in place under heat and pressure. S. S. WOOLF.

Pigmented lacquer base. H. J. HEMINGWAY and W. A. WEIDLICH (U.S.P. 1,798,840, 31.3.31. Appl., 13.10.30).—(EtOH) damp nitrocellulose is kneaded with a portion of EtOH or other non-aq. liquid until the latter is soaked up; the pigment is then dispersed by kneading (not grinding) in, and the remainder of the diluents and solvents are gradually mixed in completely to dissolve the nitrocellulose, and finally to reduce it to suitable fluidity. E. LEWKOWITSCH.

[Synthetic resin] varnishes. H. WADE. From BAKELITE CORP. (B.P. 357,140, 14.6.30).—Compositions of non-reactive resins from CH₂O and thiourea (or mixtures thereof with urea) and methylene-containing hardening agents in solid or partly polymerised state, *e.g.*, paraformaldehyde, in proportion to impart to the resin potentially reactive character, and in a common solvent for both, *e.g.*, Et lactate, ethylene glycol, etc., are claimed. S. S. WOOLF.

Control and treatment of fumes [produced in varnish manufacture]. R. S. PERRY (U.S.P. 1,799,177, 7.4.31. Appl., 10.7.26).—Alkaline sprays directed along the open-ended conduit provide the necessary draught to draw off the fumes and serve to condense and absorb them. The condensates are collected in a gravity separator, whence the alkaline liquid is returned to the system. E. LEWKOWITSCH.

Extraction of resin from coal. H. N. SKERRETT. From COMBINED METALS REDUCTION Co. (B.P. 357,733, 22.8.30).—Crude resin is separated from aq. pulp of the powdered coal by froth-flotation, using amyl alcohol (0.6 lb. per ton of coal), turpentine, cresol, etc.; the resin froth is purified by refootation in the presence of K alum (0.4 lb. per ton of original coal). E. LEWKOWITSCH.

Manufacture of artificial masses from vinyl compounds. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 357,173, 12.6.30).—Viscous plastic or solid compounds of varying solubility are formed by polymerisation (in the absence of a solvent) of a preferably equimolar mixture of an org. vinyl ester and a vinyl ether, or of either with a polymerisable compound which contains the CH₂:C: group but is not a vinyl ester, ether, or halide. E. LEWKOWITSCH.

[Glass-like resinous] urea condensation product. O. A. CHERRY, Assr. to ECONOMY FUSE & MANUFG. Co. (U.S.P. 1,799,954, 7.4.31. Appl., 20.4.29).—The resin obtained by adding sucrose to a urea–CH₂O condensation product at any stage prior to gelatinisation may be hardened by heat without risk of cracking. E. LEWKOWITSCH.

Manufacture of transparent phenol-formaldehyde condensation products. KUNSTHARZFABR. DR. F. POLLAK G.M.B.H. (B.P. 357,276, 28.6.30. Austr., 20.3.30).— $\frac{1}{2}$ mol. pts. of CH₂O are condensed with 1 mol. pt. of PhOH (etc.) in a solution sufficiently alkaline to maintain the resin in solution (cf. B.P. 267,901; B., 1928, 720). The product is then acidified (*e.g.*, with lactic acid), bases and acids being chosen which yield gel-sol. salts (cf. B.P. 290,963; B., 1929, 404), and a further small amount of CH₂O (or its solid polymerides) is added before, during, or after distilling off the H₂O in order to clarify the product before hardening at 60–100°. E. LEWKOWITSCH.

Compositions of matter and [resinous] moulding mixtures prepared therefrom. H. WADE. From BAKELITE CORP. (B.P. 357,259, 24.5.30).—A non-reactive fusible phenol-aldehyde resin is treated at about 175° with sufficient of a solid basic oxide, hydroxide, or carbonate of Ca, Mg, Na, etc. to neutralise or combine with the free OH groups of any free phenol and, preferably, also of the resin itself. The product needs no mechanical plasticising and may be readily hot-moulded after comminuting and mixing with fillers and a methylene-containing hardening agent. E. LEWKOWITSCH.

Manufacture of synthetic resins [from polyhydric alcohols and polybasic acids]. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of W. C. ARSEM (B.P. 353,249, 23.7.30. U.S., 27.7.29).—The production of resins of the “Glyptal” type is accelerated by addition of 1–5% of an org. sulphonic acid, *e.g.*, *p*-toluidine-*o*-sulphonic acid, Laurent acid, PhSO₃H, ethanesulphonic acid. C. HOLLINS.

Production of [emulsifiable] paracoumarone resins. E. H. ELLMS, Assr. to BARRETT Co. (U.S.P. 1,797,260, 24.3.31. Appl., 14.8.28).—Such resins, m.p. above 30°, are prepared by controlling the washing treatments so that the resins may contain total ash within the limits 0.3–1.9%, whilst the ratio amount of Na₂SO₄ (ash) corresponding to the org. sulphonic acids of the resin/Na₂SO₄ actually present as such is < 10 in the case of low-ash resins and < 1.5 in the high-ash material. These proportions may also be attained by blending an ordinary paracoumarone resin with paracoumarone sludges from the acid-settling tanks, or soaps from the first washes. E. LEWKOWITSCH.

Containers for liquids. Decolorising agents [for rosin].—See I. [Resin etc. from] ligneous material. Panels for oil paintings.—See V. Colloidal TiO_2 .—See VII. Moulds for rubber.—See XIV.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Active filling materials [for rubber]. W. BACHMANN, J. BEHRE, and P. BLANKENSTEIN (Kolloid-Z., 1931, 57, 64—80; cf. B., 1931, 1020).—The plasticity of non-vulcanised rubber is affected by the filling material and the treatment of the mixture, but the particle size of the filler has no important influence and plasticity alone is no measure of the value of a filler. The effect of the filler on "nerve" is doubtful. Surface tension and particle size of caoutchouc depend on the degree of kneading. Ultrafiltration experiments show caoutchouc solutions to be polydisperse, the approx. mol. wt. being 300,000 for weakly rolled material and 37,000 for very strongly rolled material. Rolled caoutchouc swells less strongly than the untreated material and the velocity of swelling is reduced by fillers. The adsorptive capacity of certain SiO_2 preparations for C_6H_6 vapour is better than that of lampblack. Vulcanised rubber with certain SiO_2 preparations as fillers is equal in tensile strength, hardness, elasticity, and wear to that containing lampblack.

E. S. HEDGES.

Value of zinc sulphide as a rubber-compounding ingredient. K. NAMITA (J. Rubber Soc. Japan, 1930, 2, 157—159).—Tensile strength, electrical insulating power, and whiteness are greater if ZnS is substituted for ZnO . Vulcanisation acceleration is greater with ZnS .

CHEMICAL ABSTRACTS.

Effect of gas-black on rubber. P. STAMBERGER (Kautschuk, 1931, 7, 182—186).—Mixtures of rubber with C black exhibit marked resistance to ordinary rubber solvents. The decrease in solubility has no parallelism with the reduction in plasticity, and flocculation of the C black in the rubber is probably not responsible, because the effect develops in the masticated mixture only after storage. No adsorption of rubber from solution by C black could be detected, and the heat of wetting of the black, and the quantity of gas concurrently liberated, were the same whether wetting was effected with PhMe or with a 5% solution of rubber in PhMe.

D. F. TWISS.

Effect of selenium in rubber mixings. W. ESCH (Kautschuk, 1931, 7, 190—192). H. RIMPEL (*Ibid.*, 192—194).—Mainly polemical (cf. B., 1931, 643).

D. F. TWISS.

Comparison of stearic and sebacic acids as rubber-softening agents. K. ISHIGURO (J. Rubber Soc. Japan, 1930, 2, 238—242).—Sebacic acid, when used in excess with ZnO , is a better softening agent than stearic acid. When thus used, sebacic acid improved the quality of the rubber and did not retard the action of vulcanisation accelerators.

CHEMICAL ABSTRACTS.

Effect of rubber compounding on the sp. gr. of vulcanised rubber. K. NAMITA, T. NAKAJIMA, and K. TSUTSUNI (J. Rubber Soc. Japan, 1931, 2, 408—413).—The formulæ $y = 0.95 + mx$ ($y = \text{sp. gr. of compounded rubber}$, $x = \text{vol.-% of compounding substance}$, $m = \text{const.}$) and $y = 0.95(x + 1)^b$ ($x =$

wt.-% of compounding substance, $b = \text{const.}$) give better results than those usually employed.

CHEMICAL ABSTRACTS.

Determination of carbon black in vulcanised rubber. K. NAMITA (J. Rubber Soc. Japan, 1930, 2, 255—260).— $B = [F - \Sigma(1 - F_u)D_u]/(1 - K)$, where $B = \%$ C, $D_u = \%$ of each ingredient, $F_u = \text{const. for each ingredient}$, $F = \text{wt. of residue after combustion in N by Ooyaji's method}$, and $K = \text{const. for C}$. Values of F_u are given. Low results are obtained when CaCO_3 is present, owing to the reaction $\text{CO}_2 + \text{C} = 2\text{CO}$.

CHEMICAL ABSTRACTS.

Determination of sulphur in rubber by the calorimetric bomb. B. SALADINI (Giorn. Chim. Ind. Appl., 1931, 13, 409—411).—The methods of determining S in rubber by oxidation in an open vessel with Na_2O_2 , HClO_4 , or $\text{K}_2\text{CO}_3\text{-KNO}_3$ mixture are long and subject to losses by projection or by incomplete oxidation. A more rapid and accurate method consists in combusting the rubber (0.1—0.3 g.) mixed with Decalin (about 1 c.c.) (to ensure complete combustion) in a Kroecker calorimetric bomb charged with O_2 at 30 atm. and containing about 10 c.c. of H_2O to condense the SO_3 formed; this is weighed as BaSO_4 in the usual way.

T. H. POPE.

Fluorescence of organic vulcanisation accelerators. K. KOJIMA and I. NAGAI (J. Rubber Soc. Japan, 1930, 2, 260—262).—Fluorescence after exposure to ultra-violet light is in some cases useful for identification.

CHEMICAL ABSTRACTS.

Combination of organic accelerators for rubber vulcanisation. II. K. KOJIMA and I. NAGAI (J. Soc. Chem. Ind., Japan, 1931, 34, 308—309 B; cf. B., 1931, 643).—Mercaptobenzthiazole and methylenedianiline form a eutectic mixture, but no mol. compound. A mixture of the two accelerators is more active than either constituent in expediting vulcanisation, and the activity attains a max. at the eutectic. The scorching tendency, however, increases with the proportion of mercaptobenzthiazole, and the eutectic mixture exhibits no exaltation of this characteristic at 70° or 100° .

D. F. TWISS.

Vulcanisation experiments with the accelerator-activator "Barak." E. A. HAUSER and H. WOLF (Kautschuk, 1931, 7, 186—188).—The use of the org. activator for org. accelerators enables satisfactory vulcanisation results to be obtained with a reduced proportion of org. accelerator or of S; the "plateau effect" is improved and subsequent blooming of S is lessened. With mixings made from conc. latex (revertex) good results could be obtained when the proportions of the vulcanising agents were still further reduced.

D. F. TWISS.

Thermochemistry of rubber. I. Heat of vulcanisation. K. NAMITA, K. FUKAYA, and T. NAKAJIMA (J. Rubber Soc. Japan, 1931, 2, 389—397).—The vulcanisation of soft rubber up to 4% combined S is endothermic; above 4% it is exothermic (max. at 12%), decreasing to 22%, when hard rubber is formed. Above 22% the reaction is endothermic.

CHEMICAL ABSTRACTS.

Heat of reaction during vulcanisation of rubber. Y. TOYABE (J. Rubber Soc. Japan, 1930, 2, 251—254).—

The heat of vulcanisation becomes max. in 1 hr., but in presence of accelerators the max. is reached immediately. At the point of max. heat of vulcanisation about 50% of S is combined with the rubber. Addition of accelerators appears to cause a great change in the state of aggregation of the rubber mol.

CHEMICAL ABSTRACTS.

Chemical risks in the rubber industry and their prevention. R. DITMAR (Chem.-Ztg., 1931, 55, 770—772).—Reference is made to the possibility of mouldiness developing with latex or rubber and to the harmful physiological action of certain compounding ingredients and solvents.

D. F. TWISS.

Rubber anti-ageing agents.—See XII.

PATENTS.

Manufacture of adhesive materials from rubber latex. IMPERIAL CHEM. INDUSTRIES, LTD., R. B. F. F. CLARKE, E. B. ROBINSON, and A. SHEPHERDSON (B.P. 357,238, 19.6.30).—Latex is creamed by the addition of a weak org. acid without coagulation; a strong acid, e.g., H_2SO_4 or benzenesulphonic acid, or an acid-forming substance is added, and after evaporation of the volatile matter, the residuum is baked, e.g., at 150° , until chemical reaction occurs between the non-aq. constituents of the latex and the acidic material. The dark-coloured product is useful as an adhesive for attaching rubber to metal surfaces.

D. F. TWISS.

Manufacture of rubber or the like material for covering floors and the like. DUNLOP RUBBER CO., LTD., and H. C. YOUNG (B.P. 357,212, 14.6.30 and 3.3.31).—Threads, strips, or cords of semi-vulcanised rubber are woven alone or in combination with textile material; vulcanisation is then effected under pressure so as to effect consolidation and impart a smooth surface (cf. B.P. 319,448; B., 1929, 991).

D. F. TWISS.

Metal moulds [for shaping rubber articles]. BAKELITE CORP., Assees. of G. W. CROSBY (B.P. 354,770, 6.3.30. U.S., 7.3.29).—The part forming the pattern, e.g., the tread of tyres, is made of moulded bakelite. (Cf. B.P. 352,519; B., 1931, 897.)

A. R. POWELL.

S product.—See VII. **Dielectric material.**—See XI. **Chewing gum.**—See XIX.

XV.—LEATHER; GLUE.

Swelling. II. Effect of acids on hide powder. A. LOTTERMOSER and F. TACHECI (Kolloid-Z., 1931, 57, 56—63; cf. A., 1931, 1232).—Strong acids are taken up to a saturation limit, which is approx. the same for each acid. Weak acids do not attain a saturation limit, the amount taken up increasing continuously with the concentration, probably because the hydrolysis of the compound formed between the weak base collagen and the weak acid is repressed by higher concentrations of acid. The swelling curves in the same acids are similar to the curves representing the acid-binding power, and there is no reason to doubt the existence of a true chemical combination between hide powder and acids.

E. S. HEDGES.

Some organic constituents (non-tans) of vegetable tanning extracts with special reference to chestnut wood extracts. I. Pentose and uronic

acid-containing constituents. H. PHILLIPS (J. Soc. Leather Trades' Chem., 1931, 15, 465—479).—Encrusting substances consisting of hexoses, pentoses, and their uronic acids are present in tannin extracts, especially those derived from woods. Determinations were made of the amounts of pentoses and uronic acid in some tanning extracts and in a series of commercial chestnut extracts; the latter were the richer in pentoses. The amount of encrusting substances extracted from tanning woods was increased by raising the temp. of extraction. The amount of pentoses and uronic acids in chestnut liquors used in sole-leather tannages was not materially increased on prolonged usage, and only small quantities were absorbed by the hides during the tannage. They were not present in tan-pit sludge, but tend to accumulate in the suspender liquors in tanneries where chestnut extract is used. They constitute 20% of the org. non-tans in such liquors and the uronic acids act as buffers.

D. WOODROFFE.

Deterioration of vegetable-tanned [book-binding] leather on storage. IV. Conditions of storage and the rotting of leather by artificial means. R. F. INNES (J. Soc. Leather Trades' Chem., 1931, 15, 480—494; cf. B., 1931, 130).—Pyrocatechol-tanned book-binding leathers, dyed in the presence of H_2SO_4 , remained sound after long storage in the dark in a polluted atm. restricted in circulation. Rotting is chiefly caused by oxidation in the presence of H_2SO_4 . Leathers of different tannages were not rotted by exposure to acid gas fumes for 88 days, nor by exposure to ultra-violet light, nor by H_2O_2 , but were rotted by treatment with H_2SO_4 and after-treatment with H_2O_2 , the leather appearing burnt and blackened. No red powdery rotting was obtained.

D. WOODROFFE.

Water-permeability of leather. R. S. EDWARDS (J. Soc. Leather Trades' Chem., 1931, 15, 495—514).—An apparatus for determining the water-permeability of leather is described. The vol. of H_2O , V , entering the leather and the time, t , required were measured; the relationship $V = At^n$ where A and n are consts. was established. The amount of H_2O which permeated the leather and the rate of evaporation of the H_2O from the air side of the leather were greater as the R.H. was diminished on the dry side of the leather. There was a sudden increase in the rates of absorption and evaporation of the H_2O at the time when the leather was completely permeated, so that this inflexion in the curve might be used to determine when the leather was completely penetrated.

D. WOODROFFE.

Examination of dyed leather in cases of alleged dermatitis. T. CALLAN and N. STRAFFORD (Analyst, 1931, 56, 625—635).—10 g. of leather are extracted for 48 hr. with 40 c.c. of 1% AcOH in the cold, and tests are carried out with 0.5 c.c. of the extract together with control portions of the extract to which small quantities of *m*- and *p*-phenylenediamine have been added. The most sensitive reagent for the *p*-diamine is a 1% EtOH solution of *p*-dimethylaminobenzaldehyde in the presence of a trace of HCl; this will detect 0.01% (calc. on the leather) in a coloured extract containing tannins. 0.5 c.c. of 1% $NH_2Ph.HCl$ and a drop of 2% $K_2Cr_2O_7$

is equally delicate, when FeCl_3 indicates the presence of more than traces of tannins. 0.02% of the *m*-diamine is indicated by the following reagents: (1) 0.2 c.c. of 2*N*-HCl and 0.05 c.c. of 0.5*N*- NaNO_2 mixed with the extract and added to 4 c.c. of 0.05% β -naphthol and 1 c.c. of NaOH; (2) *p*-dimethylaminobenzaldehyde reagent as above; (3) 1 g. of NaOAc and 1 c.c. of diazobenzene-*p*-sulphonic acid. Single tests are insufficient; several reagents must be used and the results interpreted accordingly. T. McLACHLAN.

Extracts from ethereal oils.—See XX. Waste waters from leather factories.—See XXIII.

XVI.—AGRICULTURE.

Report of the Imperial Agricultural Bacteriologist [Pusa]. J. H. WALTON (Agric. Res. Inst., Pusa, Sci. Rep., 1929—30, 49—57).—(a) Addition of 1—2% of superphosphate to cow manure greatly diminishes loss of N during storage. (b) In soils of p_H 7.0 or higher, urea was not formed from CaCN_2 , which persisted for 3 days, no nitrification occurring after incubation for many weeks. In soils of p_H 5.0—6.9 urea was formed. (c) The varying effects of addition of Na_2CO_3 , Na_2SO_4 , or NaCl on nitrification were studied. CHEMICAL ABSTRACTS.

Report of the Imperial Agricultural Chemist [Pusa]. J. SEN (Agric. Res. Inst., Pusa, Sci. Rep., 1929—30, 33—48).—(a) During curing tobacco loses 18—35% of the nicotine. Ground-cured contains more nicotine than rack-cured tobacco, especially that cured in the sun. Of the starch, 50—80% was lost, the greatest losses occurring in ground-cured samples. The sugar content was increased by rack-curing, but decreased by ground-curing. The NH_2 -N was lowest in ground-cured samples. The upper leaves were generally richer in NH_2 -N and nicotine than the lower. (b) Unfertilised plots yielded sugar-cane juice richest in sucrose and poorest in dextrose. The largest crop was obtained by the use of mustard cake, superphosphate, and K_2SO_4 . (c) In potatoes stored at 33—38° the total org. N remained const., but the dextrin and NH_3 -N increased. (d) The effect of treatment of Pusa soil with aq. NaCl on the results of mechanical analysis is described. CHEMICAL ABSTRACTS.

Soils of the Nile and Gash. IV. P. VAGELER and F. ALTEN (Z. Pflanz. Düng., 1931, 22A, 191—267; cf. B., 1931, 1022).—The water relationships of these soils are examined in reference to base contents and physical properties. The application of various methods of determining soil nutrient vals. is considered with special reference to the *Aspergillus* method. A. G. POLLARD.

New methods for examination of organic matter in soil and their application to soil types and humus material. I. Methods. U. SPRINGER (Z. Pflanz. Düng., 1931, 22A, 135—152).—Methods for separating the constituents of humus are critically examined. Special attention is given to the AcBr method and to methods involving differential oxidation of the separated material. (Cf. B., 1928, 619.) A. G. POLLARD.

Determination of the buffer capacity of the soil by the Tovborg-Jensen method. N. N. SOLOVEVA (Udobr. Urozhai, 1930, 2, 784—789).—A sandy podsol requires more CaO than a loam podsol. A certain

correlation exists between the buffer surface activity and the hydrolytic acidity. CHEMICAL ABSTRACTS.

Laws of alkali-soil formation in reference to soil amelioration. A. A. J. SIGMOND (Mezőg. Kötetások, 1929, 2, [6]; Bied. Zentr., 1931, [ii], 1A, 361—362).—The factors essential to alkali-soil formation are a dry climate, an impermeable subsoil, and occasional excessive moisture. The initial phase is the accumulation of NaCl, Na_2SO_4 , NaHCO_3 , and Na_2CO_3 . In this stage simple leaching suffices for amelioration. The second phase, "alkalination," consists of the exchange of the Na with the adsorbed bases of the soil. For soils in this phase replacement of exchangeable Na by Ca is essential for soil improvement. In the third phase H_2O -sol. salts are leached out and either are removed entirely or accumulate in the subsoil. Such soils have a weakly acid reaction due to the hydrolysis and partial replacement of exchangeable Na by H. Reclamation of this type of soil must include applications of Ca and of org. matter. Alkali soils containing Na_2CO_3 are not effectively treated by means of CaCO_3 since acid conditions are necessary for the dissolution and subsequent action of Ca. This may be ensured by secondary treatment with H_2SO_4 , S, or Ca, Al, or Fe^{+++} sulphates. A. G. POLLARD.

Effect of certain simple non-nitrogenous salts on the growth of bacteria in soil. H. J. CONN (J. Bact., 1931, 21, 35).—The growth of certain non-sporing organisms in soils in which they do not grow naturally may be secured by the addition of glucose and salts of NH_4 or NH_2 -acids. Similar growth may be obtained by the substitution for these Na compounds of certain non-nitrogenous compounds, notably K salts or KOH, certain Na and Ca salts, or NaOH. Sulphates, carbonates, phosphates, and hydroxides are very effective, but chlorides appear to be toxic. The above compounds are assumed to act by rendering available the soil N, either by chemical decomp. or by liberation from colloidal complexes in which it is adsorbed. A. G. POLLARD.

Adsorptive power of soils. K. K. GEDROIZ (Kolloidchem. Beih., 1931, 33, 317—448).—A summary of the results obtained from 20 years' work on the mechanical, physical, chemical, and biological binding power of soils, most of which has already been published. The principal features discussed are the mechanical structure of the soil, adsorption and surface tension, capillary electric properties and coagulating effect of electrolytes, influence of acidity or alkalinity, coagulation by oppositely-charged colloids, exchange adsorption between soils and electrolytes in solution, physico-chemical nature of the adsorbing soil complexes and the effect of H_2O , determination of adsorbed substances, chemical binding of PO_4 , CO_3 , and SO_4 ions by soils, and biological relations. E. S. HEDGES.

Water supply as a factor in the distribution of plants. F. SEKERA (Z. Pflanz. Düng., 1931, 22A, 152—190).—Relationships between the RK val. of soils ("Regen-Kapazität," i.e., mm. of rain which a cropped soil can store) and plant growth are examined. The use of RK vals. in the classification of soils and in the calculation of crop yields is demonstrated. A. G. POLLARD.

Drainage waters from loams and moor soils. O. BRAADLIE (Tidsskr. norske Landbruk, 1930, 341; Bied. Zentr., 1931, [ii], 1A, 363—364).—In leaching experiments, the removal of Ca, P, NO_3' , NH_3 , and total N was greater, and that of K, total org. matter, and org. N was less, from a loam than from a moor soil. Changes in p_{H} due to leaching were small in both soils.

A. G. POLLARD.

Hydrolytic acidity and lime requirement. K. K. GEDROIZ (Udobr. Urozhai, 1930, 2, 781—784).— CO_2 from the air and from the soil produces HCO_3' and hence an acid reaction to phenolphthalein when a carbonate soil is treated with $\text{Ca}(\text{OAc})_2$.

CHEMICAL ABSTRACTS.

Phosphate content of soils. E. G. DOERELL (Superphosphat, 1931, 7, 59—60; Bied. Zentr., 1931, [ii], 1A, 355—356).—Comparison of field results with various laboratory methods shows the practical value of Neubauer and Dirks' methods for determining the available P of soils.

A. G. POLLARD.

How reliable are existing chemical methods for determining soil deficiencies in ash constituents of plants? G. S. FRAPS (J. Amer. Soc. Agron., 1931, 23, 337—351).—Factors other than the capacity of the soil to supply plant food are concerned.

CHEMICAL ABSTRACTS.

Effect of roasting of phosphorites on their assimilability [by plants]. N. D. SMIRNOV (Düng. u. Ernte, 1929, 359—363; Bied. Zentr., 1931, [ii], 1A, 365).—Of numerous samples examined, the majority of phosphorites were less assimilable after roasting. Crop increases were greater from samples heated at 300° than from those heated at 800° . The response of black-earth soils and of podsols to phosphorites were definitely different.

A. G. POLLARD.

Comparative effect of superphosphate and precipitated phosphate. D. V. DRUZHININ and Z. I. STROGANOVA (Udobr. Urozhai, 1930, 2, 895—903).—With soils of various zones slight differences were observed. Soils which do not respond well to P_2O_5 fertilisation give better results with superphosphate.

CHEMICAL ABSTRACTS.

Phosphoric acid and potash from manure under various conditions of storage. I. F. ROMASHEVICH (Udobr. Urozhai, 1930, 2, 769—773).—After four months the amount of P_2O_5 sol. in HCl increased threefold for peat moss- and straw-manure (88% cow, 12% horse); the H_2O -sol. P_2O_5 also increased. In uncompacted manure the loss of P_2O_5 was 21.3%, 1% of this being lost with the liquid. Fertilisation experiments with oats and compacted manure showed that the P_2O_5 from peat moss- and straw-manures became available to the extent of 74% and 59.2%, respectively, corresponding vals. for K_2O being 82.2% and 84.6%.

CHEMICAL ABSTRACTS.

Rate of intake of the PO_4 ion by various agricultural plants. F. PEIPERS (Diss., Hohenheim, 1930; Bied. Zentr., 1931, [ii], 1A, 370—371).—The intake of P by maize was more rapid from nutrient solutions containing 0.1—10.0 mg./litre than from those with <0.1 mg./litre, whether considered as % or in abs. units. With more conc. solutions (10.0—210 mg./

litre), the abs. intake reached a max., but the % removed from the solution declined rapidly. The absorption of P by the plants was not influenced by the intensity of illumination or by temp. except in extreme cases. Older plants absorbed more P from solutions than young ones, although the % P in the roots was always greater in the younger plants.

A. G. POLLARD.

Fertilising limed soils. S. S. YARUSOV (Udobr. Urozhai, 1931, 3, 44—53).—Limed medium podsolised soils gave an increased yield of oats. They were low in N; K fertilisers were effective, but phosphates were ineffective.

CHEMICAL ABSTRACTS.

Effect of mineral nutrition on the reaction of wheat varieties to leaf rust. K. D. DOAK (Phytopath., 1931, 21, 108—109).—In artificial cultures N increased the susceptibility of wheat to leaf rust, whilst K and P reduced this. Excess N favoured the production of uredinia and decreased chlorosis. Excess P increased chlorosis and retarded the development of secondary uredinia. Excess of K increased chlorosis and decreased the size of primary uredinia.

A. G. POLLARD.

Mottling of the leaves of cereals as a phenomenon of magnesium deficiency. W. JESSEN (Z. Pflanz. Düng., 1931, 22A, 129—135).—The "mottling" or "marbling" of cereal leaves is not a manifestation of acid soil conditions, but is the result of Mg deficiency.

A. G. POLLARD.

Expressed sap of maize plants as an indicator of nutrient needs. N. A. PETTINGER (J. Agric. Res., 1931, 43, 95—119).—The brown coloration of the expressed sap of maize which remains after clarification with charcoal is greatest in plants from least productive soils. There was a close inverse relationship between the intensity of the colour and the available K content of the soil. The NO_3' content of the sap was closely correlated with that of the soil carrying the plant, and the P content of the sap with the amount of P fertiliser applied. Applications of superphosphate and of farm-yard manure increased the P content of the sap 2—5 times. Rock phosphates were less effective in this respect. The P content of the sap was high where grain production was subnormal and *vice versa*. After the development of the ear there is a rapid accumulation of P in the sap, irrespective of the fertiliser applied; this is accompanied by a similar but smaller accumulation of K. A scale of limiting concentrations of N, P, and K in the sap as indicative of the nutrient contents of the soil is given. The p_{H} of the sap is closely related to the amounts of K fertiliser applied (fertilised plots showing vals. > 5.45), but not with the soil productivity. The depth of green colour in the leaves is a good indicator of N deficiency and is in agreement with the results of the Hofferstalk test and the NO_3' concentration in the sap. K deficiency is shown by the presence of dead tissue round the margins and between the veins of the leaves. The K requirement of soils is closely in agreement with the amount of lodging of the crop.

A. G. POLLARD.

Fertiliser in the northern portion of the deep chernozem. A. G. IVANOV (Udobr. Urozhai, 1930, 2, 759—764).—N is not the limiting factor; the soil does

not respond to N fertilisation. P is minimal. The sugar content of beet decreases when $(\text{NH}_4)_2\text{SO}_4$ is used.

CHEMICAL ABSTRACTS.

Influence of nitrogen fertilisers on composition of soil solution. E. A. ZHORIKOV (Udobr. Urozhai, 1930, 2, 774—781).— NO_3^- accumulates; little NH_3 is retained, except with CaCN_2 , which gave high amounts of NH_3 , depressing the NO_3^- . Mineral N gave the highest accumulation of NO_3^- , oil meal less, and manure and green manure least. Increase in NO_3^- increases the Ca, Mg, total sol. substances, and yield of cotton, but decreases the total alkalinity and P_2O_5 .

CHEMICAL ABSTRACTS.

Influence of nitrogen, phosphoric acid, and potash on the number, shape, and weight of potato tubers. W. H. MARTIN, B. E. BROWN, and H. B. SPRAGUE (J. Agric. Res., 1931, 43, 231—260).—Fertilisers of different N : P : K ratios tended to produce tubers of varying predominant shape, the major effects being attributable to the proportion of K used. Wide potatoes are associated with fertilisers of low P content; thick potatoes with low P and medium to high K content; thin and narrow tubers with low N and K and high P; long tubers with medium to high N and P and low K; and short tubers with low N, low to medium P, and medium to high K. In general, the largest potatoes result from high N and low P, the largest numbers of tubers from low N and high P, and the fewest potatoes with high N and low K. The largest total yields were obtained with medium to high N and K and low P. Additional details of the proportions of different grades of potatoes in the various fertiliser trials are recorded.

A. G. POLLARD.

Effect of different pressures and of different types of lime in potato spraying. P. E. TILFORD (Phytopath., 1931, 21, 105).—Potato spraying with Bordeaux mixture was more successful at 400 lb. pressure than at 200 or 600 lb. Slaked limes of high Ca content gave as good results as quicklimes and better than slaked limes of high Mg content in the prep. of Bordeaux mixture.

A. G. POLLARD.

Use of fertilisers in reducing losses from pea-root rot caused by *Aphanomyces euteiches*. C. M. HAENSELER (Phytopath., 1931, 21, 116—117).—The use of complete fertiliser mixtures decreased the root rot. In this respect NaNO_3 , $(\text{NH}_4)_2\text{SO}_4$, and KCl were more effective than was superphosphate.

A. G. POLLARD.

Modification of soil-nitrogen and -organic matter by Austrian winter peas. M. M. OVESON and W. L. POWERS (J. Amer. Soc. Agron., 1931, 23, 372—387).—The growth of the peas as a green manure crop increased the soil-N and -org. matter. The soil total N remained unchanged when the crop was harvested, when the total N balance was greater than when the crop was turned under. Changes in org. C content tended to vary with those of N content. Addition of lucerne tops to the soil decreased the amount of N fixed by the pea crop, but helped to maintain a more nearly normal N : C ratio.

CHEMICAL ABSTRACTS.

Seed treatment for damping-off of tomatoes. J. G. HORSFALL (Phytopath., 1931, 21, 105).—In cases where the steaming of tomato soils is impracticable,

good results are obtained by soaking in 5% CuSO_4 solution for 1 hr. or dusting with $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ or CuCO_3 . Cu oxalate, tartrate, sulphide, silicate, arsenate, oxide, and oxychloride and Cu chloride, bromide, sulphide, thiocyanate, and also malachite reduced the disease. The germination of the seeds was not reduced and in many cases was considerably improved. Hg compounds reduced the disease, but also impaired germination.

A. G. POLLARD.

Manuring of sugar beet in Kiev. I. Collective results for 1927. P. BRASCHNIK and W. FANSTIL. **II. Results for 1928.** P. BRASCHNIK (Kiew. Landw. Versuchs-stat., 1929, 35, 30, and 1930, 57, 38; Bied. Zentr., 1931, [ii], 1A, 380—381).—Fertiliser trials are recorded and discussed.

A. G. POLLARD.

Effect of seed treatments on seed longevity. E. E. CLAYTON (Phytopath., 1931, 21, 105—106).—Commonly used wet treatments for seeds, e.g., HgCl_2 , org. Hg. compounds, hot H_2O , etc., whilst causing no apparent injury immediately, reduce germination after storage. Dust treatments have no ill after-effects. Seed treated with 0.25% ZnSO_4 solution for 25 min. at 50° produced beneficial results to seed, even when stored for 18 months after treatment.

A. G. POLLARD.

Corm treatments for gladiolus and calla lily. P. E. TILFORD (Phytopath., 1931, 21, 121—122).—Standard treatments were unsatisfactory. Good results were obtained by dipping in a suspension of Hg_2Cl_2 (1 lb. per 2½ gals.) and in Semesan solution.

A. G. POLLARD.

Effect of some inorganic and organic mercurials on growth of *Lupinus albus*. D. J. MACHT (Amer. J. Bot., 1931, 18, 598—602).—Inorg. Hg compounds were more toxic than org. preps. to lupin seedlings. Adulteration of org. Hg compounds, notably mercuriochrome, with HgCl_2 may be detected by the phytotoxic test with lupins.

A. G. POLLARD.

Control of *Botrytis* rot of pears with chemically treated wrappers. J. S. COOLEY (U.S. Dept. Agric. Circ., 1931, No. 177, 9 pp.).—Impregnation of wrapping papers with 2.5% CuSO_4 solution prevented the spread of *Botrytis* in packed pears. ZnSO_4 was slightly, and FeSO_4 considerably, less effective. Satisfactory results from oiled paper treated with CuSO_4 are indicated. No injury from CuSO_4 was observed unless the fruit was packed in a damp condition.

A. G. POLLARD.

Breeding of nicotine-free tobaccos and those poor in nicotine. R. VON SENGBUSCH (Der Züchter, 1931, 3, 33; Bied. Zentr., 1931, [ii], 1A, 375).—From normal strains of tobacco plants it is possible to breed strains of reduced nicotine content. Methods for the determination of nicotine are discussed.

A. G. POLLARD.

Burning quality of tobacco. M. B. SMITS (Int. landw. Runds., Agrik.-wiss. Runds., 1930, 21, 485; Bied. Zentr., 1931, [ii], 1A, 375—376).—In wet seasons tobacco plants contain less Cl, Ca, Mg, N, P, S, and Mn and more K, SiO_2 , Fe, and Al than in dry years; the former also have superior burning qualities. Good burning qualities are associated with an alkaline reaction and with relatively high K contents. Soils of high Cl

content tend to produce poor-burning tobacco. The general effects of climatic conditions on the quality of tobacco are discussed. A. G. POLLARD.

Plant development under Vitaglass. W. E. TOTTINGHAM and J. G. MOORE (J. Agric. Res., 1931, 43, 133—163).—In a comparison of the growth of various plants under Vitaglass and under ordinary glass, certain species showed the response to Vitaglass which might be anticipated from the slightly increased temp. caused by the additional infra-red transmission. In many cases there was an increased lipin-N content in the dry matter of the plants. A. G. POLLARD.

Guano. M. POPP and J. MARXEN (Landw. Versuchsstat., 1931, 112, 261—312).—The N of guano exists in the form of urea (50%), NH_3 (30%), purines (10%), with smaller proportions of keratin and frequently of nitrate. A portion of the NH_3 -N is easily sol., the sparingly sol. portion being probably NH_4 urate. Present-day guano contains 6% of $\text{H}_2\text{C}_2\text{O}_4$ and 1% of guanine. In soil the org. matter of guano is rapidly decomposed to form CO_2 , the yield of which is approx. 35 times that from ordinary soil org. matter. A considerable portion of the N-free org. matter of guano has a C content intermediate between that of urea and humus. In older guano deposits these compounds predominate. The P and N contents of guano are inversely related. The ageing of guano results in an increased proportion of P and decreased N. A high proportion of guano-P is sol. in 2% citric acid and a smaller amount in NH_4 citrate. In Seychelles guano of low N content NH_4 citrate-sol. P is absent, and the citric acid-sol. fraction is approx. 50%. In Peruvian guano a portion of the P exists as Mg phosphates. A. G. POLLARD.

Chemical processes involved in the decomposition of manure by *Agaricus campestris*. S. A. WAKSMAN and J. M. McGRATH (Amer. J. Bot., 1931, 18, 572—581).—During the composting of horse manure for mushroom beds, the Et_2O -sol. constituents and hemicellulose decreased rapidly. The H_2O -sol. org. matter increased slightly during composting and rapidly as the mushroom mycelium developed. The cellulose content did not change appreciably during composting, but decreased rapidly with the growth of mycelium. There was a steady rise in the lignin and protein contents during composting, and early development of mycelium, followed by a rapid decline during the period of most active growth. Lignins, proteins, and celluloses are probably directly concerned in the development of mycelium. A. G. POLLARD.

Relation of pentathionic acid and its constituents to the toxicity of sulphur fungicides. O. N. LIMING (Phytopath., 1931, 21, 130—131).—At summer temp. >10% of the S dusted on foliage may be vaporised within 14 days. S vapour is not toxic to fungus spores and the condensation products are toxic only after several hours' contact. SO_2 occurs only in traces in ground S and is not toxic at these concentrations. H_2S does not occur in ground S, but is present in non-toxic amounts when S is in contact with higher plants and fungi. $\text{H}_2\text{S}_5\text{O}_6$ is associated with ground S in toxic quantities. The $\text{S}_5\text{O}_6^{--}$ ion is stable in acid and weakly alkaline solutions, but is toxic in acid solutions

only. Its toxic action is governed by the condition of the fungus. A. G. POLLARD.

Arsenical and other fruit injuries of apples resulting from washing operations. D. F. FISHER and E. L. REEVES (U.S. Dept. Agric. Tech. Bull., 1931, No. 245, 12 pp.).—Calyx burn of apples caused by sol. As may occur on the tree or in picked apples which have become wet, but is most common in washed fruit where HCl or alkali solvents are used. Direct injury by HCl or alkalis is differentiated from injury by As. The latter is minimised in the washing process by the use of adequate quantities of rinsing water or by the addition of CaO during rinsing. A. G. POLLARD.

New sulphur dusts for apple scab control. A. L. PIERSTORFF and H. C. YOUNG (Phytopath., 1931, 21, 131).—The failure of many S dusts is attributed to uneven adherence and low toxicity. Improved dusts contain 85 pts. of S with either 15 pts. of dry lime-S or with 10 pts. of Manganar and 5 pts. of $\text{Al}(\text{OH})_3$. A. G. POLLARD.

Use of disinfectants in fertilisers for the control of potato scab and *Rhizoctinia*. W. H. MARTIN (Phytopath., 1931, 21, 104).—Results of the application of various Hg preps. in conjunction with fertilisers were satisfactory. A. G. POLLARD.

Penetration and toxicities of petroleum oil sprays. P. A. YOUNG (Phytopath., 1931, 21, 130).—Apple and potato leaves partly soaked with oils having <6% of sulphonatable residue lived for 30—80 days. Oils having >13% of such residue killed the leaves in 7—14 days and were toxic if applied to the leaves as 4—8% emulsions. The penetration of oil within the plant tissues is examined. A. G. POLLARD.

Control of San José scale with lubricating oil emulsions in the Pacific Northwest. E. J. NEWCOMER and M. A. YOTHERS (U.S. Dept. Agric. Circ., 1931, No. 175, 12 pp.).—The use of 4% oil emulsions is recommended. Grades of oil having a sulphonation val. of 50—70% may safely be used. Addition of casein to the standard caseinate emulsion does not increase its efficiency. Admixture with dil. CaO-S produces marked improvement, but the mixture is unsafe on any but dormant wood. Coconut fatty acids increase the toxicity of oil emulsions. A. G. POLLARD.

Diagnostic value of plant symptoms in determining nutrient deficiencies of soils. J. P. JONES (J. Amer. Soc. Agron., 1931, 23, 352—356).

Melassigenic nitrogen in sugar beet after various fertilisers and on different soils. P. A. VLASSJUK (Arb. Versuchsstat. Uman, 1930, 12, 22; Bied. Zentr., 1931, [ii], 1A, 379).

Phosphate rock. Silico-superphosphate.—See VII. **Soil-corrosion of metals etc.**—See X.

PATENTS.

Production of fertilisers. IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 357,461, 16.1.31. U.S., 17.1.30).—A mixture of 33—55% of urea and 60—30% of NH_4 carbamate, prepared together with a little H_2O by the interaction of CO_2 and NH_3 under raised temp. and pressure, is mixed with a solid superphosphate in

proportion such that there is not less than 0.5 mol. of NH_4 carbamate per mol. of P_2O_5 . L. A. COLES.

Manufacture of fertilisers. SOC. D'ETUDES SCIENTIF. ET D'ENTREPRISES INDUSTRI., ASSEES. OF E. VOITURON (B.P. 356,624, 16.1.31. Ger., 6.2.30. Addn., to B.P. 342,931; B., 1931, 509).—The mother-liquor from the crystallisation of $\text{NaNH}_4\text{HPO}_4 \cdot 4\text{H}_2\text{O}$ is acidified with about 15% of the total H_3PO_4 used in the cycle and evaporated for the recovery of KCl and NH_4Cl , the mother-liquor being returned to the phosphate stage of the process, in which it is treated with sylvinit, more H_3PO_4 , and NH_3 to yield microcosmic salt.

A. R. POWELL.

Fertiliser material. H. J. KRASE, H. C. HETHERINGTON, and L. A. PINCK (U.S.P. 1,797,095, 17.3.31. Appl., 2.3.26).— NH_3 , CO_2 , and H_2O are heated in an autoclave until 40% of the NH_3 is converted into urea and the solution is then treated with H_3PO_4 or HNO_3 until the remaining 60% of NH_3 is converted into $\text{NH}_4\text{H}_2\text{PO}_4$ or NH_4NO_3 , respectively. On evaporation a crystal meal with a high N content is obtained.

A. R. POWELL.

Preparation, and treatment, of phosphatic fertilising materials. W. W. TRIGGS. FROM G. OBER & SONS CO. (B.P. 375,508—9, 7.4.30).—(A) Predetermined proportions of hot H_2SO_4 and aerated crude phosphate dust are passed under pressure through a mixing device into a rotating autoclave provided with a jacket for regulation of temp., with means for withdrawing and conveying to a condenser gases liberated during the process, and for discharging the contents when the reaction is complete. (B) Nitrogenous material or K compounds may be added to the crude phosphate dust used in (A), and aq. NH_3 is added to the reaction products in the autoclave after the mixture has been cooled and the pressure reduced to <1 atm.

L. A. COLES.

Production of a fertiliser mixture. KALI-FORSCHUNGS-ANSTALT G.M.B.H. (B.P. 357,473, 17.2.31. Ger., 21.2.30).—Crude phosphate is decomposed with HNO_3 (e.g., 50%) in the presence of K_2SO_4 , and the product is treated with gaseous NH_3 as long as any H_2O escapes; a dry, granulated product stable in air is obtained.

L. A. COLES.

Insecticide and fungicide. F. W. SULLIVAN, JUN., and E. W. ADAMS, ASSS. to STANDARD OIL CO. (U.S.P. 1,800,114, 7.4.31. Appl., 13.9.26).—The material comprises a thick emulsion of 5% of liquid glue, 8% of Cu rosin soap, 9% of $\text{Pb}_3\text{As}_2\text{O}_8$, 1.5% of the Na salt of a mineral oil sulphonic acid, 43% of white oil, and 33.5% of H_2O .

A. R. POWELL.

[Fertiliser from] greensand.—See VII. Insecticide.—See XXIII.

XVII.—SUGARS; STARCHES; GUMS.

Manufacture of sugar from dried beets. J. B. MINTZ, A. K. KARATSHOV, B. E. KRASILSHCHIKOV, and P. K. GROSHEV (Nauk. Zapiski Tzuk. Prom., 1931, 11, 187—191).—A temp. above 75° at the diffusion battery increases the solubility of pectin substances, and the acidity and invert sugar in diffusion juice; a lower temp. increases losses of sugar in pulp and H_2O . The p_{H} of the juice is about 5.0; when CaO is added the colour

markedly increases. The invert sugar in diffusion juice is about 0.5—0.6% of the wt. of juice. The temp. of defecation should not be above 85°. Addition of 3% of CaO decreases the colour. Sulphitation improves the quality of syrups and masecutes.

CHEMICAL ABSTRACTS.

Chains in the cells of the diffusion battery [for sugar]. V. S. VUIROVUI and A. I. SHAPIRO (Sovet. Sakhar, 1929, 174—175).—Fe chains (diam. 15—22 mm.) decrease the loss of sugar 0.07—0.08%. The yield of molasses is decreased.

CHEMICAL ABSTRACTS.

Purification of sugar juices. J. ZAMARON (Bull. Assoc. Chim. Sucr., 1931, 48, 277—287).—On the basis of laboratory tests on beet and cane juices, it is proposed to treat raw juice with 0.25—0.3% of CaO and 1% of $\text{Al}(\text{OH})_3$ paste containing 94% H_2O , and then to heat to 83—85° and filter. The filtered juice is treated with 0.4—0.5% of CaO and 0.1—0.15% of $\text{Ba}(\text{OH})_2$, carbonated once, filtered, sulphited, filtered, and evaporated. The $\text{Al}(\text{OH})_3$ is prepared by precipitation of alum solutions with aq. NH_3 and washed in filter-presses. The $\text{Ba}(\text{OH})_2$ is added to the juice to remove sulphates derived from the alumina paste. With beet juices remarkable purification is claimed, besides a saving of 2/3 of the amount of CaO usually employed.

J. H. LANE.

Isoelectric point in the Teatini process [of beet-juice purification] and modern physico-chemical theories. D. TEATINI (Bull. Assoc. Chim. Sucr., 1931, 48, 166—182, 241—261).—Mainly an exposition of electrochemical theory leading up to the properties of amphoteric electrolytes and the nature of the isoelectric point. Treatment of raw beet juice at 80° with 2.5—3 g. of CaO per litre raises the p_{H} val. from 6.4 to about 10.6, which is the isoelectric point of the precipitable colloids, and larger amounts of CaO produce practically no further displacement of the p_{H} . The precise amount of CaO required to attain the isoelectric point may vary somewhat in different cases, depending on the quality of the CaO and the beets, but mainly on the temp. conditions during diffusion. In the Teatini process, 2.5 g. of CaO per litre may be regarded as a min., but a small excess is better than a deficiency, and even 3.5 g. per litre would not displace the p_{H} appreciably beyond the isoelectric point, especially as the SO_2 added subsequently combines with some of the CaO . (Cf. B., 1931, 736.)

J. H. LANE.

Carbonatation [of sugar-beet juice] under pressure, and economy in lime. G. DURET (Bull. Assoc. Chim. Sucr., 1931, 48, 183—188).—Continuous carbonatation under pressure has given good results in large-scale plant throughout two campaigns. Limed juice and gas were delivered separately, but continuously, under pressure to the bottom of a closed carbonatation vessel, and from the upper part of this the partly carbonated juice passed to the bottom of a second carbonatation vessel to which also the excess of gas from the first vessel was led. The second vessel was open, but the column of juice in it, 4.5 m. high, produced a back-pressure of 0.5 kg./sq. cm. in the first. The best results were obtained when the gas entered the first vessel at 1 kg./sq. cm. No froth was produced in the first vessel. The ppt. formed deposited very rapidly, and gave filter-press

cakes which could be easily sweetened off. In the second campaign the amount of CaO employed was reduced from 2.3 to 1.5% for the first carbonatation and from 0.3 to 0.1% for the second, without any disadvantage. Automatic apparatus was used for liming the juice.

J. H. LANE.

Sulphi-hydrosulphitation process [for sugar-beet juices]. R. MESTRE and J. DUTILLOY (Bull. Assoc. Chim. Suer., 1931, 48, 262—268).—It is proposed to treat raw diffusion juice with a colloidal hyposulphite, "Redoid ZN," $(\text{NH}_4)_2\text{S}_2\text{O}_4(\text{CH}_2\text{O})_2, 3\text{ZnS}_2\text{O}_4(\text{CH}_2\text{O})_2$, at the rate of 50 g. per ton of beets, followed almost immediately by 50 g. of SO_2 per ton. Liming and double carbonatation follow as usual, except that only 1.2—1.4 kg. of CaO per hectolitre are employed before the first carbonatation and none before the second. Improved purification (cf. B., 1927, 711) as well as saving in CaO are claimed.

J. H. LANE.

A degree Brix-total solid relationship [for cane molasses]. R. H. KING (Ind. Eng. Chem. [Anal.], 1931, 3, 230—232).—Data for 1870 samples of [Philippine] molasses from 31 manufacturing units showed, for average group values, an approx. proportionality between the degrees Brix, taken at 6-fold dilution and multiplied by 6, and the difference between the degrees Brix and the true solid content determined by drying. This difference ("theoretical ash") was identical with the actual carbonate ash at very low and very high vals. (8% and 14%), but at intermediate vals. it exceeded the carbonate ash by amounts up to 1.4%; it was proportional to the logarithm of the carbonate ash. The possibility of applying these relations to the calculation of the true solid contents of molasses from the degrees Brix and the ash content is suggested.

J. H. LANE.

Injection of sugar powder into vacuum pan for spontaneous crystallisation. A. VOITZEKHOVSKI (Sovet. Sakhar, 1929, 84—85).—Sugar powder (1—2 g. for 92—95° purity, 3—5 g. for 89—92° purity) is preferably injected when the massecurite is at 90—95° and a thread 5—6 cm. long does not break. CHEMICAL ABSTRACTS.

Bleaching of the massecurite of the second crystallisation (skip) with greens and molasses. DEPT. STAND. SUGAR TRUST (RUSSIA) (Sovet. Sakhar, 1929, 223—224).—Washing with diluted molasses (54° Brix at 50°) is preferred. CHEMICAL ABSTRACTS.

Speed of crystallisation of lactose, galactose, glucose [dextrose], and sucrose from pure solution. E. O. WHITTIER and S. P. GOULD (Ind. Eng. Chem., 1931, 23, 670—673).—Conc. solutions of these 4 sugars, prepared at boiling temp., were cooled and maintained, with continuous stirring, at various const. temp. between 0° and 30°, and the rates of crystallisation were determined refractometrically. With the first three sugars the rate of crystallisation is at first determined mainly by the initial supersaturation of the separating form, but later by the rate at which this form is produced from its more sol. isomeride by mutarotation. In the case of lactose, and to a smaller extent in that of galactose, mutarotation is so retarded by fall in temp. that crystallisation is slower at 20° than at 30° in spite of the greater solubility of the sugars at the higher temp. The most rapid crystallisation of lactose takes place if the solution is

maintained at or slightly above 30° for 3 hr. and is then allowed to cool to about 20°. J. H. LANE.

Effect of rate of boiling on the residual sulphur dioxide content in mixtures of sugar and corn syrup; also effect of bleaches containing sulphur dioxide. R. H. MORGAN (Analyst, 1931, 56, 638—646; cf. B., 1930, 962).—Additional time taken over the boiling process reduces the amount of residual SO_2 to a const., which is soon reached. The residual SO_2 contents in boilings from different samples of corn syrup bear no relation to each other, taking into account the initial SO_2 present, and are probably influenced considerably by viscosity. The addition of bleaches, even in small amounts, considerably raises the residual SO_2 content of boilings, as compared with controls to which no bleach has been added, but no definite relationship has been established.

T. McLACHLAN.

Determination of dextrose and lævulose in honey by use of the iodine-oxidation method. R. E. LOTHROP and R. L. HOLMES (Ind. Eng. Chem. [Anal.], 1931, 3, 334—339).—The methods of Auerbach and Bodländer (B., 1924, 107, 567) and of Slater and Acree (A., 1930, 1165) for the determination of dextrose are unsatisfactory, but that of Hinton and Macara (B., 1924, 189) gives accurate results. Mannose can be accurately determined under similar conditions, but only if the alkali is added slowly, *e.g.*, over a period of 2 min., so as to minimise the formation of iodate. The iodine absorption of lævulose varies with temp. and duration of action, and is probably the result of a slow Lobry de Bruyn transformation into aldoses. For the analyses of honey 20 c.c. of a solution containing 0.2 g. of honey should be treated with 40 c.c. of 0.05*N*-I solution and 25 c.c. of 0.1*N*-NaOH, allowed to remain stoppered for 10 min. at 20°, and then treated with 5 c.c. of 2*N*- H_2SO_4 and titrated at once with 0.05*N*- $\text{Na}_2\text{S}_2\text{O}_3$. 1 c.c. of 0.05*N*-I solution absorbed \equiv 4.502 mg. of dextrose, but the % dextrose content of the honey calc. on this basis must be corrected by subtracting 0.012 times the approx. lævulose content. The exact lævulose content is found by subtracting the corrected dextrose content from the total reducing sugar content (calc. as dextrose) and dividing the difference by 0.925; vals. thus obtained are usually 1—2% higher than those determined by polarisation at low and high temp. The ratio of lævulose to dextrose in 33 samples of fresh American honeys from different predominant floral sources was found to range from 1.02 to 1.70.

J. H. LANE.

Determination of sugar losses in water from the barometric condenser. AFANASENKO (Sovet. Sakhar, 1929, 176).—The H_2O is treated with α -naphthol and H_2SO_4 and the colour compared with standards prepared from 0.001—0.01% of sugar; if the quantity is above 0.1% the H_2O is polarised. Sampling apparatus is described. CHEMICAL ABSTRACTS.

Impurities in white sugars. II. Determination of sulphates, sulphites, and aldehyde-sulphites. J. A. AMBLER, J. B. SNIDER, and S. BYALL. **III. Determination of labile organic sulphur.** J. A. AMBLER (Ind. Eng. Chem. [Anal.], 1931, 3, 339—340, 341—343; cf. B., 1931, 648).—II. Sulphates in white sugars can

be accurately determined by direct precipitation of acidified solutions with BaCl_2 . SO_2 in 20 factory white beet sugars ranged from 0 to 1188 p.p.m., and in 4 factory white cane sugars from 19 to 295 p.p.m., whilst 5 refined sugars contained none. Iodometric titration of solutions of factory white sugars indicated amounts of SO_2 up to 56 p.p.m. in inorg. combination, and amounts up to 6 p.p.m. combined with aldehydes and liberated by pretreatment with KOH . Apparent SO_2 contents of 0.4–0.6 p.p.m. in refined sugars were attributed to traces of reducing polyphenols.

III. On boiling solutions of white sugars with alkaline plumbite, minute quantities of PbS are formed, due to compounds, such as cystine, containing labile S. A spectrophotometric method of determining such S, based on the formation of methylene-blue, is described. Results, calc. as cystine, for 14 factory white and refined sugars ranged from 3.4 p.p.m. downwards to traces.

J. H. LANE.

Turbidity in sugar products. I. Relation between intensity of Tyndall beam and depth and concentration of solution. F. W. ZERBAN and L. SATTLER (Ind. Eng. Chem. [Anal.], 1931, 3, 326–330).—The Zeiss-Pulfrich spectrophotometer, which can be used for measuring the Tyndall-beam intensities of turbid liquids as well as transmittancies, was employed in the present study. With coloured turbid liquids, the Tyndall-beam intensity cannot be satisfactorily measured without a correction for colour absorption. Using a raw sugar solution of 60° Brix diluted with pure sucrose solutions of the same density, the ratio, R , between the Tyndall-beam intensity and the transmittancy could be related to the depth, b , of the layer of solution at const. concentration, or to the concentration, c , at const. depth, by formulæ of the type $R = R_1 b^n$ or $R_1 c^n$, which are being further studied.

J. H. LANE.

Influence of size of granules on the value of starch. E. SZÉGGÖ (Bull. Assoc. Chim. Sucr., 1931, 48, 268–274).—Potato starch of first quality commonly contains 1.5–6 wt.-% of granules < 20 μ in diam. and 43–44% of granules of > 40 μ in diam., and Sprockhoff has shown that the small granules yield pastes of higher viscosity and lower acidity than pastes from the larger ones (B., 1930, 436; 1931, 648). Deterioration in the gelatinising power of the small granules in after-product starch, due to prolonged factory treatment, could be minimised by use of centrifugal methods of deposition.

J. H. LANE.

Starch gels. S. WOODRUFF and L. NICOLI (Cereal Chem., 1931, 8, 243–251).—Starch- H_2O pastes containing 5% of maize, wheat, rice, potato, arrowroot, or cassava starches require to be heated to temp. above those at which sudden change in translucency occurs, in order to produce gels strong enough to retain the shape of a mould on cooling. Max. strength is obtained by heating to 90° or above. Cereal starches give much stronger gels than root starches. Addition of sucrose reduces the strength in a greater degree than dilution with H_2O to the same vol. Addition of 60 wt.-% of sucrose to a 5% starch- H_2O paste completely prevents gelation in all cases, but 50% added to the cereal starch pastes did not prevent the formation of well-formed gels.

W. J. BOYD.

Pulp dryers.—See I. Report [on sugar cane].
Manuring of sugar beet.—See XVI. Yeast from molasses.—See XVIII. Sugar in apples. Yeasts in fermenting honey.—See XIX.

PATENT.

Higher fatty acid esters.—See V.

XVIII.—FERMENTATION INDUSTRIES.

Preservative principles of hops. XI. Effects produced by certain constituents of hop resin during the boiling of hopped worts. T. K. WALKER and J. J. H. HASTINGS. XII. Quantitative comparison of very small degrees of antiseptic activity and of very small differences between more pronounced degrees of activity. T. K. WALKER, J. J. H. HASTINGS, and E. J. FARRAR (J. Inst. Brew., 1931, 37, 509–512, 512–533; cf. B., 1929, 533).—XI. The bitterness which the α -resin imparts to the boiling wort increases to a max. and is greater in amount than that yielded by the β -resin. The time required to reach the max. depends on the concentration and physical condition of the resin, and on the rate and temp. of boiling. On prolonged boiling both α - and β -resins give rise to unpleasant flavours. The α -resin produces no aroma in the wort, whereas a pleasant aroma is imparted by the β -resin.

XII. The method is based on a given dose of antiseptic causing the max. restriction of acid formation if it is added immediately after the commencement of the logarithmic phase of growth of *B. bulgaricus* seeded into sterile wort. Under these conditions the ratio of the % restriction of acid formation to % concentration of antiseptic is const. The culture medium used throughout is sterile malt wort of d 1.05 and p_H 5.0, and the temp. of incubation is 30°. 10 c.c. of wort are inoculated by two loops of a 24-hr. old culture of *B. bulgaricus* and incubated for 18 hr. 1 c.c. of this culture is added to 99 c.c. of wort at 30°, and the whole (100 c.c.), which contains 2×10^6 organisms per c.c., is the standard inoculum for the flasks of wort on which the actual determination is conducted. Flasks containing 200 c.c. of wort at 30° are incubated for 6 hr. with 1 c.c. of the standard inoculum. The addition of 1 c.c. of a 0.5% hop decoction is then made and, after incubation for 17 hr., 50 or 100 c.c. are withdrawn and quinquedrone is added to prevent the further production of acid. The samples are then electrometrically titrated at 20° to the initial p_H of the wort, using 0.1N-NaOH. The retardation of acid formation by the antiseptic is determined by comparison with a control flask in which no hop decoction is added. The % retardation is a measure of the relative antiseptic vals. of the hops. The results show the same order of grading of the hops when compared with those obtained by the methods of Chapman and of Ford and Tait.

C. RANKEN.

Determination of dry matter (or moisture) in pressed yeast. L. FLETCHER (J. Inst. Brew., 1931, 37, 506–508).—In the standard method the weighed, unwashed yeast is moistened with abs. EtOH and dried for 7–9 hr. in a water-oven in a current of air. A content of H_2O which is 0.5–1% higher is obtained

if the yeast is first extracted by abs. EtOH and the dehydrated yeast dried in the water-oven together with the alcoholic extract. The combined solids from the yeast and the extract permit the calculation of the H₂O. If the yeast is dried at 105° in a vac., except for a minute current of air, and the H₂O is absorbed by H₂SO₄, the content of H₂O is approx. 2.5% higher than that obtained by the standard method. C. RANKEN.

† **Yields of yeast from molasses.** G. MEZZADROLI and P. VEREMEENCO (Atti III Cong. Naz. Chim. pura appl., 1929, 576—579; Chem. Zentr., 1931, i, 2813).—Beet molasses is a better nutrient than cane-sugar molasses. The yield was increased by aëration, a large impregnation, addition of phosphate, slight acidity, presence of N, and suitable dilution, and was decreased by addition of EtOH or active C. A. A. ELDRIDGE.

Fermentation of polyhydric alcohols by the colon-aërogenes group of bacteria. C. F. POE and J. T. FIELD (J. Bact., 1931, 21, 11).—In media containing inositol, *Escherichia* cultures produced no acid, but *Aerobacter* gave a distinct acid reaction. Sorbitol yielded acid in all cultures. In every case where acid and gas were obtained the products included CO₂, H₂, AcOH, HCO₂H, succinic and lactic acids.

A. G. POLLARD.

Determination of ethyl and butyl alcohols in fermentation mixtures. C. H. WERKMAN and O. L. OSBURN (J. Bact., 1931, 21, 20—21).—The liquor is neutralised and distilled and any MeCHO, COMe₂, etc. are removed by precipitation with 2:4-dinitrophenylhydrazine. From the residual liquid the alcohols are distilled and oxidised by means of K₂Cr₂O₇, and H₃PO₄ and the acids distilled off. A portion of the distillate is titrated to determine the total acidity, and in another portion the ratio of AcOH and BuOH is ascertained by partitioning in Pr²O₃.

A. G. POLLARD.

Adsorption in beer filters. J. DE CLERCK (Bull. de l'école sup. de Brass., Louvain, 1931, 31, 67; Woch. Brau., 1931, 48, 409—414, 423—426, 429—434).—During washing, pulp adsorbs alkalis which are removed by the beer during filtration. The earlier portions of the beer are thus partly neutralised and the pH is raised. Extractives are removed from the beer first filtered, principally colouring matters and those colloids which affect surface tension and thus foaming capacity. The loss of these properties may amount to 25% on the first beer going into trade. Viscosity and total N are altered to a smaller extent. New pulp forms a less dense mass than pulp which has been in use for some months and of which the fibres are partly disintegrated. Less pressure is required to filter through the former and it has a much lower adsorptive power, but soon allows fine turbidity to pass through. The first-filtered beer is inferior in biological stability to that filtered later.

F. E. DAY.

Examination of two samples of old bottled beer. A. C. CHAPMAN (J. Inst. Brew., 1931, 37, 540—541).—Compared with the same beer kept in bottle for 16 years and examined 34 years ago, a second sample kept in bottle for 51 years, which had remained quite sound, showed a marked increase in the content of esters,

whilst the volatile acidity had almost disappeared. The content of furfuraldehyde remained const., but the amount of EtOH had slightly decreased. The yeast cells in the deposits were shrunken, but they developed with a vigorous fermentation when inoculated into sterile wort, and at the end of 2 months some cells showed structures which resembled spores. A similar deposit from a sample of "King's ale" bottled for 29 years yielded no growth when seeded into sterile wort.

C. RANKEN.

Chemical composition of various types of [German] beer. W. WINDISCH, P. KOLBACH, and E. SCHILD (Woch. Brau., 1931, 48, 415—418, 427—429).—Analytical results are given for 58 varieties.

F. E. DAY.

Have electric currents action on fermentation? F. STOCKHAUSEN and R. KOCH (Woch. Brau., 1931, 48, 403—407, 419—423).—With d.c. applied during the whole fermentation harmful effects were found to begin with 0.1—0.6 milliamp./sq. cm. (0.05—0.3 milliamp./sq. cm. anode intensity), using Pt electrodes. The effect is probably on the wort rather than directly on the yeast. A.c. of 0.5 milliamp./sq. cm. is not harmful. Damage to fermentations by stray currents of the order of intensity met with in practice can occur only if Cu is brought into solution.

F. E. DAY.

Enzymic clarification of grape juice. J. J. WILLAMAN and Z. I. KERTESZ (New York Agr. Expt. Sta., Tech. Bull., 1931, No. 178, 15 pp.).—The turbidity which develops in grape juice during storage and is not filterable has been traced to the presence of pectic substances. An enzyme which is capable of converting the pectin into sol. substances and a coagulable material has been found in cultures of *Penicillium glaucum*, Link, on a synthetic medium containing sucrose. The enzyme solution may be satisfactorily conc. by evaporation in vac.; the optimum acidity is p_H 3.0—3.6, whilst the optimum temp. is 38—40°, the solution being completely inactivated at 55°. The enzyme may be added at any stage of the commercial prep., but if the addition is subsequent to the removal of tartrate reheating to 38° is necessary. The coagulum carries down suspended matter so that if commercial pectin be added, the process can be used to clarify other juices which do not contain pectin.

H. J. DOWDEN.

Chemistry of grape juice. E. L. GREEN and Z. I. KERTESZ (New York Agric. Expt. Sta., Tech. Bull., 1931, No. 181, 14 pp.).—Enzymic clarification of grape juice by the method of Willaman and Kertesz (cf. preceding abstract) removes about two thirds of the pectin; the ppt. formed is shown to consist of carbohydrate material. On keeping the juice the pectin and tartaric acid decrease without necessarily clearing the juice.

E. B. HUGHES.

Fluorescent indicators for the determination of the acidity of coloured wines. J. M. GALLART (Anal. Fis. Quím., 1931, 29, 490—493). J. M. CLAVERA (*Ibid.*, 494—496).—A criticism of Volmar and Clavera's method (B., 1931, 693), and a reply. H. F. GILLBE.

Yeasts in fermenting honey.—See XIX.

PATENTS.

Manufacture of yeast by the aeration process. H. J. and H. C. JANSEN (B.P. 357,541; 19.6.30).—Yeast with either improved reproductive or increased fermentative power is obtained by withdrawing intermittently or continuously part of the fermenting liquid, which is deprived of its suspended yeast and returned to the fermentation vat, so that the yeast content of the fermenting liquid is maintained at a predetermined value.

C. RANKEN.

Clarifying or separating the [yeast] head from fermenting liquor, in particular in brewing. A. HALLERMANN (B.P. 357,458; 13.1.31).—A perforated metal sheet which allows the passage of the rising head is fixed closely above and is distributed over the entire surface of the fermenting liquid, whereby the solid constituents are retained on the subsequent fall of the head.

C. RANKEN.

Manufacture of beer [containing vitamins]. H. VAN DE SANDT (B.P. 357,732; 20.8.30. Ger., 13.9.29).—Vitamin preps. obtained by autolysis of yeast or malt germs at approx. 50° are added to the beer after fermentation.

C. RANKEN.

Esters of EtOH.—See III.

XIX.—FOODS.

Wheat and flour studies. XIX. Effect on their bread-making properties of extracting flours with ether, with special reference to the gas-retaining powers of doughs prepared from ether-extracted flours. A. H. JOHNSON and W. O. WHITCOMB (Cereal Chem., 1931, 8, 392—402).—The improved baking quality of Et₂O-extracted flours is due to their superior gas-retention in the dough. Addition of fat to doughs prepared from such flours reduced their gas-retaining powers, and allowing the dough to rise several times, with "punching" at the proper time, produced a similar result.

E. B. HUGHES.

Bactericidal properties of ether, alcohol, chloroform, and carbon disulphide. A. C. THAYSEN and L. H. WILLIAMS (Zentr. Bakt. Par., 1931, II, 84, 252—260).—Wollney's method (Zentr. Bakt., 1892, 11, 752) of sterilisation by immersion in Et₂O is modified for use with flour. The sample is treated with Et₂O for 48 hr. to kill non-sporing organisms. Remaining spores are encouraged to germinate (*e.g.*, by storage in a moist atm. at 30°) and the Et₂O treatment is repeated for a short period. Changes in the condition of the protein of the flour are small. CS₂ and CHCl₃ may be used on a similar manner, but results are less satisfactory.

A. G. POLLARD.

Evaluating new wheat varieties by use of the baking test. C. E. MANGELS and T. E. STOA (Cereal Chem., 1931, 8, 381—391).—Variation in loaf vol. with change in fermentation period and loaf shape are the most important characteristics in judging wheat varieties by baking tests.

E. B. HUGHES.

Utility of the Tag-Heppenstall moisture-meter for determining the moisture content of ground wheat. W. F. GEDDES and C. A. WINKLER (Cereal Chem., 1931, 8, 409—414).—H₂O in ground wheat is determined by measuring the electrical conductivity

of a stream of wheat passing between two revolving rollers, which serve as electrodes. The method of using the meter and its applications are outlined.

E. B. HUGHES.

Moisture determinations in wheat with special reference to quick methods. D. A. COLEMAN (Cereal Chem., 1931, 8, 315—335).—Comparative tests have been carried out on various rapid moisture-testing devices some of which operate on the dielectric, others on the conductivity, principle.

W. J. BOYD.

Protein and moisture determinations in wheat with special reference to conditions covering preparation of samples for analysis. J. T. FLOHIL (Cereal Chem., 1931, 8, 307—312).—Procedure in sampling wheat and preparing the sample for analysis is discussed in relation to errors in protein and moisture determinations.

W. J. BOYD.

Ashing methods [in determining ash in flour]. W. C. MEYER (Cereal Chem., 1931, 8, 312—315).—The direct and indirect methods (*cf.* B., 1930, 584, 836), with and without the use of O₂, have been compared. The accuracy of the direct method is confirmed. When O₂ is used greater care is necessary, but accurate results can be obtained in approx. 2 hr.

W. J. BOYD.

Supplementary procedure with the [A.A.C.C.] basic baking test for use with low diastatic flours. M. C. MARKLEY and C. H. BAILEY (Cereal Chem., 1931, 8, 300—305).—In order to study accurately the factors influencing the baking quality of flour which are carried in the genetic constitution of the wheat it is necessary to ensure constancy in chemical composition and the presence of sufficient diastase to allow normal fermentation. The addition of 3% of flour from sprouted wheat is a convenient method of supplying the required diastase.

W. J. BOYD.

Report of activities [on experimental baking test]. P. P. MERRITT and M. J. BLISH (Cereal Chem., 1931, 8, 267—292; *cf.* B., 1931, 461).—The factors responsible for variations in the results of the standard baking test obtained by different operators have been studied. Machine mixing tends to produce larger loaves than hand mixing unless a restricted mixing time is used. Prolonged machine mixing gives greater variability than hand mixing. It is not possible to establish time factors for different types of machine so as to give identical results, as these factors vary for different flours. With correct adjustment of sheeting rolls and compression plate, especially the latter, machine moulding gives results closely approximating to those obtained by hand moulding, with reduced variability. Various types of oven have been studied. When loaves are inserted singly or in pairs, forced draught and introduction of an open pan of water into the oven have little effect on loaf quality. When several loaves are introduced at a time a set of dummy loaves should be baked first and a pan of water should be placed in the oven. Lowering the baking temp. by 10° affected crust colour only.

W. J. BOYD.

Separation of "gassing power" (diastatic activity) from "strength" in baking tests. H. JORGENSEN (Cereal Chem., 1931, 8, 361—374).—In bread-baking tests, the proportions of the ingredients

should be so adjusted that there is an excess of fermentable sugar throughout fermentation and proofing, in order to separate "gassing power" from "strength" of flour. E. B. HUGHES.

Relation of quality of dry skim milk to baking strength. O. SKOVHOLT and C. H. BAILEY (Cereal Chem., 1931, 8, 374—380).—The quality of dried milk for breadmaking is improved by preheating to above 77°. Attempts to determine the cause of improvement were not successful. E. B. HUGHES.

Chemical leavening agents and their characteristic action in doughs. R. A. BARACKMAN (Cereal Chem., 1931, 8, 423—432).—An apparatus and procedure are described for following the reaction of chemical leavening agents during mixing and keeping of mixes used for foodstuffs. E. B. HUGHES.

Composition of bread. C. B. MORISON (Cereal Chem., 1931, 8, 415—417).—Analyses of modern American bread show higher protein, fat, and ash content than figures given in text books. E. B. HUGHES.

Cooking of cereal porridges. N. T. CUNNINGHAM (Cereal Chem., 1931, 8, 403—408).—The % of gelatinisation as a measure of the cooking of cereal porridge is determined by the blue colour produced with I, a fully gelatinised starch solution being employed as a standard. E. B. HUGHES.

Soya-bean cake as a food. I. Oil-extracting process and digestion coefficient of the protein. S. IZUME and Y. YOSHIMARU. **II. Nutritive value of the alcohol-extracted oil cake.** S. IZUME, Y. YOSHIMARU, and I. KOMATSUBARA. **III. Effect of addition of the soya-bean oil cake to other grain.** S. IZUME and I. KOMATSUBARA (J. Agric. Chem. Soc., Japan, 1931, 7, 87—96).—I. Extraction with hot EtOH denatured the protein, the solubility of which fell from 88% to 24%; that of the benzene-extracted cake was 82% and of the pressed cake 45%. There is little change, however, in digestibility of the protein of various cakes.

II. No significant differences in nutritive val. of the proteins were observed. The vitamin-A and -D contents of the EtOH-extracted cake are low; the vitamin-B content is less than that of the fresh bean.

III. The incomplete nutritive val. of cereals is supplemented by addition of EtOH-extracted soya-bean cake.

CHEMICAL ABSTRACTS.

Factors for converting percentages of nitrogen in foods and feeds into percentages of proteins. D. B. JONES (U.S. Dept. Agric., 1931, Circ. No. 183, 21 pp.).—The factor 6.25 has been generally used, with exceptions, in calculating protein content from N content on the unwarranted assumptions that all proteins contain 16% N and that all the N in foodstuffs and feeds is protein-N. The following factors have been calc. from data accumulated by many different workers: wheat endosperm 5.70; wheat embryo 5.80; wheat bran 6.31; whole wheat, rye, barley, and oats 5.83; rice 5.95; maize 6.25; coconut, most oil seeds, hazel nut, and walnut 5.30; almonds 5.18; Brazil and pea nut 5.46; soya bean 5.71; gelatin 5.55; milk 6.38; eggs, meats, and leguminous seeds 6.25.

W. J. BOYD.

Detection of ammonia in milk. F. KOPATSCHEK (Milch. Zentr., 1931, 60, 309—310).—To 10 c.c. of the sample 30 c.c. of distilled H₂O and 10 c.c. of 1.5% uranyl acetate solution are added and the mixture is shaken and filtered. 10 c.c. of the filtrate are shaken with 2 c.c. of 34% Rochelle salt solution and 1 c.c. of Nessler's reagent is added. The colour is observed within 1 min. as the solution soon becomes turbid. A golden-yellow, slightly orange-red tint is faintly positive, a pale yellow is negative, and an intense orange-red is strongly positive. A blank test is carried out using 10 c.c. of distilled H₂O, 5—6 drops of uranyl acetate, 2 c.c. of Rochelle salt solution, and 1 c.c. of Nessler's reagent. A pale yellow colour should develop. A negative result of this test, by which 0.003% of NH₃ is detectable, indicates the absence of NH₃ due to bacterial or other contamination. W. J. BOYD.

Effect of heat-treatment on the quality of dry skim milk and condensed skim milk for ice cream. O. E. WILLIAMS and S. A. HALL (U.S. Dept. Agric. Circ., 1931, No. 179, 10 pp.).—Among dried skim milks, the best for ice-cream mixtures were samples prepared by spray-drying, in particular those heated at 83° before drying. Superheating of condensed milks improved their quality for ice-cream manufacture, but the product was still inferior to that obtained by spray-drying. A. G. POLLARD.

Hydrogen-ion determination of butter. O. F. HUNZIKER, W. A. CORDES, and B. H. NISSEN (J. Dairy Sci., 1931, 14, 347—372).—The quinhydrone electrode may be used for determining the p_H of butter. The curd-serum mixture must be used whole, since dilution produces marked changes in p_H . Removal of the curd from the serum causes slight lowering of the p_H .

A. G. POLLARD.

Effect of manner of preparation and calcium content on the consistency of cheese. G. WODE (Kungl. Landtbruks-Akad. Handl. Tidskr., 1930, 69, 1032—1043; Chem. Zentr., 1931, i, 2815—2816).—The higher is the Ca content of cheese the softer it is. During the prep. of cheese the Ca passes into the whey, the more readily the more acid is the milk. By rapid separation the loss of Ca is reduced. A. A. ELDRIDGE.

Properties of some acid caseins. R. W. BELL and S. P. GOULD (J. Dairy Sci., 1931, 14, 337—346).—Factors affecting the paper-coating properties of casein are examined. The reaction of casein is largely controlled by the conditions under which it is pressed. A well-washed sample has p_H 4.6 and low free acid and ash contents. Best coating properties are associated with a min. of free acid. The keeping quality and strength of casein are reduced by the presence of milk fat. Casein prepared by precipitation with HCl at temp. < 35.5° forms a soft fine curd, difficult to drain and wash. The most satisfactory ppt. with H₂SO₄ is obtained by the use of 1:30 acid. Deterioration of the dried product is not rapid if the moisture content is < 8%.

A. G. POLLARD.

Factors affecting the quality of commercial canning peas. C. B. SAYRE, J. J. WILLAMAN, and Z. I. KERTESZ (New York Agr. Expt. Sta., Tech. Bull. 1931, No. 176, 76 pp.).—A puncture and a crushing

test for tenderness in raw peas have been developed, the latter being capable of detecting peas which will be tender when canned. The changes which occur during maturation comprise decrease in sugars, increase in starch, protein, and dry matter, whilst CaO increases in the skins and is associated with increased hardness. Toughness and the CaO content of the skin also increase with lapse of time after shelling, and, after canning, the CaO content of the skins is very much greater than before canning. K fertilisers hasten maturity, KCl and K_2SO_4 being equally satisfactory, and in addition, tend to reduce Ca intake and thus produce softer peas. $CaCl_2$ definitely increases the hardness besides reducing the yield through bad germination. A quality index is proposed, based on the product of the tenderness of each size and the % of the various sizes of pea.

H. J. DOWDEN.

Determination of sugar in apples. MARILLER (Bull. Assoc. Chim. Sucr., 1931, 48, 160—162).—According to Warcollier, sucrose may represent from 5 to 42% of the total sugars in apples. During storage inversion occurs and also loss of sugar, especially of dextrose, the ratio of dextrose to laevulose never exceeding 0.5. Boinot found that the total sugar content, determined after inversion by the Clerget method, varied widely according to the method of defecating or preparing the extracts. Defecation with basic Pb acetate led to higher vals. than defecation with EtOH, or than alcoholic extraction or digestion, differences up to 24% of the total sugar content being obtained; but Pigeot has shown that the Clerget method does not effect complete inversion of sucrose in presence of EtOH.

J. H. LANE.

Nomogram for use in connexion with Gutzeit arsenic determinations on apples. W. J. YOU DEN (Contr. Boyce Thompson Inst., 1931, 3, 363—373).—The probable error of the analytical process is discussed, and is probably less than the error of sampling. A nomogram is prepared for determining the precision of the sampling procedure.

A. G. POLLARD.

Factors influencing the pectin content of stored apple pomace. Z. I. KERTESZ and E. L. GREEN (New York Agr. Expt. Sta. Tech. Bull., 1931, No. 179, 14 pp.).—Samples of dried, ground pomace containing 7.5, 20, 33.3, 50, and 60% H_2O were stored in sealed jars for 5 months at room temp. The sol. pectin was determined by extraction with cold H_2O and that derivable from protopectin by repeated extraction with $N/30-HCl$ at 97° . H_2O -sol. pectin increases with increasing H_2O in the pomace, reaching a max. at 33.3% H_2O . Acid-hydrolysable pectin suffers a corresponding decrease, and as this portion has the greater commercial val. the H_2O content of the pomace should be kept as low as possible during storage. With mould-inoculated samples no growth occurred below 20% H_2O content, but at 33.3 and 50% H_2O the total pectin extracted from the mould-infected samples was 14 and 28% lower, respectively, than that from samples kept sterile.

H. J. DOWDEN.

Effect of solid carbon dioxide on transportation diseases [in fruit]. C. BROOKS (Phytopath., 1931, 21, 103).—The CO_2 content of the atm. of small storage containers or refrigerators is conveniently increased by the

use of solid CO_2 to a degree which has the same inhibiting effect on the rotting and softening of warm fruit as a temp. fall of $17-22^\circ$. If the gas is allowed to escape within 18—24 hr. no objectionable flavour develops in the fruit except in a few cases. The inhibitory action of the gas ceases soon after it is liberated, but the interval of time permits the thorough cooling of the container or refrigerator.

A. G. POLLARD.

Preservation of lemon juice. B. MELIS (Boll. Uff. Staz. Sperim. Ind. Essenze, 1931, 6, 154—157).—The pulp of the lemons is washed to remove traces of essential oil; this may be done by means of a perforated travelling belt under a H_2O spray. Partial drying is then effected by fans at room temp. The pressed juice is conc. in a vac. until the acidity reaches 80%. Special enamelled containers are completely filled with the conc. liquid and H_2 at a pressure of 1.5 atm. is admitted. The gas is absorbed by the colloidal particles; on releasing the pressure the impurities are carried upwards and the clear juice is discharged from the lower part of the apparatus. The juice is conveyed by rail in carboys in which the upper space has been filled with H_2 .

Characteristics of yeasts found in fermenting honey. G. E. MARVIN, W. H. PETERSON, E. B. FRED, and H. F. WILSON (J. Agric. Res., 1931, 43, 121—131).—During the granulation of honey the H_2O present remains in the syrup, which ultimately becomes sufficiently dil. to permit the growth of yeasts. The slow fermentation process produces about equal quantities of CO_2 and EtOH, with small amounts of non-volatile acids. Fermentation is prevented by heating honey to 71° and cooling rapidly. Honey stored at temp. below 11° does not ferment.

A. G. POLLARD.

Evaluation of potato flakes as fodder and as raw material for distilleries. B. LAMPE (Z. Spiritusind., 1931, 54, 254—255).—The proportion of lumps in the flakes which do not fall away easily on stirring in H_2O should be small, as such aggregations have a greater moisture content and higher acidity than the loose flakes. The moisture content should be determined in both the loose and lumpy flakes and should not exceed 15%. Normal flakes are pale yellow, but they may be darker without loss of quality. The odour of the flakes when dry and also when stirred into H_2O at $50-60^\circ$ should be aromatic, breadlike, and devoid of mustiness, and the steam from flakes boiling in H_2O should be neutral to litmus. The pH of the liquid obtained by stirring 10 g. of flakes in 150 c.c. of H_2O at room temp. for 15 min. should not exceed 6.2, and > 4 c.c. of $N-NaOH$ per 100 g. of flakes should be necessary to titrate the liquid to pH 7.07 with neutral-red. If the flakes are for distillery use, the amount of EtOH yielded by the inversion method should be determined also.

C. RANKEN.

Buckwheat middlings as a protein supplement for growing and fattening swine. J. H. LONGWELL (Proc. Amer. Soc. Animal Production, 1928, 98—101).—Buckwheat middlings are superior to wheat middlings, but deficient in vitamins-A and -D.

Starch equivalent of maize silage. G. FINGERLING, P. EISENKOLBE, B. HIENTZSCH, M. JUST, and K. SCHMIDT (Landw. Versuchs-stat., 1931, 112, 243—260).—The

digestibility of the org. matter of maize silage averages 80%. The starch equiv. is definitely higher than that allocated by Kellner. A. G. POLLARD.

Determination of sand in vegetable feeding-stuffs. W. LEPPER (Chem.-Ztg., 1931, 55, 782—783; cf. B., 1930, 1129).—A reply to Rub's criticisms (B., 1931, 564). In the latter method it is considered that org. material may be carried down with the sand, and sand may be retained by the material floating in the CCl_4 . W. J. BOYD.

Rancidity accelerated by porous packings. W. RABAK (Oil and Fat Ind., 1931, 8, 373—374).—Card-board packings of cakes etc. absorb fat which becomes rancid. Hard-finish non-porous boards (e.g., silicated and waxed) develop least rancidity; the residual H_2O -sol. chemicals in the board appear to be without influence. E. LEWKOWITSCH.

Preservation of fish nets.—See V. **Analysis of butter.**—See XII. **[Potato storage].**—See XVI. **Determining sugars in honey. Starch gels.**—See XVII. **Grape juice.**—See XVIII.

PATENTS.

Preservation of milk. H. D. ELKINGTON. From OLIGODYN A.-G. (B.P. 357,688, 21.7.30).—The original qualities of fresh milk may be preserved for several days by a process involving a 1—10-min. contact with an oligodynamically active substance, a short pasteurisation treatment in which the heating is interrupted before any deleterious effects can occur, a rapid cooling, and final retention in cold storage. C. JEPSON.

Making chewing-gum base [containing rubber]. W. W. TRIGGS. From SWEETS LABORATORIES, INC. (B.P. 357,350, 25.8.30. Addn. to B.P. 347,376; B., 1931, 696).—A solution of an alkali, e.g., NaOH, is added to rubber latex, so that the latter separates into 2 layers; the upper layer may again be treated with alkali and the creaming repeated. Resinous material, e.g., coumarone resin, is then added to the cream, and the mixture is heated with stirring so as to remove H_2O and render the mass homogeneous. After removal of residual alkali by washing, the product is mixed with hard, hydrogenated oil. D. F. TWISS.

Apparatus [rotary toasting etc. ovens] for treating food materials. H. J. C. FORRESTER. From KELLOGG Co. (B.P. 357,515, 17.5.30).

[Apparatus for] preservation or keeping and display of food substances [especially fish]. M. T. ZAROTSCHENEFF, and LIVERPOOL REFRIGERATION Co., LTD. (B.P. 358,392, 24.1.31).

Grinding of org. peroxides.—See III. **Beer containing vitamins.**—See XVIII.

XX.—MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Modification of hypnotic action through changes in chemical structure. H. A. SHONLE (Ind. Eng. Chem., 1931, 23, 1104—1108; cf. A., 1930, 1047).—The narcotic action of a number of unsym. dialkylbarbituric acids has been studied. In the ethyl-alkyl series, as the mol. wt. of the alkyl group increases, max. effect occurs at the amyl group, thereafter diminishing; the secondary alkyl groups are approx. twice as effective as the primary and isoprimary isomerides, but this is

not due to a group having optical activity. If the Et group be replaced by a more complex one, the effectiveness is lessened, but at the same time a certain balance must exist between the mol. wts. of the two substituent radicals. The relationships of the groups are changed by replacing Et by allyl. The effectiveness of alkyl groups in barbituric acids is 50 times that of the group in alcohols. Unsaturation usually increases effectiveness, provided the groups have like numbers of C atoms. Introduction of CH_2Ph or propargyl produces tremors and convulsions. Arylethylbarbituric acids, aryl-methyl- and -ethyl-hydantoins have been studied, the CH_2Ph group being out of its homologous position in the Ph, CH_2Ph , and $\text{CH}_2\cdot\text{CH}_2\text{Ph}$ series. Chemical structure seems to affect the activity by modifying the physico-chemical properties of the compounds, such as H_2O -solubility, and partition coeffs. between H_2O and oil. F. R. SHAW.

Acetylsalicylic acid in citrate and other solutions. S. H. STROUD (Sydney Univ. Reprints, 1927, [iii], 1, No. 33—44, 2—7).—Acetylsalicylic acid is hydrolysed (40% in 3 days at room temp.; completely on boiling for a few min.) by solutions of KOAc, or K, Li, or Na citrate, in solutions of which it is often prescribed. CHEMICAL ABSTRACTS.

Derivative of acetylsalicylic acid. S. H. STROUD (Sydney Univ. Reprints, 1927, [iii], 1, No. 33—44, 2—10).—A solution of acetylsalicylic acid in KOAc solution deposits crystals, m.p. 170.5° (also obtained by half neutralising an alcoholic solution with KOH), composed of 1 mol. of the acid associated with 1 mol. of the K salt, probably through an oxonium salt. CHEMICAL ABSTRACTS.

Determination of halogens in pharmacopoeial organic compounds. U. O. OAKDALE and J. L. POWERS (J. Amer. Pharm. Assoc., 1930, 20, 881—885).—The U.S.P. and Thompson-Oakdale (A., 1930, 799, 1303) methods are compared. Analyses of CHI_3 , carbromal, etc. illustrate the accuracy of the latter method. Discrepancies in thyroid analyses are ascribed to inaccuracies in the U.S.P. method. H. DAVSON.

Extracts obtained in the manufacture of ethereal oils from conifers. P. A. BOBROV (Trud. Vyat. Nauk. Issledov. Inst. Kraev., 1928, 4, 76—86).—A by-product obtained in the manufacture of fir-tree oil, on hydrolysis, affords phenols, pyrocatechol, resorcinol, a carbohydrate, protocatechuic and gallic acids, and a neutral substance. The tanning qualities of the extracts were determined. CHEMICAL ABSTRACTS.

Report [on tobacco curing]. Tobacco.—See XVI. **Bactericides. Lemon juice.**—See XIX. **Sapocresols.**—See XXIII.

PATENTS.

Manufacture of 1-phenyl-2-aminoalcohols(1) hydroxylated in the phenyl nucleus [i.e., compounds allied to adrenaline]. I. G. FARBENIND. A.-G. (B.P. 353,361, 26.11.30. Ger., 26.11.29).—A hydroxylated aryl ketone is oximinated, and first the oximino-group and then the CO group is reduced. *p*-Hydroxypropiophenone gives an oximino-compound, m.p. 147° , from which β -amino- α -*p*-hydroxyphenyl-propyl alcohol (hydrochloride, m.p. 147°) is obtained.

Oximino-*m*-hydroxypropiofenone, m.p. 130°, yields the corresponding *m*-hydroxy-compound (hydrochloride, m.p. 180°), and oximino-3:4-dihydroxypropiofenone, decomp. 212°, is reduced to the 3:4-dihydroxy-aminoalcohol (hydrochloride, m.p. 178°). *m*-Hydroxypropiofenone, m.p. 69°, is obtained by diazotising the amine, b.p. 138—140°/2 mm., from *m*-nitropropiofenone, m.p. 96—97°. C. HOLLINS.

Manufacture of morphine and other alkaloids from opium. A./S. FARMARON (B.P. 353,069, 17.4.30. Nor., 17.4.29).—The crude material freed from fats etc. is basified (to p_H 9) and the dried mass extracted with an org. solvent (mixture of an alcohol and a halogenated hydrocarbon, e.g., MeOH and $CHCl_3$), from which morphine is precipitated by addition of H_2O or $COMe_2$. The mother-liquors yield other alkaloids on evaporation to dryness with sand and extraction with Et_2O .

C. HOLLINS.

Manufacture of [antiseptic] tobacco. W. T. ARMITAGE and W. BELL (B.P. 357,517, 19.5.30).—The tobacco is sprayed with a mixture (proportions given) consisting of menthol, eucalyptus oil, pini pumilio, cinnamon ver. oil, and spirit, and then stored for about 14 days in airtight containers. H. ROYAL-DAWSON.

Manufacture of a crystallised product from *Digitalis*. CHEM. FABR. VORM. SANDOZ (B.P. 357,926, 26.2.31. Ger., 1.3.30).—Moist *Digitalis* leaves (any species) are extracted with non-miscible org. solvents in presence of easily sol. salts giving an extract which is separated, concentrated, and mixed with Et_2O , thus precipitating the glucosides in the form of tannoids. The ppt. is digested with Et_2O , then dissolved in an aq. org. solvent, tannin is eliminated, and the solution conc. until precipitation occurs. The ppt. is recrystallised. A further quantity may be obtained by suitably working up the tannoid ppt. The product (C 60.4%, H 8.0%) has $[\alpha]_D^{20} + 25^\circ$ (4% in dioxan), and is 5 times as sol. in MeOH as digitoxin, to which it has a cardio-active effect quantitatively equal but qualitatively somewhat different. E. H. SHARPLES.

Manufacture of hormone preparations which are active *per os*. SCHERING-KAHLBAUM A.-G. (B.P. 357,555, 10.4.30. Ger., 22.4.29).—The hormone, e.g., insulin, and a difficultly saponifiable lipoid substance, particularly one of the lipins produced in the manufacture of female sexual hormones, e.g., placenta lipins, are dissolved in a volatile solvent, with or without absorption-promoting agents such as bile acids, polysaccharides, etc., and the solution is evaporated.

E. H. SHARPLES.

Culture of bacteria for a mixed auto-vaccine. A. BECKER (B.P. 357,553, 20.3.30. Ger., 16.1.30).—Sp. excitors of the disease obtained either from the faeces, tonsils, sputum, or other centre of the disease are grown on banana agar with or without blood or egg-white, in approx. the same ratio as they occur in the normal diseased body and for a length of time varying with the number of white corpuscles in the patient. Germs from the different sources may be mixed to form a combined auto-vaccine. E. H. SHARPLES.

Finely-divided phenolphthalein.—See III.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Experimental study of several methods of representing photographic sensitivity. R. DAVIS and G. K. NEELAND (Bur. Stand. J. Res., 1931, 7, 495—517).—The relationship of the sensitivity of various photographic emulsions to the amount of development has been investigated, the sensitivity being expressed by $10/I$, where I is the intercept made by the tangent to the sensitivity curve at the point of max. slope on a horizontal line representing the fog density, by $10/I$, where I is the exposure val. of the intersection of the tangent with the zero density line, and by $10/E_m$, where E_m is the exposure corresponding with the point in the toe of the characteristic curve where the gradient is 0.20. The sensitivity expressed in any of these ways normally rises to a max. as the time of development increases, then falls again, the optimum time for development depending on the type of emulsion used. The sensitivity of any given emulsion cannot be adequately represented by a single numerical val.; a graph of the $10/E_m$ index against development time seems most useful. From the shape of the latter curve for emulsions other than the panchromatic or process types it appears that where the utmost sensitivity of the plate is required development should not be carried very far. R. CUTHILL.

Sensitometry. H. BAINES (Chem. & Ind., 1931, 706—711).—A review.

PATENTS.

Manufacture of photographic sensitive material. I. G. FARBENIND. A.-G. (B.P. 357,817, 23.10.30. Ger., 23.10.29).—The emulsion support is made of two or more layers, consisting of cellulose derivatives, rubber, or artificial resins; the layers are superimposed by casting the second layer of material (from solution) on to the first, when dry. Any layer (preferably the middle one of three) may be dyed to form a colour filter. The complete support is emulsion-coated on both sides. The layers can be split apart, for printing, by repeatedly bending one corner. Such films may be used for simultaneous two-colour photography. J. LEWKOWITSCH.

Production of photographic screens, more particularly multi-colour screens. V. VON GERDANOVITS (B.P. 358,187, 8.8.30. Ger., 9.8.29).—Fine-grain screens are made by applying the colours (lines or grains) to a stretched, thin rubber surface; on contraction the requisite closeness of grain is obtained.

J. LEWKOWITSCH.

Colour photography. E. SOMMAVILLA (B.P. 357,625, 20.6.30).—A double picture length of film is coated with emulsion on both sides for one length, the other length having emulsion on one side and white pigment on the other. The first two emulsions are coloured red and blue, respectively, the third yellow; before printing. The negative film (three lengths) is folded round the positive film, so that the two opposite are in register. Light for exposure passes through complementary colour filters so that light falling on one emulsion is prevented by absorption from reaching the opposite emulsion. Printing of the red and blue positives is effected through line screens. The yellow positive is folded over into register with the others for viewing. J. LEWKOWITSCH.

Colour cinematography. C. W. FENNINGER, Assec. of F. E. IVES (B.P. 357,604, 24.5.30. U.S., 25.5.29).—The coloured images are produced on the picture record while the sound record is protected by a waterproof coating. The sound record may be made red, simultaneously with the red image, if the colour produced is sufficiently opaque to light affecting the photo-electric cell. [Stat. ref.]

J. LEWKOWITSCH.

Carbon and like processes employed in colour photography. L. W. OLIVER, W. G. CLARE, and COLOUR PHOTOGRAPHS (BRIT. & FOREIGN), LTD. (B.P. 357,548, 23.6.30. Cf. B.P. 340,605; B., 1931, 368).—In the "carbon" and "Carbro" processes, regenerated cellulose (*e.g.*, "cellophane") is used for the support during development, and another material, *e.g.*, paper or glass, for the final support. Transference to the latter is aided by an adhesive (gelatin) solution as mountant, and by treating with a hardening solution before stripping the development support.

J. LEWKOWITSCH.

Development of photographic negatives. F. HEPNER (B.P. 357,218, 16.6.30).—The negatives are developed in a very dil. solution containing one developing substance (*e.g.*, metol, quinol, etc.) and Na_2SO_3 (or $\text{K}_2\text{S}_2\text{O}_5$, etc.) only. The negatives are placed horizontally and kept motionless. Al or rustless steel utensils can be used without deterioration.

J. LEWKOWITSCH.

Protecting the image-bearing surface of kinema films. O. DEMARET (B.P. 358,224, 6.9.30. Belg., 14.8.30).—A thin skin of cellulose is applied with transparent adhesive, or is formed directly on the surface by immersing it in a cellulose varnish. [Stat. ref.]

J. LEWKOWITSCH.

XXII.—EXPLOSIVES; MATCHES.

Calcium nitrate as a constituent of explosives. HAID, GOETZE, SELLE, KOENEN, SCHMIDT, and BECKER (Jahresber. Chem.-tech. Reichsanst., 1930, 8, 118—119; Chem. Zentr., 1931, i, 2833).—Comparative experiments on explosive force are recorded. A $\text{Ca}(\text{NO}_3)_2$ mixture dried at 120° was superior to a saltpetre blasting powder.

A. A. ELDRIDGE.

Constituents of smokeless powder. M. GIUA and G. RACCIU (Atti R. Accad. Sci. Torino, 1930, 65, 205—212; Chem. Zentr., 1931, i, 2833).—A study of the stabilising effect of vaseline and petroleum on nitroesters.

A. A. ELDRIDGE.

Stability of pentaerythrityl nitrate and hexogen. HAID, GOETZE, SELLE, KOENEN, SCHMIDT, and BECKER (Jahresber. Chem.-tech. Reichsanst., 1930, 8, 132—136; Chem. Zentr., 1931, i, 2833).—The stability of pentaerythrityl nitrate is less than that of nitro-explosives or hexogen owing to its ester nature. The stability was not reduced by the presence of powdered metals.

A. A. ELDRIDGE.

PATENTS.

Manufacture of explosives containing calcium nitrate. DYNAMIT-A.-G. VORM. A. NOBEL & Co. (B.P. 357,432, 5.12.30. Ger., 4.6.30).—Commercial $\text{Ca}(\text{NO}_3)_2$ is melted in its own H_2O of crystallisation, and dehydrated above 100° with agitation so as to give a fine powder. It is then mixed with other ingredients,

e.g., charcoal, sawdust, or trinitrotoluene, and the mixture is incorporated with nitroglycerin. A suitable composition contains $\text{Ca}(\text{NO}_3)_2$ 62, trinitrotoluene 18, sawdust 6, charcoal 4, and nitroglycerin 10%.

W. J. WRIGHT.

Diminishing the explosiveness of explosive gaseous mixtures. W. P. JORISSEN and J. BOOY (B.P. 357,530, 14.5.30. Holl., 22.5.29).—One or more halogen or PhOH derivatives, or both, which act as negative catalysts for explosive reactions, are added in the form of an atomised vapour or liquid or of a finely-divided solid.

W. J. WRIGHT.

[Manufacture of strips of] matches. N. H. WALDINGER (B.P. 358,273, 3.10.31).

Nitrocellulose solutions.—See XIII.

XXIII.—SANITATION; WATER PURIFICATION.

Acid sludge digestion. E. L. PEARSON and A. M. BUSWELL (Ind. Eng. Chem., 1931, 23, 1144—1145).—An unseeded sludge-digestion experiment failed to develop normal digestion for some unknown reason, but became acid, the p_{H} decreasing to 6.1 and the volatile acid content increasing to 3800 p.p.m. in 130 days. The vol. of gas produced was below normal, though the sludge foamed persistently, the average composition of the gas being CH_4 54.8%, CO_2 28.0%, H_2 0.9%, N_2 16.3%. Under such conditions it would appear that the decomp. of protein matter is retarded less than that of the grease.

C. JEPSON.

Sludge-digestion capacity. E. L. PEARSON and A. M. BUSWELL (Ind. Eng. Chem., 1931, 23, 1154—1155).—Experiments carried out with a 1330-gal. digestion tank operating at 27° with a detention period of 10.7 days (on a basis of dry org. matter) indicate that a 90% yield of gas may be obtained with a capacity allowance of 0.5 cu. ft. per head. The sludge produced would be inoffensive, but not a well-drying one, and the tank should be fitted with mechanical thickeners for the digesting sludge and with adequate scum and foaming control.

C. JEPSON.

Sludge drying beds. J. F. SKINNER (Sewage Works' J., 1931, 3, 390—399).—Drying beds completely covered with glass cost three times as much to construct as open ones. The maintenance and insurance costs of the covered beds are also high, but flies and odours are more under control and about double the quantity of sludge can be dealt with.

C. JEPSON.

Bacterial studies before and after chlorination at the Madison sewage-disposal plant. B. DOMOGALLA (J. Bact., 1931, 21, 9).—In this Imhoff system chlorination reduced bacterial numbers by 50%, *B. coli* by 90%, H_2S producers by 80%, and protein digesters by 50%. Rates of nitrification and denitrification were not appreciably altered by chlorination.

A. G. POLLARD.

Partial and complete sterilisation of activated sludge and effect on purification [of sewage]. H. HEUKELEKIAN (Sewage Works' J., 1931, 3, 369—373).—Inhibition of protozoan activity by KCN or PhMe results in an increase in the bacterial population. KCN and Cl_2 deflocculate the sludge and cause an increase in the

biochemical O_2 demand of the effluent, but PhMe produces an opposite effect. C. JEPSON.

After-effect of ferric chloride on sludge digestion. W. RUDOLFS and L. R. SETTER (Sewage Works' J., 1931, 3, 352—361).—Mixtures of fresh sewage solids and ripe sludge were made in which one or other ingredient, or both, had been pretreated with $FeCl_3$. Those containing treated ripe sludge showed a retarded rate of gasification, and only treated fresh solids showed an accelerated rate though less total gas. The ripe sludges produced from all the mixtures when used as seed material showed a marked increase in gas production, probably due to some of the intermediate reaction products of the first experiment having reacted with the $FeCl_3$ and been broken down further in the second experiment when a new flora had been established. C. JEPSON.

Imhoff tanks at Philadelphia. T. F. NEVIN (Sewage Works' J., 1931, 3, 400—404).—An offensive, greasy scum on the settling compartment was beaten down by spray from a water-hose, but, later, $Ca(OH)_2$ had to be piped down and distributed through the digesting material to restore alkalinity and obtain satisfactory digestion. A daily upward application of rinsing water to the digesting sludge for a 5-min. period is effective in preventing undue densification of the sludge, its adhesion to the tank sides, and the formation of scum by entrained gases. Excessive foaming has been prevented by applying water from a $\frac{3}{4}$ -in. nozzle. C. JEPSON.

Operation of New Castle sewage plant. F. J. NUGENT (Sewage Works' J., 1931, 3, 404—410).—An average daily flow of 4,800,000 gals. is treated in Imhoff tanks fitted with gas collectors. About $\frac{1}{2}$ cu. ft. of gas (17% CO_2) is obtained *per capita* per day, but the thermal val. of most of it is wasted by burning the gas as a means of odour prevention only. C. JEPSON.

Removal of grease and oils from sewage by the Imhoff method. W. A. ALLEN (Sewage Works' J., 1931, 3, 374—376).—The type of grease separator proposed by Imhoff, in which agitation and aeration are obtained by forcing air through diffusers placed along one side of the sewage carrier, has proved successful at Pasadena in preventing undue amounts of grease from reaching the activated-sludge plant. The present unit allows a detention of 1.3 min. and is being enlarged to permit a 3.0-min. stay. C. JEPSON.

Los Angeles method of grease removal [from sewage]. G. A. PARKES (Sewage Works' J., 1931, 3, 377—379).—Agitation and aeration produced by the injection into the sewage of fine streams of high-pressure screened sewage has proved more successful at this plant than the diffused-air arrangement proposed by Imhoff. C. JEPSON.

Effects of some insecticides on the sewage sprinkling-filter fly, *Psychoda alternata*. W. W. FRYE, M. LEVINE, and E. R. BECKER (Sewage Works' J., 1931, 3, 345—351).—Attempts to control the adult *Psychoda* fly by destruction of the larvæ in the filter films by means of chemicals were unsuccessful, Cl_2 , CS_2 , $CuSO_4$, nicotine sulphate, pyrethrum, and several arsenate compounds being tried. Adult flies were kept in check by spraying the walls and ceilings of enclosed

filters with a kerosene-pyrethrum mixture, but this method might not be applicable to open filters. C. JEPSON.

Antiseptic and germicidal efficiency of "pyridium" on various organisms. B. E. PROCTOR (J. Bact., 1931, 21, 54).—Pyridium (benzeneazo-2:6-diaminopyridine hydrochloride) proved efficient against a number of organisms. A. G. POLLARD.

Purification of waste waters from leather factories by aeration in presence of activated sludge and of slag. L. F. KABAKOVA and M. M. KALABINA (Trans. Centr. Comm. Protec. Water Reservoirs, 1927, No. 6, 119—152).—Activated sludge can be obtained from the ppts. of the waste waters. In the case of aeration this sludge produces nitrification of the waste water. The best purification is obtained with 33% sludge. The concentration of the waste water can be lowered by treatment with Al or Fe salts, coagulation with sludge, etc. A non-putrefying product is obtained from highly conc. waste waters, after dilution or coagulation, by oxidation in contact with brown-coal slag. CHEMICAL ABSTRACTS.

Sapocresols. S. JENČIČ (Arh. Hemiju, 1931, 5, 197—203).—Commercial sapocresol solutions exhibit an abrupt max. viscosity at 60% H_2O at 16°; this max. is less marked at higher temp. and is absent at 25°. The concentration of K stearate required to form jellies with *o*-, *m*-, and *p*-cresol is 10 times that of Na stearate. K stearate at concentrations < 25% of stearate does not yield jellies with *m*-cresol, < 15% with *o*-cresol, and < 22% with *p*-cresol. R. TRUSZKOWSKI.

Boiler-water chemistry. H. E. JONES (Chem. & Ind., 1931, 50, 854—858).

Chemical risks in the rubber industry.—See XIV.

PATENTS.

Insecticide. W. MOORE, ASS. to AMER. CYANAMID CO. (U.S.P. 1,797,877, 24.3.31. Appl., 3.8.28).—The material comprises a quaternary base produced by the reaction of a *tert*-alkylamine and a halogen derivative of an unsaturated hydrocarbon; *e.g.*, an equimol. mixture of rimethylamine and ethylene dichloride is heated in EtOH solution at 60—75° for 22 hr. under pressure, whereby trimethylchloroethylammonium chloride is obtained which has a highly toxic action on plant lice. A. R. POWELL.

Insecticide and fumigant. G. H. BUCHANAN, ASS. to AMER. CYANAMID CO. (U.S.P. 1,795,593, 10.3.31. Appl., 23.4.26).— $CaCN_2$ and NaF are fused in an electric furnace at 1400° and the product is cooled rapidly below 400°. With an excess of NaF leaching the fused mass affords a solution of NaCN. With only a small amount of NaF the product consists mainly of $Ca(CN)_2$. A. R. POWELL.

Base-exchanging filters [for water]. S. A. KRÜGER (B.P. 357,401, 24.10.30. Denm., 26.4.30).—The pre-filtering media placed above the softening material should have a lower sp. gr. than the latter, so that it may all be smaller in size and retain its position on the surface and its function as a protector without requiring a metallic separating device or screen. C. JEPSON.

Insecticide.—See XVI.