BRITISH CHEMICAL ABSTRACTS

B.—APPLIED CHEMISTRY CHEMISTRY

FEB. 27 and MAR. 6, 1931.*

I.-GENERAL; PLANT; MACHINERY.

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Use of mercury for power production. F. SAMUELSON (Proc. Inst. Mech. Eng., 1930, 765-779) .--An account is given of the theory and development of the mercury-steam turbine and the plant at Hartford, Conn., is illustrated diagrammatically and its operation explained. The turbine carries loads of 10,300 kw. and requires 6 lb. of mercury per kw.; it operates at a mercury pressure of 70 lb./in.2 and a steam pressure of 350 lb./in.² A. R. POWELL.

Theory of alternating heat regenerators. L. THIBAUDIER (Rev. Mét., 1930, 27, 544-559).-Mathematical. Expressions are derived for the rate of heat transfer and for calculating the optimum thickness of brick in various arrangements of alternating heat regenerators. A. R. POWELL.

Heat transmission in an experimental inclinedtube evaporator. C. M. LINDEN and G. H. MONTILLON (Ind. Eng. Chem., 1930, 22, 708-713).—The apparatus used consisted of an inclined copper tube surrounded by a jacket through which steam passed downwards. An entrainment separator was provided in the vapour space. Liquid flow was measured by the deflection of a copper screen bobbin attached to a coil spring. This value was independent of the temperature. Vapour and pipe temperatures were measured at temperature differences of 5-16° for evaporation at 82°, 91°, and 99°, and the overall and individual heat-transfer coefficients were calculated. The overall coefficients were greater than those recorded by other observers for vertical tubes under similar conditions, but less than with horizontal tubes. The liquid-film coefficients were found to increase with temperature difference and with evaporation temperature. The logarithmic mean velocity of liquid + vapour upwards within the tube also varies with the temperature difference, so that the liquid-film coefficient bears a definite relation to this velocity within about 10% deviation. The steam-film coefficients were calculated. C. IRWIN.

Heat transfer from a gas stream to a bed of broken solids. II. C. C. FURNAS (Ind. Eng. Chem., 1930, 22, 721-731; cf. B., 1930, 221) .- This study was made in order to obtain quantitative thermal data on the working of the blast furnace, and is based on a development of theoretical curves obtained by Schumann for the temperature history of solids and gas at different points in the solid bed. The coefficients of heat transfer between a gas and a column of irregular solids were determined by forcing all the gas at a given plane through a relatively small orifice and determining its temperature. The apparatus used is described. Hot flue gases

(up to 1100°) were used in work with iron ore; with coal and coke the limit was 300°. Data obtained agreed closely with the computed curves. The procedure gives both the coefficient of heat transfer and the heat capacity of the charge. It was found that for beds of broken materials the coefficient of heat transfer varies with the 0.7 power of the mass velocity of the gas, at the (high) velocities studied. The effect of temperature on the coefficient was found to be small and within the range of experimental error. Considerable differences were found between different materials (iron ore, limestone, coke, and coal), and the effects of voids and particle size were also studied. The cooling of coke with air was found to give a much higher coefficient of transfer than its heating. This phenomenon is unexplained, and does not occur with iron ore. No effect of the heats of transition of ferric oxide could be detected. The calcination of limestone, whilst modifying the apparent heat capacity, does not affect the coefficient of heat transfer. Equations are developed covering the "steady state" in countercurrent flow. An example is given of the calculation of solid and gas temperatures within a cupola, the feed of iron, coke, and air and the composition of the exit gases being known. C. IRWIN.

Deposition of dust from air in motion and its application to the theory of the dust filter. F. ALBREOHT (Physikal. Z., 1931, 32, 48-56).—The theory of the deposition of dust from air currents in a cylinder is first discussed. The results obtained are tested experimentally by the examination of mists of frost deposited on cylinders. The conclusions arrived at through the theoretical investigation are applied to the examination of the properties of dust filters. Several of these are described and their action is analysed. The effect of turbulence is mentioned. A. J. MEE.

Purification of coal gas. THAU. Gas analysis apparatus. SCHMIDT.-See II. Evaporation of caustic soda. BADGER and others .- See VII. Protective coatings on iron. TILLMANS and others .--See X. Gas cleaning. Lévêque.-See XI. Fractional distillation. JANTZEN and TIEDCKE.—See XII. Water softening. McGARIGLE.—See XXIII.

PATENTS.

[Open-hearth] furnace. A. M. Gow (U.S.P. 1,769,220, 1.7.30. Appl., 17.6.21),-Natural or other rich gas cannot be preheated in an ordinary regenerator because of deposition of carbonaceous matter, hence combustion in an open-hearth furnace is delayed somewhat. In this invention highly preheated air is blown into the gas riser in line with the gas port, thus producing

* The remainder of this set of Abstracts will appear in next week's issue. K. S. VALEETICH, AME. to TUBBO-MINER CORP. (1.2.1.

a heated mixture. The heated air is driven by the injector action of a smaller quantity of compressed air. B. M. VENABLES.

Rotary furnaces or dryers. F. A. JOHNSON (B.P. 339,595, 4.9.29).—The total material is passed, together with a portion of the drying or heat-treatment medium, *e.g.*, gases from a coke fire, through a first portion of a rotating cylinder, which is of smaller diameter than that of the remaining length. At the change of diameter provision is made for screening out the finer material which is fully dried, outlet of the gaseous medium, and admission of a fresh quantity which acts only on the oversize material while traversing the remaining part of the cylinder. B. M. VENABLES.

Rotary heat-treatment furnace and lining. E. H. MIX, Assr. to REPUBLIC STEEL CORP. (U.S.P. 1,768,776, 1.7.30. Appl., 8.2.29).—A form of helically ribbed metallic lining for a rotary cylindrical furnace is described.

B. M. VENABLES.

Surface apparatus for heating or cooling liquids. R. MORTON & Co., LTD., and P. ROBINSON (B.P. 339,869 and 339,870, 7.2.30).—Tubular heat exchangers are described. A number of inner tubes (conveniently 7) are arranged within a larger tube which carries the outer fluid, the space for the latter being divided by radial and cylindrical baffles; cored headers are provided at the ends of the inner tubes so that both liquids flow in a zig-zag course. B. M. VENABLES.

Conducting catalytic exothermic gaseous reactions [under pressure]. R. WILLIAMS, ASST. to DU PONT AMMONIA CORP. (U.S.P. 1,769,873, 1.7.30. Appl., 6.11.25).—Various combinations of heat exchange between the entering and leaving gases, and between them and the catalyst mass, are claimed. B. M. VENABLES.

Heat exchanger. O. A. LABUS, ASST. to AMER. CARBONIC MACHINERY Co. (U.S.P. 1,769,265, 1.7.30. Appl., 21.4.27).—A compact type of exchanger is described which has the passage for the outer fluid in the shape of a flat helix bounded by two cylindrical shells and a helical strip; the inner fluid flows in parallel through a number of helical tubes arranged abreast in the outer passage. B. M. VENABLES.

Pulverising machine. C. M. STONER, ASST. to WOLF Co. (U.S.P. 1,769,867, 1.7.30. Appl., 5.11.27).—The construction of the machine is similar to that of an impact pulveriser with semi-circular screen round the lower half, but the action is mainly by the shearing action of hammers against cutting bars. B. M. VENABLES.

Pulverising machinery. W. J. LIBBEY (U.S.P. 1,769,352, 1.7.30. Appl., 7.7.28).—In a pulveriser of the centrifugal roll or other type a system of ploughs rotating at a lower speed than that of the pulveriser is provided to prevent accumulation of flat lumps of clogging material (e.g., compressed litharge).

B. M. VENABLES.

Grinding machine. L. BORN (U.S.P. 1,769,823, 1.7.30. Appl., 26.11.28).—A form of ball or pebble mill comprising a closed cylinder easily removable from a driving frame is described. B. M. VENABLES.

Mixing and separating or classifying apparatus. K. S. VALENTINE, Assr. to TURBO-MIXER CORP. (U.S.P. 1,768,870, 1.7.30. Appl., 4.4.29).—A tank is divided into three superposed zones by perforated horizontal screens, the central zone being maintained in active agitation, the upper one containing quiet lighter liquid suitable for decantation, and the lower one settled heavy liquid and sludge. B. M. VENABLES.

Mixing apparatus. J. PETERS, ASST. to TURBO-MIXER CORP. (U.S.P. 1,768,926, 1.7.30. Appl., 28.3.29). —A mixing device with motor is mounted on a counterpoised parallel motion so that it can be raised and lowered into a bowl which is itself mounted on wheels.

B. M. VENABLES. Multi-stage mixing apparatus. H. S. BEERS, Assr. to TURBO-MIXER CORP. (U.S.P. 1,768,735, 1.7.30. Appl., 13.4.29).—The mixer comprises alternate rings of fixed and moving blades similar to a radial-flow turbine, but the blades are provided with raised teeth acting as disintegrators. B. M. VENABLES.

(A) Mixer. (B) Mixing apparatus. (c) Mixing or emulsifying apparatus. J. JOHNSON, ASST. to TURBO-MIXER CORP. (U.S.P. 1,768,955—7, 1.7.30. Appl., [A] 14.11.28, [B] 10.1.29, [C] 7.1.29).—Mixing devices, somewhat similar to that described in U.S.P. 1,768,735 (preceding abstract), have a secondary circulation produced by a device higher up the shaft.

B. M. VENABLES.

Mixing and cooling apparatus. J. PETERS, Assr. to TURBO-MIXER CORP. (U.S.P. 1,769,890, 1.7.30. Appl., 29.5.29).—A mixing tank is submerged in a tank containing cooling fluid and is easily removable therefrom. The mixing device is attached to the bottom of the inner tank and is driven by a packed shaft passing through the bottoms of both tanks from a motor and gearing below. B. M. VENABLES.

Emulsifiers, mixers, and the like. W. J. DAVY (B.P. 339,751, 8.11.29).—The materials to be emulsified are passed through sinuous passages contained in the thickness of the piston of a hand-operated pump. One pattern comprises simply a double-acting piston in a cylinder closed at both ends. In another type a single-acting piston operates in a cylinder with an inlet valve at the bottom and a closure at the top having small apertures (causing further emulsification); no outlet valve is necessary, and the pump is contained in a larger cylindrical reservoir from and to which the material is circulated until sufficiently emulsified.

B. M. VENABLES.

Rotary filters. A. R. JAHN (B.P. 339,669, 4.9.29).— A pressure filter having rotating leaves is provided with means to remove thickened sludge from the leaves as fast as it is formed; thus the sludge falls to a sump below the prefilt compartment and passes to an additional filter of the archimedean type.

B. M. VENABLES.

Filtering of viscous material. H. PRENTICE (U.S.P. 1,769,388, 1.7.30. Appl., 2.5.28).—The material is supplied to a central feed well, which is then closed and external heat is applied to the surrounding vessel. When the material is melted air pressure is applied to the top of the feed well and the fluid forced upwards through strata of filtering medium contained in the annular space between the feed well and the wall of the vessel. The strata are supported by perforated diaphragms and may be heated by internal steam coils. B. M. VENABLES.

Centrifuge. H. E. T. HAULTAIN (B.P. 1,768,761, 1.7.30. Appl., 9.8.29).—The upper bearing of a highspeed centrifuge is allowed movement which is restrained by spring fingers which are more than 60° but less than 180° apart. The bowl is formed of a tube which is given a corrugated interior surface by means of alternate rings of metal and compressible material. B. M. VENABLES.

Separation of finely-divided impurities from liquids. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 339,636, 7.6.29).—Very fine solid or colloidal materials suspended in oleaginous or tarry liquids are removed by the use of a filter medium or filter aid composed of finely-divided, semi-solid, carbonaceous residues containing oily, tarry, or asphaltic material, such as those obtained by the heat treatment of carbonaceous material. B. M. VENABLES.

Liquid separator. J. KUHN (B.P. [A] 277,842, 28.12.26, and [B] 338,349, 6.11.29).—The apparatus comprises a closed vessel in which is situated a sliding valve operated by a ball float. In order to permit easy machining of the valve seat, in (A) the seat is inclined so that it can be reached through the end cover, in (B) the cover is inclined and the seat horizontal. B. M. VENABLES.

Rotary spraying separator. F. H. LUENSE, ASST. to ROTOSPRAY MANUFG. Co. (U.S.P. 1,769,586, 1.7.30. Appl., 3.12.25).—The material is sprayed by centrifugally rotating shallow bowls against a fixed screening surface through which liquid passes; the thickened material is lifted and re-sprayed, by means of a hollow truncated cone rotating below the bowls, until it is sufficiently dry. B. M. VENABLES.

Distillation of liquid mixtures. J. V. GAUDET and A. ABRAMSON (B.P. 339,663, 8.8.29).—A distillation system is controlled by the b.p. of the distillate, a sample of which is condensed, led to an assay flask, and reboiled ; a thermometric device in the neck of the flask regulates through a controller and valve the flow of reflux liquid in the fractionating tower. B. M. VENABLES.

Condensing apparatus. G. L. MACNEILL (U.S.P. 1,769,746, 1.7.30. Appl., 4.6.23).—A main surface condenser is provided with an auxiliary ejector-condenser which is operated by some of the main condensate pumped specially for the purpose, the vapour inlet to the auxiliary condenser being between the main condenser and the source of vapour. It is stated that the temperature of the condensate may be raised to nearer the theoretical as determined by the vacuum.

B. M. VENABLES.

Evaporation of liquids or solutions. R. M. WINTER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 339,657, 14.6.29).—The liquid when flowing as a film is evaporated by direct or indirect radiant heat from plate-like elements that are maintained incandescent by surface combustion or other means. When the heating is indirect, good heat transmission is attained either by allowing the liquid to boil or, if that is not permissible, by keeping the film so thin (not exceeding 3 mm.) that the motion is turbulent. B. M. VENABLES. Crystalliser. W. G. HALL, Assr. to R. C. PITCAIRN (U.S.P. 1,769,779, 1.7.30. Appl., 31.7.29).—A suitable tank is provided with a horizontal helical stirrer completely submerged in the liquid and with another of similar pitch, rotating synchronously, partly submerged so that it continually exposes liquid to the atmosphere. B. M. VENABLES.

Gas-washing apparatus. E. von MALTITZ, Assr. to H. A. BRASSERT & Co. (U.S.P. 1,767,628, 24.6.30. Appl., 7.2.27).—Crude gas is cooled and washed by passing through a vessel filled with a number of rotating plates which are continuously wetted by water. The component discs are placed between baffles so that the maximum contact of gas with liquid is obtained; separately mounted vertical or horizontal shafts may carry plates which rotate in opposite directions.

R. H. GRIFFITH.

Preparation of contact mass. K. B. JOHN, C. W. COSLOW, and C. J. SCHWINDT, ASSTS. to SELDEN CO. (U.S.P. 1,764,024, 17.6.30. Appl., 14.2.29).—Claim is made for a machine for making small briquettes from powdered catalysts, *e.g.*, kieselguhr, moistened with catalytically active binders. A. R. POWELL.

Treating [spent] fuller's earth etc. [from filtration or decolorising processes]. H. J. HARTLEY, Assr. to NICHOLS COPPER CO. (U.S.P. 1,768,465, 24.6.30. Appl., 23.2.28).—The organic matter is burned out by passing the material downwards through a multiplehearth furnace up which is passed a current of air prepreheated by the hot gases from the furnace.

A. R. POWELL.

Classifying apparatus [for granular materials]. A. FRANCE (U.S.P. 1,785,679, 16.12.30. Appl., 8.11.27. Belg., 2.4.27).—See B.P. 301,812; B., 1929, 191.

Separation of intermixed divided materials. K. DAVIS, ASST. to PEALE-DAVIS CO. (U.S.P. 1,787,340, 30.12.30. Appl., 10.7.22).—See B.P. 223,280; B., 1924, 999.

Filter press. L. REVEL (U.S.P. 1,785,494, 16.12.30. Appl., 6.6.28. Fr., 14.6.27).—See B.P. 292,117; B., 1929, 627.

Production of filter sieves. A. PAHL (U.S.P. 1,786,361, 23.12.30. Appl., 28.1.27. Ger., 20.5.25).— See B.P. 281,879; B., 1928, 144.

Distillation apparatus. L. J. SIMON (U.S.P. 1,787,399, 30.12.30. Appl., 13.6.27. U.K., 19.7.26).— See B.P. 278,815; B., 1927, 946.

Lining vessels for carrying out operations with liquids and the like. F. H. BRAMWELL, Assr. to IMPERIAL CHEM. INDUSTRIES, LTD. (U.S.P. 1,787,101, 30.12.30. Appl., 10.1.30. U.K., 9.1.29).—See B.P. 331,838; B., 1930, 887.

Refrigerating apparatus of the absorption type. G. Roos (B.P. 340,689 and 340,695, [A] 5.11.29, [B] 6.11.29).

Continuously acting absorption machines for producing cold or heat. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 340,659, 17.10.29. Ger., 26.10.28).

Centrifugal condensers [compressors]. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 339,720, 10.10.29. Ger., 10.10.28).

[Link-connected plate] machine for drying and/or pressing [flat] material. E. and E. SIEMPELKAMP (G. SIEMPELKAMP & Co.) (B.P. 340,660, 18.10.29).

Furnace (B.P. 337,490). Heating of furnaces etc. (B.P. 339,641). Washing of sand filters [containing oil sludge] (U.S.P. 1,769,475—6).—See II. Unoxidisable alloy (U.S.P. 1,771,773). Heat-absorbing and -emitting surfaces (B.P. 339,722).—See X. Conducting chemical reactions (G.P. 457,563 and 458,756).—See XI. Filter plugs (B.P. 339,761).—See XVIII.

II.—FUEL; GAS; TAR; MINERAL OILS.

Geological aspects of the formation of coal. C.S. Fox (Fuel, 1930, 9, 548-559).-The mode of occurrence and the general characteristics of Indian coals are described, and the following conclusions are drawn relating to the origin and formation of these coals. The original plant material, leaves, dead twigs and trunks, etc., was rapidly submerged in fresh or salt water, and finally settled down in the stagnant aseptic water of swamps or lagoons. The attack by fungi and microorganisms, however active in the plant material before and during the shallow stages of immersion, is considered to have ceased as the maturing mass sank in deeper water or was covered by further plant débris. The main processes in the maturing of peat, and its subsequent conversion into primary coal, were of a chemical character and involved all the plant components, cellulose, hemicellulose, lignin, lignocellulose, and suberin. These substances were slowly converted into a gelatinous substance of the nature of dopplerite. The spores, sheaths of sporangia, walls of wood cells, etc., which were particularly resistant, remained embedded in the gelatinous mass. This mass gradually hardened, forming primary vitrain. The further changes which the coal substances underwent, and which gave rise to the different classes of coal ordinarily met with, were brought about by the effects of heat and pressure, and involved the removal of part of the volatile matter of the material. A. B. MANNING.

History and present position of coal investigation by oxidation. W. FUCHS (Fuel, 1930, 9, 581-586).-Previous work on this subject, particularly that of Fischer, Bone, and of their collaborators, is critically discussed, and our knowledge of the chemistry of coal derived therefrom is summarised. The brown coals, in their ulmin constituents, are regarded as cyclic hydroxyoxycarboxylic acids, and the bituminous coals as reduced hydroxycarboxylic anhydrides. By mild oxidation both the ulmic acids and the ulmins are converted into "dehydroulmic acids," which contain OH, CO₂H, and CH₂·CO groups, and have mol. wts. of 1000-1400; these differ from ulmic acids in that they are soluble in organic solvents. Stronger oxidation converts these primary oxidation products into watersoluble, ether-insoluble acids which on further oxidation yield benzenecarboxylic acids and phenol.

A. B. MANNING. X-Ray study of vitrains. C. MAHADEVAN (Indian J. Physics, 1930, 5, 525-541. Cf. B., 1929, 965; 1930, 697).—Vitrains of varying composition and different

geological ages, examined by X-ray diffraction methods, gave two haloes, the spacings for the inner intense and outer faint haloes being $3 \cdot 37$ and $2 \cdot 12$ for the older and 3.50 and 2.21 Å. for the newer coals, respectively. General scattering between the direct spot and the haloes was observed; the effect of moisture content and volatile matter is discussed, and the effect on the haloes of the removal of the two last-named was examined. The sizes of the diffracting particles, calculated from Laue's formula, were of the order of colloidal particles. The spacings for the peak intensity of the halo were the same for the residues as for the original samples. The α -, β -, and γ -compounds obtained by extraction with pyridine and benzene were examined, and the spacings and widths of haloes compared with those for untreated coals. It is concluded that mineral matter present is N. M. BLIGH. in a colloidal state.

Geipert [coal assay] apparatus. F. SCHUSTER (Brennstoff-Chem., 1930, 11, 471-473; cf. B., 1926, 938).—From the results of analyses of the gas and coke produced in the Giepert apparatus it is concluded that (i) the rate of heating therein is greater than in the fullscale retorts; (ii) the gas escapes more rapidly therefrom, as is shown by its high content of unsaturated hydrocarbons (6%); (iii) the time of heating is longer and the final temperature higher than corresponds with large-scale practice, the coke produced having low hydrogen, sulphur, nitrogen, and oxygen contents. The apparatus, nevertheless, is useful for determining the thermal yield of gas, since the effects of the abovementioned differences on the result to a great extent cancel one another. A. B. MANNING.

Apparatus for determining the tendency of coal and other materials to self-ignition. D. J. W. KREULEN (Chem. Weekblad, 1930, 27, 690-694).-Analytical data are given showing the variation of the volatile and ash contents of coal according to the degree of fineness of the sample. The difficulties of accurate sampling are noted. Earlier types of apparatus for determining the lowest temperature at which self-ignition of coal takes place are criticised, and a new apparatus is described (cf. B., 1930, 847). H. F. GILLBE.

Microbiological aspect of peat formation. A. C. THAYSEN (Fuel, 1930, 9, 560—563; cf. Waksman, B., 1930, 933).—A study of the behaviour of the known types of cellulose-decomposing micro-organisms proves that the activity of these organisms in peat bogs is limited to the surface layers, that it decreases in intensity as soon as the débris has become waterlogged, and that, in acid peats at least, it ceases altogether long before the cellulose of the débris has been eliminated.

A. B. MANNING.

Evaluation of African torbanites. P. NIEMANN (Brennstoff-Chem., 1930, 11, 469-471).—Torbanites from the Transvaal (moisture 1.0%; ash 23.4%) and Angola (moisture 4.0%; ash 43.5%) have been distilled in a current of superheated steam and the products examined. The yields of tar amounted to 35.5% and 24.0%, and of coke to 42.2% and 57.3%respectively. The tars were distilled to coke, yielding (%): light oil (to 150°) 9.6, 0.3; heavy benzine 8.0, 3.3; fuel oil 51.1, 45.4; machine oil 11.0, 31.5; paraffin wax 3.25, nil; and coke 12.6, 11.0%, respectively. The oils were of good quality. By extraction of the Transvaal tar with alcohol a creosote (10.5%) of high fungicidal value was obtained. The tar cokes were particularly suitable for the manufacture of electrodes. The torbanite cokes were difficult to ignite and could be utilised only in admixture with a good-quality fuel. A. B. MANNING.

Isolation of the humic acids. G. THIESSEN and C. J. ENGELDER (Ind. Eng. Chem., 1930, 22, 1131-1133).-From a log of white cedar (Thuja occidentalis), which had decayed under conditions similar to those necessary for the formation of peat, after removal of the resins with acetone and of the lignin fraction with chlorine dioxide solution, a mixture of humic acids has been obtained by extraction with 4% sodium hydroxide solution. The acids, recovered from this extract by precipitation with dilute hydrochloric acid, may be separated into two fractions: humic acid (C 58.8%, H 5.1%), insoluble, and hymatomelanic acid (C 59.0%, H 5.5%), soluble in hot alcohol. A portion of the latter acid is soluble in acetone and ebulliscopic determinations indicate M 800 for this fraction. Similar determinations made on nitro- and bromo-humic acid indicate M 1040 and 940, respectively. Solutions of humic acid in ammonia are almost completely transparent to red and yellow light, but the absorption increases with diminution in wave-length to almost complete opacity in the blue and violet regions of the spectrum. Absorption curves of a similar nature are recorded for solutions of nitro- and bromo-humic acids in acetone.

T. H. MORTON.

Testing of coking coals. W. MELZER (Arch. Eisenhüttenw., 1930-1, 4, 169-175; Stahl u. Eisen, 1930, 50, 1643-1644).—Comparative tests with numerous coals of the various methods which have been proposed for testing the coking qualities of coal showed that reliable results are obtained only by the method of Damm (cf. B., 1929, 382) and its modifications in which softening point is determined and the rate of evolution of the various gases measured during the coking process.

A. R. POWELL.

Propagation of combustion in powdered coal. H. E. NEWALL and F. S. SINNATT (Safety in Mines Res. Bd., 1930, Paper No. 63, 58 pp.).-A moulded column of the finely-powdered (200-mesh) coal was placed on a silica plate, one end of the "train " was heated with a small Bunsen burner flame, and the time required for the zone of combustion to travel 10 cm. was then determined. Preoxidation of the coal decreased the rate of propagation of the zone. Preheating of the coal in nitrogen at 100-300° increased the time of propagation ; preheating at 300-400° decreased the time, but prolonged heating in nitrogen at these temperatures effected an increase in the time of combustion. An increase in the oxygen concentration above that of normal air decreased, and a reduction of the oxygen content increased, the time of propagation ; no coal would burn in atmospheres containing less than 14% of oxygen. Additions of small amounts of potassium, sodium, and iron salts to the coal decreased the time, whilst additions of chlorides, hydrochloric, and sulphuric acids increased the time of propagation. The temperature attained in the centre of a cone of coal was controlled by varying the rate of air supply, and the amount of hydrogen cyanide produced at various temperatures was determined; the maximum amount obtained was 0.1% by wt. of the coal, and none was found at combustion temperatures below 300°. The composition of the oxidation products produced from any coal is constant and is independent of the rate of propagation of the zone of combustion through the coal. C. B. MARSON.

Agglutination of coal and activation of its surface during coke formation, considered as two complementary phenomena. W. SWIETOSLAWSKI (Fuel, 1930, 9, 564-566).-The coke produced by carbonising a non-caking coal under suitable conditions exhibits a surface of high activity, i.e., of high decolorising and adsorptive capacity. A highly developed surface, however, is disadvantageous in a non-coking coal or a semicoke when it is desired to produce a strong coke from blends of these with a caking coal, owing to the difficulty of thoroughly impregnating such a surface with the plastic coal. Such impregnation may be accomplished by briquetting the mixture when it has attained a temperature within the plastic range of the caking constituent. Similar considerations apply to the briquetting and carbonising of mixtures of semi-coke and pitch.

A. B. MANNING.

Coking a banded bituminous coal: the part played by each band. C. P. FINN (Gas J., 1930, 192, 965-968) .- Samples of vitrain, clarain, durain, and fusain obtained from the Parkgate seam in South Yorkshire have been examined to determine their influences on coke quality. Examination of the coke buttons obtained in the volatile matter test shows that vitrain gives the most swollen button, that obtained from durain is dull and shrunken, whilst fusain is non-caking. When the various banded ingredients were heated at 1°/min. in a laboratory coking test, vitrain and clarain gave the same degrees of contraction and swelling, durain contracted without swelling, and fusain was noncontracting and non-swelling. Quantities of clarain, durain, vitrain, and blends of these substances with each other and with fusain were coked in boxes, placed on the sole of a full-scale oven, and the resulting cokes tested for size and resistance to shatter; it was found that different samples of clarain, which forms the largest percentage of the banded ingredients present in a coking slack, varied considerably in their coking properties, but, in general, yielded cokes that were much fissured and of low shatter index. The presence of vitrain in acoking slack is proportionately more valuable than that of clarain, whilst durain, although so different in its coking properties from vitrain and clarain, exerts little effect. Fusain, although itself non-coking, when added uniformly in small, carefully regulated quantities, was found to effect marked improvements in the coke; an increase in the amount of " middlings " did not have any beneficial effect, and there were indications that their removal might be an advantage. Methods for increasing the amount of vitrain in a coking slack and for collecting and adding fusain in the required proportion are described. C. B. MARSON.

Action of catalysts on the course and products of the distillation of pine wood. P. KUPFERBERG (Bull. Inst. Pin, 1930, 113-120, 137-144, 159-168, 185-191, 207-208) .- The distillation curve for pine wood without catalyst shows a break about 300° corresponding with an exothermic decomposition at that temperature. In presence of catalysts this break disappears and with acid catalysts, especially phosphoric acid, is replaced by breaks at 180-200° (cellulose decomposition) and 330-350° (lignin decomposition). Metal chlorides (aluminium, iron, zinc, manganese, calcium, magnesium) postpone the decomposition and extend the distillation curve, an effect which is even more noticeable with alkaline catalysts (sodium carbonate, sodium All the catalysts hydroxide, calcium hydroxide). increase the yield of charcoal at the expense of the pyroligneous liquor and tar; the gas yield is increased by alkaline catalysts, and decreased by metal chlorides and especially by acids. In the pyroligneous liquor the amount of crude methyl alcohol is increased about fivefold by the use of catalysts, but acetic acid remains about the same ; hydrochloric acid or sodium carbonate doubles the yield of furfuraldehyde, whilst that of acetone is similarly increased by sulphuric acid or lime. Much more furfuraldehyde is produced from the cellulose decomposition than from that of lignin. The charcoal of highest calorific value is obtained by the use of magnesium chloride, and all the catalysts increase its content both in hydrogen and in oxygen. The most important observation recorded is the effect of phosphoric acid, which on the one hand increases greatly the yield of charcoal, and on the other enables the distillation to proceed in two stages; at the end of the first stage (200°) a notable increase in calorific value is found, and the product may replace liquid fuels in gas producers. C. HOLLINS.

Theory and practice of the biological method of rendering coal gas non-poisonous. F. FISCHER, R. LIESKE, and K. WINZER (Brennstoff-Chem., 1930, 11, 452-455. Cf. Lieske and Hofmann, B., 1930, 803). -Various chemical reactions which can be brought about by bacterial action are briefly discussed. It has been found possible to free coal gas from carbon monoxide by passing it slowly through a tube packed with putrefied effluent sludge. The principal reactions which $\widehat{\operatorname{occur}}\operatorname{are}:\operatorname{CO}+3\operatorname{H}_2=\operatorname{CH}_4+\operatorname{H}_2\operatorname{O},\operatorname{CO}_2+4\operatorname{H}_2=\operatorname{CH}_4$ $+ 2H_2O$, and $CO + H_2O = CO_2 + H_2$, though doubtless a number of other reactions also take place. A reaction vessel of 100 litres capacity can free 200 litres of gas per day from carbon monoxide at 15-25°. The optimal temperature lies somewhat higher (24-32°). The activity of the bacteria falls off rapidly as the temperature is raised above 32° and ceases entirely at about 40°; at still higher temperatures, however, the reaction again sets in and exhibits a maximum at about 65°. The reaction at the higher temperature is due to thermophilic bacteria which appear to exist in most samples of effluent sludge. Attempts are being made to increase the rate of reaction. A. B. MANNING.

Recent developments in plant for the mechanical purification of coal gas. A. THAU (Brennstoff-Chem., 1930, 11, 416-418, 435-438, 455-459).—The methods of separating suspended solid and liquid particles from gases are discussed, and the following plants are described in some detail: (a) the Smith tar separator, (b) the Bartling separator (cf. B.P. 282,840; B., 1929, 191), and (c) the Feld washer. A. B. MANNING.

Humidity control in dry purification [of coal gas]. N. S. LOGAN (Gas J., 1930, 192, 970).—The important factors when revivification of the oxide in the purifier boxes is carried out *in situ* are discussed. Fresh oxide containing 35% of moisture was used in the purifiers, and water was introduced into the boxes, during revivification, to maintain this amount of moisture. C. B. MARSON.

Interaction of methane with carbon dioxide and steam in the electric discharge. K. PETERS and A. PRANSCHKE (Brennstoff-Chem., 1930, 11, 473-476).-Mixtures of methane or coke-oven gas with carbon dioxide or steam have been submitted to the action of an electric discharge under reduced pressure by the method described previously (B., 1930, 848). With high current densities the methane was completely converted into carbon monoxide: $CH_4 + CO_2 =$ $2CO + 2H_2$; $CH_4 + H_2O = CO + 3H_2$. No deposition of carbon occurred. With medium current densities the greater part of the methane was converted into acetylene. The composition of the end gas could be varied within wide limits by varying the initial gas mixture and the current density. A. B. MANNING.

Ignition of firedamp by the heat of impact of hand picks against rocks. M. J. BURGESS and R. V. WHEELER (Safety in Mines Res. Bd., 1930, Paper No. 62, 21 pp.).—Experiments are described which show that firedamp can sometimes be ignited when a hand pick is struck against certain sandstones, especially those of a quartzitic or micaceous nature and which are fairly readily crushed by the impact of the pick point. No ignitions were obtained with iron stones and pyrites.

C. B. MARSON. **Properties of high-temperature gas from Es thonian shale.** A. PUKSOV (Festschr. Jub. Ver. Estn. Chem., 1929, 76–80; Chem. Zentr., 1930, ii, 847).— The shale (1 g.) afforded gas (404 c.c.) of the following composition : CO_2 8·1, H_2S 0·5, C_nH_m 15·3, 0 1·9, CO 14·7, H 25·3, C_2H_6 0·3, CH_4 25·7, N 8·3%.

A. A. ELDRIDGE.

Apparatus for the exact analysis of gas mixtures in amounts down to 3-4 c.c. A. SCHMIDT (Gas- u. Wasserfach, 1930, 73, 1137-1144) .- The apparatus comprises a water-jacketed gas burette, a manometer, a levelling vessel, an absorption and combustion pipette with separate levelling vessel, and an oleum pipette. The quantity of gas before and after each operation is determined manometrically, i.e., by measuring the pressure when the gas is brought to a definite volume. The gas burette is divided into five bulbs, three being of 25 c.c. capacity each and two of 3-4 c.c., so that the volume to which the pressure measurements are referred can be varied according to the amount of gas available for analysis. The small bulbs are used for micro-analyses. The manometer is provided with a scale divided in mm. The absorption and combustion pipettes are connected to the gas burette through threeway taps in such a way as to leave no dead space. The combustion pipette, which is provided with a small platinum spiral capable of being heated electrically, serves also for the absorption of carbon dioxide, oxygen, and carbon monoxide, the requisite reagents being introduced through the three-way tap. The oleum pipette is used for determining unsaturated hydrocarbons. With the exception of the determination of methane in the presence of its higher homologues the apparatus is applicable to the analysis of all gases occurring in ordinary practice. The technique is described in full. When suitable precautions are taken, the accuracy of an analysis amounts to 0.05% when only 3—5 c.c. of gas are available, and to 0.01% with 30—80 c.c.

A. B. MANNING. **Titration of brown-coal-tar creosote with naphthalenediazonium chloride.** R. VON WALTHER and K. LACHMANN (Braunkohlenarch., 1930, No. 26, 1—11; Chem. Zentr., 1930, ii, 663—664).—The method is inapplicable, since various phenols present in the tar give values ranging from 36 to 103% of the theoretical.

A. A. ELDRIDGE. Treatment of oil sands. K. KELLERMANN and A. Vogt (Petroleum, 1930, 26, 1141-1148, 1157-1164).--The possibility of completely separating the oil from oil sands by displacement with water or a suitable aqueous solution has been investigated. Although theoretical considerations, based on observation of the angles of contact of the oils and water respectively with sand, indicate that it should be possible to displace the oil by water, in practice the process fails, owing apparently to the adsorbed layer of oil on the sand particles effectively preventing any contact between the water and the sand. Nor was it possible to overcome the resistance of the oil layer by the use of heavy solutions, e.g., concentrated calcium chloride. The application of an electric field in the presence of dilute solutions of sodium hydroxide etc. appeared to bring about some separation, but caused undue oxidation of the oil. The bromine, iodine, and oxygen values of the oils and their fractions were determined, and the surface tensions between the oils and some aqueous solutions, especially those of sodium carbonate, were measured. The lowering of the interfacial tension on the addition of sodium carbonate to water was shown experimentally to be associated with an adsorption of the salt on the interface. The separation of the oil from the sand was eventually effected by passing a solution of sodium bicarbonate through the material, thereby combining the effect of the lowered interfacial tension with the mechanical effect produced by the evolution of gas. A. B. MANNING.

Cracking of Californian kerosene and furnace oil at relatively low pressures. G. EGLOFF (Petrolcum, 1930, 26, 1263—1264).—Kerosene and furnace oil have been cracked at pressures of 14—21 atm. to give 53—60% of motor spirit of high anti-knock value. The oils were treated by a simultaneous cracking and coking process under pressure and the resulting distillate washed by the plumbite-sulphuric acid method and redistilled, the resultant spirit being washed with dilute caustic soda solution to eliminate traces of hydrogen sulphide. The motor spirit obtained was bright and of low gum and sulphur contents (1% or less). The proportions of unsaturated, aromatic, napthene, and paraffin hydrocarbons in the product from kerosene were 17.3%, 18.4%, 20%, and 44.3%, respectively. The residue from the cracking process is suitable for Diesel and heavy engine oil. The uncondensible gas has a heating value of about 1200 B.Th.U. per cub. ft., and may be used directly as fuel and for enriching water-gas or producer gas, or it may be cracked at high temperatures in the presence of steam in the producer, to give a gas of about 550 B.Th.U. per cub. ft. heating value. The coke obtained is practically ashand sulphur-free, and suitable for the making of briquettes or carbon electrodes; its cellular structure renders it of great value for water-gas manufacture.

H. E. BLAYDEN.

Isolation of the isomerides of hexane from petroleum. J. H. BRUUN and M. M. HICKS-BRUUN (Bur. Stand J. Res., 1930, 5, 933-942).-Fractional distillation of an Oklahoma crude petroleum concentrated the hexanes in a series of constant-boiling mixtures containing cyclic compounds. After addition of ethyl alcohol to these fractions, refractionation yields constantboiling mixtures of alcohol and the hexanes, all of which boil below $58 \cdot 7^{\circ}$, whereas similar mixtures with the cyclic compounds present all boil above 64°; the alcohol is removed by a water wash, and the hexanes are purified by equilibrium melting. The following isomerides were separated in this way : By-dimethylbutane, β - and γ -methylpentanes, and *n*-hexane. The f.p. of air-saturated β -methylpentane is -143°, that of γ -methylpentane —118°, and that of the eutectic of β-methylpentane and carbon dioxide -153°. No evidence of the presence of $\beta\beta$ -dimethylbutane in the petroleum examined could be obtained.

A. R. POWELL.

Lubricating oils. J. TAUSZ and A. STAAB (Petroleum, 1930, 26, 1117-1124, 1129-1140).-The change in viscosity produced when lubricating oils are diluted with a solvent, e.g., toluene, has been compared with the variation in viscosity with rise of temperature. The former gives a better estimate of the cohesive forces within the oil, and therefore of its lubricating value, which is higher the less the change in viscosity produced by dilution. The change is expressed by the value of x in the equation $\eta_1^x = \eta_2$, where η_1 is the viscosity of the original oil, and η_2 that of the diluted oil; vegetable oils, on dilution with 20% of toluene, give values about 0.66, whilst mineral oils give 0.50-0.53. The mol. wts. of a number of lubricating oils have been determined, both ebullioscopically and cryoscopically, in different solvents; in general, the observed mol. wts. of the mineral oils rise with increasing concentration of the oil in the solvent, whilst those of the vegetable oils fall. On mixing a typical mineral oil (" Mobiloil ") with benzene a marked increase in volume is observed; on mixing castor oil with benzene a small decrease is observed when the proportion of benzene is less than 50%, and a small increase with higher benzene concentrations. A. B. MANNING.

Formation of gum in motor fuels. R. BRUNSCHWIG and L. JACQUÉ (Compt. rend., 1930, 191, 1066—1068).— The combined and individual effects of exposure to light and air on the colour and auto-oxidation ("gumming") of various samples of commercial benzene

motor spirits (containing unsaturated hydrocarbons) have been investigated by methods described previously (B., 1929, 931). Contrary to accepted ideas, the colour developed on ageing bears no relationship to the amount of gum formed, a sample (originally containing 1 mg. of residue/100 c.c.) which remained colourless, giving 47-147 mg. of residue/100 c.c. (according to the conditions of ageing), whilst one which became yellow even in the dark gave only 15-20 mg./100 c.c. Ageing in the presence of either light or air alone results in the formation of relatively small amounts of residue (light producing the larger effect), but the combined action of these two factors gives rise to a large quantity of residue, a sample which contained originally only 3 mg./100 c.c. containing 430 mg./100 c.c. after ageing under these J. W. BAKER. conditions.

Refining of motor benzol by means of silica gel. R. C. GEDDES (Gas World, 1931, 94, Coking Sect., 17-20).—For removal of gum-forming substances from crude benzol, simultaneous treatment with dilute sulphuric acid and silica gel is preferred to that with concentrated acid alone. The losses are greatly diminished as the simple olefine hydrocarbons are hardly attacked; the refined product can be regained in 93% yield. The process appears to be catalytic, and is carried out at about 150° under sufficient pressure to maintain a liquid phase. R. H. GRIFFITH.

Purification of used compressor oil. L. PIATTI (Petroleum, 1930, 26; Motorenbetr., 3, 7).—The lubricating oil which is used in the compressors of systems for the long-distance transmission of coal gas, and which has become contaminated with constituents dissolved from the gas, has been satisfactorily purified by a simple steam-distillation at 120°.

A. B. MANNING. Extinction of benzine-air explosions by carbon tetrachloride. A. H. BELINFANTE (Chem. Weekblad, 1931, 28, 2-19).-Ignition and explosion limits, and extinction by the vapour of an inert liquid, are considered in detail from the theoretical aspect. An account is given of the method of determining from the explosion and ignition limits of the single substances and the partial pressures of the components the behaviour of the vapour emitted by a binary liquid mixture when admixed with air. The explosion limits of mixtures of air, carbon tetrachloride, and two types of benzine, viz., of $d \ 0.7942$ and 0.651, have been determined by sparking mixtures of known volumes of air saturated with benzine vapour at a certain temperature with either air or air saturated with carbon tetrachloride vapour or with a mixture of carbon tetrachloride and benzine vapours. Owing to the relatively high b.p. of the tetrachloride a somewhat high concentration is necessary to inhibit explosion, and both within and without the explosion limits a fog of hydrochloric acid is formed on passing a spark. The vapour pressure-temperature curves of benzines ranging from $d \ 0.7942$ to 0.651 and b.p. 50-202° to 32-67° have been determined, and the observed flash-points of a number of the specimens of benzine are compared with those obtained by other observers. H. F. GILLBE.

Effect of anti-knock materials on the speed of

flame in a closed tube. Y. NAGAI (J. Soc. Chem. Ind., Japan, 1930, 33, 296—299 B).—The effects of lead tetramethyl, tin tetramethyl, and ethyl selenide on the speeds of flames in mixtures of air and hydrocarbon vapour in horizontal closed tubes has been investigated, the hydrocarbon used being the same as that described previously (A., 1930, 1255). Tin tetramethyl and ethyl selenide in concentrations up to 0.1 mol.-%diminish the speed, which increases again at higher concentrations. Lead tetramethyl reduces the velocity in concentrations up to 0.1 mol.-%. (Cf. Egerton and Gates, B., 1927, 738.) C. W. GIBBY.

Iowa coal problem. H. L. OLIN. Storage. H. L. OLIN and C. E. SCOTT. Coking. H. L. OLIN, F. V. JOHNSON, JUN., and R. C. KINNE. Washing. H. L. OLIN, C. BARRETT, and H. D. ALLEN. Weathering. H. L. OLIN, J. D. WADDELL, and J. N. AMBROSE (Iowa Geol. Survey, Tech. Paper, 1930, No. 2).

Heat transfer from gas stream to broken solids. FURNAS.—See I. Pyrolysis of methane. WHEELER and WOOD. • Reduction and hydrogenation of phenols. TROPSCH.—See III. Ammonia catalysts. GLUUD and SCHÖNFELDER.—See VII. "Bitural" for roads. BROADHEAD.—See IX. Ammonia solution as fertiliser. BIMSCHAS.—See XVI. Carbon in water purification. BEHRMAN and CRANE; NORCOM and DODD; BAYLIS.—See XXIII.

PATENTS.

Concentration of minerals including coal. J. F. C. FRIEND (B.P. 337,458, 2.8.29).—A layer of the material, in suitably subdivided form, e.g., below $\frac{1}{2}$ in., is caused to travel over a horizontal screen in a series of intermittent advance movements, and is subjected to an alternating upward and downward movement of air through the material, whereby it is stratified into layers of different components. The movement of air through the layer is timed to occur between the horizontal advance movements. The stratified layers are then separated from one another. A. B. MANNING.

Preparation of oil and coal amalgam. TRENT PROCESS CORP. (B.P. 337,920, 3.10.29. U.S., 20.10.28. Cf. U.S.P. 1,512,427; B., 1925, 62; also B.P. 262,302; B., 1927, 100).—The finely-divided coal is first treated with a light oil and water to form an amalgam and to facilitate the separation of the ash, and a heavy oil is then incorporated with the amalgam, which may then be briquetted and baked. A. B. MANNING.

Apparatus for treating coal. F. B. DEHN. From MAUREL INVESTMENT CORP. (B.P. 337,600, 31.10.29).— The coal is briquetted with a waterproof asphalt or other binder, passed through a distilling zone in which steam and other volatile products are removed, then through a hardening zone, and finally through a retorting zone. The briquettes are carried through the first two zones on an endless conveyor ; in the distilling chamber they are heated indirectly by the combustion gases from a furnace, and in the hardening chamber both directly and indirectly by these gases ; the hardened briquettes are discharged from the conveyor into the retort, wherein they are further heated by passing the hot combustion gases through them. The conveyor passes into and from the apparatus and from one chamber thereof to the next through water-seals. A. B. MANNING.

Drying of peat fuels and the like. D. W. BERLIN (B.P. 340,156, 22.1.30. Swed., 6.2.29).—Wet-carbonised peat or a similar low-grade fuel is subjected to a twostage centrifugal separation, first in a vessel with watertight walls, and then in one with porous walls. The product from the first stage may be suitably subdivided before being dried in the second stage by heating.

R. H. GRIFFITH.

Manufacture of firelighters. BRIQUETTING & CARBONISING SYND., LTD., and T. A. GOSKAR (B.P. 339,985, 17.9.29).—Finely-ground coke, anthracite, or other smokeless fuel is mixed with pulverised peat and briquetted, preferably with the addition of sodium silicate; sawdust, waste paper, and similar combustible substances may also be added. The finished pieces are coated with wax or resin. R. H. GRIFFITH.

Treatment of activated charcoals. C. H. LANDER, F. S. SINNATT, J. G. KING, and W. E. BAKES (B.P. 337,348, 23.7.29).—Charcoal which has been used for absorbing substances, particularly sulphur compounds, is reactivated by being subjected to the action of superheated steam containing small proportions of air and a volatile basic substance such as ammonia, aniline, pyridine, etc. A. B. MANNING.

Regeneration of activated charcoal used for dechlorinating drinking water. H. PICK (B.P. 316,269, 26.7.29. Czechoslov., 26.7.28. Cf. Adler, B., 1929, 700).—The exhausted charcoal is treated with a hot alkaline solution, *e.g.*, dilute sodium hydroxide, with stirring, and is then washed. A. B. MANNING.

Production of lampblack. A. J. PARIS, JUN. (U.S.P. 1,756,877, 29.4.30. Appl., 4.10.21).—Hydrocarbon gases are decomposed to give high yields of lampblack by bubbling through a molten mass of hot metal such as lead. The lampblack floats on the surface of the liquid and is removed by a stream of gas.

R. H. GRIFFITH.

Purification of graphites. E. RABETRANO (B.P. 337,738, 25.6.29. Fr., 9.11.28).—The finely-ground material is added to water containing a colloid adapted to retard the rate of settling of the particles. After separation of the denser impurities by gravity the fraction containing the bulk of the graphite in suspension is subjected to further separation by selective electroosmotic action (or cataphoresis) in suitable apparatus, which is described. A. B. MANNING.

Coke ovens. N.V. SILICA EN OVENBOUW MIJ., Assees. of DR. C. OTTO & CO. G.M.B.H. (B.P. 337,667, 18.12.29. Ger., 4.5.29).—A coke oven with adjacent upflow and downflow heating flues, which are in open connexion above and below so that a certain amount of the downflow gas is returned into circulation in the incandescent upflow flues, has the brick slides which control the gas and air supplies to the upflow flues arranged below the level of the lower openings connecting the upflow and downflow flues. The cross-section of these openings can be varied by brick slides operated from the chamber below the regenerators.

A. B. MANNING.

Cylindrical oven for distillation of coal or lignite at a low or high temperature. H. HARDY (B.P. 338,047, 31.12.29. Belg., 3.1.29).-The oven comprises an outer rotatable drum, subdivided by transverse partitions into series of combustion, distillation, and suction chambers, and a hollow, fixed, central shaft divided longitudinally into three conduits for the admission of gas and air for heating and for the evacuation of the combustion products, respectively. Each distillation chamber is divided into wedge-shaped compartments, into which fit moulds charged with the coal to be distilled. As the drum slowly rotates, the temperature of each charge of coal rises as the corresponding compartment approaches the section of the combustion chamber in which the burners are situated. The volatile products of distillation pass into the suction chambers, which are also subdivided into compartments so that the products evolved at different stages of the heating may be withdrawn separately; for this purpose the corresponding compartments of the different suction chambers are connected together in axial rows.

A. B. MANNING.

Coal-carbonising apparatus for extraction of bituminous materials. K. BERGFELD (U.S.P. 1,756,969, 6.5.30. Appl., 7.3.27. Ger., 30.11.23).— Coal to be carbonised is packed in a vertical vessel round a central hollow pier in which combustion of heating gases takes place, and from which hot waste gases pass through the coal. The volume of circulating gas can be increased by addition of some of the distillation gases, which are preheated in an annular space surrounding the primary combustion zone.

R. H. GRIFFITH.

[Heating of] furnaces, carbonising chambers, retorts, etc. WOODALL-DUCKHAM (1920), LTD., and A. McD. DUCKHAM (B.P. 339,641, 6.8.29).—The gas and air required for heating coke ovens etc. are passed under pressure through a multitubular recuperator, which ends in a nozzle; from this nozzle the combustion products ascend centrally to the top of a vertical heating flue. At this point their direction of flow is necessarily reversed and they descend, along the walls of the carbonising chamber, to escape by way of the outer part of the recuperator. Great flexibility is attained by varying the nozzle design or dimensions of the flue, and the recuperator is constructed so that it can easily be withdrawn from the setting. R. H. GRIFFITH.

Recovering lost heat in coke ovens and like thermic apparatus. H. E. G. J. J. HELIN (B.P. 310,756, 29.4.29. Belg., 28.4.28).—In coke ovens, furnaces, or similar apparatus using regenerators or recuperators for heating the air for combustion, an additional air preheater is provided heated either by a source of heat independent of the apparatus, or, in the case of a coke oven, by the distillation gases. The residual heat in the combustion products leaving the regenerators is utilised for the production of steam in a separate waste-heat recovery plant. A. B. MANNING.

Distilling and gasifying solid fuels. METALLGES. A.-G. (B.P. 337,721, 24.4.30. Ger., 2.5.29).—The fuel travels by gravitation down a vertical shaft, passing successively through a drying, a distilling, and a cooling

zone, these processes being effected by the circulation of suitably preheated gases through the fuel. A part of the circulating gases is passed through the cooling zone and thence through the upper part of the distillation zone. Distillation is effected by passing highly heated gases, principally steam, to which some oxygen may be added if desired, through the intermediate zone. These gases are heated in a chamber through which refractory heating bodies are continuously circulated ; the upper part of the chamber is traversed by a current of hot combustion gases, which are subsequently utilised in drying the fuel, and the lower part by the gases which are to be heated. The temperature of the gases effecting distillation may be sufficiently high to bring about interaction between the fuel and the steam with the production of A. B. MANNING. some water-gas.

Distillation of bituminous shales, cannel coals, torbanites, and similar carbonaceous substances. F. ESLING (B.P. 339,963, 12.9.29).—Shales or other substances rich in sulphur are mixed with a petroleum oil and, if necessary, with a vegetable oil also, before carbonisation or distillation. If only comparatively low temperatures are employed, the sulphur remains largely in the retort or still in combination with asphaltic compounds, and the high-boiling residue can be used for road dressing. R. H. GRIFFITH.

Making carbonaceous material. A. OBERLE (U.S.P. 1,763,063, 10.6.30. Appl., 18.8.24).—Lampblack, petroleum coke, or similar material is prepared for use in moulding (as electrodes etc.) by grinding it to a fine powder and injecting this with superheated steam into a heated expansion chamber. Heavy particles first separate by gravity and volatile impurities are then carried off. These vapours and gases may be used as a fresh source of carbon black. R. H. GRIFFITH.

Coking of bituminous material. AMER. TAR PRODUCTS Co., Assees. of E. O. RHODES (B.P. 337,800, 9.7.29. U.S., 9.2.29).—Pitch or similar material is coked in externally heated retort ovens of the byproduct type, into which it is introduced in the liquid condition together with an inert gas, *e.g.*, steam. The material is sprayed into the oven at such a rate that the charge gradually accumulates without there being any quantity of liquid material in the oven at any time.

A. B. MANNING.

Destructive hydrogenation of carbonaceous materials. STANDARD OIL DEVELOPMENT Co., Assees. of J. M. JENNINGS (B.P. 337,671, 20.12.29. U.S., 21.12.28). -Heavy fluid asphalt-containing materials are hydrogenated by maintaining the material at the decomposition temperature, e.g., 420-520°, in the presence of hydrogen under pressures in excess of 25 atm., and in contact with a solid catalyst immune to sulphur poisoning, the latter being present in such amount that the ratio asphalt : catalyst is held below 1.5, and preferably below 0.5. The volatile products are removed as they are formed and led to condensers, fresh material being supplied to the reaction chamber as required. Fresh catalyst is added from time to time by diverting the flow of fresh material before it enters the reaction chamber through a vessel containing the catalyst.

A. B. MANNING.

Destructive hydrogenation of carbonaceous materials. W. R. TATE, H. P. STEPHENSON, J. F. LEHMANN, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 339,479, 29.11.29).—An apparatus is employed, for treatment of liquid hydrocarbons etc. with hydrogen under pressure, in which the level of liquid in a jacketing vessel is controlled by an external pneumatic indicator. Hydrogen for reaction bubbles at a controlled rate through oil which completely fills an inner vessel and which overflows from the top into the jacketing chamber. R. H. GRIFFITH.

Destructive hydrogenation of carbonaceous material. N.V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 339,875, 13.2.30. Holl., 11.3.29).—The catalyst for treatment of carbonaceous material with hydrogen under pressure consists of a simultaneously precipitated mixture of iron and aluminium oxides $Fe_2O_3 : Al_2O_3 =$ 5:1 (approx.). R. H. GRIFFITH.

Treatment of solid and fluid carbonaceous materials. F. UHDE (B.P. 339,317, 5.9.29. Ger., 3.10.28).—Destructive hydrogenation of substances such as coal, petroleum, tar, etc. is achieved by heating at about 200 atm. pressure to above 400° in the presence of finely-divided iron and steam. The nascent hydrogen produced serves for the conversion of heavy hydrocarbons into those of lower b.p. Any iron oxide remaining after the process is completed can be reduced for further use. Catalysts aiding hydrogenation may be added, or other substances (e.g., alkalis) may be dissolved in the water. R. H. GRIFFITH.

Separation of oils, tars, and the like from solid constituents. I. G. FARBENIND. A.-G. (B.P. 312,228, 1.5.29. Ger., 22.5.28).—The oils obtained by the destructive hydrogenation of coal etc. are separated from the solid residues by adding sawdust, brown coal dust, or ashes to the product, which may also be diluted with a suitable solvent, and centrifuging or filtering the mixture. The flocculating action of the sawdust etc. on the suspended solids greatly reduces the time required for filtration. A. B. MANNING.

Separation of oil from solid carbonaceous material. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 339,681, 13.9.29).—Mixtures of oil with solid carbonaceous material, such as products from destructive hydrogenation, are filtered at raised temperature through either a layer of granulated substance or a number of superimposed wire sieves. The time of passage through the filter is reduced by applying pressure or suction to opposite sides of the effective layer. The residue may be treated by distillation, by extraction with a low-boiling solvent, or with an aqueous liquid containing an emulsifying agent. R. H. GRIFFITH.

Manufacture of hydrogen or gases containing hydrogen from methane and similar hydrocarbons or gases containing these hydrocarbons. D. TYRER, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 340,050, 3.10.29).—A water-gas generator with deep fuel bed is filled with coke or with a refractory material and is supplied alternately with streams of air and of a gas rich in hydrocarbons. The latter is decomposed, and the resulting deposit of carbon is consumed during

the following blow period in which the vessel is again raised to the working temperature. The air is preheated by passage through a regenerator, and enters the generator at several different levels; the hydrocarbon gases are also preheated in a second regenerator or the system may be arranged so that a single recuperator serves two units in turn. R. H. GRIFFITH.

Simultaneously producing light hydrocarbon motor fuel oil and carburetted water-gas. F. A. HOWARD, Assr. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,767,455, 24.6.30. Appl., 5.11.23).—By selection of suitable conditions in the carburettor and superheater of an ordinary carburetted water-gas plant, appreciable amounts of light spirit, as well as permanent gas, can be obtained from gas oils. A plant, having a generator 7 ft. in diam. and 15 ft. high, was supplied with 20.3 gals. of oil per min.; this was cracked at about 690° and provided gas of 665 B.Th.U. per cub. ft. and an 18% yield of oil boiling below 200°. The rate of oil feed is appreciably higher, and the temperature lower, than that required to give the best yield of permanent gas. R. H. GRIFFITH.

Generation of [water-]gas. POWER-GAS CORF., LTD., and N. E. RAMBUSH (B.P. 337,825, 9.8.29).—Watergas is generated in a number of units each consisting of a generator, a waste-heat boiler, a generator jacket boiler, and a superheater. The units are arranged in two sets, alternately on "blow" and "run," the "blow" air in one set and the "run" steam in the other being superheated by the waste heat of the gases after these have passed through the waste-heat boiler. The gas passes through the latter preferably in a downward direction. A. B. MANNING.

Continuous manufacture of water-gas. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 337,807, 6.8.29).—The fuel, in granular form and preheated to about 500°, is passed down externally heated, narrow, brickwork chambers or cylindrical vertical retorts, which are subdivided into several cells, lying one above the other, by inclined plates which constrict the diameter of the retort. Steam, preferably preheated to 800°, is passed into each cell and the water-gas produced is led away through a collecting chamber in the upper part of the cell; this chamber serves also as a deflector for forcing the fuel in the thinnest layer practicable against the heating walls so that it is raised rapidly and uniformly to the required temperature before it passes downwards into the next gasifying zone.

A. B. MANNING.

Cooling of combustible gas for removal of condensible vapours. HUMPHREYS & GLASGOW, LTD., Assees. of J. S. HAUG (B.P. 339,885, 24.2.30. U.S., 6.5.29). —The relief holder on the gas stream from a carburetted water-gas plant is connected between the inlet and outlet of a condenser in which the hot gases are cooled. Cooling water in this condenser is circulated countercurrent to the gas stream. R. H. GRIFFITH.

Removal of sulphurous compounds from gases containing them. L'AIR LIQUIDE SOC. ANON. POUR L'ETUDE ET L'EXPLOIT. DES PROC. G. CLAUDE, and SOC. CHIM. DE LA GRANDE PAROISSE (AZOTE & PROD. CHIM.) (B.P. 317,015, 7.8.29. Fr., 8.8.28).—Water-gas is freed from organic sulphur compounds by adding sufficient coke-oven gas thereto and subjecting the mixture to progressive liquefaction under such conditions that the gas is washed by the liquefied ethylene and methane so produced. The purified gas may then be separated into mixtures of carbon monoxide and hydrogen, or nitrogen and hydrogen etc. suitable for various industrial syntheses. A. B. MANNING.

Purification of gases. A. O. JAEGER (Assr. to SELDEN Co.) and J. A. BERTSCH (U.S.P. 1,765,869, 24.6.30. Appl., 28.8.25).—Volatile metalloid compounds, particularly those of sulphur, are removed from gases or gaseous mixtures by treatment with halogens, especially chlorine and bromine. The reactions which take place may be assisted by physical means such as pressure, radiation, etc., or by catalysts. The resulting compounds of the substance to be eliminated are easily removed from the gas stream, e.g., by washing with a highboiling organic solvent (tetralin) followed by treatment with solid absorbents. R. H. GRIFFITH.

Manufacture of gases and the like. I. G. FARB-ENIND. A.-G. (B.P. 319,657, 31.7.29. Ger., 25.9.28). —The gases leaving the apparatus in which coal, oil, etc. is undergoing destructive hydrogenation are subjected to fractional condensation in stages by strong cooling or by high compression. A. B. MANNING.

Treatment of coke-oven gas. COMP. DE BETHUNE (B.P. 314,432, 22.6.29. Fr., 27.6.28).—A mixture of hydrogen, nitrogen, and carbon monoxide suitable for the direct synthesis of methyl alcohol and ammonia in successive stages is produced by the incomplete combustion of coke-oven gas, from which a large proportion of the hydrogen has already been removed, and the re-addition of the requisite amount of hydrogen after the elimination of the unsaturated hydrocarbons and carbon dioxide. The combustion of the gas is so regulated that the carbon dioxide content of the product lies between 4% and 5%, and no oxides of nitrogen are formed. The unsaturated hydrocarbons are removed by heating the gas in the presence of a catalyst containing iron, nickel, and/or chromium, and the carbon dioxide by washing with a solution of ammonia.

A. B. MANNING.

Adjusting the calorific value and density of coaldistillation gases. A. POTT (B.P. 312,348, 26.4.29. Ger., 25.5.28).—The coal gas is diluted with a gas produced by the interaction of part of the original gas with steam and/or air at high temperatures, e.g., $1100-1200^{\circ}$. This diluent gas is cheaper than water-gas and has a lower carbon monoxide content; moreover, its density can be varied within wide limits by varying the proportions of air and steam used in its production.

A. B. MANNING. Manufacture of fuel gas. J. B. GARNER, Assr. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,767,357, 24.6.30. Appl., 30.3.23).—Natural gas is passed through a heated vessel in which it is decomposed to give a gas of low calorific value, and carbon black. This gas is mixed with the untreated natural supply in such amount that the calorific value is reduced to about 800 B.Th.U. per cub. ft. R. H. GRIFFITH.

British Chemical Abstracts-

Catalytic desulphurisation of gases. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 340,016, 16.9.29).—Organic sulphur compounds present in carbonisation gases are converted into hydrogen sulphide by passage, with an excess of hydrogen, over a catalyst consisting of an oxide or sulphide of elements in groups II—VII, together with metals of group VIII or heavy metals of group I. *E.g.*, gas containing 0.44 wt.-% of carbon disulphide is passed at 280° and under normal pressure over a catalyst obtained by precipitating molybdenum sulphide on Florida earth, and adding nickel carbonate. The exit gas contains sulphur in the form of hydrogen sulphide only. R. H. GRIFFITH.

Purifying from naphthalene the distillation gases of coal. GEWERKSCHAFT M. STINNES (B.P. 311,326, 29.4.29. Ger., 9.5.28. Cf. B.P. 333,297; B., 1930, 1055).—The gas is treated at above 30° with a solvent oil comprising a mixture of low-boiling oils with higheror high-boiling oils, and the gas, charged with the vapour of the lower-boiling constituents of the solvent, is then cooled. The solvent vapour is precipitated together with the naphthalene, and, after separation from any condensed water and from at least a part of the absorbed naphthalene, is returned to the solvent oil.

A. B. MANNING.

Recovery of naphthalene from gases. N.V. SILICA EN OVENEOUW MIJ., Assees. of DR. C. OTTO & CO. G.M.B.H. (B.P. 337,723, 19.5.30. Ger., 17.5.29).—A solvent for naphthalene, e.g., xylene, is introduced into the gas in a finely-subdivided form, and the gas containing the solvent in suspension is passed through an electrical gas purifier, wherein the solvent containing the dissolved naphthalene is precipitated. The solvent is then separated from the naphthalene and returned to the current of gas before it enters the electrical purifier. A. B. MANNING.

Tar for use on roads. THERMAL INDUSTRIAL & CHEM. RES. Co., LTD., and C. O. CONDRUP (B.P. 339,640, 6.8.29).—Coal tar is treated with sulphuric acid in small amounts, at about 50—80°, and the oils which separate from the acid layer are fractionated, particularly for the removal of waxy substances. Road-making material of any desired consistency may be obtained by blending different fractions of this oil with products recovered from the acid sludge. In some cases further heat treatment of the mixtures is necessary in order to give a tar of the requisite viscosity. R. H. GRIFFITH.

Conversion of petroleum oils. PETROLEUM CON-VERSION CORP., Assees. of A. P. SACHS and E. W. BEARDS-LEY (B.P. 340,021, 19.9.29. U.S., 6.10.28).—The hydrocarbon oil is fractionally vaporised and the fractions are separately led off and added to the reacting products, so that the lighter fractions are subjected to a longer time of conversion than the heavier fractions. The temperature of the reacting gases is controlled by introducing heated carrier gas at the same points as the various oil fractions are admitted. H. S. GARLICK.

Cracking of hydrocarbon oils. J. E. POLLAK. From PETROLEUM CONVERSION CORP. (B.P. 340,030, 19.9.29. Cf. B.P. 340,030; preceding abstract).—The oil is vaporised and passed into the first of a series of re-

action chambers (preferably three) in which it is mingled with a heated gaseous carrier, the volume of which is approx. one half the total amount of gaseous carrier added at all stages, and at such a temperature that the temperature fall through the chamber is less than 55°. The mixture is passed to a second and thereafter a third reaction chamber, in each of which it is mingled with about an equal quantity of the remaining heated carrier gas, the amount added being sufficient in each case to raise the temperature of the reaction mixture substantially to its conversion temperature. A mean reaction temperature level is thus maintained throughout the operation, and the exit temperature of the last stage is not substantially more than 55° below the desirable cracking temperature. H. S. GARLICK.

Fractionation of [hydrocarbon] oils. W. K. LEWIS, ASST. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,767,298, 24.6.30. Appl., 12.1.25).-Oil is passed through a cracking tube and digestion chamber to a fractionating column maintained under approximately the same pressure as the cracking apparatus. The composition of the vapours leaving the top of the column is controlled by means of a cooling coil or by adding reflux. Reflux is taken from the column by means of a tray situated above the point of entry of the oil from the digestion chamber. The heavy oil in the bottom of the column is stripped of light products by means of a current of inert gas and then returned to the cracking cycle. T. A. SMITH.

Condensation of hydrocarbon vapours. N. E. LOOMIS, ASST. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,767,299, 24.6.30. Appl., 12.7.27).—Oil vapours are indirectly cooled with water or other low-boiling liquid which is vaporised under reduced pressure. The final cooling and also the condensation of the steam or other vapour produced is carried out by bringing the oil condensate and the vapours in indirect contact with salt water. T. A. SMITH.

Purification of [water-free] gasoline. W. S. BAYLIS, ASST. to FILTROL CO. OF CALIFORNIA (U.S.P. 1,766,211, 24.6.30. Appl., 19.9.27).—Gasoline is decolorised by treatment with water-free clay to which 6% by wt. of anhydrous sulphuric acid has been added. The mixture of clay and gasoline is then passed through a filter press. T. A. SMITH.

Low-boiling hydrocarbon oils. STANDARD OIL DEVELOPMENT Co., Assees. of H. G. M. FISCHER and C. E. GUSTAFSON (B.P. 319,362—3, 19.9.29. U.S., 21.9.28).— Gum and acid formation in low-boiling hydrocarbon oils, e.g., gasoline and naphthas, especially those from cracking processes, is inhibited or decreased by the addition of one or more stabilising agents in total quantity not exceeding 1 g. per litre. Suitable agents consist of an aromatic hydrocarbon with condensed nuclei having an α -substituted group which is able to combine with acids, e.g., α -naphthol, either (A) alone, or (B) with an aromatic hydrocarbon with condensed nuclei, e.g., anthracene. Small quantities of anti-detonating agents may also be present. H. S. GARLICK.

Absorption of olefines in sulphuric acid. STANDARD OIL DEVELOPMENT CO., Assees. of H. E. BUC (B.P. 340,098, 14.11.29. U.S., 15.11.28).—Olefine mixtures are treated with sulphuric acid in three successive stages, the concentration of the acid for the first stage being below 65%, for the second 78—82%, and for the final stage above 90%, the spent acid from each stage being collected separately. The temperature is kept at 32— 49° during the first two stages. The quantity of acid supplied to the second stage is not less than one mol. per mol. of olefine. Where gaseous olefines are being treated it is advantageous to add an absorption oil along with the acid. H. S. GARLICK.

Refining of hydrocarbons. T. T. GRAY, Assr. to GRAY PROCESSES CORP. (U.S.P. 1,759,814, 20.5.30. Appl., 9.8.26).—A hydrocarbon oil is cracked and the vapours are subjected to partial condensation to obtain a vapour fraction of definite boiling range, *i.e.*, motor fuel, which while still in the vapour phase is brought under pressure into contact with solid, absorptive, catalytic material, thereby polymerising constituents which tend to discolour on exposure to light or to form deposits. Condensate containing polymerides is continuously drained from the vicinity of the treating zone from which the vapours of the treated fraction are continuously withdrawn and separately condensed.

H. S. GARLICK.

Production of fuels for internal-combustion engines. R. T. HURLEY (B.P. 315,706, 3.7.29. U.S., 16.7.28).—The use of iron carbonyl as an anti-knock agent has the disadvantage that a conducting layer of iron oxide is deposited on the spark-plug insulators. By the addition to the fuel of lead tetraethyl or nickel carbonyl in a proportion not exceeding 10% of the iron carbonyl present the deposited layer becomes nonconducting. A. B. MANNING.

Reconditioning of sand filters [containing mineral oil sludge]. Continuous acid-washed sand filter. C. S. TEITSWORTH, ASST. to GEN. PETROL-EUM CORP. (U.S.P. 1,769,475-6, 1.7.30. Appl., 9.8.29). —A sand filter of which all the grains are coated with acid sludge removed from petroleum is cleaned : in (A) by mechanically displacing part, and hydrolysing the remainder, of the sludge by means of a comparatively small quantity of water, and then removing the water and hydrolysed sludge by one or more small washes with oil ; and in (B) by washing with 90-100% sulphuric acid. Any oil present at the beginning or end of flushing is easily settled in a clean state. B. M. VENABLES.

Revivification of fuller's earth and other [mineral oil] filtering clays. H. LOWERY, Assr. to STANDARD OIL CO. (U.S.P. 1,763,167, 10.6.30. Appl., 25.5.27).— Filtering clay containing mineral oil is heated at 85— 100° in a solution of sodium carbonate ($d \ 1 \cdot 06$), which is vigoriously agitated until the oil separates from the clay particles; these are then allowed to settle, washed free from soda, dried, and ignited to remove the last traces of oil. A. R. POWELL.

Utilisation of [low-compression] motor fuels. T. MIDGLEY, JUN., ASST. to GEN. MOTORS CORP. (U.S.P. 1,787,419, 30.12.30. Appl., 22.1.26).—See B.P. 196,237; B., 1924, 165.

Purification of hydrocarbon oils. H. G. M. FISCHER, ASST. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,767,356, 24.6.30. Appl., 19.8.27).—See B.P. 295,728; B., 1930, 231.

Regeneration of lubricating oils. H. BENSMANN (U.S.P. 1,787,353, 30.12.30. Appl., 2.11.26. Ger., 25.3.26).—See B.P. 268,284; B., 1927, 516.

Preparation of petrolatum and the like. F. LAVIROTTE, ASST. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,785,270, 16.12.30. Appl., 30.9.25. Fr., 4.10.24). —See B.P. 240,803; B., 1926, 40.

Hardening of paraffin, waxes, and the like. W. PUNGS and M. JAHRSTORFER, ASSIS. to I. G. FARBENIND. A.-G. (U.S.P. 1,786,263, 23.12.30. Appl., 22.12.27. Ger., 23.12.26).—See B.P. 306,053 ; B., 1929, 314.

Furnace for burning fuel mixtures. G. HOFMANN (B.P. 337,490, 12.8.29).

Doors for horizontal coking chambers. W. W. GROVES. From C. OTTO & Co., G.M.B.H. (B.P. 340,453, 18.3.30).

[Burner devices for] furnaces burning liquid, gaseous, or pulverised fuel. J. G. MCKEAN and R. F. JONES (B.P. 340,630, 8.10.29).

Catalysing devices, particularly for internalcombustion engines. D. BALACHOWSKY, P. CAIRE, and M. LEVY (B.P. 339,251, 26.7.29).

Separation of finely-divided impurities from liquids (B.P. 339,636). Distillation of mixed liquids (B.P. 339,663). Gas-washing apparatus (U.S.P. 1,767,628).—See I. Unsaturated hydrocarbons (B.P. 337,434). Products from olefines (B.P. 316,951). —See III. Hydrogen (U.S.P. 1,756,934).—See VII. Bituminous emulsions (B.P. 333,303). Road material (U.S.P. 1,769,442).—See IX. Coated electron metal [for engine cylinders] (B.P. 339,722). Conversion of carbonaceous materials into hydrocarbons (B.P. 339,276).—See X. Impregnating fabric (B.P. 338,538). —See XIII. Indicator of atmospheric pollution by gases (B.P. 340,195).—See XXIII.

III.-ORGANIC INTERMEDIATES.

Recent experiments on the pyrolysis of methane. R. V. WHEELER and W. L. WOOD (Fuel, 1930, 9, 567-574. Cf. B., 1929, 88).—Some further experiments, both of the "static" and "flowing" type, have been carried out on the pyrolysis of methane. The decomposition temperature, even in the presence of a catalyst, e.g., iron, which accelerates the decomposition at a higher temperature, lies between 650° and 675°. The rapid initial decomposition of methane in a silica bulb is chiefly a surface effect, its rate being increased by packing the bulb with silica; but the reaction does not proceed to a true equilibrium owing to the formation of a protective layer of adsorbed hydrogen on the surface (cf. Holliday and Exell, A., 1929, 773). Under "flowing" conditions with periods of heating of the order of 0.3 sec. at 1050°, in a silica tube, 84% of the methane is converted into higher hydrocarbons. With an increase in the duration of heating more of the methane is decomposed into its elements. With the shortest periods of heating the higher hydrocarbons consist essentially of molecules with two carbon atoms, which, with slightly increased periods of heating,

condense to form aromatic hydrocarbons. Butylene and butadiene are formed during the reaction, but neither propylene nor acetylene could be detected in the products. The use of an iron tube leads to the complete decomposition of the methane into its elements at a comparatively low temperature, the carbon formed being of a bulky gritty nature. The carbon deposit on the silica or chrome-iron tubes is of a lustrous foil-like variety, and its accumulation does not appear to affect the course of the reaction. No difference can be detected between chrome iron and silica as regards the formation of liquid hydrocarbons from methane. Moreover, an extensive increase in the area of silica exposed per unit volume of gas has no appreciable effect on the rate or extent of the decomposition. It is concluded that the reactions which are of importance under "flowing" conditions are those which occur throughout the volume of the gas when the surface reaction has been inhibited by the adsorbed hydrogen layer. It appears probable that with iron this protective layer is not formed. The formation of benzene is regarded as taking place through the intermediate formation of ethylene and butylene and/or butadiene.

A. B. MANNING.

Ether: use of potassium hydroxide in testing for aldehydes. L. W. GREEN and R. E. SCHOETZOW (Amer. J. Pharm., 1930, 102, 652).—In the U.S.P. X. test, 50% aqueous or solid potassium hydroxide gives more distinct yellow colour with ethyl ether containing 0.01% of aldehyde than does the more dilute solution prescribed. H. E. F. NOTTON.

Catalytic reduction and hydrogenation of phenols by hydrogen under pressure. H. TROPSCH [with B. HLAVICA and O. WEINSTEIN] (Brennstoff-Chem., 1930, 11, 449-452).-The influence of catalysts on the hydrogenation of tricresol has been studied. The experiments were carried out at 460-480° in small rotating autoclaves, capacity 1.9 or 4.5 litres, with a maximum hydrogen pressure of about 200 atm. and a reaction time of 1-2 hrs. Zinc oxide, copper chromate, tungstic oxide, and ferric hydroxide had no catalytic effect. Zinc chloride, aluminium hydroxide, ammonium vanadate, chromium hydroxide, uranium oxide, cobalt hydroxide, and nickel sulphide all had an appreciable effect, and gave yields of hydrocarbons up to 25% of the starting material. The most efficient catalysts were molybdenum oxide and sulphide, which gave yields of hydrocarbons of about 80%, leaving only about 4% of unchanged cresol in the product. Nickel hydroxide was also active as a catalyst, giving 56% of hydrocarbons, but was distinguished from molybdenum oxide by its sensitivity towards sulphur ; nickel sulphide was much less active than the hydroxide. About 1% of the initial material appeared as gaseous hydrocarbons. The greater part of the hydrocarbons produced boiled within the range 95-125°. Analysis of this fraction by Kattwinkel's method (B., 1928, 78) gave approx. 20% of unsaturated hydrocarbons and 40% of aromatic hydrocarbons. A partial hydrogenation of the aromatic hydrocarbons had therefore taken place; this was more marked with nickel hydroxide than with molybdenum oxide as catalyst. No cyclic alcohols were formed.

A. B. MANNING.

Humic acids. THIESSEN and ENGELDER. Products of distillation of pine wood. KupferBerg. Hexane isomerides from petroleum. BRUUN and HICKS-BRUUN.—See II. Differentiation between *p*-phenylene- and *p*-tolylene-diamines. GRIEBEL.—See IV. Effect of carbon tetrachloride etc. on metals. FORMÁNEK.—See X. Citric acid fermentation. FREY. Detection of *isopropyl* alcohol. BODENDORF. —See XVIII. Amyl acetate in sensitometry. KIESER. —See XXI.

PATENTS.

Manufacture of oxygenated organic compounds [(A) from carbon oxides and hydrogen, (B) from methane and steam]. H. DREYFUS (B.P. 337,409 and 337,410, 24.7.29).-(A) Alcohols are obtained by hydrogenation of carbon oxides in presence of borates, silicates, or phosphates of iron, nickel, or cobalt, especially the acid salts, and preferably in association with alkalis or alkaline-earths at 250-400°/50-200 atm. The carbon oxides may be partly or wholly replaced by the alcohols produced by hydrogenation. (B) Methane and steam are heated at 200-500°, preferably in presence of metals or metal compounds at 50-100 atm. Hydrogen, carbon oxides, or diluent gases may be added to the mixture. Suitable catalysts are potassium dichromate with zinc oxide, zinc chromate with cobalt oxide, and zinc chromate. The products are mainly methyl and other alcohols. C. HOLLINS.

Manufacture of [unsaturated] hydrocarbons. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 337,434, 30.5.29).—A Cowper tower packed with material of high heat capacity and preferably having catalytic properties is heated by burning (producer) gas with enough oxygen to remove carbon deposited from a preceding reaction. When the temperature reaches, e.g., 900° at the base of the tower the burning gas is led down the tower at a rate which is decreased as the tower cools. Olefines are obtained at 700—900°, benzene at 800—1100°. C. HOLLINS.

Manufacture of condensation products from olefines and unsaturated [aromatic] hydrocarbons. I. G. FARBENIND. A.-G. (B.P. 316,951, 6.8.29. Ger., 4.8.28).—Olefines over C_2 are condensed alone or with an aromatic hydrocarbon by heating at $120-180^{\circ}/10-20$ atm. in presence of a highly porous hydrosilicate (fuller's earth), with or without addition of another catalyst, *e.g.*, metal halide or hydrogen halide. A solvent may be employed. Propylene and naphthalene give tetraisopropylnaphthalene, m.p. 126° ; propylene alone yields a middle oil, b.p. $120-200^{\circ}/16$ mm., and a lubricating oil, b.p. $200-250^{\circ}/16$ mm. C. HOLLINS.

Manufacture of products [derivatives of higher hydrocarbons] containing nitrogen. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 339,962, 11.9.29).— Halogenated derivatives of paraffin hydrocarbons (above C_8) are heated with ammonia in aqueous or alcoholic solution or with agents yielding ammonia, *e.g.*, ammonium carbonate or urea, with or without the addition of copper or copper compounds as catalysts, preferably under increased pressure. H. S. GARLICK.

Manufacture of acetone from *iso*propyl alcohol. H. D. ELKINGTON. From N.V. DE BATAAFSCHE PETROL-

EUM MAATS. (B.P. 337,566, 10.10.29).—In the catalytic oxidation of *iso*propyl alcohol at 400° in presence of copper, manganese peroxide, barium peroxide, a platinum metal, zinc oxide, cadmium oxide, uranium oxide, blue tungsten oxide, vanadium pentoxide, magnesia, beryllium oxide, or zirconium oxide there is added to the catalyst about 1% of zinc oxide, thorium oxide, sodium carbonate, cerium oxide, or zirconium oxide, or more than one of these. C. HOLLINS.

Polymerisation of $1: 3[\alpha\gamma]$ -butadiene, homologues and analogues thereof. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,460, 2.8.29).—Rubberlike products are obtained by polymerisation of butadiene etc. by means of alkali metal placed in a small glass or metal container provided with a few perforations or slits. Polymerisation is complete within the small container in about 24 hrs., but only commences in the bulk of the liquid after several days. The process may be performed in 2 stages, the contents of the small container being polymerised before it is introduced into the bulk. C. HOLLINS.

Manufacture of fatty acid derivatives [wetting, emulsifying, and cleaning agents]. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,368, 26.7.29).— Fatty acids (lauric, palmitic, stearic, ricinoleic, wool fat acids) or their esters are heated at 150—200° with diethylenetriamine or other polyalkylenepolyamine; the products become water-soluble on alkylation, giving emulsifying and wetting agents not precipitated by alkali. C. HOLLINS.

Manufacture of aminohydroxyanthraquinones and substitution products thereof. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,047, 26.7.29).-Phthalic anhydride etc. is condensed with an acylaminophenol, e.g., in presence of aluminium chloride, and the product, after hydrolysis, is cyclised by treatment with sulphuric acid. Di-o-anisylcarbamide gives an intermediate acid, m.p. 188°, which is hydrolysed and cyclised by 96% sulphuric acid at 125-135° to form 2-amino-3hydroxyanthraquinone. The preparation of 1-amino-4hydroxyanthraquinone from 4-benzamidophenol, of 5-chloro-2-amino - 3 - hydroxyanthraquinone (decomp. 333°) from di-o-anisylcarbamide (intermediate acid, m.p. 274-276°), of 4-chloro-2-amino-1-hydroxyanthraquinone (m.p. 254-255°) from phosgenated 4-chloro-oanisidine, and of 2-amino-1-hydroxy-4-methylanthraquinone (m.p. 204-205°) from phosgenated cresidine, is described. C. HOLLINS.

Catalytic oxidation of organic compounds [hydrocarbons]. A. Wohl, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,787,416—7, 30.12.30. Appl., [A] 11.8.21, [B] 8.8.29. Ger., [A, B] 22.6.16).—See B.P. 156,244; B., 1922, 407 A.

Manufacture of triaryl phosphates. W. GIESON, C. R. HENSHAW, and J. B. PAYMAN, ASSIS. to IMPERIAL CHEM. INDUSTRIES, LTD. (U.S.P. 1,785,951, 23.12.30. Appl., 7.9.29. U.K., 27.9.28).—See B.P. 322,036; B., 1930, 95.

Production of thymol. W. SCHOELLER and H. JORDAN, ASSIS. to CHEM. FABR. AUF AKT. (VORM. E. SCHERING) (U.S.P. 1,786,922, 30.12.30. Appl., 20.6.27. Ger., 29.6.26).—See B.P. 273,685; B., 1930, 136.

Preparation of 4- and 2-halogeno- and 4- and 2amino-*p*-phenyl-o-benzoylbenzoic acid, of 4- and 2-amino-3-phenylanthraquinone by amination, and of *p*-phenoxy-o-benzoylbenzoic acid. P. H. GROG-GINS (U.S.P. 1,786,526—1,786,532, 30.12.30. Appl. [A-F] 8.8.29, [G] 2.10.29).—See A., 1930, 1186.

Preparation of hydroxythionaphthens. E. HOFFA and F. MÜLLER, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,785,813, 23.12.30. Appl., 2.8.28. Ger., 17.8.27).—See B.P. 295,694; B., 1930, 276.

Purification of crude anthracene. A. O. JAEGER, Assr. to SELDEN RES. & ENG. CORP. (Re-issue 17,902, 16.12.30, of U.S.P. 1,693,713, 4.12.28).—See B., 1929, 350.

Catalytic oxidation of anthracene. A. O. JAEGER, Assr. to SELDEN Co. (U.S.P. 1,786,950, 30.12.30. Appl., 29.3.28).—See B.P. 295,270; B., 1929, 806.

Coke-oven gas (B.P. 314,432). Naphthalene from gases (B.P. 311,326 and 337,723). Absorption of olefines (B.P. 340,098).—See II.

IV.-DYESTUFFS.

Fastness of dyestuffs in ultra-violet light. III. G. A. BRAVO (Boll. Uff. Staz. Sperim. Ind. Pelli, 1930, 8, 292—298 ; cf. B., 1930, 896).—A number of dyestuffs of the azo, pyrazolone, di- and triphenylmethane, xanthene, acridine, quinoline, azine, oxazine, and thiazine groups are classified, according to their resistance to the action of ultra-violet irradiation, into four groups, showing : (1) little or no change in colour after about 3 hrs., (2) appreciable change within 1—3 hrs., (3) marked change in 1—2 hrs., or (4) intense change of colour or pronounced decolorisation after 1 hr. T. H. POPE.

Differentiation of *p*-phenylenediamine and *p*-tolylenediamine in hair dyes. C. GRIEBEL (Apoth.-Ztg., 1930, 45, 318-320; Chem. Zentr., 1930, ii, 593).—Both substances give a yellow colour with a reagent consisting of vanillin (0.05 g.), alcohol (1 c.c.), and 25% hydrochloric acid (4 c.c.); with the former, however, the colour soon becomes red.

A. A. ELDRIDGE.

PATENTS.

Manufacture of substitution products of sulphur dyes. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,061, 27.7.29. Addn. to B.P. 317,776; B., 1930, 10).—The process of alkylation or aralkylation in substance or on the fibre is applied to the products of B.P. 325,519 (B., 1930, 455). The sulphur dyes from tetra- and penta-chlorinated dinaphthylene dioxide, treated on the fibre with phenylbenzyldimethylammonium chloride, give orange shades. C. HOLLINS.

Manufacture of wool dyes of the anthraquinone series. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,021, 21.6.29).—The copper compound of a 4-halogeno-1-hydroxyanthraquinone-2-sulphonic acid, precipitated by adding copper sulphate to a solution of the sodium salt, is condensed with amines or antides, R'NH₂, where R is an alkyl, cycloalkyl, aralkyl, aryl, or acyl group. p-Aminoacetanilide gives a navy-blue wool dye,4-acetamido-o-toluidine a bluish-violet, m-phenylenediamine a bluish-grey. C. HOLLINS.

Manufacture of derivatives [vat dyes] of the acridone series. J. Y. JOHNSON. From I. G. FARBEN-IND. A.-G. (B.P. 337,374, 26.4. and 12.6.29 and 13.1.30). -Orange-red to red-brown vat dyes are obtained by chlorination and/or bromination of complex quinonoid Examples of starting materials are: acridones. 1:2:6:7-diphthaloylacridone (N = 5); diacridone from benzidine and 2 mols. of 1-chloroanthraquinone-2carboxylic acid; diacridone from dibromo-1:2:6:7dibenzopyrene-3 : 8-quinone and 2 mols. of 2aldehydo-1-aminoanthraquinone; acridone from bromoand 1:2:6:7-dibenzopyrene-3: 8-quinone 2-C. HOLLINS. aldehydo-1-aminoanthraquinone.

Manufacture of pyranthrone derivatives. A. SHEPHERDSON and S. THORNLEY, ASSTS. to BRIT. DYE-STUFFS CORP., LTD. (U.S.P. 1,785,600-1, 16.12.30. Appl., [A] 29.9.27, [B] 9.5.29. U.K., [A] 3.10.26, [B] 8.10.26).—See B.P. 282,913; B., 1928, 152.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Determination of small amounts of copper in textiles. R. E. RUPP (Proc. Amer. Assoc. Textile Chem. Colorists, 1930, 215—217).—The sample (10— 20 g.) is digested with concentrated nitric (25 c.c.) and sulphuric (25 c.c.) acids and potassium sulphate (2 g.), the residue being rendered alkaline with ammonia and filtered through asbestos. The copper is then determined colorimetrically as ferrocyanide.

CHEMICAL ABSTRACTS.

Determination of copper, manganese, and iron in fabrics. W. C. SMITH (Proc. Amer. Assoc. Textile Chem. Colorists, 1930, 217—219).—The sample (10 g.) is digested with fuming nitric acid ($2 \cdot 5$ c.c.), sodium sulphate ($2 \cdot 5$ g.), and potassium sulphate ($2 \cdot 5$ g.), digestion being completed after addition of sulphuric acid (25 g.). The residue is diluted, rendered alkaline with ammonia, and then acid to Congo-red with 10% sulphuric acid, 5 c.c. in excess being added. Aliquot portions are employed for the determination of copper (ethyl xanthate), manganese (Willard and Greathouse), and iron (thiocyanate, with addition of nitric acid).

CHEMICAL ABSTRACTS.

Pine wood. M. SOUM (Bull. Inst. Pin, 1929, 173-182, 253-264, 277-291, 313-316).-Analyses of various samples of maritime pine wood are given, and celluloses and lignins prepared from them are compared. Under the action of weathering, micro-organisms, and parasites, cellulose is degraded, whilst lignin is in great part unattacked. The lignocelluloses thus yield lignin soluble in alcohol, acetone, and pyridine. The attacked lignin contains fewer methoxyl and hydroxyl groups and has a smaller phloroglucinol number. Under certain conditions, after felling of the tree the stumps remaining in the soil undergo conversion into "light wood " (" bois gras "), becoming very rich in resin (up to 40%), whilst the cellulose and lignin retain their mechanical and chemical properties. Under the influence of certain reducing diastases (" resinases ") the cellulose of the stump is almost completely converted into oleoresins, and the lignin approaches in composition and properties the humic acids of lignites. Protected from air the wood undergoes " mummification " in the soil,

the ligneous elements being preserved and the resins converted into retene. A fossil coniferous wood, rich in free humic acids but containing only light cellulose, has been identified in the ligniferous strata of the Laluque basin. The valuable constituents of "light wood" suggest its artificial production by the action of resinases on wood that has not yet been long enough in the soil. The resinases appear to be secreted by the wounded cells. C. HOLLINS.

Semi-chemical pulp prepared from spruce wood by the calcium bisulphite-steam cooking process. C. G. SCHWALBE and N. F. HAGSTRÖM (Cellulosechem., 1930, 11, 233-249).-About 4 kg. of the wood in the form of chips is impregnated with 28 litres of a solution of calcium bisulphite (4.8% SO₂, CaO 1.0%) in an autoclave at a temperature below that necessary to cause dissolution of the lignin; the excess liquor is then drained away and the residue cooked at a higher temperature by admission of steam. The drainage liquid contains about one third of the original sulphur dioxide and a small quantity, usually < 3%, of organic matter. When the bisulphite treatment is conducted at 120° for 4-7 hrs., and the steaming at 145° for 0.5-1.5 hrs., fibre (yield 45%; lignin content 10%) is obtained which can easily be pulped and is bleachable. On the other hand, bisulphiting at 105° for 6 hrs. followed by steaming at 130° for 3 hrs. yields 60% of fibre, but the product is less readily pulped, contains 20% of incrusting materials (chiefly lignin), cannot be bleached with normal quantities of reagent, but yields paper of good quality. The liquid from the steaming process contains, besides ligninsulphonic acids, most of the hemicelluloses of the wood. The concentration of fermentable sugars (arising from hydrolytic degradation of the cellulose) is very low. During the imbibition stage sulphur dioxide is used up in the formation of insoluble ligninsulphonic acids, which partly dissolve during the second stage of the process. The disintegration of a hard fibre into pulp is aided considerably by treatment with a 1% solution of magnesium hydroxide for 24 hrs. at ordinary temperatures; treatment with solutions of hydrochloric and sulphuric acids, calcium bisulphite, and calcium hydroxide is without marked action. Disintegration is also aided by treatment with a solution of chlorine, which is rapidly absorbed, followed by an equivalent amount of sodium hydroxide solution.

T. H. MORTON.

Physical properties of artificial silks and their relations to the prime materials and methods of preparation. E. VIVIANI (Giorn. Chim. Ind. Appl., 1930, 12, 519-536).-Methods are described for examining the covering power, elasticity, sections, regularity of filament, etc. Experiments made show that the maturation of alkali-cellulose in presence of oxygen is characterised by diminution in viscosity of the viscose prepared with it and of the solutions in Schweitzer's reagent. At normal temperatures (20-30°), maturation in complete absence of oxygen results, not in diminution, but rather in increase of the viscosity. Maturation in presence of oxygen leads to the formation of sodasoluble derivatives (? oxycellulose), the proportion of which increases with the amount of oxygen absorbed, until finally the cellulose is converted completely into soluble product. No such soluble products are obtained in absence of oxygen at 20—30°. As regards its practical applications, maturation of alkali-cellulose must be regarded essentially as an oxidation phenomenon, this view explaining the necessity of using sodium hydroxide free from impurities, such as metallic oxides, which accelerate absorption of oxygen. T. H. POPE.

Physical and chemical nature of nitrocellulose. A. BECK, L. CLÉMENT, and C. RIVIÈRE (Chim. et Ind., 1930, 24, 1068-1072).-By the precipitation of a 10% acetone solution by acetone containing 20% of water nitrocellulose may be separated into four fractions. The final fraction is obtained as a colloidal suspension; the solute is recovered by addition of sodium or barium chloride, or, better, by removal of the solvent under reduced pressure. The four fractions have a nitrogen content identical with that of the original material, but the viscosity of their solutions falls, the initial fraction giving the highest and the final the lowest value. A similar series of fractions is obtained when to an acetone solution of nitrocellulose there is added a quantity of water insufficient to cause precipitation and then the acetone is gradually removed by distillation in a vacuum. T. H. MORTON.

Properties of nitrocellulose made from jute, with special reference to its stability. R. C. BAGCHI (J. Indian Chem. Soc., 1930, 7, 863-874).-The yield of nitrocellulose from jute is considerably smaller than that from cotton, mainly owing to the presence of a considerable amount of γ -cellulose, which gives watersoluble nitro-compounds. Uniform nitration is also more difficult unless impurities are first removed from the jute. The jute nitrocellulose cannot be stabilised by boiling with 1% hydrochloric acid. If the product, after 4 boilings with acid, is boiled twice with 0.3% sodium carbonate solution, and then 6 times with water, a marked improvement in the stability of the nitrocellulose results. A still further increase in stability is found when the product is treated with alcohol during 3 days after the dilute acid treatment. Small amounts of sugars, gum, or hemicellulose cause the nitrocellulose to be markedly unstable. The effect of other impurities is studied, and it is found that the nitrogen content of the nitrocellulose decreases as the impurities increase. The viscocity of solutions of jute nitrocellulose in ether-alcohol is much less than that of similar solutions of cotton nitrocellulose. H. BURTON.

Removing printer's ink from paper. Schwalbe. —See XIII.

PATENTS.

Working up materials containing lignin and cellulose. O. A. MÜLLER (B.P. 340,164, 10.2.30. Ger., 9.2.29).—Undesired lignin is removed from a mixture with cellulose by treatment with chlorine and then with an organic solvent, such as alcohol, which is miscible with water and contains a mineral acid. Chlorolignin may be recovered from the extract by dilution with water or by addition of caustic alkali. Other products, which may be tanning agents, often remain in the liquid and can be obtained by removal of the solvent or addition of an alkaline-earth hydroxide. R. H. GRIFFITH. Manufacture of cellulose fatty acid esters. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,366, 25.7. and 13.11.29 and 7.3.30).—Methylene chloride or ethylene chloride is used as solvent in the manufacture of aliphatic esters (including mixed aliphatic esters) of cellulose; 0.5% of sulphuric acid is sufficient catalyst. An undegraded product of high viscosity is obtained in 5 hrs. at 50°. The alkylene chloride assists the concentration of the dilute acetic or other acid when wet precipitation is employed. For mixed esters one acid and one anhydride may be used in the desired proportions, no excess of acid being needed for solvent purposes. C. HOLLINS.

Treating [spinning] artificial silk made from viscose. K. LEUCHS (U.S.P. 1,770,412, 15.7.30. Appl., 10.10.27. Ger., 5.7.26).—See B.P. 298,688; B., 1929, 125.

Desulphurising articles consisting of regenerated cellulose. W. ELLER and T. MADLUNG, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,786,941, 30.12.30. Appl., 7.5.28. Ger., 13.7.27).—See B.P. 293,833; B., 1929,714.

Manufacture of transparent papers, particularly those used for the packing of edible articles. O. KLOTZ (U.S.P. 1,786,911, 30.12.30. Appl., 25.2.27. Ger., 9.10.26).—See B.P. 283,751; B., 1928, 229.

Beaters for paper pulp. W. KIRCHNER and G. STRECKER (B.P. 340,713, 14.11.29. Ger., 14.11.28).

Sulphite-cellulose liquors (U.S.P. 1,765,560). Reflecting material (U.S.P. 1,767,285).—See XIII.

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

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Bleaching and dyeing of jute, hemp, and like fibrous materials. T. E. ROBERTSON (B.P. 316,265, 25.7.29. Austral., 26.7.28).—Superior bleaching is obtained, and the bleached material is more amenable to dyeing in fast shades with direct dyes, if the bleaching process consists of successive treatments with a dilute solution of chlorine and a solution of sulphur dioxide or other similar reducing agent without intermediate treatment. It is preferred to use a dilute acidified solution of bleaching powder and a boiling solution of sodium hyposulphite in the bleaching process.

A. J. HALL.

[Ozonising] treatment of textile threads and fabrics. O. HOFFMANN (B.P. 337,305, 31.1.30. Ger., 9.2.29).—Linen fabric is passed in open width through a chamber having upper and lower series of guiding rollers and through which is circulated ozonised air containing 0.2-0.4 g. $O_3/m.^3$; the treated linen can be more easily and thoroughly bleached subsequently by the usual methods. The process is suitable for other textile materials. A. J. HALL.

Mordanting, weighting, and dyeing [of textile materials]. BRIT. CELANESE, LTD., W. A. DICKIE, and F. B. HILL (B.P. 337,813, 7.8.29).--Films and textile materials are treated with a high-speed stream of metal oxide or of oxidisable metal, the metal on the fabric being subsequently oxidised, whereby the oxide so thoroughly impregnates the material that mordant dyeing is rendered possible. The process is particularly suitable for treating materials consisting of cellulose esters and ethers, and is conveniently carried out by means of the Schoop metallising apparatus. Suitable metals include zinc, aluminium, tin, and alloys of these. A. J. HALL.

Production of [mordanted or weighted] cellulose derivative [ester or ether] materials. H. DREYFUS (B.P. 336,621, 9.7.29).-Cellulose acetate (etc.) materials containing fixed metal residues are produced by spinning a solution of cellulose acetate in acetone containing a soluble metal salt and then treating either directly in the coagulating bath (in the case of wet-spinning) or subsequently with substances capable of precipitating the metal. Suitable salts include stannic or ferric chlorides and thiocyanates, aluminium thiocyanate, zinc chloride, chromium thiocyanate, as precipitants tannic acid, ammonia, sodium monohydrogen phosphate, and sodium carbonate may be used. The weighted or mordanted silk may afterwards be dyed by means of direct or mordant dyes. A. J. HALL.

Naphthol dyeing. F. KARRER (B.P. 338,012, 25.11.29).-In dyeing yarn wound on cops or bobbins by the "packed" system, in which the dye liquors are pumped through the material being dyed, the formation of loose colour on the surface of the yarn is avoided by drying the yarn between its treatments with a naphthol solution and with a diazo solution. The yarn is packed in a truck which is run into a dyeing chamber capable of being hermetically sealed by an airtight door. Naphthol solution is then pumped through the yarn, and excess liquor is removed by connecting the dyeing chamber to a vacuum pump; by admitting hot air the yarn is subsequently dried. Afterwards a diazo solution is pumped through the dry yarn and almost all the dye thus formed is within the fibre substance. A. J. HALL.

Dyeing of cellulose acetate fibres, films, etc. with aniline black and the like. SILVER SPRINGS BLEACHING & DYEING CO., LTD., and A. J. HALL (B.P. 337,746, 27.7.29).—Cellulose acetate silk is treated with an aqueous suspension or solution of aniline containing a small proportion (about 10%) of p-aminodiphenylamine or p-phenylenediamine and the resulting silk containing the absorbed amines is then treated with a hot acidified solution of a dichromate saturated or nearly so with sodium chloride; the silk thereby rapidly acquires a fast black shade. It is advantageous to add to the oxidising bath small amounts of copper sulphate and sodium chlorate. A. J. HALL.

Production of fast tints on materials [azo couplings of leuco-compounds]. Soc. CHEM. IND. IN BASLE (B.P. 318,833, 9.9.29. Switz., 7.9.28).-Textiles are padded with the leuco-compound of a vat or sulphide dye, and are then pressed and passed through a diazo solution. Fast browns and olives are produced. Examples are : Ciba blue 2B, vatted and coupled with diazotised benzeneazo-a-naphthylamine (black-brown); Cibanone yellow 3G, vatted and coupled with diazotised aniline -> cresidine (full brown) ; Pyrogene green 3G vatted in sodium sulphide and coupled with benzeneazoa-naphthylamine (olive). C. HOLLINS.

Applying pictures in fast colours to textile fabrics. A. DENGLER (B.P. 337,877, 30.8.29. Ger., 3.11.28).-Pictures which may be transferred to fabrics by hot-ironing are formed by suitably spraying paper with a solution containing dyes, mordants (e.g., sodium bisulphate, milk of lime), oxidising agents (e.g., potassium, percarbonate), and thickening agents (e.g., glue, soap, and particularly a resin soap).

A. J. HALL.

Reducing or counteracting the attacks by alkaline liquids on straining cloths. ALUMINIUM-IND. A.-G. (B.P. 337,559, 9.10.29. Ger., 17.1.29).-Cotton has increased resistance to alkaline liquors, such as those resulting from the treatment of bauxite in the manufacture of aluminium, if it is impregnated with a manganese-oxygen compound such as manganous hydroxide and particularly manganese dioxide. Such impregnation may be effected by adding manganese compounds to the alkaline liquors which come in contact with the cotton, or by treating the cotton with potassium permanganate. A. J. HALL.

[Laundry] washing processes. A. MARQUARDT and E. WALTER (B.P. 338,121, 8.8.29) .- In washing textile materials the detergent liquor is prepared by adding together or successively the separate components of a soap-forming mixture such as saponifying agents and saponifiable substances, without previously pressing the detergent liquor into or out of the articles being washed; additional substances such as alcohols, hydrocarbons, protective colloids, and bleaching agents may also be added. A. J. HALL.

MASCHINENFABR. RAPPERSWIL A.-G. Dye jigs. (B.P. 340,431, 31.1.30. Switz., 2.2.29).

Steaming of dyed or printed fabrics. I. G. FARBENIND. A.-G. (B.P. 336,590, 15.7.29. Ger., 18.3.29. Addn. to B.P. 333,873).

Wetting etc. agents (B.P. 337,368).-See III. Impregnating fabric (B.P. 338,538).-See XIII.

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

Evaporation of caustic soda to high concentrations by means of diphenyl vapours. W. L. BADGER, C. C. MONRAD, and H. W. DIAMOND (Ind. Eng. Chem., 1930, 22, 700-707).-A semi-works-scale plant was designed to study the evaporation of caustic soda, using as heating medium diphenyl vapour (b.p. 256°/1 atm., latent heat 138 B.Th.U./lb., m.p. 69°, sp. heat 0.4-0.6 according to temperature). The evaporator used was a nickel tube surrounded by an iron jacket down which the diphenyl vapour passed, returning to the boiler when condensed. On account of the corrosion of iron parts by caustic soda it was found necessary to use a nickel-cast iron impeller in the circulating pump, monel metal piping, and a nickel-cast iron vapour head. The pump was packed with laminated copper. No great difficulty occurred in handling the diphenyl. The pump was rendered tight by the use of a bronze, watercooled stuffing box. Diphenyl pipe lines were traced with high-pressure steam lines and heavily insulated. A large number of determinations are given of heattransfer coefficients for condensing diphenyl and boiling

caustic soda. The former film offered the greater resistance to heat transfer. The diphenyl coefficient tended to increase with increasing temperature difference, but was scarcely affected by vapour temperature. Caustic soda was concentrated in the apparatus up to $98 \cdot 2\%$ NaOH, and it is believed that a commercial apparatus on these principles is possible. C. IRWIN.

Ammonia synthesis on a large laboratory scale. W. GLUUD, R. SCHÖNFELDER, and W. REISE (Ber. Ges. Kohlentech., 1930, 3, 52-95; Chem. Zentr., 1930, ii, 599-600).—Three series of experiments, employing pressures of 1, 100, and 300 atm., respectively, are described; various iron catalysts were employed.

A. A. ELDRIDGE.

Increasing the activity of iron [ammonia] catalysts. W. GLUUD and R. SCHÖNFELDER (Ber. Ges. Kohlentech., 1930, 3, 96—99; Chem. Zentr., 1930, ii, 594).—The catalyst containing iron is treated with carbon monoxide in order to form Fe₂C, which is then reduced by hydrogen. A. A. ELDRIDGE.

Chemical and physical composition of certain finely-divided natural phosphates from Florida. W. L. HILL, K. D. JACOB, L. T. ALEXANDER, and H. L. MARSHALL (Ind. Eng. Chem., 1930, 22, 1392-1396).-Tests on the particle size of waste-pond phosphates showed negligible quantities coarser than 50 μ , 9–19.5% of 50—5 μ , and 80.7—91.9% finer than 5 μ . Soft phosphates were considerably coarser. Both waste-pond and soft phosphates may be heated up to 500° without physical change if the time of heating is not more than $\frac{1}{2}$ hr. The average sp. gr. of waste-pond phosphates is 2.93, and of soft phosphate 3.09. The chemical compositions of several waste-pond and soft phosphates, and the variations in chemical composition with particle size, are tabulated. The citrate-soluble P2O5 content of 26 samples varied from 0.4 to 11.1% (av. 3.8%) of the total P_2O_5 ; citric acid-soluble P_2O_5 varied from 19.7 to 40.3% (av. 28.7%). W. J. WRIGHT.

Composition of citrate-insoluble residues from superphosphates and ammoniated superphosphates. K. D. JACOB, W. L. HILL, W. H. Ross, and L. F. RADER, JUN. (Ind. Eng. Chem., 1930, 22, 1385-1392).-The citrate-insoluble phosphate in ammoniated superphosphates and tricalcium phosphate. but not in non-ammoniated phosphates, decreased progressively with the weight of sample tested. The phosphoric acid dissolved from ordinary, triple, and ammoniated triple superphosphate was directly proportional to the weight of the sample. Solubility of water-insoluble phosphates in ammonium citrate solution depends on their chemical and physical nature and on the total amount present; it is reduced by the presence of other citrate-soluble salts, such as calcium sulphate. Citrate-insoluble residues from ammoniated and non-ammoniated superphosphates and triple superphosphates contain variable amounts of iron, aluminium, calcium, phosphoric acid, and fluorine, but little sulphate, whilst those from tricalcium phosphate consisted wholly or partly of calcium hydroxyphosphate. W. J. WRIGHT.

Reactions occurring during the ammoniation of superphosphate. F. G. KEENEN (Ind. Eng. Chem., 1930, 22, 1378-1382).—When the proportion of NH₃

reaches 1 mol. per mol. of water-soluble P2O5, the reaction (1) is $CaH_4(PO_4)_2 + NH_3 \rightarrow NH_4H_2PO_4 + CaHPO_4$, and no loss of available P_2O_5 occurs. With more than 1 mol. NH₃, and no control of temperature or moisture, the dicalcium phosphate disappears more rapidly than the monoammonium phosphate. Thus with 2 mols. NH₃, the temperature is 70-90° and the reaction (2), viz., $2CaHPO_4 + CaSO_4, 2H_2O + 2NH_3$ \rightarrow Ca₃(PO₄)₂ + (NH₄)₂SO₄ + 2H₂O, occurs. As ammoniation increases the temperature rises to 90-100°, and when all the dicalcium phosphate has reacted, the reaction (3) proceeds as: $\dot{N}H_4\dot{H}_2PO_4 + CaSO_4, 2\dot{H}_2O + NH_3 \rightarrow (NH_4)_2SO_4 + CaHPO_4 + 2H_2O$. Since monoammonium phosphate gradually decreases in amount as the ammonia absorption increases, reactions (2) and (3) must occur simultaneously. If a low temperature and moisture content are maintained the reaction may be controlled thus: $CaH_4(PO_4)_2 + 2NH_3 \rightarrow CaHPO_4 + (NH_4)_2HPO_4$. A review of patent and other W. J. WRIGHT. literature is given.

Manufacture of lithium carbonate from the lepidolites of U.S.S.R. E. S. BURKSER, I. S. SHTOK-MAN, and A. M. BAUMAN (J. Chem. Ind. Russia, 1930, 6, 1436—1438).—Plans are described, and analyses of minerals are given. CHEMICAL ABSTRACTS.

Arsenic determination in bismuth and barium salts. L. W. GREEN and R. E. SCHOETZOW (J. Amer. Pharm. Assoc., 1930, 19, 1310).—Salts of barium and bismuth to which 2 pts. of arsenic (As_2O_3) per million had been added, gave by the Gutzeit test stains indicating slightly more than 2 p.p.m.; this test was much more sensitive than the Bettendorf test, which gave negative results in the above cases. E. H. SHARPLES.

Hydrolysis of arsenious iodide. W. J. HUSA (J. Amer. Pharm. Assoc., 1930, 19, 1287—1291).—A dilute, aqueous solution of arsenious iodide is essentially a solution of arsenious acid and hydriodic acid in equilibrium with a small quantity of arsenious iodide (cf. Cocking, B., 1930, 348). In freshly prepared solutions equilibrium is reached within a few minutes (cf. B., 1930, 585). E. H. SHARPLES.

Production of oxygen from lime and chlorine. O. R. SWEENEY, J. W. HUSSEY, and W. RALSTON (Ind. Eng. Chem., 1930, 22, 716-718).-If dry bleaching powder is heated, 88% of the theoretical yield of oxygen is obtained. If chlorine is passed into hot milk of lime containing cobalt nitrate the yield is 99%. Oxygen is also produced by passing chlorine over lime at 850°. The second method, employing catalysts, was studied. The optimum temperature for cobalt was 94°, and cobalt and nickel were the most efficient catalysts tested. A design for a commercial plant, using a 0.001Msolution of nickel sulphate, is given and costs are discussed. Even in cases where chlorine is almost a waste product the process is not likely to compete with the usual method of manufacture of oxygen. It is, however, capable of small-scale operation, and might be employed in exceptional localities or perhaps in C. IRWIN. laboratories.

Aluminium alloys. STERNER-RAINER; Röhrig. Corrosion of lead by sulphuric acid. MAHIN and WILHELM.—See. X.

PATENTS.

Neutralisation of acid waste waters. A. M. HAGEMAN and W. L. SULLIVAN, Assrs. to WESTINGHOUSE LAMP Co. (U.S.P. 1,765,424, 24.6.30. Appl., 25.4.29).— The liquors are diluted until they contain 0.3% of free sulphuric acid and then circulated through a bed of (a) granular dolomite to neutralise most of the acid, and (b) limestone or marble to neutralise the remainder. This procedure avoids the deposition of calcium sulphate in the neutralising tanks. A. R. POWELL.

Production of (A) ammonia, (B) hydrogennitrogen mixture in the manufacture of synthetic ammonia. L. C. Jones, Assr. to CHEM. ENG. CORP. (U.S.P. 1,765,534-5, 24.6.30, Appl., [A] 24.3.25, [B] 28.10.25).-(A) The gas mixture is treated with about 0.2% of ammonia prior to compression, whereby the aqueous condensate obtained on compression contains all the catalyst poisons present in the gases, e.g., chlorine, sulphur, and phosphorus compounds. (B) A mixture of air, carbon monoxide from the manufacture of aluminium or calcium carbide, and steam is passed over iron (or chromium) oxide catalyst at 325-500°, sufficient steam being added to prevent the temperature exceeding 500°. The greater part of the resulting carbon dioxide is removed, and the residual gases are again mixed with steam and passed over a second similar catalyst. A. R. POWELL.

Synthetic production of ammonia. R. S. RICHARDSON, ASST. to CHEM. ENG. CORP. (U.S.P. 1,765,541, 24.6.30. Appl., 26.2.27).—The gas mixture from the converters is cooled to 30° and passed upwards through a tower packed with glass or porcelain rings and down which is circulated a stream of liquid ammonia at or below 0°. In this way the greater part of the ammonia in the gas mixture is condensed and the liquid ammonia, after cooling, can be used again.

A. R. POWELL.

Preparation of adsorptive [silica] gels. H. N. HOLMES (U.S.P. 1,762,228, 10.6.30. Appl., 12.9.25).— A dilute solution of sodium silicate is treated with sufficient ferric chloride or sulphate solution completely to precipitate the silica. After keeping for 60 hrs., the gelatinous mass is filtered off and dried in a warm place until the moisture content falls to 35-70%; the lumps are roughly broken and preserved in an airtight vessel until syneresis causes them to sweat, then boiled with 9N-sulphuric acid until the iron is extracted, washed free from iron salts and acid, and dried. The product has a greater pore volume and higher adsorptive power than have gels produced in the usual way. A. R. POWELL.

Production of titanic oxide. M. SCHNETKA, ASST. to TITANIUM PIGMENT Co., INC. (U.S.P. 1,758,472, 13.5.30. Appl., 25.6.28. Ger., 6.9.27).—Hydrolysis of titanium sulphate solutions containing ferric sulphate is effected by boiling in the presence of a small quantity of hydrofluoric acid or a soluble fluoride. The precipitated titania is free from iron and more granular than that obtained by known methods. A. R. POWELL.

Production of titanium dioxide. W. MECKLEN-BURG (U.S.P. 1,758,528, 13.5.30. Appl., 1.2.29. Czechoslov., 5.5.28.).—A suspension of titanium dioxide in sodium sulphate solution is prepared by treating

a solution of titanium sulphate at 80° with sodium hydroxide solution until the $p_{\rm H}$ of the solution is 4-4.5. A small quantity of this suspension is added to a boiling solution containing 20% TiO₂ and 40-45% H₂SO₄, and the mixture is boiled for 3 hrs., whereby 95% of the titania present is precipitated as a dense white flocculent precipitate which settles and filters readily. A. R. POWELL.

Production of oxides of titanium, thorium, or rare metals of the fourth group. IMPERIAL CHEM. INDUSTRIES, LTD., and F. L. CLARK (B.P. 339,608, 7.9.29).—The ore, e.g., ilmenite, is fused with alkali carbonate or hydroxide and the product ground and suspended in a 40% solution of sodium hydroxide. On electrolysing the solution at 90—120° under a pressure of 20 atm. of hydrogen, using insoluble anodes, the iron and other metallic impurities are removed and a relatively pure titania suspension remains. The process is also applicable to the purification of zirconia, hafnia, and thoria. A. R. POWELL.

Manufacture of salt [from brine]. W. F. Down-ING, JUN., ASST. to DIAMOND CRYSTAL SALT CO. (U.S.P. 1,768,399, 24.6.30. Appl., 29.5.24).—Brine is evaporated until saturated with sodium chloride, then passed through a series of open-pan evaporators in which the salt is deposited. Part of the brine with suspended salt crystals is passed back from a late stage in the evaporation to an earlier stage so as to control the size of the crystals formed. A. R. POWELL.

Recovery of borax from brine. H. D. HELLMERS, Assr. to WEST END CHEM. Co. (U.S.P. 1,756,122, 29.4.30. Appl., 24.10.25).—Borax is recovered from Searles Lake brine by saturating the brine with carbon dioxide above 25°, removing the precipitated sodium hydrogen carbonate, and cooling the solution or mixing it with a proportion of the original brine. A. R. POWELL.

Manufacture of alkali carbonates and bicarbonates and soluble magnesium salts. H. E. POTTS. From Soc. ANON. ALCALINA (B.P. 339,330, 1.8.29).— A double carbonate of magnesium and potassium is prepared by causing nascent magnesium carbonate to react with a solution of a potassium salt, such as the chloride, saturated with carbon dioxide under a pressure equal to or greater than the critical pressure, and then to be decomposed by steam. Magnesium carbonate is precipitated and may be used again, and alkali carbonate passes into solution in the water of crystallisation. From the mother-liquors obtained in the preparation of the double carbonate magnesium chloride is recovered.

W. J. WRIGHT.

Recovery of sodium sulphite from spent sulphite [cellulose] liquors. P. A. BARBOU, ASST. to SOC. BARBOU & CIE. (U.S.P. 1,765,560, 24.6.30. Appl., 12.1.28. Fr., 21.1.27).—The spent liquors from the digestion of straw with sodium sulphite solution are treated with sulphuric acid equivalent to the sodium present, then with calcium hydrogen sulphite equivalent to the sulphuric acid added, whereby a precipitate of calcium sulphate and lignin derivatives is obtained together with a solution of sodium hydrogen sulphite which is neutralised with sodium carbonate for re-use in the digestion process. A. R. POWELL.

Manufacture of alkali sulphydrates [hydrogen sulphides]. H. P. BASSETT (U.S.P. 1,766,810, 24.6.30. Appl., 24.3.27).-Sodium sulphate is reduced with coke at 650-850° and the resulting mass is extracted with water. The filtered solution is evaporated to $d \ 1.4$, whereby most of the unreduced sodium sulphide separates as the anhydrous salt, this being collected and returned to the first stage. The mother-liquor is diluted to $d \cdot 1 \cdot 3$ and allowed to cool to deposit sodium sulphide crystals; some of these are dissolved in water and converted into sodium hydrogen sulphide by treatment with the hydrogen sulphide evolved by treating the remaining crystals and the mother-liquor with sodium hydrogen sulphate (nitre cake). The sodium sulphate from the gas generator is recovered and used in the preparation of further quantities of sulphide.

A. R. POWELL.

Manufacture of fertiliser salts [ammonium sulphate and phosphate]. H. B. KIPPER (U.S.P. 1,768,075, 24.6.30. Appl., 14.1.28).—A suspension of finelyground calcium sulphate or calcium phosphate in hot water is beaten into a mist in a closed reaction vessel into which is passed a mixture of carbon dioxide, ammonia, and steam to convert the calcium into carbonate and leave a solution of ammonium sulphate or phosphate. A. R. POWELL.

(A) Treatment of phosphate rock and the like. (B) Production of mixtures suitable for use as fertilisers. (c) Production of mixtures comprising ammonium nitrate and calcium carbonate. ODDA SMELTEVERK A./S., and E. JOHNSON (B.P. 339,340, Addn. B.P. 339,500, and B.P. 339,562, [A] 4.9.29, [B] 12.12.29, [c] 24.2.30. Nor., [A] 27.10.28, [B] 14.12.28, [c] 4.3.29).-(A)Phosphate rock is treated with nitric acid of 50% concentration in such amount and under conditions that, by suitable cooling, more than 80% of the lime is obtained as Ca(NO3)2,4H2O, the phosphoric acid and the rest of the lime remaining in the mother-liquor. (B) The motherliquor, obtained as described in (A), is precipitated with ammonia or ammonium liquor (20% N), and the dicalcium phosphate produced is mixed with calcium nitrate and urea, together with other nitrogen compounds and potassium salts, if desired. (c) A solution of calcium nitrate is treated with ammonia and carbonic acid, and the mixture of ammonium nitrate and calcium carbonate is obtained in a solid, granular form by evaporation, the temperature of the mass being maintained at 80-100° after the water content is reduced to about 5%. W. J. WRIGHT.

Manufacture of barium sulphate. J. B. PIERCE, JUN. (U.S.P. 1,765,737, 24.6.30. Appl., 10.11.24).—A solution of barium sulphide is treated with the carbon dioxide produced by the interaction of sodium carbonate and sodium hydrogen sulphate, the precipitate of barium carbonate is removed, and the filtrate, containing barium hydrogen sulphide, is treated with the sodium sulphate solution from the carbon dioxide generator, whereby barium sulphate (blanc fixe) of good quality is precipitated, leaving a solution of sodium hydrogen sulphide which is evaporated to 30% for marketing.

A. R. Powell. Preparation of by-product calcium sulphate for **plaster**. R. S. EDWARDS, Assr. to RUMFORD CHEM. WORKS (U.S.P. 1,756,637, 29.4.30. Appl., 9.4.27).— Calcium sulphate obtained as a by-product in the treatment of phosphate rock and fluorspar with sulphuric acid may contain acid calcium phosphate and fluoride, which interfere with the setting of plaster made from it. This difficulty may be overcome by treating the calcium sulphate with hot dilute sulphuric or hydrochloric acid and neutralising the solution with milk of lime. The calcium sulphate thus obtained is neutral and contains calcium fluosilicate which acts as an accelerator in the setting of the plaster prepared from it. A. R. POWELL,

Manufacture of cyanates and cyanamides. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 339,371, 13.9.29, 12.4. and 8.7.30).—A mixture of urea and an oxide or carbonate of a bivalent metal is heated to at least 130°, preferably in a current of a gas free from oxygen to remove the water formed, whereby cyanate is obtained, the temperature being then raised to 400— 600° to produce cyanamide. Instead of urea, ammonia and carbon dioxide may be used, in which case the reaction with the metallic oxide or carbonate is carried out at a pressure not less than 50 atm., or a mixture of ammonium carbonate and carbamate may be employed. W. J. WRIGHT.

Preparation of silicious materials. A. S. BEHR-MAN, Assr. to GEN. ZEOLITE Co. (U.S.P. 1,755,496, 22.4.30. Appl., 29.7.25).—A dilute solution of sodium silicate is treated with sufficient sulphuric acid to combine with the soda and produce a colloidal solution of silicic acid. Addition of ammonia to this solution results in the separation of a silica gel which may be dried for use as an adsorptive. Addition of aluminium sulphate and sodium carbonate to the colloidal acid solution precipitates sodium aluminium zeolite for use as a base-exchange substance. The aluminium salt may be replaced wholly or partly by salts of other metals, and ammonia may be used instead of soda as a precipitant, to produce gels containing iron, chromium, or other metals for use as catalysts. A. R. POWELL.

Manufacture of a base-exchange material. E. M. PARTRIDGE and E. W. SCARRITT, Assrs. to PERMUTIT Co. (U.S.P. 1,766,350, 24.6.30. Appl., 5.1.26).—A solution of sodium silicate and trisodium phosphate is treated with a solution of aluminium sulphate and the resulting gel is dried at 95°. The dried mass is thrown into water and thereby caused to break up into small particles which can be readily washed free from soluble salts.

A. R. POWELL.

Production of hydrogen [from carbon monoxide and steam]. J. S. BEEKLEY, ASST. to DU PONT AM-MONIA CORP. (U.S.P. 1,756,934, 6.5.30. Appl., 19.12.27). —Steam is mixed with 33—50% of the quantity of watergas with which it will react and the mixture, preheated to 420°, is passed over a catalyst. The issuing gases are mixed with a further quantity of water-gas to reduce the temperature again to 420° and once more passed over a catalyst. If desired, the process can be repeated a third time. It is claimed that the amount of methane formed and the quantity of carbon deposited in the catalyst chambers are reduced to very small proportions by working in this manner. A. R. POWELL.

Brillish Che

Manufacture of [solid] compounds of hydrogen peroxide. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 339,332, 6.8.29).—Solid substances capable of reacting with hydrogen peroxide are subjected to the action of gaseous mixtures poor in hydrogen peroxide so that no liquid is condensed on the substances. Stabilisers, such as starch, amines, ethyl alcohol, or neutral pyrophosphates, may be present. Gaseous mixtures produced by treating hydrogen-oxygen mixtures by means of the silent electric discharge or photochemically are suitable. W. J. WRIGHT.

Production of nitrogen. W. B. VAN ARSDEL, Assr. to BROWN CO. (U.S.P. 1,765,781, 24.6.30. Appl., 10.11.21).—Purified air and hydrogen are passed in correct proportions through a magnesite-lined tube furnace packed with a porous refractory. Automatic means are provided for regulating the supplies of the two gases so that just sufficient hydrogen is supplied for the complete combustion of the oxygen in the air. A. R. POWELL.

Composition for the generation of chlorine. G. J. HOWITZ, ASST. to LER. SEIDELL (U.S.P. 1,767,676, 24.6.30. Appl., 11.8.24).—A mixture of sodium chloride and chlorate with a solid acidic substance, *e.g.*, citric acid, boric acid, or sodium hydrogen sulphate, is claimed. The components are used in powdered form, the chloride-chlorate mixture being packed separately from the acidic substance; for use the two powders are mixed dry, whereby a slow stream of chlorine is evolved suitable for disinfecting and medical purposes. A. R. POWELL.

Manufacture of carbon disulphide. F. W. VOGEL, Assr. to BROWN Co. (U.S.P. 1,765,809, 24.6.30. Appl., 22.12.24).—The gases resulting from the action of sulphur vapour on wood charcoal at 1000° are treated with sulphur dioxide in amount equivalent to their hydrogen sulphide content and cooled to 150°, whereby the resulting sulphur is condensed for further use in the process. The remaining gases are cooled to the ordinary temperature to condense the carbon disulphide.

A. R. POWELL.

Production of hypochlorite compositions. R. B. MCMULLIN and M. C. TAYLOR, ASSTS. to MATHIESON ALKALI WORKS, INC. (U.S.P. 1,787,080 and 1,787,048, 30.12.30. Appl., [A] 6.3.30, [B] 16.8.28. Ger., [A] 11.5.29).—See B.P. 317,437; B., 1930, 711.

Transforming barium and strontium sulphates. F. ROTHE and H. BRENEK, ASSTS. to RHENANIA VER. CHEM. FABR. A.-G. (U.S.P. 1,772,269, 5.8.30. Appl., 3.11.25. Ger., 12.11.24).—See B.P. 242,996; B., 1926, 787.

Preparation of pure alumina. T. SUZUKI, H. TANAKA, and T. KURITA, ASSTS. to ZAIDAN HOJIN RIKAGAKU KENKYUJO (U.S.P. 1,785,464, 16.12.30. Appl., 6.7.27. Jap., 3.2.27).—See B.P. 284,661; B., 1928, 927.

Detergents and their preparation. C. A. JENSEN. From ELECTRIC SMELTING & ALUMINUM Co. (B.P. 339,355, 7.9.29).—See U.S.P. 1,745,844; B., 1930, 662.

Hydrogen from hydrocarbons (B.P. 340,050). Sulphurous compounds from gases (B.P. 317,015). Purification of gases (U.S.P. 1,765,869). Fuller's earth (U.S.P. 1,763,167). Coke-oven gas (B.P. 314,432).—See II. Straining cloths [for bauxite treatment] (B.P. 337,559).—See VI. Unoxidisable alloy (U.S.P. 1,771,773). Oxides (B.P. 339,645).—See X. Reflecting material (U.S.P. 1,767,285). Red lead (B.P. 340,082).—See XIII. Fertilisers (B.P. 316,583).— See XVI. Filter plugs (B.P. 339,761).—See XVIII.

VIII.-GLASS; CERAMICS.

PATENTS.

Manufacture of abrasive or refractory articles. P. H. WALKER and S. S. KENYON, Assrs. to CARBORUNDUM Co. (U.S.P. 1,785,102, 16.12.30. Appl., 1.5.28).—See B.P. 310,841; B., 1931, 65.

Continuously drawing glass tubes or rods. P. A. FAVRE (B.P. 319,361, 18.9.29. Belg., 22.9.28).

Saggars, setters, or similar containers [in one or more parts] for use in the manufacture of ceramic wares. G. W., J. F., W., and C. E. NAYLOR (B.P. 340,376, 18.11.29).

IX.—BUILDING MATERIALS.

Sparingly soluble cement from Portland cement and arsenic. D. WERNER and S. GIERTZ-HEDSTRÖM (Tekn. Tidskr., 1930, 60, 41-49; Chem. Zentr., 1930, ii, 443).—A mixture of Portland cement (70%) and arsenious oxide (30%), after being heated at 200°, affords a hydraulic cement of normal setting time and of smaller solubility than ordinary cement.

A. A. ELDRIDGE.

Manufacture of "Bitural" as a road builder. C. F. BROADHEAD (Chem. Eng. Min. Rev. [Chem. Sec.], 1930, 23, 68-73).-Owing to the lower viscosity of continuous vertical-retort tar it is necessary to remove more of the light oils to obtain the same consistency as that of distilled horizontal tar. The higher temperature necessary results in a brittle pitch content of the resultant road tar. This and the presence of waxes (b.p. 280-300°) and of a higher content of unsaturated hydrocarbons are the causes of the inferiority of continuous vertical-retort road tar. A method for improving this type of tar to produce "Bitural" is outlined, in which 10 gals. of formalin and 5 gals. of ammonia ($d \ 0.880$) are intimately mixed with 1000 gals. of tar and digested at 71° for 8 hrs., whereby formaldehyde condensation products are formed in situ with the phenols, cresols, xylols, etc. Heated air is then passed over or through the tar until the desired consistency is obtained, the temperature of the tar being gradually raised during this period to 193°. The penetration test of a satisfactory product yields the value 220. The addition of 8% of asphaltic-base petroleum to the product is advantageous. A description of a large-scale plant incorporating two digestor units of 2500 and 5000 gals. capacity, erected in Victoria, is given. H. S. GARLICK.

Heat transfer from gas stream to broken solids. FURNAS.—See I. Pine wood. SOUM.—See V.

PATENTS.

Colouring of granulated slate, mineral granules, etc. H. C. FISHER, Assr. to PHILIP CAREY MANUF. Co. (U.S.P. 1,766,891-2 and 1,766,814-5, 24.6.30. Appl., [A] 29.4.25, [B] 14.5.26, [C, D] 13.10.26).—(A) Granulated slate, free from dust, is mixed with a small quantity of sodium silicate solution containing in suspension a suitable mineral pigment and the coated particles are heated gradually in a rotating kiln until an adherent, glassy, coloured film is formed on the particles without causing them to stick together. (B) Slate is treated with a mixture of sulphuric acid and sodium dichromate to convert the mineral chlorite in the slate into ferric sulphate and gelatinous silica. The mass is then heated until the sulphate is converted into ferric oxide, whereby the particles are coloured red to brown. (c) The particles are coated with a film of sodium silicate, borax, and ferric oxide and heated until a reddish-brown fused glaze is formed on the surface. (D) The particles are coated with a slurry containing ferric oxide and fluxes such as litharge, silica, magnesia, borax, and sodium carbonate and the mass is heated to cause the flux to melt and fix the pigment on the surface of the particles. A. R. POWELL.

Manufacture of bituminous emulsions. J. PAR-KER (B.P. 333,303, 14.5.29).—Tar macadam for surfacing roads etc. is prepared by heating 1—3 pts. of casein, 1—3 pts. of rosin, 0.15—0.45 pt. of sodium hydroxide, and 30—60 pts. of water at 100° for 30 min. to saponify the rosin, cooling to 95°, heating for 30 min. at this temperature with 5—10 pts. of crude naphtha under reflux, and stirring in slowly 60—120 pts. of coal tar, pitch, and/or bitumen, with or without a proportion of animal and/or vegetable oils. The resulting emulsion is stable down to —6° and may be diluted with water as required.

A. R. POWELL.

Manufacture of bituminous road material. F. O. W. LOOMIS and D. M. LOOMIS (U.S.P. 1,769,442, 1.7.30. Appl., 12.10.29. Can., 10.11.28).—A roadmaking aggregate is cleaned and dried by a stream of air, then mixed with a small amount of kerosene, and an aqueous emulsion of asphalt agitated violently with the mixture so that the emulsion is broken without heating and a film of bituminous material uniformly deposited.

R. H. GRIFFITH. Producing [printing of] veneer woods. Masa GES.M.B.H. ZUR HERSTELLUNG KÜNSTL. OBERFLÄCHEN (B.P. 340,483, 20.9.29. Ger., 4.10.28).

Furnace drum (U.S.P. 1,768,964). Combined crusher-separator (U.S.P. 1,769,310).—See I. Distillation [products] of bituminous shales (B.P. 339,963). Tar for roads (B.P. 339,640).—See II. Calcium sulphate for plaster (U.S.P. 1,756,637). Reflecting material (U.S.P. 1,767,285).—See VII.

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

Course of reduction of iron ore. II. B. STALHANE and T. MALMBERG (Jernkontorets Annaler, 1930, 114, 1-26; Chem. Zentr., 1930, ii, 972).—The reduction proceeds by way of ferrosoferric and ferrous oxides to the metal, the end-product being a sponge of 95% purity.

The reaction $\operatorname{Fe}_3O_4 \rightarrow \operatorname{FeO}$ is fairly rapid and somewhat retards the reaction $\operatorname{FeO} \rightarrow \operatorname{Fe}$. The reaction time depends on the speed of the reaction $(\operatorname{FeO})_n + n\operatorname{CO} \rightarrow$ $n\operatorname{Fe} + n\operatorname{CO}_2$ in the reaction zone and the speed with which the carbon dioxide so formed can diffuse away. A. A. ELDRIDGE.

Manufacture and heat treatment of sheet [iron and steel] for the automobile industry. A. T. KATHNER and P. DAMIRON (Rev. Mét., 1930, 27, 615— 629).—An account is given of modern mass-production methods of manufacturing and heat-treating steel sheet for motor bodies. A. R. POWELL.

Hardening of steel. H. ESSER and W. EILENDER (Arch. Eisenhüttenw., 1930-1, 4, 113-144; Stahl u. Eisen, 1930, 50, 1616-1617).-Annealing and rapid air-quenching experiments on thin sheets of steel have afforded evidence that martensite is a heterogeneous mixture of a-iron and cementite and not a solid solution, and that all iron-carbon alloys, even those with a very small carbon content, are capable of being hardened provided that they are quenched extremely rapidly from a suitable annealing temperature. The authors conclude that the hardening of steel by quenching is controlled by the degree of dispersion of the precipitated iron carbide and by the considerable distortion of the α -iron lattice produced by the separation of carbide in the $\gamma \, \rightarrow \, \alpha$ transformation at a temperature at which the plasticity of the metal is very low. This theory is shown to be in accordance with the phenomena observed during the reheating of quenched steels, and also accounts for the changes which take place in the physical properties of the metal during heat treatment. A. R. POWELL.

Iron-aluminium-carbon alloys. O. VON KEIL and O. JUNGWIRTH (Arch. Eisenhüttenw., 1930-1, 4, 221-224; Stahl u. Eisen, 1930, 50, 1643).-The effect of aluminium on the iron-carbon system has been investigated. The eutectic composition is reduced by 0.16% C by the addition of 1% Al, the pearlite transformation point is slightly reduced by addition of aluminium up to 3.5%, but with 3.5-8% Al it is raised again, and with more than 8% Al the intensity of this transformation is infinitely small, and in alloys with a high carbon content the y-field ceases to exist. With hypoeutectic alloys containing less than 5% Al the finely granular distribution of the graphite, which corresponds with metastable freezing and spontaneous decomposition, is rendered more prominent; with 5-9.5% Al the edges of the primary solid solution crystals show a decreased tendency to decompose, and these zones become more readily soluble in acids, and with more than 9.6% Al the solid solution becomes stable and readily soluble in acids. Addition of aluminium to iron with a high carbon content results in complete separation of the carbon as graphite with 2.3% Al, complete disappearance of the graphite with 11% Al, and complete precipitation again with 18% Al.

A. R. POWELL.

Determination of carbon in high-sulphur steels by direct combustion. H. A. BRIGHT and G. E. F. LUNDELL (Bur. Stand. J. Res., 1930, 5, 943-949).— The recommended combustion train is as follows: The porcelain combustion tube is 48 cm. long and 2.5 cm.

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

internal diam. tapering to 1 cm. for the last 14 cm. of length, and finally to about 6 mm. for a short length. Beyond the combustion boat the tube contains only the usual oxidised copper gauze in the zone which is heated at 700—800°. The exit gases pass consecutively through 50% chromic acid solution, asbestos coated with iron oxide, 97% sulphuric acid, more asbestos, 20-mesh anhydrone, and a tube packed with ascarite and anhydrone. The copper gauze becomes coated with copper sulphate and ferric oxide and requires occasional renewal. A. R. POWELL.

Influence of high temperatures and of addition of salts on the equilibrium in solution between calcium carbonate and bicarbonate, and the limerust-protective coating [on iron]. J. TILLMANS, P. HIRSCH and W. R. HECKMANN (Gas- u. Wasserfach, 1931, 74, 1-9).-The equilibrium between calcium carbonate and bicarbonate has been investigated at temperatures from 40° to 100° by removing carbon dioxide from a saturated calcium bicarbonate solution until equilibrium is attained and determining the free and combined carbon dioxide content of the solution. The concentrations being expressed in mg./litre, the equilibrium constant $K = [HCO_3]/[H_2CO_3]$ falls from 2.05×10^4 at 40° to 3.976×10^3 at 100°, and at any temperature, t, is given by $K_t = 66,300 \times (0.9714)^t$. Sodium salts, and calcium salts at concentrations below 60 mg./litre, do not influence the equilibrium; calcium salts at high concentrations produce a neutral salt effect. Addition of magnesium chloride markedly reduces the free carbon dioxide content of the solutions. Study of the action of water containing calcium bicarbonate and oxygen on iron, with the formation of a protective coating at temperatures up to 100°, shows that although at the higher temperatures visible corrosion appears to take place more rapidly, the time needed for the formation of the protective layer remains unchanged. It has been shown experimentally that dissolved oxygen is essential for the formation of the layer, as in its absence the coating of ferric hydroxide, upon which carbon dioxide and calcium carbonate are adsorbed, is not produced. The significance of the results for hot-water engineering is indicated.

H. F. GILLBE.

Mechanism of corrosion of copper-steel. C. CARIUS (Z. Metallk., 1930, 22, 337-341).-During the rusting of copper-steel (0.25-1.1% Cu) in the air or in distilled water the metal becomes covered with an adherent film of metallic copper the surface of which is converted into cupric oxide. Under sea-water four layers of corrosion products are produced : the lowest consists of spongy copper, above this is a thicker layer of a greenish mixture of ferrous and ferric hydroxide, then follows a thin black film of hydrated ferrosoferric oxide, and finally there is a brownish-red, thick, outer layer of the hydroxide, FeO(OH). The formation of the copper layer in both cases is shown to be a secondary reaction, both metals first going into solution and the copper then being reduced to metal by the unchanged steel with the formation of various oxidation products of iron; the deposited copper and the unchanged steel form a local element with a relatively high E.M.F. , and hence the rusting of the steel is accelerated. A

complete electrochemical explanation of the formation of the various corrosion layers is given.

A. R. POWELL.

Corrosion of copper. I. Behaviour towards chemical agents. II. Electrochemical behaviour and formation of a protective film. L. W. HAASE (Metall-Wirt., 1930, 9, 503-506; Chem. Zentr., 1930, ii, 797-798).-Corrosion by steam and gaseous sulphur dioxide, hydrogen chloride, fluoride, bromide, or iodide, and carbon dioxide; by neutral salts (ammonium chloride in particular); by carbonates; by magnesium salts of sea-water; and by acids is discussed. With the exception of sulphurous acid, dilute acids corrode copper only in presence of oxygen. Alkali hydroxide solutions corrode little, calcium hydroxide not at all, and ammonia solution only in presence of oxygen. Liquid hydrocarbons dissolve superficial oxide; vegetable oils are more harmful than saturated aliphatic A. A. ELDRIDGE. compounds.

Methods of corrosion testing. E. K. O. SCHMIDT (Z. Metallk., 1930, 22, 328-333).-The methods used at the German Aeronautical Research Institute m testing the behaviour of light metals and alloys in corrosive media are described and illustrated. The apparatus includes mechanical devices for the alternate wetting and drying test in sea-water, for exposing the specimens to circulating streams of sea-water, and for carrying out the salt-spray test. The decrease in elongation and tensile strength with progressive comsion is shown to be a satisfactory method of comparing the behaviour of metals under corrosive conditions. Characteristic curves for various aluminium alloys showing the percentage reduction in various mechanical properties when subjected to the action of sea-water under different conditions, are reproduced.

A. R. POWELL.

Use of aluminium [in chemical laboratories]. P. DROSSBACH (Hausz. V.A.W. Erftw. Aluminium, 1930, 2, 39—44; Chem. Zentr., 1930, ii, 976).—The influence of oxygen on the corrosion of aluminium (always anodic) was investigated. The amount of corrosion depends on the nature of the cathode in the local element.

A. A. ELDRIDGE.

Effect of soda and soap solutions on aluminium. H. BOHNER (Hausz. V.A.W. Erftw. Aluminium, 1930, 2, 48—49; Chem. Zentr., 1930, ii, 977).—The corrodibility of aluminium and its alloys, alone or in presence of copper, brass, tin, zinc, iron, or magnesium, by alkaline soap solutions at 20° or 50—60°, has been measured. In general, the corrodibility is in the order of the potential series, but with sodium carbonate solution zinc is an exception, having a protective action on aluminium. A. A. ELDRIDGE.

Resistance of aluminium to fatty acids at 80– 100°. W. CLAUS (Hausz. V.A.W. Erftw. Aluminium, 1930, 2, 44–47; Chem. Zentr., 1930, ii, 977).—Under the working conditions employed aluminium was almost completely resistant to the action of solid and liquid fatty acids. A. A. ELDRIDGE.

Behaviour of aluminium, copper, zinc, and iron foil in contact with moist lithopone. ANON. (Hausz. V.A.W. Erftw. Aluminium, 1930, 2, 52 : Chem. Zentr., 1930, ii, 977; also Farben-Chem., 1931, 2, 88).— Aluminium is least affected. A. A. ELDRIDGE.

Annealing and quenching of duralumin. MATTER (Rev. Mét., 1930, 27, 560-562).—Air-quenching of duralumin sheets not thicker than 2 mm. followed by ageing at the ordinary temperature produces the same mechanical properties as does quenching in-water. With increasing thickness, however, the tensile strength of aged air-quenched sheets becomes progressively lower. Further tests have shown that the critical rate of cooling for obtaining a tensile strength above 30 kg./mm.² after ageing is about 150°/hr. measured at 400°. Quenching from 500° in a salt bath at 200° produces metal equally as good as that obtained by quenching in water.

A. R. POWELL.

Effect of heat treatment on aluminium and its light alloys. J. SUHR (Rev. Mét., 1930, 27, 563—569). —Examples are given of the variation of the physical and mechanical properties of aluminium and some of its alloys with the heat treatment to which they have been subjected. A. R. POWELL.

Flowability of the light alloys of aluminium : influence of chemical composition. A. COURTY (Compt. rend., 1930, 191, 1128-1130).-By the method (cf. B., 1930, 563) described previously (temperature of mould 15°, of pouring 750°), the flowability of alloys of aluminium with (a) silicon (0-21.72%), (b) copper (0-22.05%), and (c) zinc (0-30%) has been determined. Both (a) and (b) show a sharp drop to about 2% of addition, and then a steady rise, the flowability for 6-7% being about the same as for aluminium itself; after 18% it remains nearly constant at some 60% above that of aluminium; (b) is throughout slightly lower than (a). Alloy (c) shows a slow but steady drop to little more than half that of aluminium for 12% Zn, followed by a similar rise to 30% Zn, for which it is still slightly below the initial figure. C. A. SILBERRAD.

Electrical conductivity and tensile properties of light magnesium-aluminium alloys as affected by atmospheric exposure. E. WILSON (J. Inst. Electr. Eng., 1930, 69, 89-94).-Comparative atmospheric corrosion tests have been made on stressed conductor wires of high-purity aluminium, aldrey, duralumin, and a 0.75% nickel-aluminium alloy. The change in resistance with time was least with the nickel alloy and greatest with duralumin; after two years the ratio R_0/R_t was 0.96 for the nickel alloy, 0.93 for aluminium, 0.90 for aldrey, and 0.85 for duralumin. Intercrystalline corrosion in the duralumin was very marked, but occurred to only a slight extent in aldrey and not at all in the nickel alloy or aluminium. The loss in weight and the increase in sp. resistance were the same for the nickel alloy after exposure for 24 yrs. as for aldrey after exposure for 1.5 yrs. All four conductors showed an average loss of 7.5% in the breaking load after 9 months, but there was a tendency for the more tightly stressed wires to suffer a smaller decrease in strength than that of similar wire under smaller stresses. The most marked deterioration caused by corrosion was in the elongation, especially in the case of duralumin, which after 8 yrs. failed to show any elongation in the tensile test. A. R. POWELL.

Corrosion and protection of aluminium rolling alloys in aircraft construction. P. BRENNER (Z. Metallk., 1930, 22, 348-355).-The various phenomena, such as local pitting, intercrystalline corrosion, etc., associated with the corrosion of duralumin and lautal in sea-water are discussed and illustrated with relation to their bearing on the use of aluminium alloys in aircraft construction. The causes of intercrystalline corrosion in duralumin are too low a quenching temperature, inefficient quenching (e.g., in oil or hot water), and too high an ageing temperature, all of which leave the copper in such a condition as to produce local elements. The best resistance to corrosion is obtained by quenching in cold water from above 500° followed by ageing at the ordinary temperature, and comparative tests with various aluminium alloys have shown that duralumin treated in this way behaves better than any of the other commercial aluminium alloys on exposure to sea water or atmospheric corrosion. Comparative tests on a new German and a new American alloy of the duralumin type are shown graphically. "KS sea-water" alloy in the hardened state has too low an elongation, and in the annealed state too low a tensile strength for aircraft work, but is definitely more resistant to corrosion than duralumin. The value of various protective coatingspaints, varnishes, electrolytically and chemically produced films, and pure aluminium-on hard aluminium alloys is briefly discussed. A. R. POWELL.

Corrosion of aluminium casting alloys. R. STERNER-RAINER (Z. Metallk., 1930, 22, 357-361).---The reduction in tensile strength and elongation of pure aluminium, commercial aluminium, and aluminium with small quantities of manganese, titanium, antimony, magnesium, iron, silicon, magnesium silicide, MgZn₂, cadmium, bismuth, zinc, or copper has been determined after 1-10 days' immersion in 3% sodium chloride solution. Of the alloying constituents tested, copper and MgZn₂ have the greatest accelerating effect on the corrosion of commercial aluminium, whereas magnesium up to 1%, antimony up to 2%, bismuth up to 2%, and Mg₂Si up to $2\cdot5\%$ appear to improve the resistance of commercial aluminium to corrosion. The behaviour of typical aluminium casting alloys during prolonged exposure to sea water has confirmed the superiority of "KS sea-water" alloy; apparently this alloy develops a highly resistant protective film in the early stages of exposure. A table showing the behaviour of pure aluminium, KS alloy, silumin, and the German and American light alloys towards numerous salt solutions, organic acids, and various foods is included. A. R. POWELL.

Micrographical researches on the corrosion of aluminium and its alloys. H. Röhrie (Z. Metallk., 1930, 22, 362—364).—Microscopical examination of polished sheets of aluminium and various light aluminium alloys after immersion in 50% nitric acid, 0.1Nhydrochloric acid, 0.1N-sodium hydroxide, and 3% sodium chloride solution containing 1% of hydrogen peroxide has shown that corrosion starts in the ground mass in the vicinity of a particle of a cathodic constituent and spreads either along the grain boundaries or concentrically outwards over the surface according to the nature of the corroding medium. Annealing tests on 99.8% aluminium show that the number and magnitude of the etching pits which form after immersion for 1 min. in aqua regia decrease rapidly with the temperature of annealing, owing to the impurities present entering into solid solution. A. R. POWELL.

Effect of physical state of small amounts of copper on rate of corrosion of lead by sulphuric acid. E. G. MAHIN and E. J. WILHELM (Ind. Eng. Chem., 1930, 22, 1397-1404).-The amount of copper retained in solution in lead-copper alloys is less than 0.0025%; alloys which have been quenched in water retain 0.065-0.08% in solid solution. Copper is precipitated if the alloy is annealed for 50 hrs. at 280°, but annealing at 100° for 500 hrs. precipitates copper only when its content reaches 0.06%. Rapid cooling increases the corrosion of lead by sulphuric acid owing to induced stresses, but the addition of up to 1% of copper reduces the attack, provided the alloy is quenched. When lead is to be subjected to annealing, the amount of copper present should not exceed 0.2%, as above this amount copper crystals separate and cause electrolytic action, whereby the protective coating of lead sulphate becomes ruptured. W. J. WRIGHT.

Corrosion of lead and its importance for the general knowledge of corrosion. M. WERNER (Z. Metallk., 1930, 22, 342-346).-Pure electrolytic lead melted in vacuo has a relatively fine-grained structure and an extraordinarily high resistance to corrosion by sulphuric acid and hydrochloric acid. Addition of small quantities of other metals may cause grain refinement or grain growth together with increased or diminished resistance to corrosion, but there is no relation between grain size and resistance to corrosion as stated by Brenthel (B., 1930, 286). Lead, which is rapidly attacked by sulphuric acid at 280°, is completely resistant thereto after addition of 0.1% Pt, but addition of a small quantity of bismuth renders the metal more readily soluble in sulphuric acid in spite of its action in refining the grain size. The presence of small quantities of elements more noble than, and insoluble in, lead may increase its resistance to corrosion by producing passive surface layers. On the other hand, elements which form a eutectic with lead tend to decrease its resistance to corrosion, as also does the presence of lead oxide.

A. R. POWELL. Physical and radiative properties of tantalum carbide [filaments]. K. BECKER and H. EWEST (Z. tech. Physik, 1930, 11, 148-150, 216-220; Chem. Zentr., 1930, ii, 597).-Tantalum carbide filaments are prepared by carburisation of tantalum wire in an atmosphere containing carbon. Such filaments are stable up to about 3600° Abs. in a vacuum or in an argon (85%)-nitrogen mixture. Decarburisation is effected at high temperatures by hydrogen or tungsten; the carbide is attacked by oxygen and aqueous vapour with formation of oxide. The carbide has m.p. 4150° Abs., and coefficient of thermal expansion $8 \cdot 2 \times 10^{-6}$. The specific electrical resistance at 20° is 1.02×10^{-4} ohm per cm. The electron emission is smaller than with tantalum, and the total radiation greater than with tungsten. A. A. ELDRIDGE.

Behaviour of metals towards disinfectant and

cleansing media. W. GUERTLER, T. LIEPUS, MOHR, and OSTERBURG (Metall-Wirt., 1930, 9, 447—449; Chem. Zentr., 1930, ii, 798).—The behaviour of metals and alloys towards various disinfectants at optimal concentration is recorded. A. A. ELDRIDGE.

Effect of carbon tetrachloride, trichloroethylene, and tetrachloroethane on metals. J. FORMÁNEK (Chem. Obzor, 1930, 5, 57—59; Chem. Zentr., 1930, ii, 976).—The corrosion of copper, brass, nickel, tin, lead, aluminium, zinc, iron, and iron coated with ferrosoferric oxide is negligibly small. Trichloroethylene and tetrachloroethane attack copper, brass, tin, iron, and iron coated with ferrosoferric oxide more markedly, but still to a relatively small extent. A. A. ELDRIDGE.

Influence of high-frequency oscillations on the treatment of metallurgical products. G. MAHOUX (Compt. rend., 1930, 191, 1328-1330).-Round bars of austenitic and nickel-chromium-molybdenum steels were subjected to the action of high-frequency oscillations and heated, simultaneously, for 10 hrs. at 500° in a current of ammonia. Comparison with test pieces treated similarly, but with the omission of the discharge, showed considerable increases in the Brinell-Vickers hardnesses of the surface and interior, in the magnetic susceptibility, and in the rate of nitridation, and a small increase in resilience. Both the penetration of an electrolytic deposit of chromium into a soft steel, and the diffusion of carbon from the centre to the outside of an iron casting heated for 9 hrs. at 530° were accelerated by the action of the discharge (cf. following abstract). J. GRANT.

[Influence of high-frequency oscillations on the treatment of metallurgical products.] L. GUILLET (Compt. rend., 1930, 191, 1331-1332).—The experiments of Mahoux (preceding abstract) have been confirmed. The possibilities of the process are indicated. J. GRANT.

Effect of surface conditions and electrodeposited metals on the resistance of materials to repeated stresses. R. H. D. BARKLIE and H. J. DAVIES (Proc. Inst. Mech. Eng., 1930, 731-750).-The fatigue limit of steel is seriously reduced by electroplating it with nickel, owing to the formation of a crack in the nickel layer under the combined influence of its own tensile stress and of the stress applied in the test and the resulting concentration of stress at the base of this crack. This effect of nickel-plating exceeds that produced by a circular groove in the test piece of equal depth to the depth of the crack as the internal stress in the nickel tends to widen the crack. The difference between the effects of the groove and the crack decreases with decreasing thickness of the deposit and depth of groove. The deleterious effects of nickel-plating may be avoided by depositing the nickel at 50°, using a superposed alternating current, and treating the iron anodically in 10% sulphuric acid prior to plating. Copper plate free from internal stress reduces the fatigue limit of steel as the deposit cracks at a lower range of stress than the steel; zinc and lead deposits, on the other hand, have no effect on the fatigue limit of steel, and the deposition of a very thin layer of lead, e.g., 1×10^{-7} in. thick, is sufficient to insulate the steel from the effect of stressed nickel deposits. A. R. POWELL.

Contamination of solutions (in cleaning and electroplating). F. J. LISCOMB (Metal Ind., N.Y., 1930, 28, 427-429).—A discussion of the introduction of iron into alkaline cleaning and electroplating solutions, which should be free from chlorides and used in rubberlined tanks. Sódium ferrocyanide does not interfere with anodic corrosion in acid copper solutions except when the free cyanide is low and the current density high. CHEMICAL ABSTRACTS.

Determination of cathodic yield in chromiumplating baths. O. MACCHIA (Ind. chim., 1930, 5, 561—565; Chem. Zentr., 1930, ii, 975).—The chromium is deposited on copper or nickel-plated copper strips which have previously been immersed for 1 min. in boiling 10% potassium cyanide solution, dried with filter paper, then dried for 5—6 min. at 50—60° and weighed. With the nickel-plated strips the deposit of chromium is dissolved anodically in 10% sodium hydroxide solution against a lead cathode.

A. A. ELDRIDGE. Plating of rolled zinc and zinc-base die-castings. E. A. ANDERSON and C. E. REINHARD (N.J. Zinc Co. Res. Bull., 1929, Nov., 12 pp.).—Successful methods, together with modifications, are described.

CHEMICAL ABSTRACTS.

Electrodeposition of lead on metals. N. A. ISGARISCHEV and A. N. IVANOV (Min. Suir. Tzvet. Met., 1929, 4, 1048—1052).—White, finely crystalline deposits of lead were obtained on copper or iron from a bath containing lead ace⁴ ate (25 g.), acetic acid (80%, 32 g.), glue (1 g.), and pyridine (2 c.c.) in water (1 litre); the current density could be increased to 0.33 amp./in.²

CHEMICAL ABSTRACTS. Mercury for power production. SAMUELSON.

Heat transfer from gas stream to broken solids. FURNAS.—See I. Gas-cleaning plant. Lévêque.— See XI.

PATENTS.

Furnaces for the heat treatment of metals [iron] etc. A. SMALLWOOD and J. FALLON (B.P. 337,362, 25.6.29).—The furnace comprises a muffle chamber for heating the billets for colling and one or more secondary chambers' heated by waste gases from the muffle and adapted for the heat treatment of the sheets produced in the rolling of the ingots. A. R. POWELL.

Slag-reducing process [for steelworks' slag]. T. F. BALLY and L. G. PRITZ (U.S.P. 1,754,845, 15.4.30. Appl., 28.1.28).—Basic and acid slags from steel furnaces are reduced with carbon in an electric arc furnace to yield ferromanganese containing silicon and phosphorus and a slag containing lime, alumina, and silica; after addition of scrap iron this slag is heated further with more carbon to produce ferrosilicon and a highly basic aluminate slag which can be used again in the steel furnaces. A. R. POWELL.

Reduction of metal oxides [iron ore] without melting. W. H. SMITH (U.S.P. 1,759,173, 20.5.30. Appl., 10.5.28).—A mixture of iron ore and carbon is passed downwards through a long vertical retort divided into four zones: a preheating zone at the top followed by a reducing zone, a nodulising zone, and finally a cooling zone at the bottom. The first three are electrically heated at 425°, 870°, and 1040°, respectively, and provision is made for withdrawing evolved gases at points between succeeding zones. A stream of carbon monoxide is passed upwards from the bottom of the cooling zone to drive out carbon dioxide and steam therefrom and thus prevent re-oxidation of the reduced iron sponge. A. R. POWELL.

Manufacture of steel having good machining properties. F. BORGGRÄFE (B.P. 318,177 and 339,946, [A] 28.8.29, [B] 12.9.29. Ger., [A] 29.8.28, [B] 22.12.28).— (A) Scrap steel or iron is melted in a cupola with siliconiron, ferrosilicon, or hæmatite pig iron low in phosphorus, and the resulting metal is mixed with Thomas pig iron so that the mixture contains about 0.25% P. The product is refined in a small acid-lined Bessemer converter until the required carbon content (0.04— 0.10%) is obtained, deoxidised with ferromanganese, and cast into ingots which contain 0.2—0.5% P, 0.3—0.6% Mn, 0.04—0.1% C, 0.05—0.15% S, and 0.1—0.25% Si. (B) The refining is effected in an acid-lined open-hearth furnace. A. R. POWELL.

Removal of the last traces of oxygen from iron alloys. A. GLAZUNOV (B.P. 317,493, 17.8.29. Czechoslov., 18.8.28).—The metal is deoxidised with an alloy of lead containing sodium and calcium or magnesium. The deoxidiser is introduced into the iron bath in a perforated sheet-iron cage of such a weight that the cage and alloy are sufficiently heavy to sink through the slag into the bath before the alloy melts. A. R. POWELL.

Heat treatment of manganese steel. H. WADE. From TAYLOR-WHARTON IRON & STEEL Co. (B.P. 339,521, 31.12.29).—The grain structure of austenitic manganese steel is refined by annealing at 450—525° for 72 hrs. to cause partial transformation of the austenite, cooling slowly to 20°, reheating at 1060° to reconvert the martensite etc. into austenite, and quenching in cold water. A. R. POWELL.

Production of magnetic materials [heat treatment of permalloy]. P. S. McCANN, Assr. to WESTERN ELECTRIC Co., INC. (U.S.P. 1,765,436, 24.6.30. Appl., 6.11.24).—Permalloy tape is annealed at 1200°, cooled slowly to 800°, quenched, and reduced in thickness at least 50% by rolling. A. R. POWELL.

Refining and working of copper. H. H. Stour (B.P. 317,400, 12.8.29. U.S., 15.8.28).—Broken copper cathodes, clean scrap, or copper shot are pressed into briquettes which are heated below the m.p. in an atmosphere of hydrogen or carbon monoxide to effect reduction of the surface oxide films and removal of dissolved oxygen, then subjected to pressure at the same temperature to consolidate the briquettes into a homogeneous mass which is finally extruded into rods.

A. R. POWELL.

Unoxidisable [manganese-copper-nickel] alloy. C. CONTAL (U.S.P. 1,771,773, 29.7.30. Appl., 17.7.29. Fr., 21.6.29).—The alloy comprises 40 (40—50)% Ni, 31 (30—40)% Cu, 18 (10—20)% Mn, 9 (5—15)% Sb, and 2 (1—10)% Sn. It has d 8.28, m.p. about 1000°, a white colour and homogeneous microstructure, and is highly resistant to the action of sulphuric and nitric acids, steam, ammonia, and caustic alkalis.

A. R. POWELL.

Manufacture of porous metals or metal oxides. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 339,645, 5.9.29).—The metal oxide is made into a stiff foam with an organic reagent, the foam is dried at 100°, and the resulting porous mass heated at a suitable temperature in a reducing atmosphere to produce a porous sinter of the metal. E.g., 120 pts. of cupric oxide are beaten up with a foam made from 100 pts. of a 2% solution of sodium diisopropylnaphthalenesulphonate and the dried foam is heated at 900-1000° in hydrogen. The copper oxide may be replaced by the oxides of silver, iron, lead, or nickel, or by powdered chromium, molybdenum, aluminium, or silicon, and the sulphonate by other similar compounds or by saponin, with or without binders such as glycol, glycerol, or glue. The products are suitable for use as catalysts.

A. Ř. POWELL.

Aluminium alloy. H. J. GARRARD (B.P. 338,923, 30.5.29).—A hardener alloy containing 37% Al, 17% Mg, and 46% Zn is prepared and cast into ingots. Pure aluminium is then melted in an electric furnace and 3-20% of the hardener added, followed by 0.5-5% Bi. The resulting castings have an ultimate strength of 15—18 tons/in.², which may be increased to 30 tons/in.² by cold-work. A. R. POWELL.

Production of ingots from metals of high crystallising speed, e.g., aluminium and its alloys. H. RÖHRIG (B.P. 339,624, 8.7.29).—The metal is cast into covered moulds the bottoms of which consist of a metal having a high heat conductivity and the sides and covers of a heat-insulating material into which may be embedded heating means so that cooling takes place only at the bottoms of the ingots. [Stat. ref.]

A. R. POWELL.

Increasing the resistance to corrosion of aluminium alloys. DURENER METALLWERKE A.-G. (B.P. 318,999, 16.8.29. Ger., 14.9.28).—Duralumin containing 0.25-1% Mg, 3.5-5% Cu, and 0.2-1% Mn is coated on one or both sides with a thin layer of another duralumin alloy, containing, e.g., 0.2-1% Mg and 0.2-2%Mn, but no copper, and the combined alloy is heattreated in the usual way. A. R. POWELL.

Increasing the radiation constant of or heatabsorbing and -emitting capacity of metallic surfaces. [Providing electron-metal engine cylinders with an oxidised aluminium coating.] W. W. TRIGGS. From VEREIN. ALUMINIUM-WERKE A.-G. (B.P. 339,722, 11.10.29).—Cylinders of electron metal for use in a combustion engine are provided with a thin coating of aluminium or an aluminium alloy and the surface of the coating is treated in known manner to produce thereon an adherent film of alumina. [Stat. ref.]

A. R. POWELL.

Blast-roasting or sintering of [zinc] ores and metallurgical materials. NAT. PROCESSES, LTD., and T. B. GYLES (B.P. 338,886, 27.8.29).—Furnace gases with a low content of sulphur dioxide (e.g., 0.5%) are passed through a heap of zinc oxide sinter until the

sulphur content of the latter rises to 7-8%; 3 pts. of this material mixed with 1 pt. of raw blende are then roasted on a Dwight-Lloyd sintering grate, whereby a good sinter containing only 0.2% S should be obtained. Alternatively the gases may be passed through a mixture of raw and partly calcined blende and the product blast-roasted as before. A. R. POWELL.

Zinc-base die-casting alloy. New JERSEY ZINC Co., Assees. of E. A. ANDERSON (B.P. 340,104, 20.11.29. U.S., 5.6.29).—The alloy contains 2-10% Al and $0\cdot1-0\cdot3\%$ Mg: the zinc used contains more than $99\cdot99\%$ Zn, $< 0\cdot003\%$ Pb, $< 0\cdot003\%$ Cd, and $< 0\cdot001\%$ Fe. This alloy is not subject to growth or intercrystalline oxidation. A. R. POWELL.

Simultaneous reduction of [nickel] ores and conversion of carbonaceous materials into hydrocarbons of low b.p. J. L. FOHLEN (B.P. 339,276, 25.7.29).—The gases from the destructive distillation of lignite are passed through a heated mass of garnierite and calcium sulphide and the resulting nickel matte is separated from the slag, crushed, roasted to oxide, and reduced at 150—300° by means of the vapour of the liquid products obtained in the lignite distillation, whereby nickel powder and cracked hydrocarbon products of low b.p. are obtained. The combustible gases obtained in the process are utilised in heating the retorts and the rotary furnace in which the matte is produced. A. R. POWELL.

[Silver-copper-nickel] alloy. M. E. BARKER, Assr. to H. H. SEMMES (U.S.P. 1,757,507, 6.5.30. Appl., 5.9.28).—An alloy of 55—65% Ni, 27—37% Cu, and 3—13% Ag is claimed. The preferred composition is 60% Ni, 32% Cu, and 8% Ag. The colour resembles that of silver, and the alloy is not tarnished by exposure to acid foods or by the air. A. R. POWELL.

(A) Manufacture of metallic [copper] sheet, strip, or wire. (B, C) Electrodeposition of metals. S. O. COWPER-COLES (B.P. 338,173, 338,487, and 338,540, [A] 16.5.29 and 17.1.30, [B] 15.5., 28.11., 27.12., and 31.12.29, and 7. and 17.1.30, [c] 15.5.29.)-(A) The metal is deposited on a slowly rotating disc-cathode and is automatically stripped therefrom in the form of a sheet or strip which is thickened by a further electroplating process using the same or one or more other metals. During the thickening operation the original sheet or strip is supported on a glass plate and subjected to the smoothing action of rollers which are free to move to a limited extent in the direction of travel of the sheet. (B) The metal is deposited on a mandrel which is revolved at such a speed that fresh electrolyte is continuously brought into contact with it. By means of loosely mounted rotating discs the deposit is kept smooth, and means are provided for stripping the mandrel of the deposit in the form of a cylinder or as a helical spiral strip. (c) The mandrel consists of brass or copper the surface of which has been oxidized or sulphide ed and then coated with a film of graphite to allow of ready removal of the deposit. A. R. POWELL.

Electrolytic production of alloys of calcium or strontium with lead. METALLGES. A.-G. (B.P. 318,599, 6.9.29. Ger., 6.9.28).—Calcium or strontium chloride. is fused with 20-40% of its weight of sodium chloride or, preferably, with 60-80% of its weight of potassium chloride, and the bath is electrolysed at 650-700%, using a lead cathode and a carbon anode with a current density not exceeding 4 amp./cm.² of anode area.

A. R. POWELL.

Apparatus for high-temperature treatment of ores etc. M. FORMENT (U.S.P. 1,786,202, 23.12.30. Appl., 22.12.26. Fr., 2.2.26).—See B.P. 265,548; B., 1927, 753.

Reduction of ores. H. WITTEK (U.S.P. 1,787,348, 30.12.30. Appl., 1.12.26. Ger., 26.7.26).—See B.P. 274,803; B., 1928, 269.

Reduction of metals from ores. J. W. HORNSEY, Assr. to GRANULAR IRON CO. (U.S.P. 1,786,999, 30.12.30. Appl., 27.9.28).—See B.P. 306,561; B., 1929, 360.

Reduction of ore and conversion of hydrocarbons. W. H. SMITH (U.S.P. 1,785,427-8, 16.12.30. Appl., [A] 27.12.26, [B] 4.4.27).—See B.P. 288,193; B., 1929, 398.

Extraction of tin from ores or materials containing tin. E. A. ASHCROFT (U.S.P. 1,786,386, 23.12.30. Appl., 4.5.28. U.K., 24.6.27).—See B.P. 297,784; B., 1928, 899.

Recovery of fluorspar from ores thereof. J. C. WILLIAMS and O. W. GREEMAN, ASSTS. to ALUMINUM CO. OF AMERICA (U.S.P. 1,785,992; 23.12.30. Appl., 26.9.28).—See B.P. 319,685; B., 1931, 68.

Production of lamelliform metal powders. E. Podszus, Assr. to HARTSTOFF-METALL A.-G. (HAMETAG) (U.S.P. 1,785,283, 16.12.30. Appl., 6.9.23. Ger., 12.9.22). —See B.P. 204,055; B., 1924, 985.

Protectively treating metals. A. ARENT, ASST. to A. ARENT LABS., INC. (U.S.P. 1,770,828, 15.7.30. Appl., 8.12.25).—See B.P. 338,221; B., 1931, 119.

Removal of foreign substances such as grease and rust from metal surfaces. C. F. DINLEY (B.P. 340,323, 28.9.29).—See U.S.P. 1,729,767; B., 1930, 18.

Concentration of minerals (B.P. 337,458).—See II.

XI.—ELECTROTECHNICS.

Industrial development of the electrical cleaning of gas. Lévêque (Kev. Mét., 1930, 27, 513-521).-Several electrostatic gas-cleaning plants in various French metallurgical works are illustrated and brief details of the volume of gas treated, the recovery of suspended particles, and the power consumption are given.

A. R. POWELL.

[Tar cokes from] torbanites. NIEMANN. Reacting methane-carbon dioxide mixture. PETERS and PRANSCHKE.—See II. Copper-steel. CARIUS. Conductivity of magnesium-aluminium alloys. WILSON. Protecting aluminium alloys. BRENNER. Tantalum carbide filaments. BECKER and EWEST. Treatment of metallurgical products. MAHOUX; GUILLET. Electrodeposited metals. BARKLIE and DAVIES. Contamination of plating solutions. LIS-COMB. Chromium plating. MACCHIA. Plating of zinc. ANDERSON and REINHARD. Deposition of lead on metals. ISGARISCHEV and IVANOV.—See X. **PH** of soils. FROGNIER. Calomel electrodes for soils. SALMINEN.—See XVI. Cinchona assay. KRANTZ.— See XX.

PATENTS.

Conducting chemical reactions in gases and vapours with the aid of electrical discharges. I. G. FARBENIND. A.-G., Assees. of (A) O. EISENHUT and (A, B) W. FRANKENBURGER (G.P. 457,563 and Addn. G.P. 458,756, [A] 25.9.24, [B] 30.9.24).-(A) The gas subjected to an interrupted glow is mixture discharge produced by allowing mercury to fall in a fine stream of drops from a mercury reservoir, which forms one electrode, into a small trough which forms the other electrode. The overflow from the lower electrode is automatically pumped back to the upper reservoir. Alternatively, the gas mixture may be passed down a tube containing perforations between metal electrodes on to which mercury is allowed to drop so as to produce a glow discharge in the neighbourhood of the perforations. (B) The gas mixture is passed through a reaction chamber filled with a metal-vapour catalyst at a low temperature and surrounding a transparent vessel in which the electrical discharge takes place. In this apparatus a mixture of methane and nitrogen vields hydrogen cyanide and methylcarbylamine.

A. R. POWELL.

[Closing device for] doors of electric [annealing] furnaces. HIRSCH, KUPFER- U. MESSINGWERKE A.-G. (B.P. 340,730, 3.12.29. Ger., 11.3.29).

Manufacture of [indirectly heated] cathode for thermionic devices. W. R. BULLIMORE (B.P. 340,212, 18.9.29).

[Starting device for] electric-discharge lamps with rare gas filling. A. LEDERER (B.P. 340,213, 19.9.29. Austr., 4.10.28).

X-Ray tubes [for dental purposes]. T. H. FORDE and N. W. MELLARS (B.P. 317,451, 16.8.29).

Light-sensitive apparatus [selenium cell]. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of A. W. HULL (B.P. 319,286, 19.9.29. U.S., 19.9.28).

Graphite (B.P. 337,738). Carbonaceous material (U.S.P. 1,763,063). Recovering naphthalene from gases (B.P. 337,723). Cracking of petroleum oil (U.S.P. 1,766,987).—See II. Rare-metal oxides (B.P. 339,608).—See VII. Reduction of steelworks' slag (U.S.P. 1,754,845). Magnetic materials (U.S.P. 1,765,436). Copper sheet etc. (B.P. 338,173, 338,487, and 338,540). Calcium- or strontium-lead alloys (B.P. 318,599).—See X. Indicator of atmospheric pollution (B.P. 340,195).—See XXIII.

XII.—FATS; OILS; WAXES.

Examination of fats. A. S. Koss (Przemysl Chem., 1926, 10, 33—35; Chem. Zentr., 1930, ii, 491).—Values of $n_{\rm D}$ and viscosity of various oils and of their mixtures with solar oil are recorded. In certain cases the values may be employed analytically. A. A. ELDRIDGE.

Use of ultra-violet light for detection of solventextracted cacao butter. W. T. FIELD (Analyst, 1930, 55, 744-745).—As a means of differentiating extracted and expressed butters, examination of a 1% solution of cacao butter in light petroleum in ultra-violet light has been found not entirely satisfactory. The conclusions reached are that (i) a non-fluorescent butter is almost certainly not solvent-extracted and is from lowroast beans, (ii) a highly fluorescent butter is probably solvent-extracted or is contaminated with mineral oil, (iii) slight fluorescence affords inconclusive evidence which must be supported from other sources.

H. J. DOWDEN.

[Olive] oils under ultra-violet light. E. R. BOLTON (Analyst, 1930, 55, 746).—The examination of olive oils in ultra-violet light (cf. Glantz, B., 1930, 916) has no diagnostic value since certain adulterants (e.g., teaseed oil) will reproduce the effects of a virgin oil, whilst certain methods of refining will entirely remove the characteristic fluorescence. H. J. Dowden.

Oxygen absorption and skin formation of oils and varn'sh. ANON. (Farben-Ztg., 1931, 36, 646-647, 691-693).-The changes in weight and in physical condition on storage of raw, varnish, boiled, and "stand" linseed oils, cobalt rosinate solution, and oil varnishes were observed, the samples being kept in closed press-capped tins about one fourth filled, the lids being removed at each weighing to renew the air. From the results, which are discussed on the light of current views on colloidal processes involved in the drying of oil films, it is concluded that oxygen absorption is the first and essential stage, and that the subsequent colloidal changes are produced thereby. The significance of oxygen absorption in varnish manufacture is indicated and the prevention of "skinning" by the use of non-drying oils and inhibitors and by exclusion of air is briefly discussed. S. S. WOOLF.

Purification of castor oil. A. TIKHONOV (Masloboino Zhir.-Delo, 1929, No. 7, 9—14).—Purification (a) by heating with water and treatment with sodium chloride solution, and (b) by treatment with sodium hydroxide solution together with sodium chloride, is described. CHEMICAL ABSTRACTS.

Causes of the increase in acidity of castor oil. V. JONES and M. BAUMAN (Masloboino Zhir.-Delo, 1929, No. 4, 28—39).—The lipolytic enzyme passes during pressing of the seed into the oil, where its activity is stimulated by the water-soluble acids of low mol. wt. arising from the fermentation of the foots in the unfiltered oil. The acids of high mol. wt. formed by hydrolysis of the oil do not exert any appreciable influence on the activity of the enzyme. CHEMICAL ABSTRACTS.

Darkening of cod-liver oil in the presence of iron. A. E. BRIOD and W. G. CHRISTIANSEN (J. Amer. Pharm. Assoc., 1930, 19 1308—1309).—Darkening and increase in the iron content of a commercial sample of poultry cod-liver oil stored in contact with iron is retarded by dehydration without removing the fatty acid, and, to a smaller degree, by using the alkali-refined oil. E. H. SHARPLES.

Hydrogenation of polymerised and oxidised oils. A. BAG (Masloboino Zhir.-Delo, 1929, No. 7, 40-44).—Sunflower oil, (a) untreated, (b) polymerised by heating in carbon dioxide, and (c) oxidised by air, was hydrogenated with nickel at 230-240°. Poly-

merised oil was not depolymerised; oxidation products are reduced. When air is blown through the oil oxidation and polymerisation take place simultaneously. The hydrogenation products of the three oils are not identical. CHEMICAL ABSTRACTS.

Second Shanness Substracts -B.

Formation of isooleic acid in the hydrogenation of sunflower oil. B. TIUTIUNNIKOV and R. KHOLO-DOVSKAYA (Masloboino Zhir.-Delo, 7929, No 5, 535-61). —Unsaturated solid acids cannot be produced by the dehydrogenation of stearic acid. In the earlier stage of hydrogenation 66% of the linoleic acid is reduced to $\Delta^{\mu\nu}$ oleic acid; in the latter stage this isomerises to $\Delta^{\iota\kappa}$ -oleic acid, or isomerides with the double linking nearer to the carboxyl group. CHEMICAL ABSTRACTS.

Drying of palm oil in a drying oven and extraction in a Soxhlet apparatus. G. DE BELSUNCE (Bull. Mat. grasses, 1929, 289-290; Chem. Zentr., 1930, 1, 3116).-Samples of palm oil dehydrated for 19 hrs. at 100° showed losses in weight which were almost inversely proportional to the weight taken. On account of them strong solvent powers for resinous and non-fatty substances carbon disulphide and trichloroethylene are unsuitable for extraction in a Soxhlet apparatus. Extracts with the latter must be purified by treatment with light petroleum, but even then the error is about 1%. Light petroleum is the most suitable extraction medium for dried substances. Drying of the fleshy fruit at 100° is unreliable, but the use of a vacuum desiccator is satisfactory. L. S. THEOBALD.

Oil palms of Angola. C. DE M. GERALDES (Bull. Mat. grasses, 1930, 105—112; Chem. Zentr., 1930, ii, 492).—The oil content of the fruit and of the kernels of several varieties of *Elaeis guineensis* and *E. Poissoni* is recorded. A. A. ELDRIDGE.

Oil-palm fruit and its oil. C. DE M. GERALDES [with C. DUARTE and F. GOUVEIA] (Bull. Mat. Grasses, 1930, 97—104; Chem. Zentr., 1930, ii, 492).—A study was made of varieties of *Elaeis guineensis* and *E. Poissone* in respect of the characteristics of the oil, its yield, and the composition of the pericarp and kernel.

A. A. ELDRIDGE.

Pumpkin-seed oil. N. BELIAIEV (Masloboino Zhir.-Delo, 1929, No. 7, 38—40).—The whole seeds, kernels, and husks, respectively, contained : *oil 24.73, 51.76, 10.0; crude protein 18.36, 35.03, 5.13; crude fibre 54.16, —, 61.15; ash 2.44, 4.16, 1.22%. The oils from the whole seeds and the kernels, respectively, had d^{15} 0.9266, 0.9246; saponif. value 190.05, 188.46; iodine value 129.14, 126.50. The fatty acids, m.p. 27° , f.p. 17° , have iodine value 106.01, saponif. value 215.66. The oil resembles sunflower-seed oil.

CHEMICAL ABSTRACTS.

Rye oil. J. W. CROXFORD (Analyst, 1930, 55, 735– 738; cf. Paul, B., 1921, 518 A).—Rye oils obtained from the grain, from "Ryvita crisphread," and from rye flour, by extraction with light destroleum followed by drying at 70° in an atmosphere of carbon dioxide, have been examined. The oil (semi-solid at 15°) may be classed as a semi-drying oil having an abnormally high proportion (9.3%) of unsaponifiable matter. Vitamins-A and -B are apparently absent. Rye oil (average of 4 samples) had: d_{15}^{15} 0.9353, acid value 20.6, iodine value (Wijs) 121.4, bromine value (vapour method) 75.6, saponif. value 181.3. The fatty acids derived from the oil had (aver. values): m.p. 36.8°, iodine value 126.2, bromine value (vapour method) 79.3, mean mol. wt. 299.6, and consisted of linoleic (60.9%), oleic (17.7%), and solid (21.4%) acids.

H. J. DOWDEN.

Sulphonated oils. VIII. Solubilities of ricinoleic acid sulphuric ester and its alkali salts in hydrochloric acid and salt solutions. K. WINOKUTI. IX. Properties of commercial sulphonated oils. K. NISHIZAWA, K. WINOKUTI, and S. IGARAS (J. Soc. Chem. Ind. Japan, 1930, 33, 342-344 B, 344-349 B).-VIII. The solubilities are tabulated. A modification of the ether-brine method for the determination of inorganic sulphate, suitable for samples which are not salted out by brine, is mentioned. The mechanism of Kern's process (B., 1920, 632 A) is explained as the conversion, by the mild acidity of monosodium phosphate, of the sulphuric esters into acid salts, and the soaps into fatty acids, which are then salted out completely. It is shown (a) that losses of the esters would be negligible if sodium sulphate solution were used for washing sulphonated oils during the manufacture, and (b) that in separating sulphoricinoleic ester from aqueous solution, quantitative results are obtained when alkali chlorides, sulphates, etc. (cf. A., 1930, 321), or acetates followed by strong acids, are used as reagents for double decomposition and salting out.

IX. A systematic study has been made of seven commercial oils from German and Japanese sources. As in the case of pure sodium sulphoricinoleate (cf. A., 1930, 321), the properties of the oils are determined by the degree of neutralisation. The influence of concentration on the surface tension and viscosity is, in general, of the same type, but the effect on the stability of the solutions (towards acids and salts) differs markedly for the various samples. E. LEWKOWITSCH.

Separation of the acids of arachis oil by application of a new principle in fractional distillation. E. JANTZEN and C. TIEDCKE (J. pr. Chem., 1930, [ii], 127, 277-291).-An apparatus is described for fractional distillation in a high vacuum, and measurement of the m.p. of the distillate while the operation is in progress. A pear-shaped flask, with a tubulure carrying a thermometer which reaches to the bottom, is affixed to an effectively lagged column, packed with aluminium rings, and maintained by electrical heating at a suitable temperature. A capillary is unnecessary. Condensed liquid from the analyser flows out of the column through a side-arm terminating in a capillary ; but on account of the slow flow of liquid through this capillary, most of it overflows and is returned through the column. The distillate may be made to pass through another capillary surrounded by a water-jacket carrying a thermometer and stirrer, where, by cooling, it may be solidified, and by reheating its m.p. may be determined. The methyl esters of the acids of high m.p. from arachis oil give, when distilled in this apparatus, three main fractions of practically constant m.p. By recrystallisation to constant m.p., hydrolysis, and direct comparison of the acids with the synthetic products, these are identified as the methyl esters of *n*-eicosoic, m.p. $44 \cdot 4 - 44 \cdot 7^{\circ}$, *n*-docosoic, m.p. $52 \cdot 4 - 52 \cdot 6^{\circ}$, and *n*-tetracosoic, m.p. $57 \cdot 8 - 58^{\circ}$, acids. This is the first definite proof of the existence of *n*-tetracosoic acid in arachis oil. No indication of the presence of *iso*docosoic or *iso*tetracosoic acids could be obtained. H. A. PIGGOTT.

Mechanism of the action of siccatives and of anti-oxidants. G. DUPONT (Bull'. Inst. Pin, 1930, 285-288).-In the air-oxidation of linoleic acid one of the oxidation products is an accelerator, *i.e.*, the action is autocatalytic. In the case of abietic acid the catalyst is an oxygenated abietic acid, AO, capable of combining with oxygen to form a peroxide, $(AO)O_2$, which oxidises 2 mols. of abietic acid. Siccatives (of which the most active is cobalt abietate or resinate) act by associating with the oxide, AO, and thus stabilising it in its active form. On the other hand, the association of AO with an anti-oxidant, such as quinol, leads to its stabilisation in an inactive form, and the amount of anti-oxidant necessary is that required to combine with and inactivate the AO present. C. HOLLINS.

Manganese soaps. H. WAGNER and G. HOFFMANN (Farben-Ztg., 1931, 36, 689-691).—The behaviour of umbers (2-30% Mn), pyrolusites, and laboratoryprepared hydroxides of manganese of different degrees of oxidation, when mixed with linoleic acid and subjected to the action of ultra-violet light, was studied microscopically. Photomicrographs show that crystals of manganese soaps and of linoleic acid may separate out. Umbers of relatively high manganese content yield soaps, but pyrolusite does not so react. The experiments with the prepared hydroxides show that crystallisation is induced by the presence of free oxygen or other suitable catalyst. S. S. WOOLF.

Lubricating oils. TAUSZ and STAAB.—See II. Effect of soap on aluminium. BOHNER. Resistance of aluminium to fatty acids. CLAUS.—See X. Prevention of foaming. MEYER.—See XV. Iodometry of food products. FUCHS and others. Milk fat. ANDERSEN.—See XIX. Spiritus saponatus etc. MEYER. Emulsions. SMITH and others.—See XX. Germicidal soaps. SCHAFFER and TILLEY.—See XXIII.

PATENTS.

Preservation of bones [for fat and glue extraction]. BRIT. GLUES & CHEMICALS, LTD., and R. B. DREW (B.P. 340,010, 7.9.29).—Fresh bones are comminuted (preferably in the form of shavings), washed, and dried by heating *in vacuo* or in a current of dry air until the moisture content is reduced to about 10%. Suitable plant is described. The product may be stored without decomposition. E. LEWKOWITSCH.

Heat treatment of plants and fruits containing oil. GUTEHOFFNUNGSHÜTTE OBERHAUSEN A.-G. (B.P. 340,107, 25.11.29. Ger., 23.11.28. Addn. to B.P. 339,048; B., 1931, 125).—The oily fruits are heated in a stream of hydrogen; catalysts may be introduced by mixing the fruits with oxides of iron, copper, manganese, etc., or by steeping them in solutions of salts of these metals prior to heating, or the vapours produced may be led over the catalyst. E. LEWKOWITSCH. Apparatus for recovery of fats, oils, or oleaginous substances from materials yielding them. W. T. POWLING, Assr. to J. W. PITTOCK (U.S.P. 1,785,361, 16.12.30. Appl., 13.1.27. U.K., 29.1.26).—See B.P. 269,985; B., 1927, 495.

Production of neutral fats and oils. O. JORDAN and G. KRAEMER, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,786,248, 23.12.30. Appl., 18.3.29. Ger., 5.4.28).— See B.P. 312,523; B., 1929, 608.

Water-soluble product from fatty acids in wool fat. G. MAUTHE and A. THAUSS, ASSIS, to GEN. ANILINE WORKS, INC. (U.S.P. 1,784,941, 16.12.30. Appl., 31.1.29. Ger., 7.2.28).—See B.P. 305,597; B., 1930, 725.

Shredded soap manufacture. J. A. SCHWANTES, Assr. to COLGATE-PALMOLIVE-PEET CO. (U.S.P. 1,785,532—3, 16.12.30. Appl., 28.6.28).—See B.P. 314,482; B., 1930, 725.

Extraction of vitamin-A from fish oils and the like. K. Takahashi, Assr. to Zaidan Hojin Rikagaku Kenkyujo (U.S.P. 1,786,095, 23.12.30. Appl., 2.5.23. Jap., 10.2.23).—See B.P. 220,697; B., 1924, 886.

Fatty acid derivatives (B.P. 337,368).—See III. Washing processes (B.P. 338,121).—See VI. Resinous products (B.P. 339,958).—See XIII.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

"Setting " of red lead [paint]. W. VAN WÜLLEN-SCHOLTEN (Farben-Ztg., 1931, 36, 644-645).-The viscosity-time relationships were determined for a number of red lead paints comprising non-setting and " normal " red leads with a range of different proportions of oil, various mixtures of litharge and lead peroxide with the same proportion of oil, and paints in which the amounts of oil for grinding and for thinning out and the period between these two operations were varied. The results, which are tabulated and graphed, indicate that the amount of oil used should be kept as high as is compatible with general utility, opacity, etc. Increase in peroxide content diminishes settling on storage, other things being equal. Allowance of a period of 3-4 days between grinding and thinning out is recommended. S. S. WOOLF.

Possibilities of inorganic paint vehicles. N. HEATON (J. Oil and Col. Chem. Assoc., 1930, 13, 330— 340).—Organic media generally employed in the paint industry have decided limitations, chiefly with respect to temperature, moisture, and chemical activity. The author reviews the classical methods of mural decoration, and shows that the recent work of Laurie, Wilson, and of King on the uses of silicon ester as a paint vehicle offers a great advance on the older methods (cf. King, B., 1930, 622). Purely inorganic vehicles such as sodium silicate are not of general application, nor is the silicon ester method suitable where the surface to be painted is non-porous, owing to the limited elasticity of the silica film. F. C. HARWOOD.

Pigment primaries and mixtures. F. F. RUPERT (J. Opt. Soc. Amer., 1930, 20, 661–684).—An account is given of an attempt to establish a method of predicting quantitatively the results of mixing of coloured paints, especially of water colours, by the application of certain general principles to the spectrophotometric curves of the constituents of the paint mixture. Owing to the complexity of mathematical relations obtained from theoretical considerations and ignorance of some necessary factors, a satisfactory method was not discovered. W. Goop.

Inks and ultra-violet light. C. A. MITCHELL (Analyst, 1930, 55, 746—747).—Whilst erasures of pencil markings are readily distinguishable under ultra-violet light, the differentiation of writing inks or of writings in the same ink of different ages is less satisfactory. Tannin solutions of different origin have characteristic fluorescent appearances, but when made into inks they are indistinguishable even when the inks on paper are obviously different. H. J. DOWDEN.

Removal of printer's ink [from paper]. G. SCHWALBE (Z. angew. Chem., 1931, 44, 24).—Small quantities of gum or gutta-percha in trichloroethylene solution remove the ink by emulsification.

E. S. HEDGES. "Gemmes "[crude resin-terebenthene]. (MLLE.) M. BARRAUD (Bull. Inst. Pin, 1930, 217-223).-In Austrian pine "gemmes" (excluding the "barras" or sixth "gemme") the terebenthene varies from 19.8 to 20.8%, resin 64-72%, ash 2-4.5%, and water 3-14%; the Sourgen process gives a "gemme" with $4\cdot 5-23\%$ of water. The proportion of terebenthene is largest in the early part of the year; the effects of the size of the incision, the mode of collection, the orientation and age of the incision, the size of the tree, and its distance from the sea are described. The rotatory power of the terebenthenes obtained from Austrian and maritime pines varies considerably, especially in the latter, which is found to contain d-pinene. A Bordeaux pine has given a *l*-pinene of $[\alpha]_D$ -51.13°, the highest yet recorded. C. HOLLINS.

Constitution of phenol-formaldehyde resins. F. POLLAK and F. RIESENFELD (Z. angew. Chem., 1930, 43, 1129-1132).-The acid-condensation product ("Novolak ") obtained from pure phenol and β-polyoxymethylene was isolated and its structure examined by determination of ultimate composition, mol. wt., hydroxyl number, behaviour with alkali, water, etc., procedure and results being detailed. It is deduced that the "Novolak" consists of a chain of 7 mols. of phenol and 6 mols. of formaldehyde, 6 mols. of water being eliminated. The two end phenol residues differ from the remaining five, in that the former are disubstituted and the latter trisubstituted. This evinces itself in the relatively loose attachment of two phenol groups per mol. etc. A possible ring structure for the product is rejected from similar reasoning, and the resinous character of the "Novolak" is attributed to existence of a number of isomeric products rather than S. S. WOOLF. to molecular magnitude.

Pine wood. SOUM. Nitrocellulose. BECK and others. Nitrocellulose from jute. BAGCHI.—See V. Behaviour of aluminium etc. with moist lithopone. ANON. Protecting aluminium alloys. BRENNER.— CL. XIV.-INDIA-RUBBER; GUTTA-PERCHA. CL. XV.-LEATHER; GLUE.

See X. Skin formation on varnishes. Anon. Rye oil. CROXFORD.—See XII.

PATENTS.

Production of a composition for coating or impregnating fabric. L. D'ANTAL (B.P. 338,538, 20.8.29. Hung., 19.10.28).—A cheap, soft, rubber-like product, suitable for impregnating paper or fabric bags to render them resistant to chemicals, such as caustic alkali, carbide, and quicklime, is prepared by oxidising above 180° a vegetable drying oil (e.g., linseed or sunflower oil) with the acid sludge obtained as a residue in mineral oil refining; resin or asphalt-like substances may be added to the vegetable oil before oxidation.

A. J. HALL. Reflecting material. H. H. HIGBIE (U.S.P. 1,767,285, 24.6.30. Appl., 28.7.28).—The material comprises a layer of a highly reflecting white substance, *e.g.*, magnesium carbonate, zinc oxide, titania, or lead carbonate, covered with a layer of a transparent or translucent substance, *e.g.*, cellophane or thin glass. Alternatively the white substance may be incorporated into a plastic and the mixture made into sheets which are dried in such a way that a highly reflecting surface is produced. Application to wall coverings, lamp-shade linings, etc. is indicated. A. R. POWELL.

Production of red lead. H. ERZINGER, and CHEM. FABR. SCHONENWERD H. ERZINGER A.-G. (B.P. 340,082, 30.10.29).—A suspension of commercial litharge in water is treated with formic acid, carbon dioxide being passed through until a basic lead carbonate of very low density is produced. This is separated, dried, and oxidised at a temperature which is 100° lower than that employed in making crystal red lead, a finely-divided product ("disperse" red lead) being thus obtained.

W. J. WRIGHT.

Condensation of urea or its derivatives with formaldehyde or its polymerides. FABR. DE PROD. DE CHIM. ORGANIQUE DE LAIRE, J. MALET, and R. ARMEN-AULT (B.P. 340,114, 6.12.29. Fr., 6.12.28).—The components are condensed together in the presence of carbonate or oxide of zinc or lead, bismuth carbonate, a coloured metal carbonate, titanium oxide, etc. as condensing agent. S. S. WOOLF.

Manufacture of [resinous] condensation products. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 339,958, 12.8.29).—Almost neutral, resinous, oily products are obtained by heating (e.g., at 260°) longchain aliphatic hydroxy-acids (e.g., ricinoleic, dihydroxystearic acids) or their esters or glycerides with colophony etc., in vacuo, or in a stream of inert gas until the acid value has practically disappeared. Acid or alkaline condensing agents may be used. E. LEWKOWITSCH.

Synthetic resins and their uses. BRIT. CELANESE, LTD. (B.P. 340,101—2, 18,11.29. U.S., 17,11.28).—An aromatic sulphonamide is condensed with (A) benzaldehyde, (B) furfuraldehyde, in the presence or absence of acid, neutral, or alkaline catalysts, and, if desired, of one or more reactants capable of forming other synthetic resins, e.g., formaldehyde, acetone, urea, phenol, aniline. Solvents, resins, plasticisers, pigments, and/or dyes may be incorporated. S. S. WOOLF.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

213

Water absorption of rubber compounds. H. A. WINKELMANN and E. G. CROAKMAN (Ind. Eng. Chem., 1930, 22, 1367-1370).-Using a mixture of rubber (93 pts.), zinc oxide (3 pts.), sulphur (5 pts.), and diphenylguanidine (0.75 pt.), with 5, 10, and 15 vols. of various compounding ingredients at various degrees of vulcanisation, increased volume-loading with any ingredient has little effect on the water absorption. With increasing time of vulcanisation the water absorption at first decreases, reaching a minimum near the "optimum cure," and then increases. Whiting and barytes increase the water absorption of over-vulcanised rubber, but clay and zinc oxide have a marked adverse effect at all degrees of vulcanisation; carbon black has little effect and thermatomic black decreases the water absorption. The presence of salts such as metallic acetates inflates the water absorption, as also does subjecting the rubber to stretch. A vulcanite mixture absorbs water in much the same manner as a soft rubber mixture, but the absorption decreases rapidly as optimum vulcanisation is approached. Reclaimed rubbers vary in water absorption, the effect increasing with the proportion of residual alkali. Immersion of a vulcanised tread-mixing in water for 30 days with subsequent drying does not affect the tear-resistance, but decreases the elongation and increases the tensile strength and resistance to abrasion. D. F. Twiss.

PATENTS.

Vulcanising rubber to leather, L. B. CONANT, Assr. to STANDARD PATENT PROCESS CORP. (U.S.P. 1,787,145, 30.1.30. Appl., 22.7.27).—See B.P. 275,194; B., 1928, 494.

Polymerised ay-butadiene (B.P. 337,460).—See III.

XV.—LEATHER; GLUE.

Extraction of fir bark. M. RAUCHWERGER (Gerber, 1930, 56, 81-83; Chem. Zentr., 1930, ii, 1025).—In order to avoid high losses of tannin, the material was extracted for 2 days with cold water and finally with water at 85°. Bark (1 kg.) containing 135 g. of tanning substances gave an extract containing 59.4 g., 48 g. remaining in the bark and 27.6 g. being lost by hydrolysis. Extraction at 15° yielded 69.4 g., 50 g. remaining and 15.6 g. being lost. A. A. ELDRIDGE.

Determination of insoluble matter in tanning extracts. E. BÉLAVSKY and G. WANEK (Gerber, 1930, 56, 83-84, 89-90; Chem. Zentr., 1930, ii, 1027).— The official method 'or the determination of insoluble material does not measure the insoluble matter in the actual tanning liquor, which is preferably determined by the sedimentation method. Factors on which the determination depends have been examined.

A. A. ELDRIDGE.

Detection of mineral-tanned leather in smallest quantities of leather. K. KLANFER (Mikrochem., 1931, 9, 34-37).—The tanning agent used in mineral tanning can best be recognised by microchemical methods. Chromium may be detected by igniting a small quantity of leather and treating the ash with sodium peroxide to form sodium chromate. An intense violet coloration is

calcium, or to the effect of both factors combined. In a "swelling" saline soil the increased calcium content of later washings resulted from the slow and irregular dissolution of gypsum. Each soil exhibited characteristic properties during prolonged extraction with water. A. G. POLLARD.

Soil acidity. A. TERÄSVUORI (Valtion Maatalouskoetoiminnan Julkaisuja, 1930, No. 29 : Proc. Internat. Soc. Soil Sci., 1930, 5, 206).—The effect of electrolytes on the observed $p_{\rm H}$ values of soils is examined.

A. G. POLLARD.

Determination of the $p_{\rm H}$ of soils by means of the quinhydrone electrode. R. FROGNIER (Ann. Soc. Sci. Brux., 1930, 50, B, 135-144).-The pH of soil suspensions is generally different from that of the liquid after the solid particles have been removed by centrifuging. An investigation of the causes of this phenomenon has shown that the principal factor may be traced to diffusion of the potassium chloride used in making the measurements; this reacts with the soil particles by exchange adsorption, liberating hydrogen ions therefrom. The diffusion can be greatly reduced by using a plug of filter paper at the end of the potassium chloride bridge. The purity of the quinhydrone is also of more importance than has hitherto been recognised, acid preparations affecting the results considerably, especially in suspensions which are not efficiently buffered. The form of the platinum electrode has received attention, and it is recommended to use a platinum wire 5 or 6 cm. long with only the tip immersed in the suspension; the tip should be passed through a flame before each measurement is made, and the wire should be kept in chromic acid mixture when not in use.

E. S. HEDGES.

Calomel electrodes [for soils]. A. SALMINEN (J. Agric. Soc. Finland, 1930, 60—62; Proc. Internat. Soc. Soil Sci., 1930, 5, 206).—A form of calomel electrode suited to the field examination of soils is built in a test tube and connected by an agar-agar-potassium chloride bridge with the test solution. A. G. POLLARD.

Effects of manuring and cropping on soil dispersion. V. S. DENISIEVSKI (Nat. Agric. Exp. Sta. Kiev, 1930, No. 40; Proc. Internat. Soc. Soil Sci., 1930, 5, 214).—Existing methods of defining soil dispersion are unsatisfactory. Dispersion decreases with the soil moisture content, which is the principal controlling factor. Cropping affects dispersion mainly by its influence on the moisture content of the soil. Application of lime, straw, and mineral fertilisers decreases soil dispersion, the effects decreasing in the order named. Farmyard manure may exert a reverse effect in spring and autumn. Dispersion decreases with increasing electrolyte content of the soil. A higher degree of dispersion is associated with increased $p_{\rm H}$ value and with higher ammonia absorption.

A. G. POLLARD. Nitrogen fixation in some Iowa soils. R. H. WALKER and P. E. BROWN (Iowa State Coll. J. Sci., 1930, 4, 425—429).—Tests with two soils are described. CHEMICAL ABSTRACTS.

Mobilisation and immobilisation of calcium in soil. A. T. KALATSCHIKOV (Nat. Agric. Exp. Sta.

obtained on the addition of a drop of sulphuric acid and 1 or 2 drops of 2% diphenylcarbazide. Iron may be recognised by performing the thiocyanate test on the ash, and aluminium by dissolving the leather ash in fused potassium hydrogen sulphate, cooling, dissolving in hot water, and testing with alizarin or with morin. E. S. HEDGES.

Prevention of foaming in aqueous binding and thickening media. J. B. MEYER (Farben-Ztg., 1930, 36, 481-482, 573-574, 619-620).-Methods available for reducing the troublesome foaming in technical operations involving colloidal solutions are reviewed. In most cases the substances used in practice prevent or diminish foaming in a particular operation, but are not universally applicable. The effect of adding numerous organic liquids to a foam made with a glue solution was investigated; fatty acids had more effect in destroying the foam than had the corresponding alcohols. No relation could be found between the surface tension of the liquid and its power for destroying foam, but in a homologous series the preventive effect increases with the mol. wt. of the compound. With increasing concentration of glue the foaming power passes through a maximum. A mixture of linseed oil and alkali is very effective in preventing foaming.

PATENTS.

E. S. HEDGES.

Working up cellulosic materials (B.P. 340,164).– See V. Glue from bones (B.P. 340,010).–See XII.

XVI.—AGRICULTURE.

Soil colloids. F. N. ANTIPOV-KARATAIEV and A. J. RABINERSON (Proc. Leningrad Lab. Agro-Soil Inst. U.S.S.R., 1930, No. 10: Proc. Internat. Soc. Soil Sci., 1930, 5, 218–220).—A critical survey of recent work in the physical and physico-chemical properties of soil colloids. A. G. POLLARD.

Colloidal nature of soil humus. L. WOLF and H. SCHLATTER (Cellulosechem., 1930, 11, 254—257).— A stable humus sol is obtained by shaking sandy soils with water for 8 days. The production of this sol depends on the presence of coarse sand acting as a colloid mill, since no humus is dissolved if the sand is initially removed. The humus obtained by electrodialysis can, after drying, no longer be peptised on shaking with water. The dry material contains 47—53% of ash, essentially ferric aluminium silicate; the ash content is diminished to about 30% by prolonged treatment with hydrochloric acid. A solution of humus in Npotassium chloride is somewhat more acid than a similar one in water. T. H. MORTON.

Influence of irrigation on the chemical and physical properties of saline alluvial soils. S. J. SUSHKO (Proc. Lenin. Acad. Agric. Sci., U.S.S.R., 1930, No. 9; Proc. Internat. Soc. Soil. Sci., 1930, 5, 238).— The effects of repeated leaching of soils are examined. In bog soils and alkaline bog soils the alkalinity decreased with the earlier leachings, but increased as the process continued. The soluble calcium content of the soil varied similarly. The reappearance of calcium in the later leachates is ascribed to the decomposition of calcium carbonate, to the displacement of adsorbed Kiev, 1929, **38**, No. 28; Proc. Internat. Soc. Soil Sci., 1930, **5**, 209—210).—In moist soils (60% of water capacity) there occurs simultaneously a physico-chemical adsorption of calcium and a biological process of mobilisation. Addition to soil of organic material (e.g., starch) causes the biological immobilisation of calcium. Nitrification and mobilisation of calcium are parallel processes. In water-saturated soils mobilisation proceeds in the presence or absence of starch. In soils of optimum moisture content the mobilisation of calcium and the immobilisation of phosphates are antagonistic processes. In the presence of starch the $p_{\rm H}$ of the soil controls the mobilisation of calcium. A. G. POLLARD.

Culture of Aspergillus niger for the biochemical determination of potassium and phosphoric acid fertiliser needs of soils. H. NIKLAS, H. POSCHEN-RIEDER, and J. TRISCHLER (Ernähr. der Pflanze, 1930, 26, 97—103; Chem. Zentr., 1930, i, 3097—3098).— A method for determining potassium and phosphorus in soils by means of culture of Aspergillus niger is now described. L. S. THEOBALD.

Orthophosphoric acid as a fertiliser constituent and an active soil component. M. GRAČANIN (Jahresber, Univ. Zagreb, 1930; Proc. Internat. Soc. Soil Sci., 1930, 5, 224-226).-Orthophosphoric acid is produced in soil during the mineralisation of plant and animal residues, by the decomposition of phosphatides, nucleoproteins, and phytin. Superphosphate contains up to 5% of orthophosphate. In water cultures, orthophosphates are typical activators of germinative energy. Crop increases due to orthophosphate in pot cultures vary with the nature of the plant and of the soil. The injurious concentration of phosphoric acid is much higher than that of other fertiliser materials. No increase of soil acidity results from fertilisation with phosphate even in excessive amounts. Small dressings of orthophosphate reduce the acidity of acid soils and the alkalinity of alkaline soils. A. G. POLLARD.

Effect of "nitrophoska" complete fertiliser compared with that of other manurial combinations. T. POLLINGER (Fortschr. Landw., 1930, 5, 320-321; Chem. Zentr., 1930, ii, 446).—The composition of "nitrophoska" is variable; the conditions under which the 1928 field tests were carried out are criticised. A. A. ELDRIDGE.

Fertilisation with phosphorites. G. TOMMASI and S. D. DI DELUPIS (Ann. R. Staz. Chim.-Agr. Sperim. di Roma, 1930, 13, Publ. No. 271, 41 pp.).-Excepting in soil with an acid reaction or free from lime, the direct application of natural phosphates is not advisable to cereal crops, which are able to utilise the phosphoric acid of slightly soluble compounds in only slight degree. Indirect application of natural phosphorite-to the preceding crop-may, however, be of advantage, even in neutral soils, but the best results are then obtainable by the supplementary use of small amounts of soluble fertilisers to supply sufficient readily-assimilable phosphoric acid during the initial periods of growth. Tests with maize show that, after flowering, this is well able to utilise slightly soluble phosphates. With leguminous crops, especially when grown for several years on the same plot, direct application of finely-powdered natural

phosphates is profitable, not only to acid, but also to neutral soils, especially if these are poor in lime. Kosseir phosphorite is especially adapted to direct application, owing to the readiness with which it may be powdered to a high degree of fineness. T. H. POPE.

Value of rock phosphate and "bone and superphosphate" as fertilisers for maize production. A. D. HUSBAND (Rhodesia Agric. J., 1929, 126, 1247— 1252).—In soil of $p_{\rm H}$ 7 raw rock phosphate was slightly more effective than a mixture of bone meal and superphosphate (1:2) containing the same amount of citratesoluble phosphate. CHEMICAL ABSTRACTS.

Plant growth experiments with ammonia solution [as fertiliser]. BIMSCHAS (Gas- u. Wasserfach, 1931, 74, 13—16).—Experiments have been made with 2% and 20% ammonia solutions as fertilisers for oats and mustard, in both sandy and heavy soils in conjunction with acid and alkaline fertilisers containing potash and phosphate. The results indicate that especially when used with an alkaline fertiliser gasworks byproduct ammonia may be satisfactorily used as the source of nitrogen. H. F. GILLBE.

Free-ammonia injury with concentrated fertilisers. L. G. WILLIS and W. H. RANKIN (Ind. Eng. Chem., 1930, 22, 1405-1407).-Seedlings in light, sandy soil sustain root injury from organic ammoniates in mixed fertilisers, unless the latter contain calcium salts to combine with the free ammonia. In pot-culture tests with cottonseed meal on cotton seedlings, the effect of various amounts of nitrogen and gypsum per acre, and of various intervals between application and planting, was investigated on the basis of the percentage of seedlings injured. Root injury occurs with a proportion of 16 lb. of nitrogen per acre and no calcium salt, if the interval is less than 8 days, but if calcium is present planting may be done immediately. When the proportion of nitrogen is 32 lb. per acre (without gypsum), injury was severe until 16 days had elapsed ; with an 8-day interval the gypsum has no protective W. J. WRIGHT. action until the third planting.

Unsuitability of sodium chlorate as a weedicide in banana plantations. H. W. EASTWOOD (Agric. Gaz. N. S. Wales, 1930, 41, 851–852).—The spraying of sodium chlorate for weed control injured banana plants, not only by contact with aerial portions, but also by root injury when applied 1 ft. from the stools. After several weeks leaves became discoloured and fell. New leaves produced subsequently were healthy.

A. G. POLLARD.

Abnormalities in the composition of oranges. P. R. V.D. R. COPEMAN (S. Afr. J. Sci., 1930, 27, 310– 316).—Fruit from two among six trees examined had abnormally low contents of soluble solids, sugar, and acids. Statistical examination of analytical data obtained at intervals during the growth season shows the abnormalities to be inherent characteristics of the trees. The difficulty of obtaining average "normal" data for fruit grown under apparently uniform conditions is emphasised. A. G. POLLARD.

Species of wood on different types of soil. H. BURGER (Mitt. schweiz. Centralanst. forstl. Vers., 1930, 16, [i]; Proc. Internat. Soc. Soil Sci., 1930, 5, 231-234).--Ash constituents of a number of woods varied with the soils in which they grew, but, in general, were characteristic of species. Wood grown on light calcareous soils was richer in ash constituents and higher in calcium content than that from soils deficient in lime. The magnesia content of the wood varied with the amounts available in the soil. The CaO : MgO ratios of individual species of woods grown on different soils were within fairly well-defined limits. No direct relationship was observed between the phosphorus contents of woods and the soils in which they grew, although, in general, high phosphate contents in wood were associated with lime-deficient soils and vice versa. Wood grown on humus soils had a relatively low potash content, without, however, exhibiting potash deficiency. The CaO: SiO, ratios of various types of woods lie in fairly definite ranges. Relatively high nitrogen contents of woods are associated with lime-deficient soils. Relationships between the nature of soils, their lime and nutrient contents, and the growth and nutrient content of individual species of trees growing on them are discussed. A. G. POLLARD.

Factors influencing yield and quality of peas. V. R. Boswell (Maryland Agric. Exp. Sta. Bull., 1929, No. 306, 341-382).-The effect of soil conditions on the growth, nodulation, and quality of peas was examined. Acidity within the range $p_{\rm H}$ 5.8-6.7 had little effect on nodulation. Of soil factors examined the organic content was the most closely related to growth, yield, and nodulation. Fertiliser trials indicate that larger applications of nitrogen than are customary are advantageous. The growth and maturing of peas is characterised by a rapid decrease in the proportions of sugar and soluble nitrogenous matter and by an increase in starch, acid-hydrolysable matter, and insoluble nitrogen. Good quality in peas is associated with high sugar and low starch contents. Late-sown, late-maturing peas were not markedly different in sugar or starch content from earlier varieties. A. G. POLLARD.

Selection of potatoes and the effect of external conditions, especially manuring, on the result of selection. H. M. QUANJER (Ernähr. der Pflanze, 1931, 27, 1—8).—Nitrogenous fertilisers increased the severity of pseudonecrosis in potatoes from infected seed and favoured its spread to adjacent plants from clean seed. Potash fertilisers produced the reverse effect.

A. G. POLLARD.

Sweet potato (Ipomœa batatas). S. D. TIMSON (Rhodesia Agric. J., 1929, 26, 890—903).—Analyses of silages made from maize and from sweet potato tops are recorded. CHEMICAL ABSTRACTS.

Incidence and control of apple scab and apple mildew at East Malling. II—III. M. H. MOORE (J. Pomology, 1930, 8, 283—304).—The application of either lime-sulphur mixtures or Bordeaux mixture at the "pink bud" stage is important in the control of apple scab. Bordeaux mixture with lead arsenate, applied three times, once at the 8–8–100 concentration at the "pink bud" stage, and twice at 8–25–100 (*i.e.*, with excess of quicklime) after blossoming, gave the best results. Trees of the variety Cox's Orange Pippin

suffer severely from such sprays. The results obtained suggest that post-blossom applications of Bordeaux mixture are cumulative and lead, in subsequent years, to a reduction in the number of blossom trusses. Limesulphur with lead arsenate, applied at the same three stages, gave good control and did not damage Cox's Orange Pippin trees. Colloidal sulphur gave approximately as good control as 1–150 lime-sulphur, both applied after blossoming; preliminary trials with sulphur dusts are recorded. There were indications in further experiments that trees receiving a fertiliser are less susceptible than untreated trees to scab infection. No treatment tried was completely successful against apple mildew, but three applications of lime-sulphur, without arsenate, were the most effective.

E. HOLMES.

Raspberry and loganberry beetle and its control. Further experiments with pyrethrum emulsion sprays and a dust. C. L. WALTON (J. Pomology, 1930, 8, 309—315).—Experiments in which logan infestations were reduced from 35.8 and 9.6% to 7.4 and 1.0%, respectively, support earlier work proving the utility of pyrethrum emulsion sprays. Pyrethrum dusts are much inferior. E. HOLMES.

Composition of soils of Hungarian lowlands. I. Lime. S. ARANY (Mezög.-Kutat., 1929, 2, 557– 569; Chem. Zentr., 1930, ii, 447).

[Tar from] torbanites. NIEMANN.—See II. Pine wood. SOUM.—See V. Florida phosphates. HILL and others. Citrate-insoluble residues from superphosphates. JACOB and others. Ammoniation of superphosphate. KEENEN.—See VII.

PATENTS.

Production of dicalcium fertilisers. A. HoLZ (B.P. 316,583, 30.7.29. U.S., 31.7.28).—Phosphate rock is decomposed with sulphuric acid, one third of the precipitated calcium sulphate is removed, and ammonia is added, the remaining calcium sulphate being kept in suspension by stirring and the pressure increased. The dicalcium phosphate, which contains 2½ times as much available phosphoric acid as commercial acid phosphate fertiliser, is dried at a temperature insufficient to remove water of crystallisation, and the ammonium sulphate in the mother-liquor is crystallised and mixed with it.

W. J. WRIGHT.

Manufacture of a phosphate for fertilising. E. HAMMEL, Assr. to M. RAUCH (U.S.P. 1,786,651, 30.12.30, Appl., 23.12.26. Ger., 19.8.26).—See B.P. 284,741; B., 1928, 280.

Manufacture of ammonium phosphate fertiliser. G. H. BUCHANAN, ASST. to AMER. CYANAMID CO. (U.S.P. 1,785,375, 16.12.30. Appl., 28.1.27).—See B.P. 284,322; B., 1928, 724.

Fertilisers (B.P. 339,340, 339,500, and 339,562, and U.S.P. 1,768,075).—See VII.

XVII.—SUGARS; STARCHES; GUMS.

Volumetric determination of reducing sugars. IV. Invert sugar. A. R. L NG and W. A. CARTER (Analyst, 1930, 55, 730-734; cf. B., 1908, 581, 582).— In the titration of reducing sugars with Fehling's solution, using methylene-blue as an internal indicator (cf. Lane and Eynon, J.S.C.I., 1923, 42, 32 T), the same volume of indicator must be used for standardising the Fehling's solution as for the assay, and it should be added just before titration is complete. The greatest accuracy is secured when (i) the liquid is kept boiling throughout the titration, (ii) the titration occupies more than 10 min., (iii) air is excluded from the surface. These conditions are conveniently fulfilled by using a closed flask and by adding to the boiling Fehling's solution small volumes of the assay liquid (0.5 c.c.) at short intervals of time (15 sec.). H. J. DOWDEN.

Determination of starch in potatoes. B. LAMPE (Z. Spiritusind., 1930, 52, 357).—Errors ranging from 0.2 to 0.3% in the value of the starch content of potatoes may occur if the measurement of the under-water weight of the potatoes is made before the potatoes have reached the normal temperature (17.5°). The potatoes, which may have been chilled by a washing water of low temperature, should be kept for at least $\frac{1}{2}$ hr. in the water maintained at 17.5° prior to the determination of the under-water weight, on which is based the calculation of the starch value. C. RANKEN.

Determination of the tenacity of starch. A. PARLOW and G. DÜLL (Z. Spiritusind., 1930, 53, 356-357).-The viscosity of a solution of starch paste kept at 100° gradually decreases after the first 2 or 3 min. This decrease varies very much with different starches, and whilst the initial and final viscosities of one starch solution kept at 100° for 3 hrs. were 139 and 134%, respectively, the corresponding values for a second were 256 and 96%. Starches with large grains have a lower initial viscosity, but are not affected much by temperature, whereas the viscosity of those with small grains rapidly decreases and may eventually reach a value smaller than that given by a starch with a lower initial viscosity. It is accordingly suggested that it is misleading to take the initial viscosity of a starch solution as the criterion of its tenacity, and the viscosity changes and the final viscosity after retention at a high temperature should be taken as the governing factors. Owing to the extreme sensitiveness of the viscosity to the condition of the starch solution, full details are given of the methods for its preparation. C. RANKEN.

Bakers' yeast. ROSENBAUM. Xylose for citric acid fermentation. FREY. Alcohol from molasses. SCHINDLER. Sugars in port wine. MUTTELET.—See XVIII. Photoactivity of honey. STITZ. Starch in vegetable preserves etc. von Fellenberg.—See XIX. Vanilla sugar. DINGEMANS.—See XX.

PATENTS.

Curing of massecuite. J. BERGÉ, ASST. to RAFFIN-ERIE TIRLEMONTOISE SOC. ANON. (U.S.P. 1,784,982, 16.12.30. Appl., 11.2.27. Ger., 24.7.26).—See B.P. 274,799; B., 1928, 31.

XVIII.—FERMENTATION INDUSTRIES.

Bakers' yeast. I. Influence of age on the fermentation time of the yeast. E. ROSENBAUM (Z. Unters. Lebensm., 1930, 59, 607-612).—The manufacture of yeast cake from beet-sugar molasses is described and the results of examination of a number of samples of different origin are recorded. The water content as determined by heating at 105-108° for 4 hrs. is generally 72-73%; a high value is associated with poor keeping qualities. This property was gauged by the time required for the cake to soften when heated at 35°; the times ranged from 55 to 105 hrs. The nitrogen content (Kjeldahl) varied from 1.81 to 2.52% of the dry material, corresponding to protein contents of 41.38-57.25%. The "fermentation time" was determined by the time taken by a dough of standard composition pressed into a mould of fixed dimensions to rise 5 times in succession to a height of 7 cm. above the mould. The sum of the five periods or total fermentation time showed great variation (176-271 min.). The fermentative power of the yeast decreases rapidly on storage, but the deterioration is reduced by storage at low temperatures. H. J. DOWDEN.

Diastatic power of malt and malt extract. C. T. BENNETT and F. C. L. BATEMAN (Quart. J. Pharm., 1930, 3, 349-353).-The Lintner test (A., 1886, 386), even with later modifications (Harrison and Gair, B., 1906, 830; Ling, B., 1910, 834; Lane and Eynon, A., 1923, ii, 193; Baker and Hulton, B., 1921, 272), is stated to be unsatisfactory; variability of the soluble starch used is given as the chief cause of inconsistent results. It is recommended that attention should be paid to the freedom of the distilled water and the laboratory atmosphere from ammonia and nitrites, to careful temperature regulation (the use of a thermostat is desirable), and to frequent agitation during digestion and starch conversion. It is considered that the present official test (Ministry of Agriculture's Marketing Leaflet No. 14, Appendix 3) based on a report of the Institute of Brewing, as modified by Hind and others (B., 1926, 170), needs amendment before it can be considered suitable for R. CHILD. inclusion in the British Pharmacopœia.

Xylose as a nutritive substrate for citric acid fermentation. A. FREY (Z. angew. Chem., 1931, 44, 16-21).—The value of xylose as a substrate for the production of citric acid by means of *Aspergillus niger* and *Citromyces* has been investigated. Preliminary purification of the xylose is necessary, and, in particular, furfuraldehyde and other aldehydes must be removed. This may be effected by steam-distillation or by adsorption on active charcoal. Under favourable conditions the yield of citric acid may be 20%, but is generally lower. E. S. HEDGES.

Alcohol from cane-sugar molasses. H. K. SCHINDLER (Chem.-Ztg., 1930, 54, 993—994).—As a result of the general and increasing use of mixtures of benzine, benzol, etc. with 99% alcohol for power fuel, the problem arises as to whether it is more remunerative to convert cane-sugar molasses into alcohol than to manufacture sugar from it. The loss of residues from the manufacture of sugar, which can be used as fodder, is more than counterbalanced by the value of the fermentation carbon dioxide. C. RANKEN.

Barley husks. H. LÜERS (Woch. Brau., 1930, 47, 557 -561, 571-575).—The amounts of nitrogen, ash, and pentoses extracted by water, 0.25% caustic potash, 0.25% hydrochloric acid, saturated lime water, and lactic buffer solution ($p_{\rm H}$ 5.0) at various temperatures were determined. The amounts of nitrogen and ash dissolved varied widely with the conditions of extraction, that of the pentoses much less. There were indications that enzyme action is a factor in aqueous extracts. The nitrogenous constituents were extracted in greatest quantity by dilute caustic potash, and by hydrochloric acid especially at high temperatures. The solubility in water was much less, but was increased by heating under 1 atm. pressure. The increased nitrogenous material extracted by alkali consisted of relatively complex proteins, the formol nitrogen of this extract being the same as that of the aqueous extract. Total ash was most soluble in alkali, less in acid, and least in water, but the silicic acid was extracted in greatest amounts by alkali and by hot water. Phosphoric acid, lime, and magnesia were extracted in greatest quantity by acid media. Water extracted the least colouring matter and the extracts developed least turbidity; the alkaline extracts were extremely dark. "Testinic" acid was prepared according to Moufang's directions and found to be a complex of protein, tannin, and ash, the ash containing about 50% of silicic acid; reference is made to a similar complex noted in beer by Hartong (B., 1930, 836). Preliminary separation of the tannins was effected. Comparative brewings were made with a barley steeped normally and with a preliminary steep for 3 hrs. in 0.2% caustic soda at 45° . In the latter case the wort contained slightly less non-coagulable nitrogen, and yielded a paler, better coloured beer, of superior flavour. F. E. DAY.

[Wine] must in 1929 from the wine-growing districts Pillnitz, Lössnitz, Meissen, and Seusslitz. A. HEIDUSCHKA and C. PYRIKI (Z. Unters. Lebensm., 1930, 59, 613-615).—The grape harvest for 1929 was small in quantity, but of good quality. The range of density of the must was $60 \cdot 7$ -88 $\cdot 4^{\circ}$ Oechsle, that of the titratable acids $4 \cdot 4$ -12 $\cdot 8$ g./litre, and of the mineral constituents $2 \cdot 64$ -5 $\cdot 04$ g./litre. As compared with the preceding year, the average density was $4 \cdot 2^{\circ}$ higher, the acid $2 \cdot 7$ g./litre lower, and the mineral content $0 \cdot 42$ g./litre higher for the year 1929. H. J. DOWDEN.

[Wine] must in 1929 from the wine-growing districts of Nahe and Glan, Rheintal, the Rhine district, Lahn, Rhine, and Main. A. RÖHLING (Z. Unters. Lebensm., 1930, 59, 629-631).—The must densities and acidities for some 360 varieties are tabulated. The influences of the severe winter are shown chiefly in a reduced crop, although the quality was excellent. The wine was the best since 1921. In the Wiesbaden district the musts showed a high sugar or alcohol content with correspondingly lower acid content. H. J. DOWDEN.

[Wine] must in Baden for the year 1929. F. MACH and M. FISCHLER (Z. Unters. Lebensm., 1930, 59, 617— 628).—The influences of the severe winter and the ensuing seasonal vagaries on the grape harvest in 1929 are described and analyses of a large number of varieties of wine are statistically examined. The most noticeable features are the high density and the low acidity of the must. H. J. DOWDEN.

Sugars in port wines. C. F. MUTTELET (Ann. Falsif., 1930, 23, 205-207).—In view of the statement that port wine contains sucrose, three genuine samples

were examined. No sucrose could be detected, but there were found about 4% of dextrose and 5% of lævulose. E. B. HUGHES.

Lactic acid in Hérault wines. E. HUGUES and R. CHEVALIER (Ann. Falsif., 1930, 23, 214—216).—The lactic acid content of 80 normal samples of wine varied from 0.64% to 2.88% (average 1.5%). Wines from the lees were a little richer in lactic acid, whilst in the case of spoiled samples the amounts found were 0.5%higher than in normal samples. Whereas the lactic acid content is considered important in cenology, no limit could be fixed beyond which it would be necessary to take account of the amount present. E. B. HUGHES.

Determination of hydrogen cyanide in kirsch. T. VON FELLENBERG (Mitt. Lebensm. Hyg., 1930, 21, 43—52; Chem. Zentr., 1930, i, 3111).—The spirit (40 c.c.) is vigorously shaken with 5 c.c. of silver nitrate solution (1 c.c. $\equiv 0.5$ mg. HCN), then with 2.5 c.c. of N-ammonia solution, followed by 3.5 c.c. of N-nitric acid. After filtering and washing the precipitate with 0.1% nitric acid the filter and precipitate are evaporated with concentrated ammonia solution (1—2 c.c.) and boiled with water until all the ammonia is removed. The silver cyanide is dissolved in concentrated nitric acid, and the silver determined by titration with ammonium thiocyanate in presence of iron alum.

A. A. ELDRIDGE.

Detection of isopropyl alcohol in spirituous liquors. K. BODENDORF (Z. Unters. Lebensm., 1930, 59, 616-617).—The method of Böhm and Bodendort (B., 1930, 531) has been applied in the case of a large number of commercial spirits, wines, and liqueurs. The sample (5 c.c.), diluted with an equal vol. of water, is distilled, and, after about 5 c.c. have been collected, 1-2 c.c. of the distillate are diluted with a double volume of water, shaken with about 0.2 g. of charcoal, and filtered. A portion of the filtrate is floated on a few c.c. of a freshly prepared solution of *m*-nitrobenzaldehyde in concentrated sulphuric acid (1 g. in 50 c.c.), when, if isopropyl alcohol is present, an intense red coloration develops at the junction on warming for a short time. Concentrations of 0.1% may be detected and positive results were obtained with all adulterated samples, whilst with pure liquors the test was completely negative. H. J. DOWDEN.

Measurement of the colour of red wines. L. Roos (Ann. Falsif., 1930, 23, 207-211).—Two colorimeters are described for measuring tint and quantity of colour. A range of standards is made from varying proportions of potassium permanganate and dichromate, and the tint is found by matching the wine against these. For intensity of colour, 1 c.c. of wine is diluted with water until it matches the standard. E. B. HUGHES.

Polarographic examination of vinegar with the dropping mercury cathode. J. HEYROVSKÝ, I. SMOLÉR, and J. STASTNÝ (Vestn. Ceskoslov. Akad Zem., 1930, 6, 490-500; Chem. Zentr., 1930, ii, 641).— Reproducible results are automatically recorded. Fermentation vinegar contains acetaldehyde, as intermediate product of bacterial alcoholic fermentation, and surface-active substances. A. A. ELDRIDGE.

"Elmocid "disinfection. Stockhausen.—See XXIII.

PATENTS.

Filter plugs [for wine casks]. K. PRILINGER (B.P. 339,761, 18.11.29).—A plug for allowing purified air to enter the casks comprises strata containing various combinations of salicylic acid, potassium dichromate, alcohol, potassium permanganate, charcoal, and calcium cyanamide. Finally a portion of the air is bubbled through sulphurous acid. B. M. VENABLES.

Production of wort. F. O. LANDTBLOM, ASST. to LAVAL SEPARATOR CO. (U.S.P. 1,770,411, 15.7.30. Appl., 30.4.25. Swed., 24.6.24).—See B.P. 233,321; B., 1926, 251.

XIX.—FOODS.

Chemical composition of authentic samples of whole-wheat flours and modified whole-wheat flours. L. H. BAILEY and S. C. Rowe (J. Assoc. Off. Agric. Chem., 1930, 13, 503-506).-Six varieties of wheat were milled and portions of the flour from each variety were modified (a) by sifting to effect a 10%(by wt.) removal of bran, and (b) by a 10% (by wt.) addition of bran. Analysis of the series of whole-wheat and the modified flours showed that with each variety of wheat the greatest differentiation between the grades of flour was shown by the crude fibre content, the pentosan determination being next in importance. The ratios of starch to crude fibre, starch to ash, and starch to pentosans also are significant. The maximum and minimum values for the fibre content of the whole-wheat flours were 2.56 and 2.23%, respectively, and those for whole flour less 10% of bran were 1.62 and 1.21%, respectively, whilst the corresponding pentosan values were: max. (min.) 7.46 (6.36)% and 5.70% (4.77)%, respectively. There is thus a dividing line between the two grades of flour. H. J. DOWDEN.

Detection of corncockle in flour and bread. R. FISCHER and E. RIEDL (Z. Unters. Lebensm., 1930, 59, 595-598).-Two methods are described for the detection of corncockle. An aqueous suspension of flour (5 g. in 20 c.c.) is prepared, and after keeping for 6-20 hrs. it is filtered and the filtrate centrifuged. The clear liquid is examined for saponin by the method of Kofler and co-workers (cf. B., 1930, 166), in which the liquid is capillarised by strips of filter paper having a band of cholesterol with which the saponin combines. After washing, the saponin-cholesterol is dried, decomposed by boiling with xylene, and tested with bloodgelatin, the hæmolytic zone indicating the presence of Agrostemma saponin. Concentrations as low as 1:17,000 may be detected by this method. In the examination of bread the sample is extracted with alcohol-chloroform, the extract being evaporated to dryness and, after dissolving the residue in hot water, the solution is examined as described. Concentrations of 1 in 2000 may be detected. When the content is 0.05-0.1% a second method enables macroscopic fragments to be identified. The sample of flour (0.01-0.02 g.) is mixed with 1.5-2.0 c.c. of blood-gelatin and examined between glass plates. After 1-1 hr. circular hæmolytic areas are visible to the naked eye and fragments of seed are visible under the microscope.

Ĥ. J. DOWDEN. Iodometry of milled [food] products. II. K.

FUCHS, W. RUZICZKA, and E. KOHN (Z. Unters. Lebensm.,

1930, 59, 573-585; cf. B., 1930, 790).-Further series of flours, brans, and fats have been examined, and the observation that the iodine value increases with degree of grinding has been confirmed. In a series of wheat and rye flours the iodine and periodine values followed closely the degree of grinding and with greater sensitivity than the fat content. The values for flours of the same grade from different mills agreed fairly well; those for brans were, however, less consistent. Bleaching has but little influence on the iodine or periodine values, so that the degree of grinding can still be followed in bleached flours. Meals from oats, barley, maize, and leguminous materials were examined by the same method with satisfactory results. In a series of wheat flours the $p_{\rm H}$ was found to decrease with increased fineness of grinding. H. J. DOWDEN.

Detection of rice hulls and sawdust in bran and sharps. C. RAUNIER and H. PAU (Ann. Falsif., 1930, 23, 229–233).—Rice hulls and sawdust give different colours from those given by bran and sharps when treated with iodine or with dimethyl-p-phenylenediamine sulphate or with phloroglucinol and phosphoric acid. The amount of adulterant is determined by calculation of the ratio of ash to silica, the figures obtained being for bran 7.78, sawdust 2.25, rice hulls 1.05. To characterise the adulterant, parallel colorimetric tests are made on the sample and on mixtures made according to the results calculated from ash and silica content. E. B. HUGHES.

New procedure in the chemical investigation of fodder and foodstuffs. J. KÖNIG [with F. BARTSCHAT and B. STEMPEL] (Z. Unters. Lebensm., 1930, 59, 564-572).—The deficiencies in the normal methods of recording the constituents of foodstuffs are enumerated and a systematic scheme is presented for analysis and separation into the following groups :--water content ; fat (ether extract); crude protein (amide + pure protein, both water-soluble and soluble or insoluble in 2% hydrochloric acid); water-soluble carbohydrates (acid as lactic acid + sugar, reducing powers before and after inversion + dextrin + residue); starch; proto- and hemi-celluloses (including hemipentosans); orthocellulose and ortholignin (including orthopentosans); insoluble lignin, cutin, and suberin; mineral matter (water-soluble and soluble or insoluble in 2% hydrochloric acid). The results of analyses of wheat, flour, bran, etc. are tabulated. H. J. DOWDEN.

Rapid determination of dry gluten. E. BERLINER and R. RÜTER (Z. ges. Mühlenw., 1930, 7, 1–4; Chem. Zentr., 1930, ii, 487).—The dry gluten of 14 wheat flours had d 1·325, whence the weight of dry gluten is equal to the under-water weight multiplied by 4.08. A. A. ELDRIDGE.

Significance of the coloration of flours by hydrochloric acid. H. KÜHL (Z. ges. Getreidew., 1930, 17, 101—105; Chem. Zentr., 1930, ii, 1007).—The colour developed by the action of hydrochloric acid on flour is due to protein degradation products containing aldehydoor keto-groups. A. A. ELDRIDGE.

Ferric chloride reaction of aqueous extracts of cereals. Detection of rye flour in wheat flour. H. KÜHL (Z. ges. Getreidew., 1930, 17, 122-128; Chem. Zentr., 1930, ii, 1299).—Soluble carbohydrates

affect the reaction between ferric chloride and proteins. Characteristic colour reactions are obtainable only when definite quantity ratios are employed. Rye flour in wheat flour can be determined by observing the degree of turbidity produced when an extract is treated with ferric chloride and kept for 2 min. in a water-bath.

A. A. ELDRIDGE.

Abnormal sweetened condensed milk. S. DIXON and J. H. SUGDEN (Analyst, 1930, 55, 749-751).— Two samples of sweetened condensed milk were found to have a gelatinous consistency and to contain "buttons" of a reddish-brown colour. These characteristics coupled with a high content of invert sugar $(3 \cdot 9\%)$ were ascribed to the presence of micro-organisms of the *Aspergillus* genus, the development of which had been favoured by storage of the milk at too high a temperature. H. J. DOWDEN.

Determination of milk fat. A. C. ANDERSEN (Z. Unters. Lebensm., 1930, 59, 600-602).-In the determination of butter fat in milk which is beginning to decompose, separation of the fat under alkaline conditions, as in the Röse-Gottlieb method, is liable to lead to low results owing to saponification even when potassium dichromate has been added as preservative. It is preferable to use the Schmid-Bondzynski-Ratzlaff method, 10 g. of the milk being mixed with 10 c.c. of hydrochloric acid $(d \ 1.19)$ and boiled for 4-5 min., the heating being as gentle as possible in order to avoid discoloration. After cooling, the mixture is extracted with 10 c.c. of alcohol, 25 c.c. of ether, and 25 c.c. of light petroleum according to the normal Röse-Gottlieb method. H. J. DOWDEN.

Detection of viscogen [calcium saccharate] in cream. G. T. PYNE (Analyst, 1930, 55, 747–749; cf. B., 1929, 735).—The detection of viscogen in cream by the high calcium content of the ash is troublesome, whilst if souring has commenced $p_{\rm H}$ determinations are of little value. The thickening effect of viscogen may be detected, however, by the decrease in viscosity produced by the addition of a soluble oxalate, which converts the gelatinous calcium phosphate into crystalline calcium oxalate with redissolution of the precipitated casein. H. J. Dowden.

Factors influencing the growth of moulds in butter. H. Macy (Minn. Agric. Exp. Sta. Tech. Bull., 1929, No. 64, 86 pp.).—The growth of moulds isolated from butter in media containing butter constituents or their decomposition products is examined. The partial removal of carbon dioxide from the atmosphere does not prevent the growth of moulds, but none developed in the absence of oxygen. The growth of moulds in butter is largely controlled by atmospheric humidity and temperature, the oxygen supply, and the concentration of salt present. A. G. POLLARD.

Detection of the onset of decomposition in meat by the content of ammonia in the form of salts. F. M. LITTERSCHEID (Z. Unters. Lebensm., 1930, 59, 599-600).—The influence of ammonia gas (from a defective cold-store) on the appearance and quality of meat is described. Such contamination may be detected by testing the rinsing water with Nessler's solution. In conducting the Glassmann–Rochwarger test (cf. B., 1930, 530) it is recommended that the outer and inner

portions of the meat be examined separately in order to determine whether the meat has been exposed to ammonia gas or has been dressed with ammonium salts as preservatives. H. J. Dowden.

Red colour in sardines in oil. G. HINARD and M. BOURY (Ann. Falsif., 1930, 23, 216—218).—It was found that towards the end of the packing season in a few of the boxes the colour of the oil has a reddish tint and in such boxes is generally found at least one sardine having red-brown spots. It is considered that the red colour is probably due to a particular condition of the natural oil of the fish and not to any fault in, or effect of, the packing. E. B. HUGHES.

Photoactivity of honey. J. STITZ (Z. Unters. Lebensm., 1930, 59, 606-607).—The possibility that the radium reported to be present in the ash of honey may be accounted for by the photoactivity of potassium compounds has been investigated. Samples of natural honey and of the ash were placed in glass or quartz containers and stored for 1 month in contact with photographic plates. Other samples were irradiated with ultra-violet light and Röntgen rays and similarly exposed. In all cases the results were negative, and no evidence of radioactivity was manifested. H. J. DOWDEN.

Fruit jellies. VI. Rôle of pectin. Extraction of pectin from pectic materials. P. B. MyERS and G. L. BAKER (Delaware Agric. Exp. Sta. Bull., 1929, No. 160, 64 pp.; cf. B., 1928, 138).-The jellying power of pectin reaches an optimum when extracted at pn 2.4 (approx.), the optimum point being independent of the total titratable acidity of the extracting solution and of the nature of the acid used. Under conditions of greater acidity the rapid decline of jellying power 18 indicative of pectin hydrolysis. The decline of jellying power with increasing time of boiling during extraction is irregular. Jellying power is not related to the methoxyl content of the pectin. No relationship exists between the yield of pectic acid from pectin and its jellying power, since pectic acid is also produced by alkaline hydrolysis of the decomposition products of pectin. Viscosity measurements can only be accepted as criteria of the jellying power of pectins extracted by the same method. The yield of pectin depends on the $p_{\rm H}$ of the extracting solution (maxima $p_{\rm H} 2.0$ for tartaric acid and $p_{\rm H}$ 1.45 for hydrochloric acid) and on the period of boiling (maximum at 120 min.), but the optimum jelly units is reached after 30 min. A method for the extraction of pectin at $p_{\rm H}$ 2.15 after boiling for 1 hr. is described. A. G. POLLARD.

Jelly test for jellying fruit juices and pectin preparations. L. GERET (Mitt. Lebensm. Hyg., 1930, 21, 116—117; Chem. Zentr., 1930, ii, 834).— The fruit juice or pectin solution (15 c.c.), mixed if necessary with the corresponding quantity of fruit acid, is mixed with 5 c.c. of 95% alcohol and then kept for 1 hr. at 0°, when a good sample may be removed as a single rod. A. A. ELDRIDGE.

Behaviour of pure natural and artificial fruit essences for lemonades towards the sodium salt of *p*-toluenesulphonchloroamide (chloramine-Heyden). A. MIERMEISTER (Z. Unters. Lebensm., 1930, 59, 585-594).—The method of Tillmans and Hollatz (cf. B., 1929, 926) for differentiating artificial and natural fruit extracts has been applied to a number of essences used in the manufacture of still and aerated beverages. For the direct titration, 1 c.c. of essence was mixed with 20 c.c. of water, 50 c.c. of 0.01N-chloramine solution, and 0.5 c.c. of 10% acetic acid, and, after keeping for 1 hr., the excess of chlorine was determined iodometrically. Whilst, in general, artificial essences were characterised by a high chloramine value, there were certain exceptions. Further evidence was afforded by steam-distillation followed by ether-extraction of the residue. With the exception of citrus fruit essences the natural products contain but small amounts of volatile aromatic substances and the ethereal extracts have a high chloramine value, whilst in the artificial essences some are completely volatile and others only partly so. The aqueous residue after ether-extraction possessed an aroma in the case of certain artificials due to the addition of vanilla extracts as a "fixative." The commonly used citric, malic, and lactic acids do not affect the chloramine titrations, but colouring matters do, and these have to be removed by absorption with wool. The chloramine values of some 22 natural and artificial products are given, with notes on their identification by means of the behaviour after distillation or extraction with ether. H. J. DOWDEN.

Spinach for canning. F. W. GEISE (Maryland Agric. Exp. Sta. Bull., 1930, No. 320, 303-326).-Seasonal effects on the quality and chemical composition of spinach are examined. As the age of the leaves increased there was a decrease in free reducing substances, an increase in total and invert sugars, and a decrease in acid-hydrolysable matter. Variations in crude fibre content could not be correlated with seasonal conditions or period of harvesting. The total nitrogen content was greatest in young leaves. Storage of leaves at 40° and 60° led to losses of total and invert sugars. In leaves stored at above 0° there was a loss of acidhydrolysable matter accompanied by an increase in crude fibre. A minimum period of storage prior to canning is recommended. A. G. POLLARD.

Determination of starch in vegetable preserves and other pasty products. T. VON FELLENBERG (Mitt. Lebensm. Hyg., 1930, 21, 78-79; Chem. Zentr., 1930, i, 3114).-The preserve (10 g.) is boiled with water (5 c.c.), filtered off through cloth, and gently pressed ; the procedure is repeated twice, using 20-30 c.c. of water each time, until the residue gives no blue colour with iodine and potassium iodide. The turbid filtrate is treated with 0.1 vol. of 50% calcium chloride solution and excess of 0.1N-iodine in potassium iodide solution, the starch iodide being then centrifuged. Sodium hydrogen sulphite is added, the acid is neutralised with calcium carbonate, and the mixture is boiled with calcium chloride and filtered through cellulose pulp, an aliquot part of the filtrate being treated with iodine and calcium chloride solution. Further procedure is as previously described (B., 1928, 833). A. A. ELDRIDGE.

Effect of soda and soap on aluminium. BOHNER. Resistance of aluminium to fatty acids. CLAUS. Aluminium alloys. STERNER-RAINER.—See X. Cacao butter. FIELD.—See XII. Banana plantations. EASTWOOD. Oranges. COPEMAN.—See XVI. Determination of starch in potatoes. LAMPE.—See XVII. Bakers' yeast. ROSENBAUM.—See XVIII. Emulsions. SMITH and others.—See XX.

PATENTS.

[Machine for] preparation of eggs. A. BEATTIE and A. A. LYON (B.P. 340,543, 2.7.29).

Silver-copper-nickel alloy (U.S.P. 1,757,507).— See X.

XX.-MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Iron and ammonium citrate, B.P. A. J. JONES and N. GLASS (Quart. J. Pharm., 1930, 3, 488-498).-This preparation should be neutral $(p_{\rm H} 7.5)$, and should contain 7-8% NH₃ and 53-57% $C_6H_5O_7$. A series of ten commercial samples has been examined : in 7 cases the sample contained <30% Fe₂O₃, and in the others below the B.P. minimum (31%). Iron was determined iodometrically. The scales (0.5 g.) are dissolved in water, hydrochloric acid ($d \ 1 \cdot 16$) is added, and the mixture brought to boiling and cooled. Potassium iodide is added and, after 3 min., the solution is diluted and titrated with thiosulphate. Ferrous iron, if present, is originally oxidised by permanganate. Samples may be satisfactory according to B.P. requirements, and yet may give precipitates in solution with magnesium sulphate. The cause of such precipitation remains obscure and requires further elucidation. R. CHILD.

Determination of alkalinity and silver content of protargol. (MMES.) A. L. DRAGENESCO and E. WEINBERG-SACHETTI (J. Pharm. Chim., 1930, [viii], 12, 536-539).-Samples of protargol and silver proteinate, although corresponding to Pharmacopœia requirements, caused irritation when used as eyedrops, due, it is thought, to excessive alkalinity. The dark colour of their solutions prevents a direct determination of their reaction, but pretreatment with neutral sodium thiosulphate enables the alkalinity to be titrated in the ordinary way with 0.1N-sulphuric acid, using phenolphthalein as indicator. Samples of protargol were found to be less alkaline than those of silver proteinate. In the determination of the silver content, oxidation of the organic matter by potassium permanganate and sulphuric acid was found to give higher and more consistent results than precalcination. T. McLACHLAN.

Variation of sp. gr. and refractive index with concentration of camphor and alcohol in Spiritus camphoræ, B.P. F. H. MILNER (Quart. J. Pharm., 1930, 3, 338-341).-Owing to natural variations in the optical rotation of camphor, the determination of camphor in spirit of camphor by this means is inaccurate unless the rotation of the camphor used be known. From a number of determinations of sp. gr. and refractive index of spirit of camphor, prepared to contain different percentages of camphor and with alcohol of varying concentration, it is shown that the former factor is the better criterion. Allowing for a variation in camphor content of from 9.5 to 10.5% wt./vol., and in the alcohol concentration from 89 to 91% wt./vol., the possible variations are : $d^{15.5}$ 0.8438-0.8503, n^{20} 1.3746-1.3759. Since increase of water content increases d but reduces n, whilst loss of camphor decreases both values, a combination of the two determinations affords a useful means of testing the preparation.

R. CHILD.

Spiritus saponatus and Spiritus saponis kalini, D.A.B. VI. W. MEYER (Arch. Pharm., 1930, 268, 572-585).—Analyses of samples of (a) Spiritus saponato-camphoratus, (b) Spiritus saponatus, and (c) Spiritus saponis kalini, show that, although these conform to the D.A.B. VI requirements and have been produced by official methods, they may exhibit considerable variations in their content of alcohol, free alkali, unsaponified oil, and fatty acid, according as an olive oil or a linseed oil soap has been employed. The following additional standards are proposed for these preparations: d^{20} : (a) 0.912-920; (c) 0.930-940; minimum fatty acid content: (a) 6.5%, (b) 9.3%, (c) 19.5%; iodine value of fatty acids: (a) and (b) 93-104, (c) 190-210; reaction: (a) and (b) neutral to phenolphthalein, (c) neutral after addition of 1 c.c. of 0.1N-hydrochloric acid; minimum spirit content: (c) $42 \cdot 4\%$; minimum alcohol value: (c) $5 \cdot 7$. Methods for the determination of these values are H. E. F. NOTTON. described.

Assay of stramonium leaves and tincture of stramonium. C. M. CAINES (Quart. J. Pharm., 1930, 3, 342-348).-The following method (which avoids the emulsification occurring in the B.P. process) is recommended. Stramonium leaves (10 g.) in No. 60 powder, after moistening first with ether-chloroform mixture and then with dilute ammonia, are percolated with 4:1 ether-chloroform to remove total alkaloids. The percolate is concentrated and transferred to a separator. together with chloroform washings; 90% alcohol is added and the mixture extracted with 0.2N-sulphuric acid until the alkaloids are removed. The combined acid extracts are washed with chloroform, basified with ammonia, and alkaloids are extracted with successive quantities of chloroform. The chloroform extracts after washing with water are evaporated, and the residue is dissolved successively in ether and absolute alcohol, the solvent being evaporated each time. The residue, dried for 30 min. at 100°, is dissolved in absolute alcohol, 0.02N-sulphuric acid added, and excess of acid titrated against methyl-red with 0.02N-sodium hydroxide (1 c.c. of 0.02N-acid $\equiv 0.005785$ g. of alkaloids as hyoscyamine). A similar method is used for the assay of the tincture as for the percolate above. After shaking, the chloroform is separated and the extraction repeated with two lots of chloroform (10 c.c. each); alcohol (15 c.c. of 90%) is added to the combined chloroform extracts, which are then treated with 0.2Nsulphuric acid and the determination completed as described above. R. CHILD.

Determination of moisture in tobacco by the Steich-hygrometer. N. M. MILOSLAVSKI and A. I. PALANT (Ukraine Chem. J., 1930, 5, 117–125).—The Steich-hygrometer, for the determination of moisture in stored goods, consists of a hair-hygrometer through which air is drawn, relative humidity being read from the scale. Results given by it do not agree with those obtained analytically. There is no simple relationship between moisture content of tobacco and the R.H. of air. The moisture content depends on the biological state, absorptive capacity, and chemical constitution of the leaf. The hygrometer is therefore inapplicable in the case of tobacco. E. B. UVAROV.

[Tobacco-]smoking, nicotine limits, and the determination of nicotine by Pfyl and Schmitt's method. F. BOLM (Z. Unters. Lebensm., 1930, 59, 602-606).—Apart from minor modifications the method of Pfyl and Schmitt (cf. B., 1927, 955) has been found entirely satisfactory and the observations on the influence of rate, intermittency, etc. of the smoking on the nicotine content of the smoke have been confirmed. The results of analysis of so-called "nicotine-free" tobacco and cigarettes are given, both as regards the total nicotine and the amount evolved in the smoke. None of the treatments was found to fix the nicotine in the tobacco and give a nicotine-free smoke, and hence determination of total nicotine in the tobacco is alone sufficient in judging the tobacco. H. J. DOWDEN.

Potentiometric assay of cinchona. J. C.KRANTZ, JUN. (J. Amer. Pharm. Assoc., 1930, 19, 1299—1303).— A potentiometric method for the evaluation of cinchona alkaloid residues is described. Either the quinhydrone or the hydrogen electrode may be used and the shakingout process is unnecessary. E. H. SHARPLES.

Mandelin's test for strychnine. C. F. POE and D. W. O'DAY (J. Amer. Pharm. Assoc., 1930, 19, 1292– 1299).—About 500 organic compounds have been tested with Mandelin's reagent (ammonium vanadate-sulphuric acid) under varying conditions. A number give colour reactions similar to strychnine, but very few completely mask the test when present in small amounts. None of the aliphatic compounds tested gave the reaction, but no special group seems to be responsible for the test, and the reaction should be checked by other characteristics. E. H. SHARPLES.

Determination of alkaloid in Extractum belladonnæ siccum cum rad. liquirit. paratum 1 + 1. G. BÜMMING (Arch. Pharm., 1930, 268, 590—592).— Application of the D.A.B. VI and B.P. 1914 methods for determining the alkaloid in Extractum belladonnæ to dry extracts containing liquorice powder or extract gives consistently low results, although a mixture of atropine and lactose gives a correct result. Commercial samples which give correct results must therefore be assumed to contain an excess of alkaloid.

H. E. F. NOTTON.

Transmission spectra of vanilla extracts. E. H. HARVEY (Amer. J. Pharm., 1930, 102, 659—661).—The visual transmission spectra of extracts of vanilla beans from different sources and of the adulterants, caramel and prune juice, have been measured. All show general absorption of varying intensity in the violet and green regions, the differences being insufficient to allow the source of the bean to be distinguished.

H. E. F. NOTTON.

Vanilla sugar. J. J. J. DINGEMANS (Chem. Weekblad, 1930, 27, 694).—None of the usual colour reactions for vanillin serves to differentiate between this substance and "vanirom" (protocatechualdehyde ethyl ether). If to the solution in hot water of the residue from the ether extract of 10 g. of vanilla sugar a solution of hydrazine sulphate, followed by 4N-hydrochloric acid, be added, "vanirom" yields a citron-yellow precipitate, whereas vanillin yields an orange-red precipitate. The two compounds may be readily distinguished even at high dilutions. H. F. GILLBE. Evaluation of chlorophyll and chlorophyll preparations. U. DREHMANN (Arch. Pharm., 1930, 268, 585—589).—Chlorophyllin and commercial samples of chlorophyll containing copper do not show the red fluorescence spectrum excited by ultra-violet light in solutions of pure chlorophyll. Examination of the absorption and fluorescence spectra of extracts shows that among nineteen pharmaceutical preparations stated to contain chlorophyll, only three contain it in notable quantity. H. E. F. NOTTON.

Emulsification. I. Examination and analysis of pharmaceutical emulsions. II. Manufacture of pharmaceutical emulsions. III. A factor inhibiting the emulsification of cod-liver oil. E. L. SMITH (Quart. J. Pharm., 1930, **3**, 354—361, 362—372, 373—374).—I. [With G. N. GRINLING.] The most satisfactory criterion of the degree of subdivision of the disperse phase of an emulsion is considered to be the number of globules into which 1 c.c. of the oil is subdivided; a convenient method is described, employing the Thoma hæmocytometer, by which this may be measured. Simple analytical methods are given by means of which the nature and amount of the oil and emulsification agents may be determined.

II. [With (MISS) V. HAZLEY.] Gum acacia is preferred as an emulsifying agent for edible emulsions, with gum tragacanth as thickener. Factors influencing the "creaming" of emulsions are discussed, and the methods of combating this are considered; details are given for the large-scale preparations of a typical emulsion, based on the foregoing results.

III. The oxidation or "drying" of cod-liver oil produces a substance capable of stabilising water-in-oil emulsions and of inverting or reducing the stability of oil-in-water emulsions. The suitability of a cod-liver oil for the preparation of emulsions may be estimated by measurement of the interfacial tension between the oil and water by the drop-pipette method. R. CHILD.

Diatomite, its analysis and use in pharmacy. N. I. HENDEY (Quart. J. Pharm., 1930, **3**, 390-407).— It is suggested that fossil deposits of diatomaceous character be termed "diatomite" or "diatomaceous earth," and that local names (kieselguhr, tripolite, etc.) be avoided. Methods are given for the chemical, physical (colour, moisture, grit determination, porosity, and apparent d), and microscopical examination of the product, and recommendations are made of the types of diatomite (as classified by such examination) best adapted for certain purposes. R. CHILD.

Extraction of odoriferous substances from flowers. I. V. VINOGRADOVA (Trans. Sci. Chem.-Pharm. Inst., Moscow, 1930, No. 22, 130—139).—Light petroleum, b.p. 60—70°, is preferred, and prolonged extraction is avoided. The odour is influenced by the hour of collection of the flowers. CHEMICAL ABSTRACTS.

Testing ether for aldehyde. GREEN and SCHOETzow.—See III. Arsenic in barium and bismuth salts. GREEN and SCHOETZOW. Arsenious iodide. HUSA.—See VII.

PATENTS.

Manufacture of physiologically active hormone preparations. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 339,943, 10.9.29).—The activity of thymus gland preparations is measured by observing the occurrence or failure of rutting phenomena on administering the extract to immature female animals; *e.g.*, a given extract in Ringer's fluid may be injected and from the result the extract can be adjusted to any desired activity (rat units/c.c.) by dilution or concentration *in vacuo*. E. H. SHARPLES.

Treatment of physiological or pathological liquids containing albumin, or of used bandages etc. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 337,473, 1.5.29. Cf. B.P. 334,876; B., 1930, 1167).—The condensation products (diarylmethanes, diaralkylbenzenes, etc.) from aldehydes or ketones and chlorinated or brominated phenols or cresols are added to the liquids or to the material (except wool) to prevent attack by bacteria, moulds, etc. C. HOLLINS.

Preparation of thiosemicarbazones of hydroxyarsenobenzenes. K. STREITWOLF and A. FEHRLE, Assrs. to WINTHROP CHEM. Co., INC. (U.S.P. 1,785,660, 16.12.30. Appl., 11.7.28. Ger., 21.7.27).—See B.P. 294,263; B., 1929, 339.

Generation of chlorine (U.S.P. 1,767,676).—See VII.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Determination of so-called primary silver in photographic gels. H. H. SCHMIDT and F. PRETSCHNER (Z. wiss. Phot., 1930, 28, 293—297).—The amounts of free silver present in unwashed and washed shredded silver chloride emulsions fixed in sodium thiosulphate or sodium sulphite solution have been determined gravimetrically. Contrary to the results of Weigert and Lühr (B., 1930, 303), the silver values were the same as_in blank determinations (gelatin shreds washed in used fixing solution) within experimental error. The very small amounts of free silver found are due to hydrolysis of silver halide (or complex formed in the fixing solution) during washing (cf. following abstracts).

J. LEWKOWITSCH.

Silver values and fixing processes. II. H. H. SCHMIDT and F. PRETSCHNER (Z. wiss. Phot., 1930, 28, 297-302).-Sodium thiosulphate solution cannot be used as a fixer in the determination of free silver in emulsions, since it dissolves appreciable amounts of colloidal silver. Sodium sulphite, the solvent power of which is negligible, forms a satis actory fixer. Gravimetric determinations of the free silver in unfixed "synthetic" emulsions gave values of 0 and 0.0684 g. (per 50 g. of dry material) for unwashed and washed emulsions, respectively. Values of 0.0012 g. (a) and 0.0010 g. (b) were found for the corresponding fixed emulsions. The value (a) must be due to silver derived from the used fixing solution. Since the silver value (b) is smaller than that of the unfixed washed emulsion, some of the silver in the latter must have been present as silver oxide and dissolved by the sodium sulphite. The residual silver in the fixed emulsion is probably present as sulphide. (Cf. preceding and follow ng abstracts.)

J. LEWKOWITSCH.

Origin and chemical nature of silver values [free silver in emulsion]. II. H. H. SCHMIDT and F. PRETSCHNER (Z. wiss. Phot., 1930, 28, 302-311).— Washed and unwashed synthetic silver chloride emulsions were centrifuged and the fractions analysed gravimetrically. The results confirm previous conclusions (cf. preceding abstracts) that free silver is not present in unwashed emulsions, but is formed during the washing process by hydrolysis of silver halides; owing to differential diffusion of the ions in gelatin (comparable with their mobilities in water) halogen is lost; the silver is converted into oxide which forms a gelatin complex sparingly soluble in water but soluble in sodium sulphite solution. Passing from chloride to bromide and iodide emulsions, the apparent silver value decreases, as is to be expected from a consideration of the relative solubilities of the halides. J. LEWKOWITSCH.

Ripening processes in silver bromide-gelatin emulsions, "primary silver," and lysidine as sensitiser. J.M.EDER (Z. wiss. Phot., Schaum-Festschr., 1930, 29, 20-22).-Early theories suggesting the formation of primary or reduction silver nuclei during the ripening process receive support from recent analytical investigations on photographic emulsions. Lysidine added to a washed and melted emulsion causes a definite increase in sensitivity as shown by a lowering of the threshold value and an increase in gamma. The optimum quantity must be determined for each emulsion, and varies between 0.02% and 0.05% of the weight of emulsion. The sensitising effect is most marked with under-ripened emulsions and is almost negligible with those fully ripened by the ammonia process. The formation of silver bromide-lysidine complexes may play a part in the sensitisation.

J. W. GLASSETT.

Amyl acetate in sensitometry. K. KIESER (Z. wiss. Phot., Schaum-Festschr., 1930, 29, 87-90).-Commercial amyl acetate was fractionated and the suitability of the various fractions for sensitometric purposes was tested in a Hefner lamp, using a sample of amyl acetate recommended for this purpose as a standard of comparison. The fractions obtained at 120-133° and 138-144° gave a photographic intensity equal to that of the standard, whilst the 133-138° fraction gave a slightly higher value. For ordinary work the 120-145° fraction may be used. Measurements of the refractive index of each fraction indicated that this property could be used as a criterion of suitability for sensitometric work. The value at 15° should be $1 \cdot 4000 - 1 \cdot 4050.$ J. W. GLASSETT.

Early uses of light filters in practical photography. E. STENGER (Z. wiss. Phot., Schaum-Festschr., 1930, 29, 43-46).—Historical. J. W. GLASSETT.

PATENT.

Pretreatment of metal plates for production of [photozincograph] printing plates. F. ULLMANN (U.S.P. 1,785,606, 16.12.30. Appl., 7.3.27. Ger., 10.3.26). —See B.P. 288,023; B., 1928, 503.

XXII.—EXPLOSIVES; MATCHES.

Black powder. K. A. HOFMANN (Sitzungsber. preuss. Akad. Wiss., Berlin, 1930, 25, 432—436).—The ignition of mixtures of sulphur, charcoal, and saltpetre at 290—300°, as compared with 320° for charcoalsaltpetre, and 470° for sulphur-saltpetre mixtures, is due to formation at 150° of hydrogen sulphide. This gas decomposes the saltpetre at 285—290° to form sul-

phate and give a rise in temperature, so that the saltpetre fuses, and in this condition reacts with the charcoal and the melted sulphur. Ignition by sparks runs parallel with ignition by external heating. Under the fall-hammer, mixtures of sulphur, charcoal, and saltpetre are less sensitive than sulphur-saltpetre mixtures, the former igniting at 70-85 cm. and the latter at 45-50 cm., whilst charcoal-saltpetre mixtures are insensitive. Incorporation of graphite with the mixtures lowers their sensitiveness to shock, but superficial coating has no effect, the inference being that ignition is caused by electrically-produced sparks from friction of sulphur particles and crystals of saltpetre. Sulphur increases the amount of the explosion gases, but in absence of sulphur more carbon monoxide is formed. Mixtures containing charcoal give rise to hydrocyanic acid; to prevent this, powder used in mines should contain not less than 10% of sulphur. As regards the relative advantages of brown and black charcoal, it is found that with the former larger amounts of water vapours are developed, thus increasing the gas volume and lowering the temperature.

W. J. WRIGHT.

Instability of colloidal powders. H. MURAOUR (Bull. Soc. chim., 1930, [iv], 47, 1259—1264).—Experiments are described in support of the view that the instability of nitric esters is due to hydrolysis, catalytically accelerated by free nitric acid, derived from incomplete washing of the initial product or through the presence of a trace of an unstable nitric ester. Further confirmation of this view is drawn from a consideration of the results of Marqueyrol (B., 1929, 873) on the thermal decomposition of nitric esters. This is regarded as due to hydrolysis in addition to the normal thermal effect. J. R. I. HEPBURN.

Detonation of solid explosives. P. LAFFITTE and M. PATRY (Compt. rend., 1930, 191, 1335-1337). The author's method (A., 1924, ii, 472, 623) has been extended to the determination of explosion velocity by measurement of the angle produced by the front of a compression wave propagated in an explosion tube illuminated by a powerful arc lamp, in such a way as to render visible the change in refractive index. In the case of dynamite or mercury fulminate detonated m a glass tube 15 mm. in diam., a partial or complete opacity of the glass was observed (7000 m./sec.). In the air of the tube a non-luminous wave of compression or shock and a luminous column of gas are propagated simultaneously, at the same initial speed (about 7000 m./ sec.), the latter, however, weakening more rapidly so that after 60 cm. the speeds are 2300 and 1750 m./sec., J. GRANT. respectively.

Testing of detonators. A. HAID and H. KOENEN (Z. ges. Schiess- u. Sprengstoffw., 1930, 25, 393-398, 433-439, 463-468).—In applying the Esop test, the authors used charges of compressed trinitrotoluene phlegmatised with talcum. Detonators loaded with various compositions were tested with these charges on lead plates, $10 \times 10 \times 3$ cm., in lead blocks, and in Kast's brisance apparatus, the detonators alone being also tested on 7-mm. lead plates. The results are tabulated. It was found that the initiating effect of detonators could be determined by any of the methods

described, and that it depends on the brisance. The percentages of talcum with which, on lead plates, the critical point was reached were 65, 50, and 25 for tetryl, trinitrotoluene, and fulminate detonators, respectively. Methods of measuring the dimensions of detonators, removing the composition, and determining the effects of wet and dry storage are briefly described.

W. J. WRIGHT.

High brisance [of explosives] in relation to blasting efficiency and chemical constitution. II. Mannitol hexanitrate and pentaerythritol tetranitrate, A. STETTBACHER (Z. ges. Schiess- u. Sprengstoffw., 1930, 25, 461—462).—The brisance, determined in iron-plate tests, of pentaerythritol tetranitrate ("Penthrite") mixtures is superior to that of mixtures containing mannitol hexanitrate ("Nitromannite"). This superiority is ascribed to the central carbon linking of the former, as compared with the open-chain constitution of the latter, this theory being confirmed by the high brisance of tetranitromethane-trinitrotoluene mixtures. W. J. WRIGHT.

Nitrocellulose. BECK and others .- See V.

PATENTS.

Blasting cartridges. D. HODGE (B.P. 339,983, 14.9.29).—In blasting cartridges, in which gaseous carbon dioxide is generated by means of a heating element, solid, instead of liquid, carbon dioxide is employed, and the release of the gas is effected by means of a valve instead of a rupturable disc. W. J. WRIGHT.

Electric blasting fuses and detonators. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 340,041, 24.9.29).—A non-inflammable sealing composition for electric detonators consists of chloronaphthalene (45— 60% Cl) mixed with about 26% of sulphur, a noninflammable substance (e.g., kieselguhr or talcum), which does not react with sulphur, being added if desired. W. J. WRIGHT.

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XXIII.—SANITATION; WATER PURIFICATION. Germicidal efficiency of soaps and of mixtures of soaps with sodium hydroxide or with phenols. J. M. SCHAFFER and F. W. TILLEY (J. Agric. Res., 1930, 41, 737-747).-The bactericidal efficiencies of neutral soaps prepared from coconut oil, linseed oil, and castor oil were examined. Addition of sodium hydroxide increased the efficiency of coconut oil soaps in most cases. The toxicity of sodium laurate to Pasteurella avicida was decreased by the presence of excess of soda, but increased by excess of lauric acid. The bactericidal effect of phenol was increased by admixture with 50% of linseed, castor, or coconut soaps in the absence of other organic matter, but in the presence of milk or blood-serum differences were small. Germicidal soaps containing cresol or o-hydroxydiphenyl were efficient against Staph. aureus even where organic matter was present. A. G. POLLARD.

The "Elmocid" treatment; a new method in disinfection technique. F. STOCKHAUSEN (Woch. Brau., 1930, 47, 533-538, 545-549, 561-565, 575-579).—The antiseptic action of solutions of inorganic bases and acids is first increased, then decreased, by the addition of successive amounts of salts of the alkali metals. Based on this fact, disinfecting solutions marketed by the Elektro-Osmose A.-G. under the names of "Elmocid-alkalisch" and "Elmocid-sauer," consisting, respectively, of equimolecular proportions of sodium hydroxide and chloride, and of nitric acid and potassium nitrate, to be used at 0.1N-concentration, have been examined regarding their suitability for brewery practice. The alkaline preparation is for general use, the acid-for aluminium and lacquered vessels. Laboratory and technical experiments show that they have a satisfactory cleansing action and antiseptic power. F. E. DAY.

Water softening and purification methods. J. A. McGARIGLE (J. Amer. Water Works' Assoc., 1930, 22, 1609-1624).-The improved floc obtained by the use of mechanical agitators during the coagulation process enables the size of the settling basin to be reduced. The addition of clay prior to flocculation is often of value in facilitating colour removal. The advantages of the zeolite softening process in obtaining water suitable for use in modern high-pressure boilers are emphasised. The cost of this treatment is quoted at 5 cents per thousand gals. as against 55 cents for evaporators, and since calcium salts are absent it requires a smaller addition of phosphate to prevent corrosion fatigue than water softened by the hot lime-soda process. With the latter process the correction of the sulphate-carbonate ratio is apt to result in the formation of a hard calcium sulphate scale with consequent local overheating. C. JEPSON.

Purification of highly turbid waters. J. D. FLEMING (J. Amer. Water Works' Assoc., 1930, 22, 1559-1576).-The usual methods adopted in dealing with highly turbid waters, e.g., those of the rivers Mississippi and Missouri, are described and compared with those in use at the 50,000,000-gal./day plant at St. Louis. When the raw water contains upwards of 1200 p.p.m.of suspended solids, presedimentation in specially designed tanks is recommended, as the reduced variation in turbidity will enable economies to be made in the use of chemicals. Presedimentation may be assisted by the introduction of sludge from the coagulation basins, and the control of the conditions promoting satisfactory coagulation is rendered more flexible by the use of variable-speed mechanical agitators. C. JEPSON.

Comparison of the Dominick-Lauter presumptive test with "Standard Methods" test for *B.* coli in water. H. W. LEAHY (J. Amer. Water Works' Assoc., 1930, 22, 1490—1494).—Three hundred samples of water from 91 different sources were tested by these two methods. It is shown that the same number of positive results could be obtained by either method, but the percentage confirmation was much higher with the Dominick-Lauter medium (cf. B., 1929, 836) than with standard lactose broth, as of the total samples showing a positive presumptive test 100% were confirmed for the new test and only 26.9% for the standard method. C. JEPSON.

Chemical and mechanical utilisation of activated carbon in water purification. A. S. BEHRMAN and H. B. CRANE (J. Amer. Water Works' Assoc., 1930, 22, 1399—1413).—Experience with many plants of all sizes suggests that the most economical function of activated carbon is in the removal of colour, odours, and tastes, *e.g.*, excess of chlorine, from previously clarified and

filtered water, and particularly as a safeguard in small plants where adequate supervision is not always available. The material recommended is Hydrodarco, obtained from certain Texas lignites and containing 70% of pure carbon. Its density renders it suitable for use in upward-flow filters operating at rates up to 15 gals./sq. ft./min. Designs of plants utilising activated carbon or water treatment are described and discussed. C. JEPSON.

Activated carbon for removal of taste and odour [from river water]. G. D. NORCOM and R. I. DODD (J. Amer. Water Works' Assoc., 1930, 22, 1414-1437) .--Small-scale experiments on Delaware River water show that from a raw water containing a wide variety of polluting materials, a drinking water can be obtained free at all times from appreciable odour or taste. The filters used were constructed from 4-in. diam. glass tubes and 8-in. diam. cast-iron pipes, and three types of activated carbon (Darco, Nuchar, and Minchar) were tested. When dealing with previously coagulated and filtered water Darco proved to be the most efficient and Minchar the least, although the latter, being the harder, would be the most suitable for use in place of filter sand. Odour is best removed by downwardflow units, but when possible the upward-flow method is preferred because of the decreased loss of head in operating and the tendency of the material to be selfcleansing. A rate of 2 gals./sq. ft./min. is recommended, and an effective life of about a year may be expected under conditions similar to those in the experiment. By passing steam through beds of Darco or Nuchar so as to maintain boiling heat for $\frac{1}{2}$ hr. much of the substances previously absorbed by the carbon will be removed, but it is considered that revivification may be incomplete and the material may eventually need replacement. C. JEPSON.

Use of activated carbon in removing objectionable taste and odours from water. J. R. BAYLIS (J. Amer. Water Works' Assoc., 1930, 22, 1438-1461). -A continuation of earlier work (cf. B., 1929, 624). An experimental carbon adsorption unit with a Hydrodarco carbon bed 24 in. thick and 10 ft.² in area continues to remove successfully over 1 p.p.m. of chlorine from filtered water at a rate of 2 gals./ft.2/min. after 17 months' operation. The water is applied in an upward direction and the bed has been washed twice in a similar manner to that used for rapid sand filters. Experiments carried out in glass tubes 15 in. diam. indicate that (a) deep beds are more efficient than shallow ones; (b) the maximum rate of upward flow for 4-12-mesh Hydrodarco is about 4 gals./ft.2/min.; (c) the lower the rate of application, the larger is the volume of water dealt with per lb. of material; and (d)1 lb. of Hydrodarco will reduce the residual chlorine in 30,000 gals. of water from 1.0 to less than 0.1 p.p.m. when operating at the 2 gals./min. rate without revivification, or 200,000-500,000 gals. if revivified when necessary. C. JEPSON.

Determination of silicic acid in water. W. STEFFENS (Chem. Ztg., 1930, 54, 996-997).-The addition of ammonium molybdate to the acidified water yields a solution of silicomolybdate the yellow colour of which is compared with that of a standard solution

of either potassium chromate or of picric acid; the latter is considered to give a colour which permits the more accurate matching. A solution containing 50 mg. of silicic acid per litre is equivalent to $25 \cdot 6$ mg. per litre of picric acid dried in vacuo. C. RANKEN.

Dust filters. Albrecht.—See I.

PATENTS.

Innocuous destruction of pests and germs. T. GOLDSCHMIDT A.-G. (B.P. 318,898, 11.9.29. Ger., 11.9.28).-The inflammability of ethylene oxide or similar alkylene oxides used for this purpose may be reduced by dilution with inert substances, e.g., carbon dioxide or nitrogen, which are gases under normal temperature and pressure. Thus a solution of 1 pt. of ethylene oxide in 20 pts. of liquid carbon dioxide, contained under pressure in a cylinder, is claimed. C. JEPSON. [Stat. ref.]

Indicator of atmospheric pollution by illuminating and similar gases. F. FREITAG (B.P. 340,195, 22.4.30. Ger., 24.4.29) .- A contact layer of platinised asbestos is placed inside a U-shaped bow of two superposed metals of different coefficients of expansion. One end of the bow is fixed; the other, when stretched, e.g., by heat, makes contact in an electric circuit containing an alarm device. The heat produced by the oxidation of small quantities of coal gas, carbon monoxide, etc. in the presence of this layer is sufficient to give the warning signal. Greater sensitivity is attained if the catalyst be heated to 70°, by inserting it between the bow and a similar shaped silundum heating element directly connected to the electrical mains.

C. JEPSON.

Softening of water [by base exchange]. A. ROSEN-HEIM (B.P. 314,067, 11.6.29. Ger., 23.6.28).—The de-solution of silicic acid from artificial base exchangers prepared from silicic acid sols (cf. B.P. 286,307; B., 1929, 962) may be prevented and the removal of silicic acid from water accomplished by increasing the proportion of the metal oxide present. The ordinary watersoftening powers of the base exchanger when exhausted may be regenerated in the usual way, but the regeneration of the silicic acid-removing powers requires treatment with silicic acid-dissolving agents, e.g., aqueous solutions of alkalis, hot water, etc., under pressure, it C. JEPSON. necessary.

Carbonation [of water etc.]. P. W. SHIELDS (U.S.P. 1,768,158, 24.6.30. Appl., 20.10.23).—The water 18 sprayed into a vacuum chamber, whereby the dissolved air is removed, and is then pumped through a type of Venturi valve where a stream of carbon dioxide under pressure is introduced at the point at which the water is under maximum pressure. The reduction of pressure of the gas cools the water and thus aids absorption. The carbonated water passes to an agitation chamber, where the gas is stirred into the water by means of rotating paddles and finally the saturated water is drawn into reservoirs. A. R. POWELL.

Charcoal for dechlorinating water (B.P. 316,269). -See II. Acid waste liquors (U.S.P. 1,765,424). Silicious materials (U.S.P. 1,755,496). Base-exchange material (U.S.P. 1,766,350). Generation of chlorine (U.S.P. 1,767,676).-See VII.